QGIS User Guide

Выпуск 2.6

QGIS Project

22 May 2015

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Глава 1

Преамбула

This document is the original user guide of the described software QGIS. The software and hardware described in this document are in most cases registered trademarks and are therefore subject to legal requirements. QGIS is subject to the GNU General Public License. Find more information on the QGIS homepage, http://www.qgis.org.

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This document has been typeset with reStructuredText. It is available as reST source code via github and online as HTML and PDF via http://www.qgis.org/en/docs/. Translated versions of this document can be downloaded in several formats via the documentation area of the QGIS project as well. For more information about contributing to this document and about translating it, please visit http://www.qgis.org/wiki/.

Ссылки в этом документе

Этот документ содержит внутренние и внешние ссылки. При нажатии на внутреннюю ссылку перемещение происходит внутри документа, в то время как при нажатии на внешнюю ссылку — открывается адрес в сети Интернет. В документе, представленном в формате PDF, внутренние и внешние ссылки показаны синим цветом, при этом внешние ссылки обрабатываются интернет-браузером, назначенным в системе по умолчанию. В документе, представленном в формате HTML, интернет-браузер отображает и обрабатывает внутренние и внешние ссылки одинаково.

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Лицензия этого документа

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Элементы

This section describes the uniform styles that will be used throughout this manual.

2.1 Элементы интерфейса пользователя

The GUI convention styles are intended to mimic the appearance of the GUI. In general, a style will reflect the non-hover appearance, so a user can visually scan the GUI to find something that looks like the instruction in the manual.

- Пункты меню: *Слой* → *Добавить растровый слой* или *Вид* → *Панели инструментов* → *Оцифровка*
- Инструмент: Добавить растровый слой
- Кнопка : **[По умолчанию]**
- Заголовок диалогового окна: *Свойства слоя*
- Вкладка: *Общие*
- Флажок: *Отрисовка*
- Radio Button: *Postgis SRID* *EPSG ID*
- Select a number: 1,00
- Select a string: ...
- Browse for a file: ...
- Select a color: Border
- Ползунок:
- Ввод текста: Display name lakes.shp

Затенение указывает на интерактивный компонент графического интерфейса.

2.2 Текстовые элементы или клавиатурные сокращения

This manual also includes styles related to text, keyboard commands and coding to indicate different entities, such as classes or methods. These styles do not correspond to the actual appearance of any text or coding within QGIS.

- Гиперссылки: http://qgis.org

- Keystroke Combinations: Press `Ctrl+B`, meaning press and hold the Ctrl key and then press the B key.
- Название файла: `lakes.shp`
- Название класса: **NewLayer**
- Метод: *classFactory*
- Имя сервера: *myhost.de*
- Текст, вводимый пользователем: `qgis --help`

Lines of code are indicated by a fixed-width font:

```
PROJCS["NAD_1927_Albers",
  GEOGCS["GCS_North_American_1927",
```

2.3 Инструкции, специфичные для конкретных платформ

GUI sequences and small amounts of text may be formatted inline: Click *File* *QGIS → Quit to close QGIS*. This indicates that on Linux, Unix and Windows platforms, you should click the File menu first, then Quit, while on Macintosh OS X platforms, you should click the QGIS menu first, then Quit.

Larger amounts of text may be formatted as a list:

- Do this
- Do that
- Do something else

or as paragraphs:

Do this and this and this. Then do this and this and this, and this and this and this, and this and this and this.

Do that. Then do that and that and that, and that and that and that, and that and that and that, and that and that and that, and that and that and that.

Снимки экрана, которые встречаются в руководстве пользователя, были созданы на разных платформах; платформа обозначается специальной иконкой в конце подписи к рисунку.

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Глава 3

Предисловие

Добро пожаловать в удивительный мир географических информационных систем (ГИС)!

QGIS is an Open Source Geographic Information System. The project was born in May of 2002 and was established as a project on SourceForge in June of the same year. We've worked hard to make GIS software (which is traditionally expensive proprietary software) a viable prospect for anyone with basic access to a personal computer. QGIS currently runs on most Unix platforms, Windows, and OS X. QGIS is developed using the Qt toolkit (http://qt.digia.com) and C++. This means that QGIS feels snappy and has a pleasing, easy-to-use graphical user interface (GUI).

QGIS aims to be a user-friendly GIS, providing common functions and features. The initial goal of the project was to provide a GIS data viewer. QGIS has reached the point in its evolution where it is being used by many for their daily GIS data-viewing needs. QGIS supports a number of raster and vector data formats, with new format support easily added using the plugin architecture.

QGIS выпускается на условиях лицензии GNU General Public License (GPL). Разработка QGIS под этой лицензией означает, что вы можете просмотреть и изменить исходный код, и гарантирует, что вы, наш счастливый пользователь, всегда будете иметь доступ к программному обуспечению ГИС, которое является бесплатным и может свободно адаптироваться. Вы должны были получить полную копию лицензии с вашей копией QGIS, лицензию также можете найти в Приложении *GNU General Public License*.

Совет: Актуальная версия документации

The latest version of this document can always be found in the documentation area of the QGIS website at http://www.qgis.org/en/docs/.

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Возможности

QGIS offers many common GIS functionalities provided by core features and plugins. A short summary of six general categories of features and plugins is presented below, followed by first insights into the integrated Python console.

4.1 Просмотр данных

Можно просматривать и накладывать друг на друга векторные и растровые данные в различных форматах и проекциях без преобразования во внутренний или общий формат. Поддерживаются следующие основные форматы:

- Spatially-enabled tables and views using PostGIS, SpatiaLite and MS SQL Spatial, Oracle Spatial, vector formats supported by the installed OGR library, including ESRI shapefiles, MapInfo, SDTS, GML and many more. See section *Работа с векторными данными*.
- Raster and imagery formats supported by the installed GDAL (Geospatial Data Abstraction Library) library, such as GeoTIFF, ERDAS IMG, ArcInfo ASCII GRID, JPEG, PNG and many more. See section *Работа с растровыми данными*.
- GRASS raster and vector data from GRASS databases (location/mapset). See section *Интеграция с GRASS GIS*.
- Online spatial data served as OGC Web Services, including WMS, WMTS, WCS, WFS, and WFS-T. See section *Работа с данными OGC*.

4.2 Исследование данных и создание карт

You can compose maps and interactively explore spatial data with a friendly GUI. The many helpful tools available in the GUI include:

- Обозреватель QGIS
- Перепроецирование «на лету»
- DB Manager
- компоновщик карт
- панель обзора
- пространственные закладки
- инструменты аннотаций
- определение/выборка объектов
- редактирование/просмотр/поиск атрибутов

- Data-defined feature labeling
- Data-defined vector and raster symbology tools
- Atlas map composition with graticule layers
- North arrow scale bar and copyright label for maps
- Support for saving and restoring projects

4.3 Управление данными: создание, редактирование и экспорт

You can create, edit, manage and export vector and raster layers in several formats. QGIS offers the following:

- Digitizing tools for OGR-supported formats and GRASS vector layers
- Ability to create and edit shapefiles and GRASS vector layers
- Georeferencer plugin to geocode images
- GPS tools to import and export GPX format, and convert other GPS formats to GPX or down/upload directly to a GPS unit (On Linux, usb: has been added to list of GPS devices.)
- Support for visualizing and editing OpenStreetMap data
- Ability to create spatial database tables from shapefiles with DB Manager plugin
- улучшенная поддержка пространственных баз данных
- Tools for managing vector attribute tables
- Option to save screenshots as georeferenced images

4.4 Анализ данных

You can perform spatial data analysis on spatial databases and other OGR- supported formats. QGIS currently offers vector analysis, sampling, geoprocessing, geometry and database management tools. You can also use the integrated GRASS tools, which include the complete GRASS functionality of more than 400 modules. (See section *Интеграция с GRASS GIS*.) Or, you can work with the Processing Plugin, which provides a powerful geospatial analysis framework to call native and third-party algorithms from QGIS, such as GDAL, SAGA, GRASS, fTools and more. (See section *Введение*.)

4.5 Публикация карт в сети Интернет

QGIS can be used as a WMS, WMTS, WMS-C or WFS and WFS-T client, and as a WMS, WCS or WFS server. (See section *Работа с данными OGC*.) Additionally, you can publish your data on the Internet using a webserver with UMN MapServer or GeoServer installed.

4.6 Расширение функциональности QGIS с помощью модулей расширения

QGIS can be adapted to your special needs with the extensible plugin architecture and libraries that can be used to create plugins. You can even create new applications with C++ or Python!

4.6.1 Основные модули

Core plugins include:

1. Coordinate Capture (Capture mouse coordinates in different CRSs)
2. DB Manager (Импорт/экспорт, редактирование и просмотр слоёв и таблиц; выполнение SQL-запросов)
3. Diagram Overlay (Place diagrams on vector layers)
4. Dxf2Shp Converter (Convert DXF files to shapefiles)
5. eVIS (Visualize events)
6. fTools (Analyze and manage vector data)
7. Инструменты GDAL (интеграция инструментов GDAL в QGIS)
8. Georeferencer GDAL (Add projection information to rasters using GDAL)
9. GPS Tools (Load and import GPS data)
10. GRASS (Integrate GRASS GIS)
11. Heatmap (Generate raster heatmaps from point data)
12. Interpolation Plugin (Interpolate based on vertices of a vector layer)
13. Offline Editing (Allow offline editing and synchronizing with databases)
14. Oracle Spatial GeoRaster (Доступ к данным Oracle Spatial GeoRaster)
15. Processing (ранее SEXTANTE)
16. Raster Terrain Analysis (Analyze raster-based terrain)
17. Road Graph Plugin (Analyze a shortest-path network)
18. Пространственные запросы
19. SPIT (Import shapefiles to PostgreSQL/PostGIS)
20. SQL Anywhere Plugin (Store vector layers within a SQL Anywhere database)
21. Topology Checker (Find topological errors in vector layers)
22. Zonal Statistics Plugin (Calculate count, sum, and mean of a raster for each polygon of a vector layer)

4.6.2 Внешние модули Python

QGIS offers a growing number of external Python plugins that are provided by the community. These plugins reside in the official Plugins Repository and can be easily installed using the Python Plugin Installer. See Section *The Plugins Dialog*.

4.7 Консоль Python

For scripting, it is possible to take advantage of an integrated Python console, which can be opened from menu: *Plugins* → *Python Console*. The console opens as a non-modal utility window. For interaction with the QGIS environment, there is the `qgis.utils.iface` variable, which is an instance of `QgsInterface`. This interface allows access to the map canvas, menus, toolbars and other parts of the QGIS application.

For further information about working with the Python console and programming QGIS plugins and applications, please refer to http://www.qgis.org/html/en/docs/pyqgis_developer_cookbook/index.html.

4.8 Known Issues

4.8.1 Number of open files limitation

If you are opening a large QGIS project and you are sure that all layers are valid, but some layers are flagged as bad, you are probably faced with this issue. Linux (and other OSs, likewise) has a limit of opened files by process. Resource limits are per-process and inherited. The `ulimit` command, which is a shell built-in, changes the limits only for the current shell process; the new limit will be inherited by any child processes.

You can see all current ulimit info by typing

```
user@host:~$ ulimit -aS
```

You can see the current allowed number of opened files per proccess with the following command on a console

```
user@host:~$ ulimit -Sn
```

To change the limits for an **existing session**, you may be able to use something like

```
user@host:~$ ulimit -Sn #number_of_allowed_open_files
user@host:~$ ulimit -Sn
user@host:~$ qgis
```

To fix it forever

On most Linux systems, resource limits are set on login by the `pam_limits` module according to the settings contained in `/etc/security/limits.conf` or `/etc/security/limits.d/*.conf`. You should be able to edit those files if you have root privilege (also via sudo), but you will need to log in again before any changes take effect.

More info:

http://www.cyberciti.biz/faq/linux-increase-the-maximum-number-of-open-files/
http://linuxaria.com/article/open-files-in-linux?lang=en

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Что нового в QGIS 2.6

This release contains new features and extends the programmatic interface over previous versions. We recommend that you use this version over previous releases.

This release includes hundreds of bug fixes and many new features and enhancements that will be described in this manual. You may also review the visual changelog at http://changelog.linfiniti.com/qgis/version/2.6.0/.

5.1 Application and Project Options

- **Project filename in properties**: You can now see the full path for the QGIS project file in the project properties dialog.

5.2 Data Providers

- **DXF Export tool improvements**:
  - Tree view and attribute selection for layer assigment in dialog
  - support fill polygons/HATCH
  - represent texts as MTEXT instead of TEXT (including font, slant and weight)
  - support for RGB colors when there's no exact color match
  - use AutoCAD 2000 DXF (R15) instead of R12

5.3 Компоновщик карт

- **Update map canvas extent from map composer extent: On the Item** properties of a Map element there are now two extra buttons which allow you to (1) set the Map canvas extent according with the extent of your Map element and (2) view in Map canvas the extent currently set on your Map element.
- **Multiple grid support**: It is now possible to have more than one grid in your Map element. Each grid is fully customizable and can be assigned to a different CRS. This means, for example, you can now have a map layout with both geographic and projected grids.
- **Selective export**: To every item of your map composer layout, under Rendering options, you may exclude that object from map exports.

5.4 QGIS Server

5.5 Символика

5.6 Интерфейс

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Глава 6

Первые шаги

This chapter gives a quick overview of installing QGIS, some sample data from the QGIS web page, and running a first and simple session visualizing raster and vector layers.

6.1 Установка

Installation of QGIS is very simple. Standard installer packages are available for MS Windows and Mac OS X. For many flavors of GNU/Linux, binary packages (rpm and deb) or software repositories are provided to add to your installation manager. Get the latest information on binary packages at the QGIS website at http://download.qgis.org.

6.1.1 Установка из исходного кода

If you need to build QGIS from source, please refer to the installation instructions. They are distributed with the QGIS source code in a file called `INSTALL`. You can also find them online at http://htmlpreview.github.io/?https://raw.github.com/qgis/QGIS/master/doc/INSTALL.html

6.1.2 Установка на внешний носитель

QGIS allows you to define a `--configpath` option that overrides the default path for user configuration (e.g., `~/.qgis2` under Linux) and forces **QSettings** to use this directory, too. This allows you to, for instance, carry a QGIS installation on a flash drive together with all plugins and settings. See section *Вкладка «Система»* for additional information.

6.2 Примеры данных

В данном руководстве приводятся приёмы работы, основанные на демонстрационном наборе данных QGIS.

The Windows installer has an option to download the QGIS sample dataset. If checked, the data will be downloaded to your `My Documents` folder and placed in a folder called `GIS Database`. You may use Windows Explorer to move this folder to any convenient location. If you did not select the checkbox to install the sample dataset during the initial QGIS installation, you may do one of the following:

- Use GIS data that you already have
- Download sample data from http://download.osgeo.org/qgis/data/qgis_sample_data.zip
- Uninstall QGIS and reinstall with the data download option checked (only recommended if the above solutions are unsuccessful)

For GNU/Linux and Mac OS X, there are not yet dataset installation packages available as rpm, deb or dmg. To use the sample dataset, download the file `qgis_sample_data` as a ZIP archive from http://download.osgeo.org/qgis/data/qgis_sample_data.zip and unzip the archive on your system.

The Alaska dataset includes all GIS data that are used for examples and screenshots in the user guide; it also includes a small GRASS database. The projection for the QGIS sample dataset is Alaska Albers Equal Area with units feet. The EPSG code is 2964.

```
PROJCS["Albers Equal Area",
GEOGCS["NAD27",
DATUM["North_American_Datum_1927",
SPHEROID["Clarke 1866",6378206.4,294.978698213898,
AUTHORITY["EPSG","7008"]],
TOWGS84[-3,142,183,0,0,0,0],
AUTHORITY["EPSG","6267"]],
PRIMEM["Greenwich",0,
AUTHORITY["EPSG","8901"]],
UNIT["degree",0.0174532925199433,
AUTHORITY["EPSG","9108"]],
AUTHORITY["EPSG","4267"]],
PROJECTION["Albers_Conic_Equal_Area"],
PARAMETER["standard_parallel_1",55],
PARAMETER["standard_parallel_2",65],
PARAMETER["latitude_of_center",50],
PARAMETER["longitude_of_center",-154],
PARAMETER["false_easting",0],
PARAMETER["false_northing",0],
UNIT["us_survey_feet",0.3048006096012192]]
```

If you intend to use QGIS as a graphical front end for GRASS, you can find a selection of sample locations (e.g., Spearfish or South Dakota) at the official GRASS GIS website, http://grass.osgeo.org/download/sample-data/.

6.3 Пример сеанса работы

Now that you have QGIS installed and a sample dataset available, we would like to demonstrate a short and simple QGIS sample session. We will visualize a raster and a vector layer. We will use the `landcover` raster layer, `qgis_sample_data/raster/landcover.img`, and the `lakes` vector layer, `qgis_sample_data/gml/lakes.gml`.

6.3.1 Запуск QGIS

- Start QGIS by typing "QGIS" at a command prompt, or if using a precompiled binary, by using the Applications menu.
- Запустите QGIS, используя меню Пуск или ярлык на Рабочем столе, или двойным щелчком на файле проекта QGIS.
- Дважды щёлкните на значке QGIS в папке Приложений.

6.3.2 Загрузка пробных слоёв

1. Click on the Load Raster icon.
2. Browse to the folder `qgis_sample_data/raster/`, select the ERDAS IMG file `landcover.img` and click **[Open]**.

3. If the file is not listed, check if the *Files of type* combo box at the bottom of the dialog is set on the right type, in this case "Erdas Imagine Images (*.img, *.IMG)".
4. Now click on the Load Vector icon.
5. *File* should be selected as *Source Type* in the new *Add vector layer* dialog. Now click **[Browse]** to select the vector layer.
6. Browse to the folder `qgis_sample_data/gml/`, select 'Geography Markup Language [GML] [OGR] (.gml,.GML)' from the *Files of type* combo box, then select the GML file `lakes.gml` and click **[Open]**. In the *Add vector layer* dialog, click **[OK]**. The *Coordinate Reference System Selector* dialog opens with *NAD27 / Alaska Alberts* selected, click **[OK]**.
7. Немного увеличьте изображение территории с озерами.
8. Дважды щёлкните на слое `lakes` в панели слоёв, чтобы открыть окно *Свойства слоя*.
9. Click on the *Style* tab and select a blue as fill color.
10. Click on the *Labels* tab and check the *Label this layer with* checkbox to enable labeling. Choose the "NAMES" field as the field containing labels.
11. To improve readability of labels, you can add a white buffer around them by clicking "Buffer" in the list on the left, checking *Draw text buffer* and choosing 3 as buffer size.
12. Click **[Apply]**. Check if the result looks good, and finally click **[OK]**.

You can see how easy it is to visualize raster and vector layers in QGIS. Let's move on to the sections that follow to learn more about the available functionality, features and settings, and how to use them.

6.4 Starting and Stopping QGIS

In section *Пример сеанса работы* you already learned how to start QGIS. We will repeat this here, and you will see that QGIS also provides further command line options.

- Assuming that QGIS is installed in the PATH, you can start QGIS by typing `qgis` at a command prompt or by double clicking on the QGIS application link (or shortcut) on the desktop or in the Applications menu.
- Запустите QGIS, используя меню Пуск или ярлык на Рабочем столе, или двойным щелчком на файле проекта QGIS.
- Double click the icon in your Applications folder. If you need to start QGIS in a shell, run `/path-to-installation-executable/Contents/MacOS/Qgis`.

To stop QGIS, click the menu option *File* *QGIS* → *Quit*, or use the shortcut `Ctrl+Q`.

6.5 Параметры командной строки

QGIS supports a number of options when started from the command line. To get a list of the options, enter `qgis --help` on the command line. The usage statement for QGIS is:

```
qgis --help
QGIS - 2.6.0-Brighton 'Brighton' (exported)
QGIS is a user friendly Open Source Geographic Information System.
Usage: /usr/bin/qgis.bin [OPTION] [FILE]
OPTION:
      [--snapshot filename]   emit snapshot of loaded datasets to given file
      [--width width] width of snapshot to emit
      [--height height]       height of snapshot to emit
```

```
      [--lang language]       use language for interface text
      [--project projectfile] load the given QGIS project
      [--extent xmin,ymin,xmax,ymax]  set initial map extent
      [--nologo]      hide splash screen
      [--noplugins]   don't restore plugins on startup
      [--nocustomization]     don't apply GUI customization
      [--customizationfile]   use the given ini file as GUI customization
      [--optionspath path]    use the given QSettings path
      [--configpath path]     use the given path for all user configuration
      [--code path]   run the given python file on load
      [--defaultui]   start by resetting user ui settings to default
      [--help]                this text

FILE:
  Files specified on the command line can include rasters,
  vectors, and QGIS project files (.qgs):
   1. Rasters - supported formats include GeoTiff, DEM
      and others supported by GDAL
   2. Vectors - supported formats include ESRI Shapefiles
      and others supported by OGR and PostgreSQL layers using
      the PostGIS extension
```

Совет: Пример использования параметров командной строки

You can start QGIS by specifying one or more data files on the command line. For example, assuming you are in the `qgis_sample_data` directory, you could start QGIS with a vector layer and a raster file set to load on startup using the following command: `qgis ./raster/landcover.img ./gml/lakes.gml`

Параметр `--snapshot`

Этот параметр позволяет создавать снимок текущего вида в формате PNG. Данная функция применяется при большом количестве проектов и при необходимости создания снимков имеющихся данных.

Currently, it generates a PNG file with 800x600 pixels. This can be adjusted using the `--width` and `--height` command line arguments. A filename can be added after `--snapshot`.

Параметр `---lang`

Based on your locale, QGIS selects the correct localization. If you would like to change your language, you can specify a language code. For example, `--lang=it` starts QGIS in italian localization. A list of currently supported languages with language code and status is provided at http://hub.qgis.org/wiki/quantum-gis/GUI_Translation_Progress.

Параметр `--project`

Starting QGIS with an existing project file is also possible. Just add the command line option `--project` followed by your project name and QGIS will open with all layers in the given file loaded.

Параметр `--extent`

To start with a specific map extent use this option. You need to add the bounding box of your extent in the following order separated by a comma:

```
--extent xmin,ymin,xmax,ymax
```

Параметр `--nologo`

This command line argument hides the splash screen when you start QGIS.

Параметр `--noplugins`

If you have trouble at start-up with plugins, you can avoid loading them at start-up with this option. They will still be available from the Plugins Manager afterwards.

Command line option `--customizationfile`

Using this command line argument, you can define a GUI customization file, that will be used at startup.

Параметр `--nocustomization`

Using this command line argument, existing GUI customization will not be applied at startup.

Параметр `--optionspath`

You can have multiple configurations and decide which one to use when starting QGIS with this option. See *Параметры* to confirm where the operating system saves the settings files. Presently, there is no way to specify a file to write settings to; therefore, you can create a copy of the original settings file and rename it. The option specifies path to directory with settings. For example, to use /path/to/config/QGIS/QGIS2.ini settings file, use option:

```
--optionspath /path/to/config/
```

Параметр `--configpath`

This option is similar to the one above, but furthermore overrides the default path for user configuration (`~/.qgis2`) and forces **QSettings** to use this directory, too. This allows users to, for instance, carry a QGIS installation on a flash drive together with all plugins and settings.

Command line option `--code`

This option can be used to run a given python file directly after QGIS has started.

For example, when you have a python file named `load_alaska.py` with following content:

```python
from qgis.utils import iface
raster_file = "/home/gisadmin/Documents/qgis_sample_data/raster/landcover.img"
layer_name = "Alaska"
iface.addRasterLayer(raster_file, layer_name)
```

Assuming you are in the directory where the file `load_alaska.py` is located, you can start QGIS, load the raster file `landcover.img` and give the layer the name 'Alaska' using the following command: `qgis --code load_alaska.py`

6.6 Проекты

The state of your QGIS session is considered a project. QGIS works on one project at a time. Settings are considered as being either per-project or as a default for new projects (see section *Параметры*). QGIS can save the state of your workspace into a project file using the menu options *Project* → *Save* or *Project* → *Save As...*.

Load saved projects into a QGIS session using *Project* → *Open...*, *Project* → *New from template* or *Project* → *Open Recent* →.

Если вы хотите очистить сеанс и начать новый, выберите *Проект* → *Создать*. При выборе любого из этих вариантов вам будет предложено сохранить существующий проект, если были внесены изменения с момента его открытия или последнего сохранения.

Информация, сохраненная в файле проекта, включает в себя:

- добавленные слои
- Layer properties, including symbolization
- проекцию окна карты
- последний охват карты

The project file is saved in XML format, so it is possible to edit the file outside QGIS if you know what you are doing. The file format has been updated several times compared with earlier QGIS versions.

Project files from older QGIS versions may not work properly anymore. To be made aware of this, in the *General* tab under *Settings* → *Options* you can select:

- *Запрашивать сохранение изменений в проекте и источниках данных, когда это необходимо*
- *Предупреждать при попытке открытия файлов проекта старых версий QGIS*

Whenever you save a project in QGIS 2.2 now a backup of the project file is made.

6.7 Вывод

There are several ways to generate output from your QGIS session. We have discussed one already in section *Проекты*, saving as a project file. Here is a sampling of other ways to produce output files:

- Menu option *Project* → Save as Image opens a file dialog where you select the name, path and type of image (PNG or JPG format). A world file with extension PNGW or JPGW saved in the same folder georeferences the image.
- Menu option *Project* → *DXF Export …* opens a dialog where you can define the 'Symbology mode', the 'Symbology scale' and vector layers you want to export to DXF.
- Menu option *Project* → *New Print Composer* opens a dialog where you can lay out and print the current map canvas (see section *Компоновщик карты*).

.

Интерфейс QGIS

При первом запуске QGIS пользователь видит окно, показанное ниже (номерами от 1 до 5 выделены пять основных областей, которые рассматриваются далее):

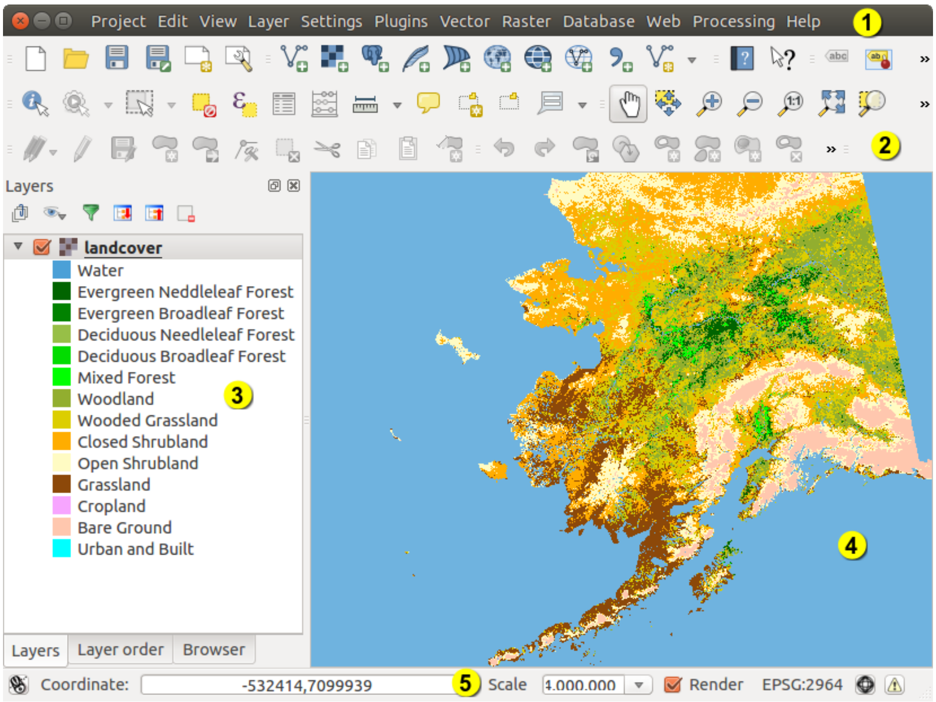

Рис. 7.1: QGIS с загруженным демонстрационным набором данных

Примечание: Внешний вид элементов интерфейса (заголовки окон и т.п.) может отличаться, в зависисмости от операционной системы и менеджера окон.

Интерфейс QGIS разделяется на пять областей:

1. Главное меню
2. Панель инструментов
3. Легенда
4. Область карты
5. Строка состояния

Компоненты интерфейса QGIS, комбинации клавиш и контекстная справка более подробно описаны в следующих разделах.

7.1 Главное меню

Главное меню предоставляет доступ ко всем возможностям QGIS в виде стандартного иерархического меню. Ниже показаны меню верхнего уровня и краткое описание их содержимого, а также значки соответствующих им инструментов по мере их появления на панели инструментов и комбинации клавиш клавиатуры. Комбинации клавиш, описанные в этом разделе, заданы по умолчанию, но их можно изменить, вызвав диалог настройки из меню *Установки* → *Комбинации клавиш*.

Несмотря на то, что большинству пунктов меню соответствует свой инструмент, и наоборот, - меню и панели инструментов организованы по-разному. Панель инструментов, в которой находится инструмент, показана после каждого пункта меню в виде флажка. Дополнительную информацию об инструментах и панелях инструментов можно найти в разделе *Панель инструментов*.

7.1.1 Проект

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Создать	Ctrl+N	см. *Проекты*	*Проект*
Открыть	Ctrl+O	см. *Проекты*	*Проект*
Создать из шаблона →		см. *Проекты*	*Проект*
Недавние проекты →		см. *Проекты*	
Сохранить	Ctrl+S	см. *Проекты*	*Проект*
Сохранить как	Ctrl+Shift+S	см. *Проекты*	*Проект*
Сохранить как изображение...		см. *Вывод*	
Экспорт в DXF...		см. *Вывод*	
Создать макет	Ctrl+P	см. *Компоновщик карты*	*Проект*
Управление макетами...		см. *Компоновщик карты*	*Проект*
Макеты карт →		см. *Компоновщик карты*	
Выход	Ctrl+Q		

7.1.2 Правка

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Отменить	Ctrl+Z	см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Вернуть	Ctrl+Shift+Z	см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Вырезать объекты	Ctrl+X	см. *Редактирование существующего слоя*	*Оцифровка*
Копировать объекты	Ctrl+C	см. *Редактирование существующего слоя*	*Оцифровка*
Вставить объекты	Ctrl+V	см. *Редактирование существующего слоя*	*Оцифровка*
Вставить объекты как →		см. *Работа с таблицей атрибутов*	
Создать точку	Ctrl+.	см. *Редактирование существующего слоя*	*Оцифровка*
Переместить объект		см. *Редактирование существующего слоя*	*Оцифровка*
Удалить выделенное		см. *Редактирование существующего слоя*	*Оцифровка*
Повернуть объект		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Упростить объект		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Добавить кольцо		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Добавить часть		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Заполнить кольцо		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Удалить кольцо		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Удалить часть		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Корректировать объекты		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Offset Curves		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Разбить объекты		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Разбить части		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Объединить выделенные объекты		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Объединить атрибуты выделенных объектов		см. *Дополнительные функции оцифровки*	*Дополнительные функции оцифровки*
Редактирование узлов		см. *Редактирование*	*Оцифровка*

После активации Режима редактирования для слоя, в меню *Правка* появится значок `Добавить объект`, в зависимости от типа слоя (точечный, линейный или полигональный).

7.1.3 Правка (дополнительно)

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Создать точку		см. *Редактирование существующего слоя*	*Оцифровка*
Создать линию		см. *Редактирование существующего слоя*	*Оцифровка*
Создать полигон		см. *Редактирование существующего слоя*	*Оцифровка*

7.1.4 Вид

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Прокрутка карты			*Навигация*
Центрировать выделение			*Навигация*
Увеличить	`Ctrl++`		*Навигация*
Уменьшить	`Ctrl+-`		*Навигация*
Выбрать →		см. *Выбор объектов*	*Атрибуты*
Определить объекты	`Ctrl+Shift+I`		*Атрибуты*
Измерить →		см. *Измерения*	*Атрибуты*
Полный охват	`Ctrl+Shift+F`		*Навигация*
Увеличить до слоя			*Навигация*
Увеличить до выделенного	`Ctrl+J`		*Навигация*
Предыдущий охват			*Навигация*
Следующий охват			*Навигация*
Увеличить до наилучшего масштаба (100%)			*Навигация*
Оформление →		см. *Оформление*	
Всплывающие описания			*Атрибуты*
Новая закладка	`Ctrl+B`	см. *Пространственные закладки*	*Атрибуты*
Показать закладки	`Ctrl+Shift+B`	см. *Пространственные закладки*	*Атрибуты*
Обновить	`Ctrl+R`		*Навигация*

7.1.5 Слой

Продолжае

Таблица 7.1 – продолжение с предыдущей страницы

Пункт меню	Комбинация клавиш	Справка
Пункт меню	Комбинация клавиш	Справка
New →		см *Создание нового векторного слоя*
Встроить слои и группы...		см. *Встраиваемые проекты*
Add Vector Layer	`Ctrl+Shift+V`	see *Работа с векторными данными*
Add Raster Layer	`Ctrl+Shift+R`	see *Загрузка растровых данных в QGI*
Add PostGIS Layer	`Ctrl+Shift+D`	see *Слои PostGIS*
Add SpatiaLite Layer	`Ctrl+Shift+L`	see *Слои SpatiaLite*
Add MSSQL Spatial Layer	`Ctrl+Shift+M`	see *Слои MSSQL Spatial*
Add Oracle GeoRaster Layer		see *Oracle Spatial GeoRaster Plugin*
Add SQL Anywhere Layer		see *Модуль «SQL Anywhere»*
Add WMS/WMTS Layer	`Ctrl+Shift+W`	see *Клиент WMS/WMTS*
Add WCS Layer		see *Клиент WCS*
Add WFS Layer		see *Клиент WFS и WFS-T*
Add Delimited Text Layer		see *Delimited Text Files*
Копировать стиль		см. *Вкладка «Стиль»*
Вставить стиль		см. *Вкладка «Стиль»*
Открыть таблицу атрибутов		см. *Работа с таблицей атрибутов*
Режим редактирования		см. *Редактирование существующего с*
Сохранить правки		см. *Редактирование существующего с*
Текущие правки		см. *Редактирование существующего с*
Сохранить как...		
Save selection as vector file...		See *Работа с таблицей атрибутов*
Remove Layer(s)	`Ctrl+D`	
Дублировать		
Изменить систему координат	`Ctrl+Shift+C`	
Выбрать систему координат слоя для проекта		
Свойства		
Запрос...		
Подписи		
Добавить в обзор	`Ctrl+Shift+O`	
Добавить все в обзор		
Удалить все из обзора		
Показать все слои	`Ctrl+Shift+U`	
Скрыть все слои	`Ctrl+Shift+H`	

7.1.6 Установки

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Панели →		см. *Панели инструментов*	
Панели инструментов →		см. *Панели инструментов*	
Полноэкранный режим	F 11		
Свойства проекта...	Ctrl+Shift+P	см. *Проекты*	
Ввод системы координат...		см. *Пользовательские системы координат*	
Управление стилями...		см. *Presentation*	
Комбинации клавиш...			
Настройка интерфеса...		см. *Настройка интерфейса*	
Параметры...		см. *Параметры*	
Параметры прилипания...			

7.1.7 Модули

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Manage and Install Plugins		см. *The Plugins Dialog*	
Консоль Python			

При первом запуске QGIS активированы не все модули ядра.

7.1.8 Вектор

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Open Street Map →		см *Загрузка данных OpenStreetMap*	
Analysis Tools →		см. *Модуль fTools*	
Research Tools →		см. *Модуль fTools*	
Geoprocessing Tools →		см. *Модуль fTools*	
Geometry Tools →		см. *Модуль fTools*	
Data Management Tools →		см. *Модуль fTools*	

При первом запуске QGIS активированы не все модули ядра.

7.1.9 Растр

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Raster calculator ...		see *Калькулятор растров*	

При первом запуске QGIS активированы не все модули ядра.

7.1.10 Анализ

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Панель инструментов		см. *Панель инструментов*	
Graphical Modeler		см. *Редактор моделей*	
History and log		см. *Журнал*	
Options and configuration		см. *Настройка платформы геообработки*	
Results viewer		см. *Настройка сторонних приложений*	
Командная строка	Ctrl+Alt+M	см. *The QGIS Commander*	

При первом запуске QGIS активированы не все модули ядра.

7.1.11 Справка

Пункт меню	Комбинация клавиш	Справка	Панель инструментов
Содержание	F1		*Справка*
Что это?	Shift+F1		*Справка*
API-документация			
Need commercial support?			
Веб-сайт QGIS	Ctrl+H		
Проверить версию QGIS			
О программе			
Спонсоры QGIS			

Please note that for Linux, the menu bar items listed above are the default ones in the KDE window manager. In GNOME, the *Settings* menu has different content and its items have to be found here:

Project Properties	*Проект*
Параметры...	*Правка*
Комбинации клавиш...	*Правка*
Управление стилями...	*Правка*
Ввод системы координат...	*Правка*
Панели →	*View*
Панели инструментов →	*View*
Toggle Full Screen Mode	*View*
Tile scale slider	*View*
Live GPS tracking	*View*

7.2 Панель инструментов

The toolbar provides access to most of the same functions as the menus, plus additional tools for interacting with the map. Each toolbar item has pop-up help available. Hold your mouse over the item and a short description of the tool's purpose will be displayed.

Every menu bar can be moved around according to your needs. Additionally, every menu bar can be switched off using your right mouse button context menu, holding the mouse over the toolbars (read also *Панели инструментов*).

Совет: Восстановление панелей инструментов

If you have accidentally hidden all your toolbars, you can get them back by choosing menu option *Settings* → *Toolbars* →. If a toolbar disappears under Windows, which seems to be a problem in QGIS from time to time, you have to remove key `\HKEY_CURRENT_USER\Software\QGIS\qgis\UI\state` in the registry. When you restart QGIS, the key is written again with the default state, and all toolbars are visible again.

7.3 Легенда

The map legend area lists all the layers in the project. The checkbox in each legend entry can be used to show or hide the layer. The Legend toolbar in the map legend are list allow you to **Add group**, **Manage Layer Visibility** of all layers or manage preset layers combination, **Filter Legend by Map Content**, **Expand All** or **Collapse All** and **Remove Layer or Group**. The button allows you to add **Presets** views in the legend. It means that you can choose to display some layer with specific categorization and add this view to the **Presets** list. To add a preset view just click on , choose *Add Preset...* from the drop down menu and give a name to the preset. After that you will see a list with all the presets that you can recall pressing on the button.

All the added presets are also present in the map composer in order to allow you to create a map layout based on your specific views (see *Main properties*).

A layer can be selected and dragged up or down in the legend to change the Z-ordering. Z-ordering means that layers listed nearer the top of the legend are drawn over layers listed lower down in the legend.

Примечание: This behaviour can be overridden by the 'Layer order' panel.

Layers in the legend window can be organised into groups. There are two ways to do this:

1. Press the icon to add a new group. Type in a name for the group and press `Enter`. Now click on an existing layer and drag it onto the group.
2. Select some layers, right click in the legend window and choose *Group Selected*. The selected layers will automatically be placed in a new group.

To bring a layer out of a group, you can drag it out, or right click on it and choose *Make to toplevel item*. Groups can also be nested inside other groups.

Флажок возле имени группы даёт возможность переключать видимость всех слоев в группе одним действием.

The content of the right mouse button context menu depends on whether the selected legend item is a raster or a vector layer. For GRASS vector layers, Toggle editing is not available. See section *Оцифровка и правка векторных слоёв GRASS* for information on editing GRASS vector layers.

Контекстное меню для растровых слоев

- *Zoom to layer extent*
- *Показать в обзоре*
- *Увеличить до наилучшего масштаба (100%)*
- *Stretch Using Current Extent*
- *Удалить*
- *Дублировать*

- *Set Layer Scale Visibility*
- *Изменить систему координат*
- *Выбрать систему координат слоя для проекта*
- *Сохранить как...*
- *Save As Layer Definition Style*
- *Свойства*
- *Переименовать*
- *Copy Style*

Дополнительно, в зависимости от положения слоя

- *Make to toplevel item*
- *Сгруппировать выделенное*

Контекстное меню для векторных слоев

- *Zoom to Layer Extent*
- *Show in Overview*
- *Удалить*
- *Дублировать*
- *Set Layer Scale Visibility*
- *Изменить систему координат*
- *Выбрать систему координат слоя для проекта*
- *Открыть таблицу атрибутов*
- *Режим редактирования* (недоступен для слоёв GRASS)
- *Сохроанить как...*
- *Save As Layer Definition Style*
- *Фильтр...*
- *Показать количество объектов*
- *Свойства*
- *Переименовать*
- *Copy Style*

Дополнительно, в зависимости от положения слоя

- *Make to toplevel item*
- *Сгруппировать выделенное*

Контекстное меню для групп слоев

- *Увеличить до группы*
- *Удалить*
- *Изменить систему координат группы*
- *Переименовать*
- *Add Group*

При зажатой клавише CTRL можно выделять несколько слоёв или групп одновременно. Это позволит переместить все выделенные слои из одной группы в другую.

You may also delete more than one layer or group at once by selecting several layers with the Ctrl key and pressing Ctrl+D afterwards. This way, all selected layers or groups will be removed from the layers list.

7.3.1 Независящий от легенды порядок отрисовки

There is a panel that allows you to define an independent drawing order for the map legend. You can activate it in the menu *Settings* → *Panels* → *Layer order*. This feature allows you to, for instance, order your layers in order of importance, but still display them in the correct order (see figure_layer_order). Checking the *Control rendering order* box underneath the list of layers will cause a revert to default behavior.

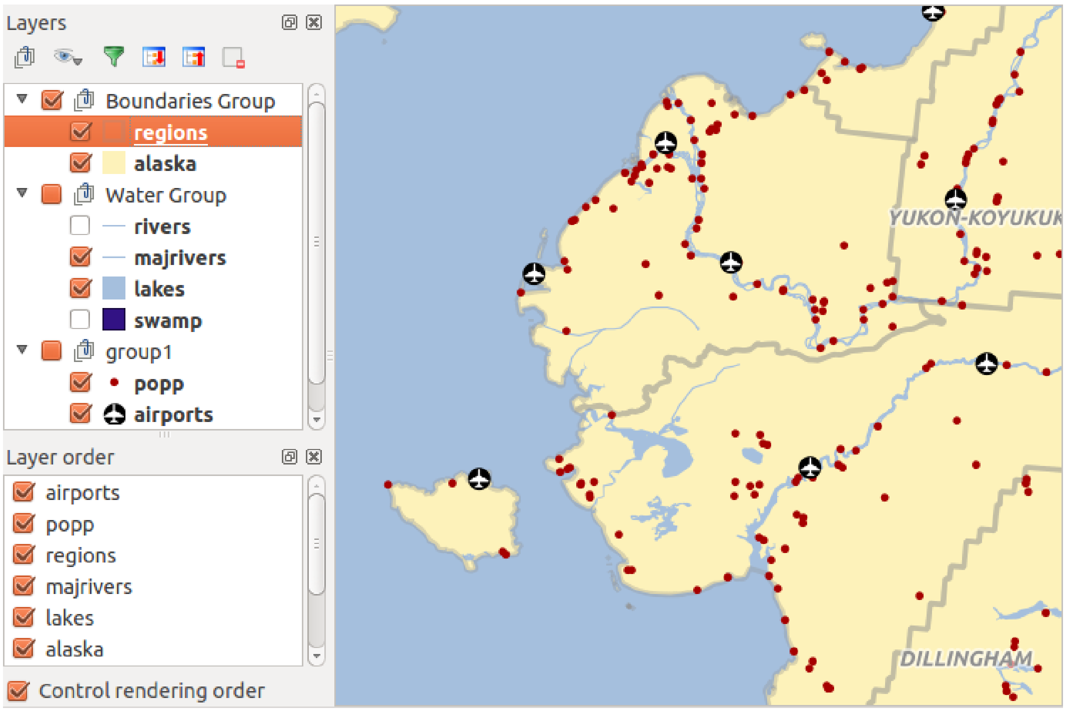

Рис. 7.2: Независимый от легенды порядок отрисовки слоёв

7.4 Область карты

This is the "business end" of QGIS — maps are displayed in this area! The map displayed in this window will depend on the vector and raster layers you have chosen to load (see sections that follow for more information on how to load layers). The map view can be panned, shifting the focus of the map display to another region, and it can be zoomed in and out. Various other operations can be performed on the map as described in the toolbar description above. The map view and the legend are tightly bound to each other — the maps in view reflect changes you make in the legend area.

Совет: Масштабирование карты с помощью колеса мыши

You can use the mouse wheel to zoom in and out on the map. Place the mouse cursor inside the map area and roll the wheel forward (away from you) to zoom in and backwards (towards you) to zoom out. The zoom is centered on the mouse cursor position. You can customize the behavior of the mouse wheel zoom using the *Map tools* tab under the *Settings* → *Options* menu.

Совет: Панорамирование карты, используя клавиши со стрелками и клавишу пробела

You can use the arrow keys to pan the map. Place the mouse cursor inside the map area and click on the right arrow key to pan east, left arrow key to pan west, up arrow key to pan north and down arrow key to pan south. You can also pan the map using the space bar or the click on mouse wheel: just move the mouse while holding down space bar or click on mouse wheel.

7.5 Строка состояния

The status bar shows you your current position in map coordinates (e.g., meters or decimal degrees) as the mouse pointer is moved across the map view. To the left of the coordinate display in the status bar is a small button that will toggle between showing coordinate position or the view extents of the map view as you pan and zoom in and out.

Next to the coordinate display you will find the scale display. It shows the scale of the map view. If you zoom in or out, QGIS shows you the current scale. There is a scale selector, which allows you to choose between predefined scales from 1:500 to 1:1000000.

A progress bar in the status bar shows the progress of rendering as each layer is drawn to the map view. In some cases, such as the gathering of statistics in raster layers, the progress bar will be used to show the status of lengthy operations.

If a new plugin or a plugin update is available, you will see a message at the far left of the status bar. On the right side of the status bar, there is a small checkbox which can be used to temporarily prevent layers being rendered to the map view (see section *Рендеринг* below). The icon immediately stops the current map rendering process.

To the right of the render functions, you find the EPSG code of the current project CRS and a projector icon. Clicking on this opens the projection properties for the current project.

Совет: Calculating the Correct Scale of Your Map Canvas

When you start QGIS, the default units are degrees, and this means that QGIS will interpret any coordinate in your layer as specified in degrees. To get correct scale values, you can either change this setting to meters manually in the *General* tab under *Settings* → *Project Properties*, or you can select a project CRS clicking on the CRS status icon in the lower right-hand corner of the status bar. In the last case, the units are set to what the project projection specifies (e.g., '+units=m').

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Основные инструменты

8.1 Комбинации клавиш

QGIS provides default keyboard shortcuts for many features. You can find them in section *Главное меню*. Additionally, the menu option *Settings* → *Configure Shortcuts..* allows you to change the default keyboard shortcuts and to add new keyboard shortcuts to QGIS features.

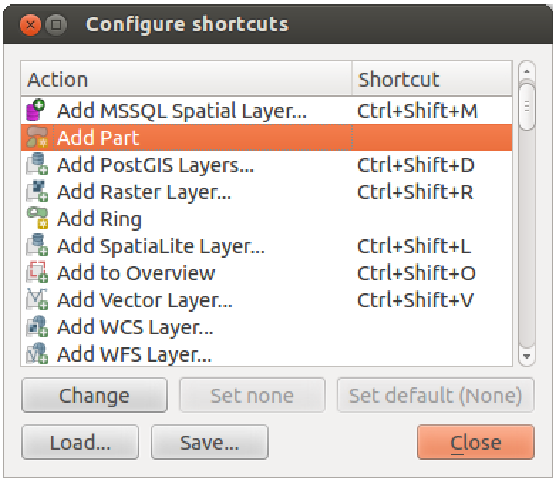

Рис. 8.1: Настройка комбинаций клавиш (Gnome)

Configuration is very simple. Just select a feature from the list and click on **[Change]**, **[Set none]** or **[Set default]**. Once you have finished your configuration, you can save it as an XML file and load it to another QGIS installation.

8.2 Контекстная справка

When you need help on a specific topic, you can access context help via the **[Help]** button available in most dialogs — please note that third-party plugins can point to dedicated web pages.

8.3 Рендеринг

By default, QGIS renders all visible layers whenever the map canvas is refreshed. The events that trigger a refresh of the map canvas include:

- добавление слоя

- панорамирование или масштабирование
- изменение размеров окна QGIS
- включение или отключение слоя/слоёв в легенде

В ряде случаев QGIS позволяет контролировать процесс отрисовки.

8.3.1 Видимость в пределах масштаба

Scale-dependent rendering allows you to specify the minimum and maximum scales at which a layer will be visible. To set scale-dependent rendering, open the *Properties* dialog by double-clicking on the layer in the legend. On the *General* tab, click on the ☑ *Scale dependent visibility* checkbox to activate the feature, then set the minimum and maximum scale values.

Значения масштабов можно задать по первому масштабированию слоя, который вы хотите использовать, отмечая значение масштаба в строке состояния QGIS.

8.3.2 Управление отрисовкой карты

Map rendering can be controlled in the various ways, as described below.

Приостановка отрисовки

To suspend rendering, click the ☑ *Render* checkbox in the lower right corner of the status bar. When the ☑ *Render* checkbox is not checked, QGIS does not redraw the canvas in response to any of the events described in section *Рендеринг*. Examples of when you might want to suspend rendering include:

- Adding many layers and symbolizing them prior to drawing
- Adding one or more large layers and setting scale dependency before drawing
- Adding one or more large layers and zooming to a specific view before drawing
- комбинации вышеперечисленного

Включение флажка ☑ *Отрисовка* активирует отрисовку и немедленно обновляет содержимое карты.

Добавление невидимых слоёв

You can set an option to always load new layers without drawing them. This means the layer will be added to the map, but its visibility checkbox in the legend will be unchecked by default. To set this option, choose menu option *Settings* → *Options* and click on the *Rendering* tab. Uncheck the ☑ *By default new layers added to the map should be displayed* checkbox. Any layer subsequently added to the map will be off (invisible) by default.

Отмена отрисовки

Чтобы остановить отрисовку карты нажмите `ESC`. Обновление карты будет отменено и она останется частично отрисованной. Между нажатием клавиши `ESC` и остановкой отрисовки может пройти некоторое время.

Примечание: It is currently not possible to stop rendering — this was disabled in the Qt4 port because of User Interface (UI) problems and crashes.

Обновление окна карты во время отрисовки

You can set an option to update the map display as features are drawn. By default, QGIS does not display any features for a layer until the entire layer has been rendered. To update the display as features are read from the datastore, choose menu option *Settings* → *Options* and click on the *Rendering* tab. Set the feature count to an appropriate value to update the display during rendering. Setting a value of 0 disables update during drawing (this is the default). Setting a value too low will result in poor performance, as the map canvas is continually updated during the reading of the features. A suggested value to start with is 500.

Регулирование качества отрисовки

To influence the rendering quality of the map, you have two options. Choose menu option *Settings* → *Options*, click on the *Rendering* tab and select or deselect following checkboxes:

- *Рисовать сглаженные линии (снижает скорость отрисовки)*
- *Исправлять ошибки заливки полигонов*

Speed-up rendering

There are two settings that allow you to improve rendering speed. Open the QGIS options dialog using *Settings* → *Options*, go to the *Rendering* tab and select or deselect the following checkboxes:

- *Enable back buffer*. This provides better graphics performance at the cost of losing the possibility to cancel rendering and incrementally draw features. If it is unchecked, you can set the *Number of features to draw before updating the display*, otherwise this option is inactive.
- *Use render caching where possible to speed up redraws*

8.4 Измерения

Measuring works within projected coordinate systems (e.g., UTM) and unprojected data. If the loaded map is defined with a geographic coordinate system (latitude/longitude), the results from line or area measurements will be incorrect. To fix this, you need to set an appropriate map coordinate system (see section *Работа с проекциями*). All measuring modules also use the snapping settings from the digitizing module. This is useful, if you want to measure along lines or areas in vector layers.

To select a measuring tool, click on and select the tool you want to use.

8.4.1 Измерение длин, площадей и углов

Measure Line: QGIS is able to measure real distances between given points according to a defined ellipsoid. To configure this, choose menu option *Settings* → *Options*, click on the *Map tools* tab and select the appropriate ellipsoid. There, you can also define a rubberband color and your preferred measurement units (meters or feet) and angle units (degrees, radians and gon). The tool then allows you to click points on the map. Each segment length, as well as the total, shows up in the measure window. To stop measuring, click your right mouse button.

Measure Area: Areas can also be measured. In the measure window, the accumulated area size appears. In addition, the measuring tool will snap to the currently selected layer, provided that layer has its snapping tolerance set (see section *Настройка порога прилипания и радиуса поиска*). So, if you want to measure exactly along a line feature, or around a polygon feature, first set its snapping tolerance, then

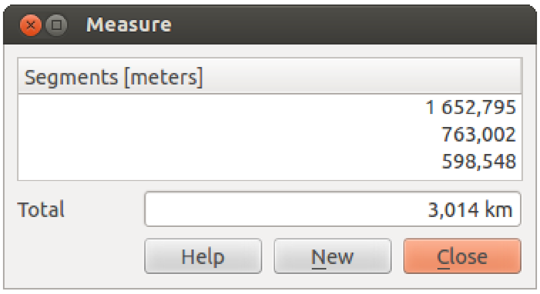

Рис. 8.2: Измерение расстояний (Gnome)

select the layer. Now, when using the measuring tools, each mouse click (within the tolerance setting) will snap to that layer.

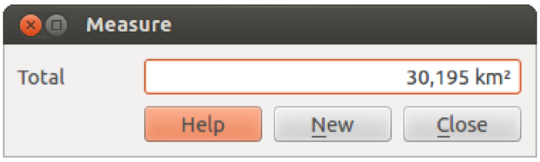

Рис. 8.3: Измерение площадей (Gnome)

Measure Angle: You can also measure angles. The cursor becomes cross-shaped. Click to draw the first segment of the angle you wish to measure, then move the cursor to draw the desired angle. The measure is displayed in a pop-up dialog.

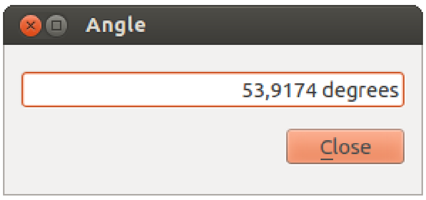

Рис. 8.4: Измерение углов (Gnome)

8.4.2 Выбор объектов

The QGIS toolbar provides several tools to select features in the map canvas. To select one or several features, just click on and select your tool:

- Выделить отдельный объект
- Выделить объекты прямоугольником
- Выделить объекты полигоном
- Выделить объекты произвольной линией
- Выделить объекты в радиусе

Снять выделение с объектов можно нажав на кнопку Снять выделение во всех слоях.

Select feature using an expression allow user to select feature using expression dialog. See *Expressions* chapter for some example.

Users can save features selection into a **New Memory Vector Layer** or a **New Vector Layer** using *Edit* → *Paste Feature as …* and choose the mode you want.

8.5 Определение объектов

The Identify tool allows you to interact with the map canvas and get information on features in a pop-up window. To identify features, use *View* → *Identify features* or press `Ctrl + Shift + I`, or click on the Identify features icon in the toolbar.

If you click on several features, the *Identify results* dialog will list information about all the selected features. The first item is the number of the feature in the list of results, followed by the layer name. Then, its first child will be the name of a field with its value. Finally, all information about the feature is displayed.

This window can be customized to display custom fields, but by default it will display three kinds of information:

- Actions: Actions can be added to the identify feature windows. When clicking on the action label, action will be run. By default, only one action is added, to view feature form for editing.
- Derived: This information is calculated or derived from other information. You can find clicked coordinate, X and Y coordinates, area in map units and perimeter in map units for polygons, length in map units for lines and feature ids.
- Data attributes: This is the list of attribute fields from the data.

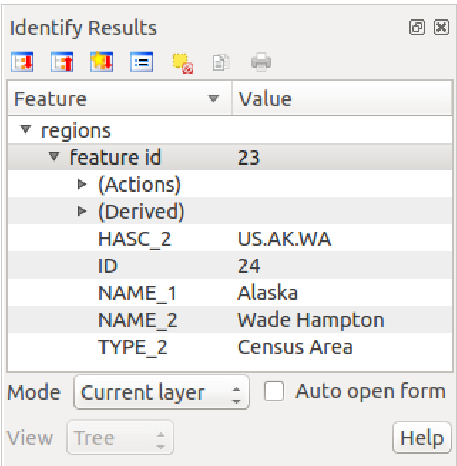

Рис. 8.5: Диалог «Результат определения» (Gnome)

At the bottom of the window, you have five icons:

- Развернуть всё
- Свернуть всё
- Раскрывать результаты автоматически
- Копировать выделенный объект в буфер обмена
- Распечатать веб-страницу

Other functions can be found in the context menu of the identified item. For example, from the context menu you can:

- View the feature form

- Увеличить до объекта
- Copy feature: Copy all feature geometry and attributes
- Toggle feature selection: adds identified feature to selection
- Copy attribute value: Copy only the value of the attribute that you click on
- Copy feature attributes: Copy only attributes
- Clear result: Remove results in the window
- Clear highlights: Remove features highlighted on the map
- Подсветить всё
- Подсветить всё в слое
- Activate layer: Choose a layer to be activated
- Layer properties: Open layer properties window
- Развернуть всё
- Свернуть всё

8.6 Оформление

The Decorations of QGIS include the Grid, the Copyright Label, the North Arrow and the Scale Bar. They are used to 'decorate' the map by adding cartographic elements.

8.6.1 Сетка

Grid allows you to add a coordinate grid and coordinate annotations to the map canvas.

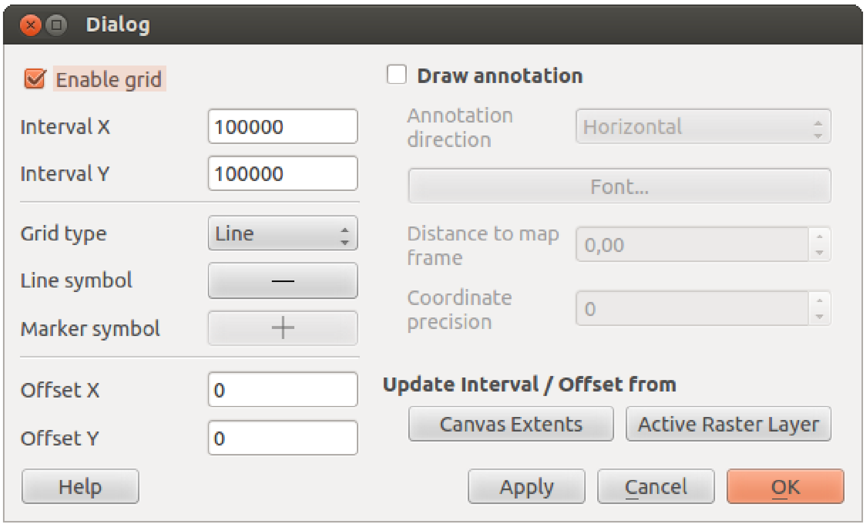

Рис. 8.6: Диалог «Сетка»

1. Выберите пункт меню *Вид* → *Оформление* → *Сетка*. Откроется диалог (см. figure_decorations_1).
2. Активируйте флажок *Включить сетку* и настройте её параметры.
3. Активируйте флажок *Аннотация* и настройте отображение подписей координат.

4. Click **[Apply]** to verify that it looks as expected.
5. Нажмите **[OK]** чтобы закрыть диалог.

8.6.2 Знак авторского права

Copyright label adds a copyright label using the text you prefer to the map.

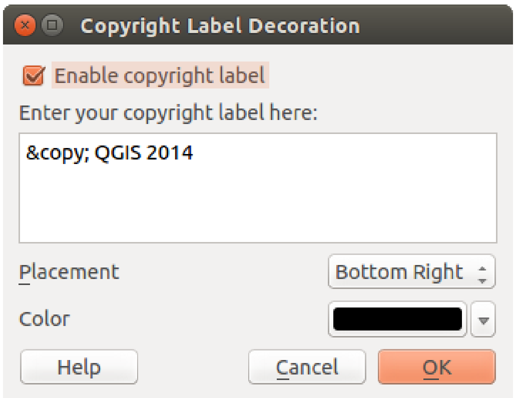

Рис. 8.7: The Copyright Dialog

1. Выберите пункт меню *Вид* → *Оформление* → *Знак авторского права*. Откроется диалог (см. figure_decorations_2).
2. Enter the text you want to place on the map. You can use HTML as shown in the example.
3. Choose the placement of the label from the *Placement* combo box.
4. Make sure the *Enable Copyright Label* checkbox is checked.
5. Click **[OK]**.

In the example above, which is the default, QGIS places a copyright symbol followed by the date in the lower right-hand corner of the map canvas.

8.6.3 Указатель «север-юг»

North Arrow places a simple north arrow on the map canvas. At present, there is only one style available. You can adjust the angle of the arrow or let QGIS set the direction automatically. If you choose to let QGIS determine the direction, it makes its best guess as to how the arrow should be oriented. For placement of the arrow, you have four options, corresponding to the four corners of the map canvas.

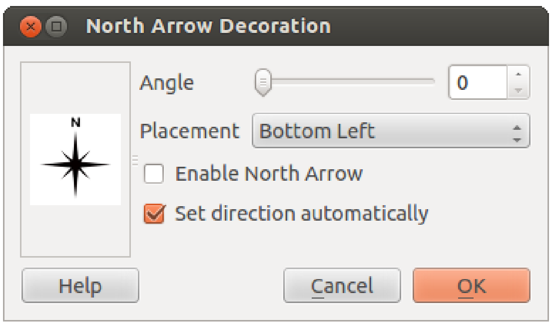

Рис. 8.8: Диалог «Указатель “север-юг”»

8.6.4 Масштабная линейка

Scale Bar adds a simple scale bar to the map canvas. You can control the style and placement, as well as the labeling of the bar.

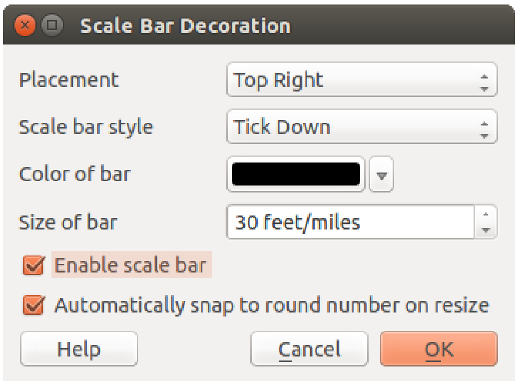

Рис. 8.9: Диалог «масштабная линейка»

QGIS only supports displaying the scale in the same units as your map frame. So if the units of your layers are in meters, you can't create a scale bar in feet. Likewise, if you are using decimal degrees, you can't create a scale bar to display distance in meters.

Для добавления масштабной линейки:

1. Select from menu *View* → *Decorations* → *Scale Bar*. The dialog starts (see figure_decorations_4).
2. Choose the placement from the *Placement* combo box.
3. Choose the style from the *Scale bar style* combo box.
4. Select the color for the bar *Color of bar* Border or use the default black color.
5. Set the size of the bar and its label *Size of bar* 1,00.
6. Make sure the *Enable scale bar* checkbox is checked.
7. Optionally, check *Automatically snap to round number on resize*.
8. Click **[OK]**.

Совет: Настройки оформления

When you save a `.qgs` project, any changes you have made to Grid, North Arrow, Scale Bar and Copyright will be saved in the project and restored the next time you load the project.

8.7 Инструменты аннотации

The Text Annotation tool in the attribute toolbar provides the possibility to place formatted text in a balloon on the QGIS map canvas. Use the *Text Annotation* tool and click into the map canvas.

Double clicking on the item opens a dialog with various options. There is the text editor to enter the formatted text and other item settings. For instance, there is the choice of having the item placed on a map position (displayed by a marker symbol) or to have the item on a screen position (not related to the map). The item can be moved by map position (by dragging the map marker) or by moving only the balloon. The icons are part of the GIS theme, and they are used by default in the other themes, too.

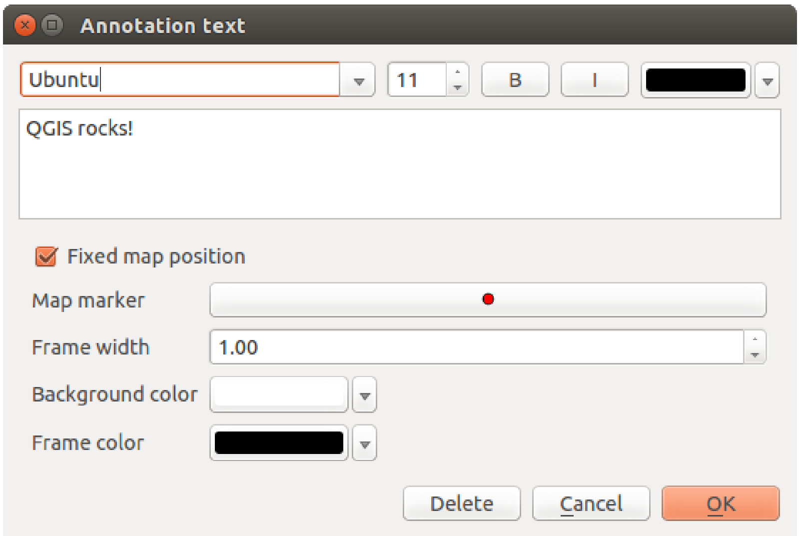

Рис. 8.10: Диалог текстовой аннотации

The Move Annotation tool allows you to move the annotation on the map canvas.

8.7.1 HTML-аннотация

The Html Annotation tools in the attribute toolbar provides the possibility to place the content of an html file in a balloon on the QGIS map canvas. Using the *Html Annotation* tool, click into the map canvas and add the path to the html file into the dialog.

8.7.2 SVG-аннотация

The SVG Annotation tool in the attribute toolbar provides the possibility to place an SVG symbol in a balloon on the QGIS map canvas. Using the *SVG Annotation* tool, click into the map canvas and add the path to the SVG file into the dialog.

8.7.3 Диалоговая аннотация

Additionally, you can also create your own annotation forms. The Form Annotation tool is useful to display attributes of a vector layer in a customized Qt Designer form (see figure_custom_annotation). This is similar to the designer forms for the *Identify features* tool, but displayed in an annotation item. Also see this video https://www.youtube.com/watch?v=0pDBuSbQ02o from Tim Sutton for more information.

Примечание: Нажатие `Ctrl+T` при активном инструменте аннотаций (переместить аннотацию, текстовая аннотация, диалоговая аннотация), инвертирует видимость существующих аннотаций.

8.8 Пространственные закладки

Пространственные закладки позволяют создавать своеобразные «закладки» географического положения и возвращаться к ним позднее.

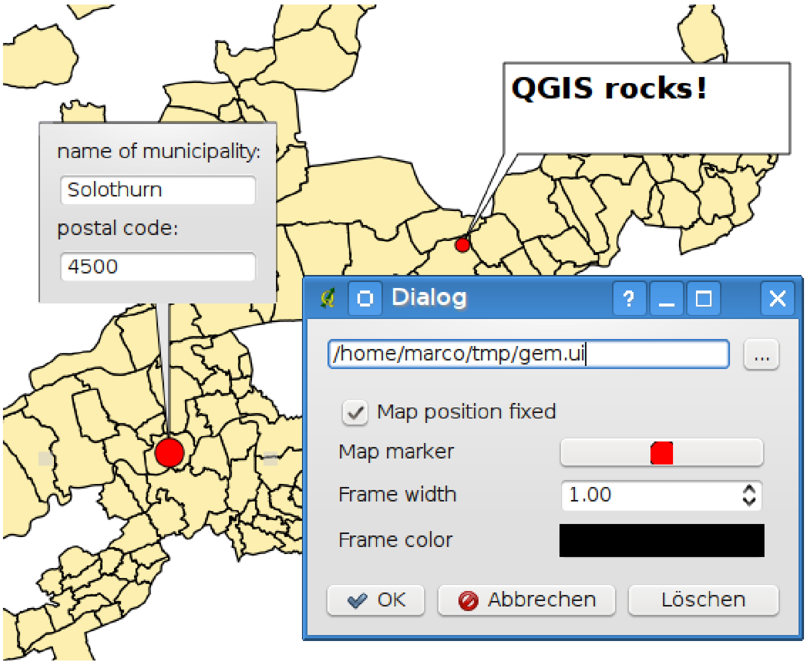

Рис. 8.11: Пользовательская форма аннотации

8.8.1 Создание закладки

Для создания закладки:

1. Масштабируйте или панорамируйте карту до интересующей вас территории.
2. Выберите пункт меню *Вид* → *Новая закладка* или нажмите `Ctrl-B`.
3. введите описательное имя для закладки (до 255 символов)
4. Нажмите `Enter`, чтобы добавить закладку, или **[Удалить]** для удаления существующей закладки

Помните, что можно иметь множество закладок с одинаковыми названиями.

8.8.2 Работа с закладками

To use or manage bookmarks, select the menu option *View* → *Show Bookmarks*. The *Geospatial Bookmarks* dialog allows you to zoom to or delete a bookmark. You cannot edit the bookmark name or coordinates.

8.8.3 Просмотр закладки

В диалоговом окне *Пространственные закладки*, выберите необходимую закладку, нажав на неё, затем нажмите кнопку **[Увеличить до]**. Также можно просмотреть закладку, дважды нажав на неё.

8.8.4 Удаление закладки

To delete a bookmark from the *Geospatial Bookmarks* dialog, click on it, then click **[Delete]**. Confirm your choice by clicking **[Yes]**, or cancel the delete by clicking **[No]**.

8.9 Встраиваемые проекты

If you want to embed content from other project files into your project, you can choose *Layer* → *Embed Layers and Groups*.

8.9.1 Встраивание слоёв

The following dialog allows you to embed layers from other projects. Here is a small example:

1. Нажмите кнопку ..., чтобы указать другой проект из набора данных «Аляска».
2. Select the project file `grassland`. You can see the content of the project (see figure_embed_dialog).
3. Press `Ctrl` and click on the layers `grassland` and `regions`. Press **[OK]**. The selected layers are embedded in the map legend and the map view now.

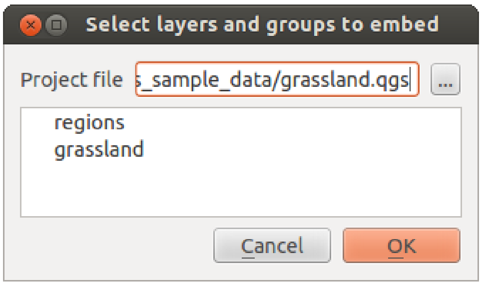

Рис. 8.12: Выбор слоёв и групп для встраивания

While the embedded layers are editable, you can't change their properties like style and labeling.

8.9.2 Removing embedded layers

Вызовите контекстное меню встроенного слоя и выберите Удалить.

.

Настройка QGIS

QGIS is highly configurable through the *Settings* menu. Choose between Panels, Toolbars, Project Properties, Options and Customization.

Примечание: QGIS follows desktop guidelines for the location of options and project properties item. Consequently related to the OS you are using, location of some of items described above could be located in the :menuselection'view' menu (Panels and Toolbars) or in *Project* for Options.

9.1 Панели инструментов

In the *Panels*→ menu, you can switch on and off QGIS widgets. The *Toolbars*→ menu provides the possibility to switch on and off icon groups in the QGIS toolbar (see figure_panels_toolbars).

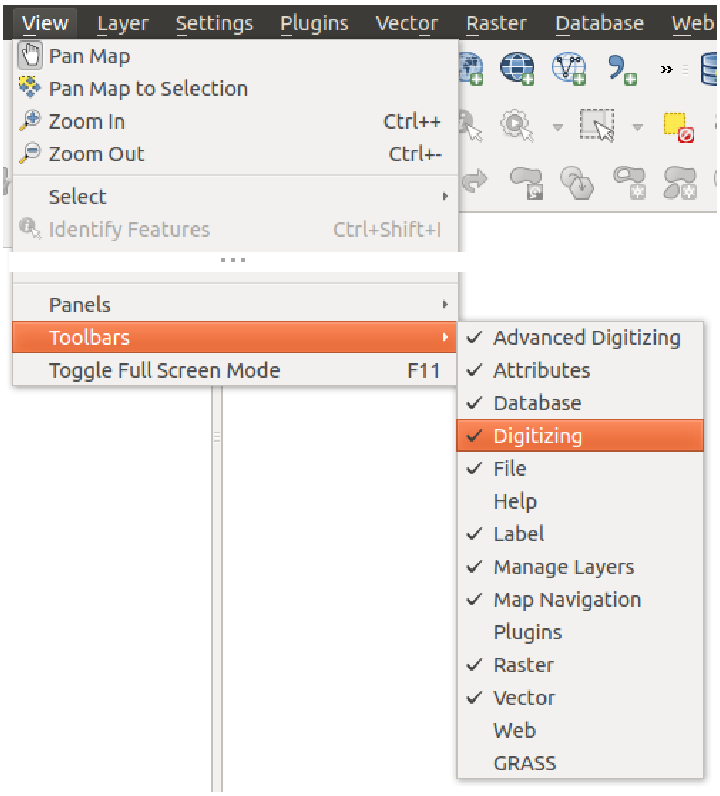

Рис. 9.1: Меню «Панели инструментов»

Совет: Обзорная карта

In QGIS, you can use an overview panel that provides a full extent view of layers added to it. It can be selected under the menu *Settings* → *Panels* or *View* → *Panels*. Within the view is a rectangle showing the current map extent. This allows you to quickly determine which area of the map you are currently viewing. Note that labels are not rendered to the map overview even if the layers in the map overview have been set up for labeling. If you click and drag the red rectangle in the overview that shows your current extent, the main map view will update accordingly.

Совет: Отладочные сообщения

It's possible to track the QGIS messages. You can activate *Log Messages* in the menu *Settings* → *Panels* or *View* → *Panels* and follow the messages that appear in the different tabs during loading and operation.

9.2 Свойства проекта

In the properties window for the project under *Settings* → *Project Properties* (kde) or *Project* → *Project Properties* (Gnome), you can set project-specific options. These include:

- In the *General* menu, the project title, selection and background color, layer units, precision, and the option to save relative paths to layers can be defined. If the CRS transformation is on, you can choose an ellipsoid for distance calculations. You can define the canvas units (only used when CRS transformation is disabled) and the precision of decimal places to use. You can also define a project scale list, which overrides the global predefined scales.
- Вкладка *Система координат* позволяет выбрать систему координат для данного проекта и включить преобразование координат векторных и растровых слоёв «на лету», если используются слои с разными системами координат.
- With the third *Identify layers* menu, you set (or disable) which layers will respond to the identify tool (see the "Map tools" paragraph from the *Параметры* section to enable identifying of multiple layers).
- The *Default Styles* menu lets you control how new layers will be drawn when they do not have an existing `.qml` style defined. You can also set the default transparency level for new layers and whether symbols should have random colours assigned to them. There is also an additional section where you can define specific colors for the running project. You can find the added colors in the drop down menu of the color dialog window present in each renderer.
- The tab *OWS Server* allows you to define information about the QGIS Server WMS and WFS capabilities, extent and CRS restrictions.
- The *Macros* menu is used to edit Python macros for projects. Currently, only three macros are available: `openProject()`, `saveProject()` and `closeProject()`.
- The *Relations* menu is used to define 1:n relations. The relations are defined in the project properties dialog. Once relations exist for a layer, a new user interface element in the form view (e.g. when identifying a feature and opening its form) will list the related entities. This provides a powerful way to express e.g. the inspection history on a length of pipeline or road segment. You can find out more about 1:n relations support in Section *Creating one to many relations*.

9.3 Параметры

Some basic options for QGIS can be selected using the *Options* dialog. Select the menu option *Settings* → *Options*. The tabs where you can customize your options are described below.

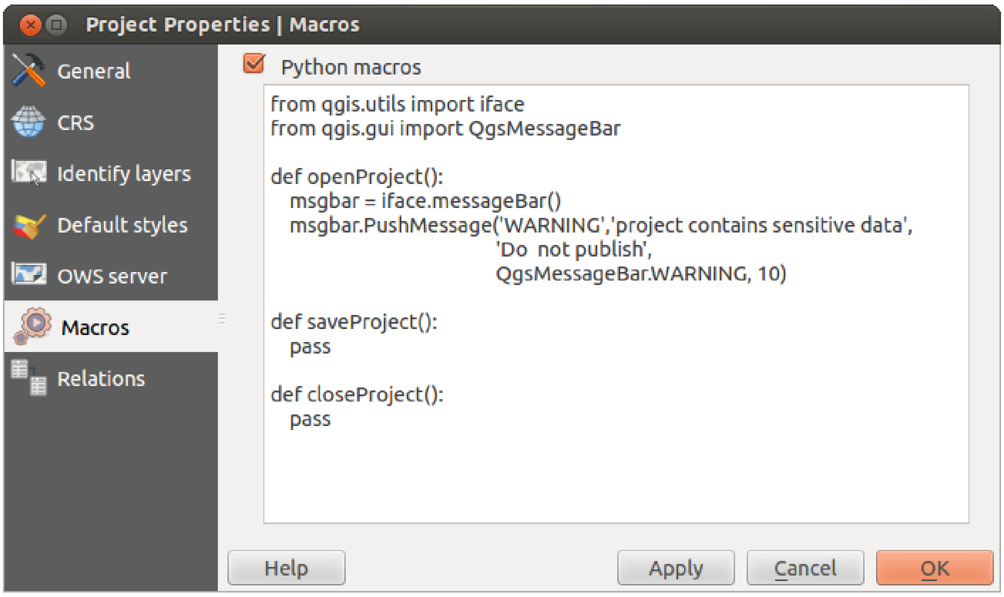

Рис. 9.2: Настройка макросов в QGIS

9.3.1 Владка «Общие»

Приложение

- Select the *Style (QGIS restart required)* and choose between 'Oxygen','Windows','Motif','CDE', 'Plastique' and 'Cleanlooks' ().
- Задать *Тема значков* . Доступна только тема «default».
- Настроить *Размер значков* .
- Define the *Font*. Choose between *Qt default* and a user-defined font.
- Изменить *Время показа диалогов и сообщений состояния* .
- *Не показывать заставку при запуске*
- *Показывать совет дня при запуске*
- *Выделять заголовки групп виджетов*
- *Оформлять группы виджетов в стиле QGIS*
- *Use live-updating color chooser dialog*

Файлы проектов

- *Open project on launch* (choose between 'New', 'Most recent' and 'Specific'). When choosing 'Specific' use the ... to define a project.
- *Create new project from default project*. You have the possibility to press on *Set current project as default* or on *Reset default*. You can browse through your files and define a directory where you find your user-defined project templates. This will be added to *Project* → *New From Template*. If you first activate *Create new project from default project* and then save a project in the project templates folder.
- *Запрашивать сохранение изменений в проекте и источниках данных, когда это необходимо*

- *Warn when opening a project file saved with an older version of QGIS*
- *Enable macros* . This option was created to handle macros that are written to perform an action on project events. You can choose between 'Never', 'Ask', 'For this session only' and 'Always (not recommended)'.

9.3.2 Вкладка «Система»

Переменные среды

System environment variables can now be viewed, and many configured, in the **Environment** group (see figure_environment_variables). This is useful for platforms, such as Mac, where a GUI application does not necessarily inherit the user's shell environment. It's also useful for setting and viewing environment variables for the external tool sets controlled by the Processing toolbox (e.g., SAGA, GRASS), and for turning on debugging output for specific sections of the source code.

- *Use custom variables (restart required - include separators)*. You can **[Add]** and **[Remove]** variables. Already-defined environment variables are displayed in *Current environment variables*, and it's possible to filter them by activating *Show only QGIS-specific variables*.

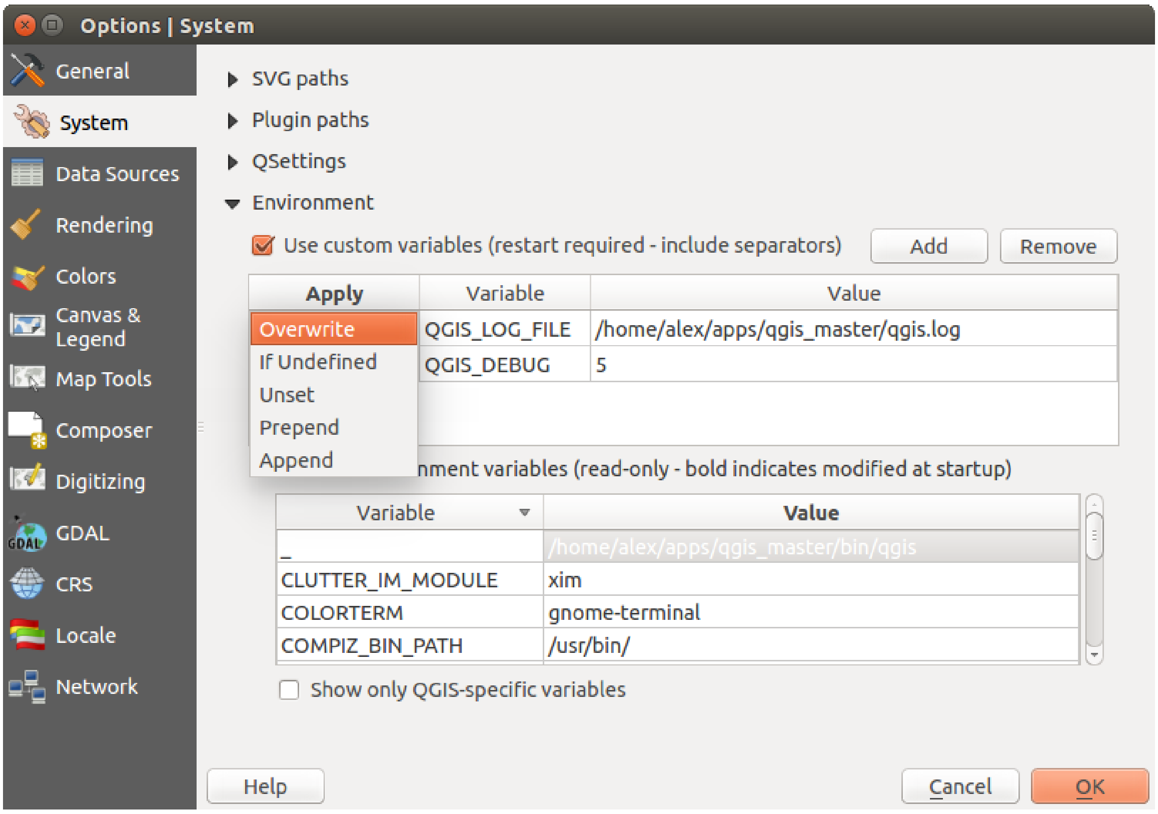

Рис. 9.3: Просмотр переменных окружения в QGIS

Модули

[Add] or **[Remove]** *Path(s) to search for additional C++ plugin libraries*

9.3.3 Вкладка «Источники данных»

Таблица атрибутов

- *Открывать таблицу аттрибутов во встраиваемом окне (требуется перезапуск)*

- *Copy geometry in WKT representation from attribute table.* When using Copy selected rows to clipboard from the *Attribute table* dialog, this has the result that the coordinates of points or vertices are also copied to the clipboard.
- *Attribute table behaviour* . There are three possibilities: 'Show all features', 'Show selected features' and 'Show features visible on map'.
- *Attribute table row cache* 1,00. This row cache makes it possible to save the last loaded N attribute rows so that working with the attribute table will be quicker. The cache will be deleted when closing the attribute table.
- *Representation for NULL values.* Here, you can define a value for data fields containing a NULL value.

Источники данных

- *Искать источники данных в панели обозревателя* . Предлагается два метода: «По расширению» и «По содержимому».
- *Scan for contents of compressed files (.zip) in browser dock* . 'No', 'Basic scan' and 'Full scan' are possible.
- *Prompt for raster sublayers when opening.* Some rasters support sublayers — they are called subdatasets in GDAL. An example is netCDF files — if there are many netCDF variables, GDAL sees every variable as a subdataset. The option allows you to control how to deal with sublayers when a file with sublayers is opened. You have the following choices:
  - 'Always': Always ask (if there are existing sublayers)
  - 'If needed': Ask if layer has no bands, but has sublayers
  - 'Never': Never prompt, will not load anything
  - 'Load all': Never prompt, but load all sublayers
- *Ignore shapefile encoding declaration.* If a shapefile has encoding information, this will be ignored by QGIS.
- *Add PostGIS layer with double click and select in extended mode*
- *Добавлять слои Oracle двойным щелчком и включить расширенную выборку*

9.3.4 Вкладка «Отрисовка»

Rendering behaviour

- *By default new layers added to the map should be displayed*
- *Use render caching where possible to speed up redraws*
- *Render layers in parallel using many CPU cores*
- *Max cores to use*
- *Map update interval (default to 250 ms)*
- *Enable feature simplication by default for newly added layers*
- *Simplification threshold*
- *Simplify on provider side if possible*
- *Maximum scale at which the layer should be simplified*

Параметры отрисовки

- *Рисовать сглаженные линии (снижает скорость отрисовки)*

Растры

- With *RGB band selection*, you can define the number for the Red, Green and Blue band.

Contrast enhancement

- *Single band gray* . A single band gray can have 'No stretch', 'Stretch to MinMax', 'Stretch and Clip to MinMax' and also 'Clip to MinMax'.
- *Multi band color (byte/band)* . Options are 'No stretch', 'Stretch to MinMax', 'Stretch and Clip to MinMax' and 'Clip to MinMax'.
- *Multi band color (>byte/band)* . Options are 'No stretch', 'Stretch to MinMax', 'Stretch and Clip to MinMax' and 'Clip to MinMax'.
- *Limits (minimum/maximum)* . Options are 'Cumulative pixel count cut', 'Minimum/Maximum', 'Mean +/- standard deviation'.
- *Границы среза с накоплением*
- *Множитель стандартного отклонения*

Отладка

- *Map canvas refresh*

9.3.5 Colors Menu

This menu allows you to add some custom color that you can find in each color dialog window of the renderes. You will see a set of predefined colors in the tab: you can delete or edit all of them. Moreover you can add the color you want and perform some copy and paste operation. Finally you can export the color set as a `gpl` file or import them.

9.3.6 Вкладка «Карта и легенда»

Внешний вид по умолчанию

- Установить *Цвет выделения* Border и *Цвет фона* Border .

Легенда

- *По двойному щелчку на слое в легенде* можно открывать свойства слоя или открывать таблицу атрибутов.
- The following *Legend item styles* are possible:
  - *Выводить имена слоёв с прописной буквы*
  - *Выделять слои полужирным шрифтом*
  - *Выделять группы полужирным шрифтом*
  - *Показывать в легенде атрибуты классификации*
  - *Создавать значки для растровых слоёв*
  - *Add new layers to selected or current group*

9.3.7 Вкладка «Инструменты»

This menu offers some options regarding the behaviour of the *Identify tool*.

- *Search radius for identifying and displaying map tips* is a tolerance factor expressed as a percentage of the map width. This means the identify tool will depict results as long as you click within this tolerance.
- *Highlight color* allows you to choose with which color should features being identified are to be highlighted.
- *Buffer* expressed as a percentage of the map width, determines a buffer distance to be rendered from the outline of the identify highlight.
- *Minimum width* expressed as a percentage of the map width, determines how thick should the outline of a highlighted object be.

Инструмент измерений

- Установить *Цвет линии* для инструментов измерений
- Установить число *Десятичных знаков*
- *Сохранять базовые единицы*
- *Preferred measurements units* (‘Meters’, ‘Feet’, ‘Nautical Miles’ or ‘Degrees’)‘
- *Preferred angle units* (‘Degrees’, ‘Radians’ or ‘Gon’)

Прокрутка и масштабирование

- Задать *Действие при прокрутке колеса мыши* («Увеличить», «Увеличить и центрировать», «Увеличить в положении курсора», «Ничего»)
- Установить *Фактор увеличения* для колеса мыши

Масштабный ряд

Here, you find a list of predefined scales. With the **[+]** and **[-]** buttons you can add or remove your individual scales.

9.3.8 Composer Menu

Composition defaults

You can define the *Default* font here.

Grid appearance

- Define the *Grid style* (‘Solid’, ‘Dots’, ‘Crosses’)
- Define the *Color...*

Grid defaults

- Define the *Spacing* 1,00
- Define the *Grid offset* 1,00 for x and y
- Define the *Snap tolerance* 1,00

Guide defaults

- Define the *Snap tolerance* 1,00

9.3.9 Вкладка «Оцифровка»

Создание объектов

- *Отключить всплывающее окно ввода атрибутов для каждого создаваемого объекта*
- *Использовать последние введённые значения*
- *Validate geometries*. Editing complex lines and polygons with many nodes can result in very slow rendering. This is because the default validation procedures in QGIS can take a lot of time. To speed up rendering, it is possible to select GEOS geometry validation (starting from GEOS 3.3) or to switch it off. GEOS geometry validation is much faster, but the disadvantage is that only the first geometry problem will be reported.

Резиновая нить

- Установить *Толщину линии* 1,00 и *Цвет линии* Border для «резиновой нити»

Прилипание

- *Открывать параметры прилипания во встраиваемом окне (требуется перезапуск)*
- Установить *Режим прилипания по умолчанию* («К вершинам», «К сегментам», «К вершинам и сегментам», «Выключена»)
- Установить *Порог прилипания по умолчанию* в единицах карты или пикселях
- Установить *Радиус поиска для редактирования вершин* 1,00 (в единицах карты или пикселях)

Маркеры вершин

- *Показывать маркеры только для выбранных объектов*
- Установить *Стиль маркера* («Перекрестие» (по умолчанию), «Полупрозрачный круг» или «Без маркера»)
- Задать *Размер маркера* 1,00.

Параллельные кривые

The next 3 options refer to the Offset Curve tool in *Дополнительные функции оцифровки*. Through the various settings, it is possible to influence the shape of the line offset. These options are possible starting from GEOS 3.3.

- *Join style*
- *Quadrant segments*
- *Miter limit*

9.3.10 Вкладка «GDAL»

GDAL is a data exchange library for raster files. In this tab, you can *Edit create options* and *Edit Pyramids Options* of the raster formats. Define which GDAL driver is to be used for a raster format, as in some cases more than one GDAL driver is available.

9.3.11 Вкладка «Система координат»

Система координат для новых проектов

- *Don't enable 'on the fly' reprojection*

- *Automatically enable 'on the fly' reprojection if layers have different CRS*
- *Enable 'on the fly' reprojection by default*
- *Создавать новые проекты в указанной системе координат*

Система координат для новых слоёв

This area allows you to define the action to take when a new layer is created, or when a layer without a CRS is loaded.

- *Запрашивать систему координат*
- *Использовать систему координат проекта*
- *Use default CRS displayed below*

Default datum transformations

- *Ask for datum transformation when no default is defined*
- If you have worked with the 'on-the-fly' CRS transformation you can see the result of the transformation in the window below. You can find information about 'Source CRS' and 'Destination CRS' as well as 'Source datum transform' and 'Destination datum transform'.

9.3.12 Locale Menu

- *Переопределить системный язык* и *Язык, используемый вместо системного*
- Дополнительная информация о системном языке

9.3.13 Network Menu

Общие

- Задать *Адрес поиска WMS-серверов*,по умолчанию используется `http://geopole.org/wms/search?search=\%1\&type=rss`
- Установить *Таймаут для сетевых запросов (мс)*. Значение по умолчанию — 60000
- Настроить *Время актуальности данных WMS-C/WMTS по умолчанию (часы)*. Значение по умолчанию —- 24 часа.
- Define *Max retry in case of tile request errors*
- Define *User-Agent*

Параметры кэширования

Задать *Каталог* и *Размер* кэша.

- *Использовать прокси-сервер для внешних соединений* и настроить поля «Узел», «Порт», «Пользователь», и «Пароль».
- Установить *Тип прокси* в соответствии с конфигурацией сети.
  - *Default Proxy*: прокси определяется настройками приложения
  - *Socks5Proxy*: Общий прокси для любого вида связи. Поддерживаются TCP, UDP, привязка к порту (входящие соединения) и авторизация
  - *HttpProxy*: реализован с использованием команды «CONNECT», поддерживает только исходящие TCP соединения; поддерживает авторизацию
  - *HttpCachingProxy*: Implemented using normal HTTP commands, it is useful only in the context of HTTP requests.

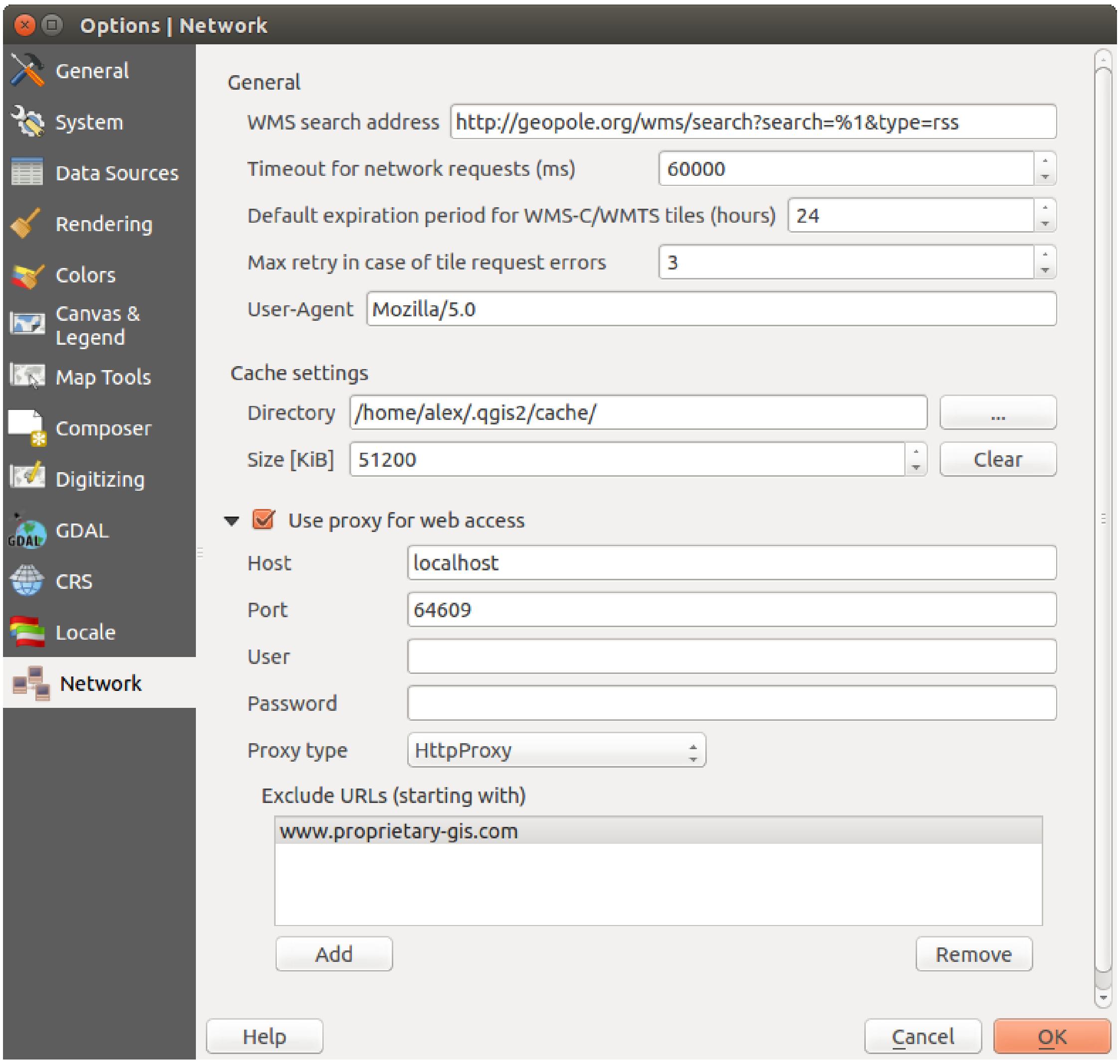

Рис. 9.4: Настройка прокси-сервера в QGIS

– *FtpCachingProxy*: Implemented using an FTP proxy, it is useful only in the context of FTP requests.

Excluding some URLs can be added to the text box below the proxy settings (see Figure_Network_Tab).

If you need more detailed information about the different proxy settings, please refer to the manual of the underlying QT library documentation at http://doc.trolltech.com/4.5/qnetworkproxy.html#ProxyType-enum.

Совет: Использование прокси-серверов

Using proxies can sometimes be tricky. It is useful to proceed by 'trial and error' with the above proxy types, to check to see if they succeed in your case.

Можно настроить параметры в соответствии со своими потребностями. Внесение некоторых изменений может потребовать перезапуска QGIS для их применения.

- Settings are saved in a text file: `$HOME/.config/QGIS/QGIS2.conf`
- You can find your settings in: `$HOME/Library/Preferences/org.qgis.qgis.plist`
- Settings are stored in the registry under: `HKEY\CURRENT_USER\Software\QGIS\qgis`

9.4 Настройка интерфейса

The customization tool lets you (de)activate almost every element in the QGIS user interface. This can be very useful if you have a lot of plugins installed that you never use and that are filling your screen.

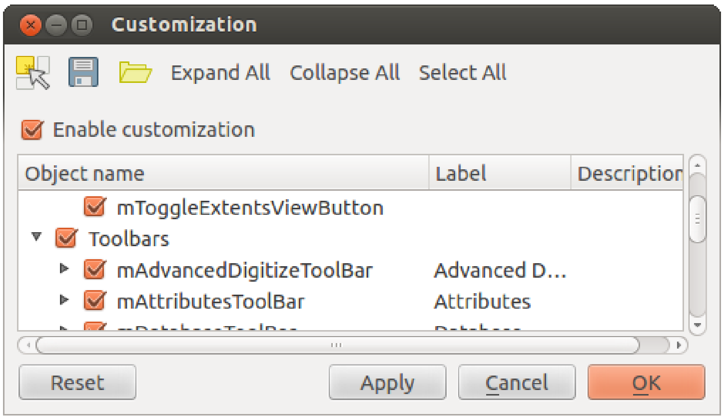

Рис. 9.5: Диалог «Настройка интерфейса»

QGIS Customization is divided into five groups. In *Menus*, you can hide entries in the Menu bar. In *Panel*, you find the panel windows. Panel windows are applications that can be started and used as a floating, top-level window or embedded to the QGIS main window as a docked widget (see also *Панели инструментов*). In the *Status Bar*, features like the coordinate information can be deactivated. In *Toolbars*, you can (de)activate the toolbar icons of QGIS, and in *Widgets*, you can (de)activate dialogs as well as their buttons.

With Switch to catching widgets in main application, you can click on elements in QGIS that you want to be hidden and find the corresponding entry in Customization (see figure_customization). You can also save your various setups for different use cases as well. Before your changes are applied, you need to restart QGIS.

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Глава 10

Работа с проекциями

QGIS allows users to define a global and project-wide CRS (coordinate reference system) for layers without a pre-defined CRS. It also allows the user to define custom coordinate reference systems and supports on-the-fly (OTF) projection of vector and raster layers. All of these features allow the user to display layers with different CRSs and have them overlay properly.

10.1 Обзор поддержки проекций

QGIS has support for approximately 2,700 known CRSs. Definitions for each CRS are stored in a SQLite database that is installed with QGIS. Normally, you do not need to manipulate the database directly. In fact, doing so may cause projection support to fail. Custom CRSs are stored in a user database. See section *Пользовательские системы координат* for information on managing your custom coordinate reference systems.

The CRSs available in QGIS are based on those defined by the European Petroleum Search Group (EPSG) and the Institut Geographique National de France (IGNF) and are largely abstracted from the spatial reference tables used in GDAL. EPSG identifiers are present in the database and can be used to specify a CRS in QGIS.

In order to use OTF projection, either your data must contain information about its coordinate reference system or you will need to define a global, layer or project-wide CRS. For PostGIS layers, QGIS uses the spatial reference identifier that was specified when the layer was created. For data supported by OGR, QGIS relies on the presence of a recognized means of specifying the CRS. In the case of shapefiles, this means a file containing the well-known text (WKT) specification of the CRS. This projection file has the same base name as the shapefile and a `.prj` extension. For example, a shapefile named `alaska.shp` would have a corresponding projection file named `alaska.prj`.

Whenever you select a new CRS, the layer units will automatically be changed in the *General* tab of the *Project Properties* dialog under the *Project* (Gnome, OS X) or *Settings* (KDE, Windows) menu.

10.2 Настройка системы координат по умолчанию

QGIS starts each new project using the global default projection. The global default CRS is EPSG:4326 - WGS 84 (`proj=longlat +ellps=WGS84 +datum=WGS84 +no_defs`), and it comes predefined in QGIS. This default can be changed via the **[Select...]** button in the first section, which is used to define the default coordinate reference system for new projects, as shown in figure_projection_1. This choice will be saved for use in subsequent QGIS sessions.

When you use layers that do not have a CRS, you need to define how QGIS responds to these layers. This can be done globally or project-wide in the *CRS* tab under *Settings* → *Options*.

На рисунке figure_projection_1 показаны возможные варианты:

- *Prompt for CRS*

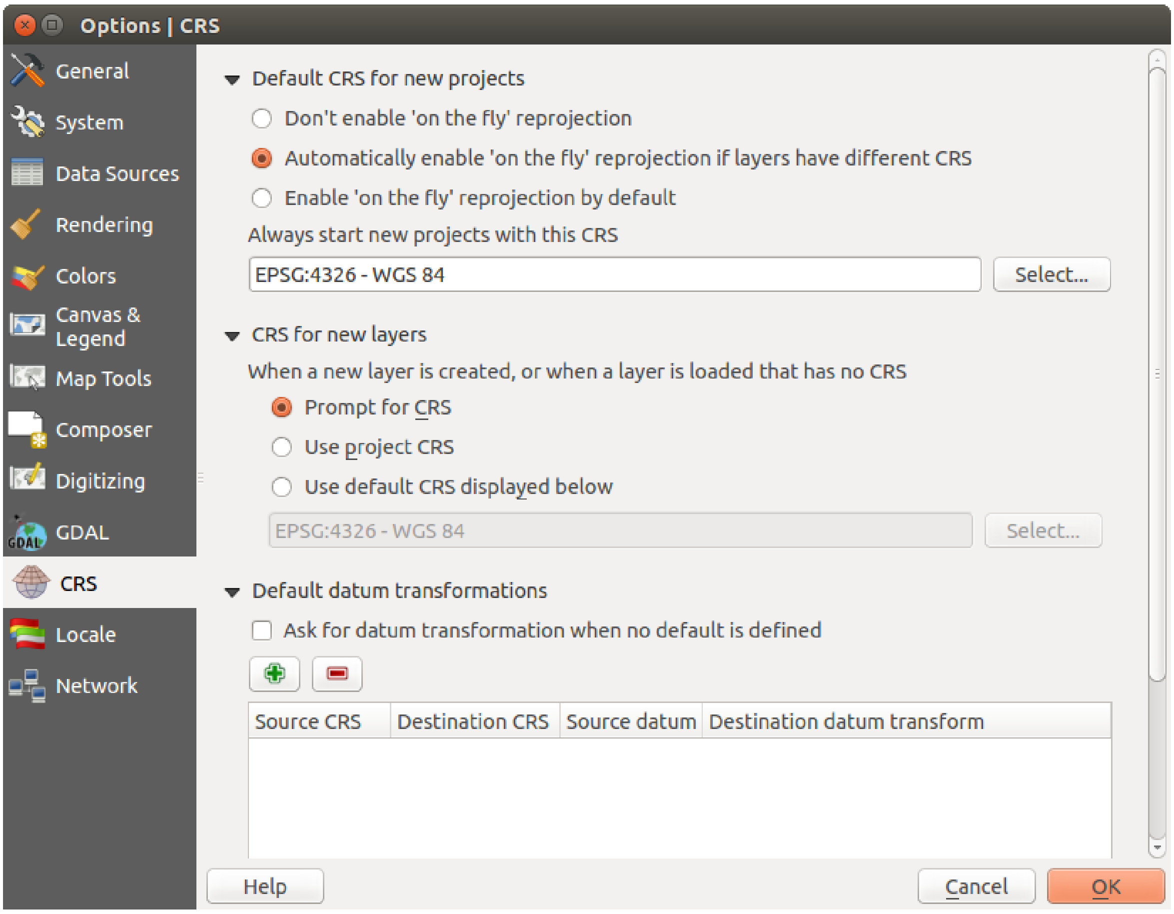

Рис. 10.1: Вкладка «Система координат» в диалоге настройки QGIS

- *Использовать систему координат проекта*
- *Use default CRS displayed below*

If you want to define the coordinate reference system for a certain layer without CRS information, you can also do that in the *General* tab of the raster and vector properties dialog (see *General Menu* for rasters and *Общие* for vectors). If your layer already has a CRS defined, it will be displayed as shown in *Свойства векторного слоя* .

Совет: Установка системы координат из списка слоёв

Right-clicking on a layer in the Map Legend (section *Легенда*) provides two CRS shortcuts. *Set layer CRS* takes you directly to the Coordinate Reference System Selector dialog (see figure_projection_2). *Set project CRS from Layer* redefines the project CRS using the layer's CRS.

10.3 Перепроецирование «на лету»

QGIS supports OTF reprojection for both raster and vector data. However, OTF is not activated by default. To use OTF projection, you must activate the *Enable on the fly CRS transformation* checkbox in the *CRS* tab of the *Project Properties* dialog.

There are three ways to do this:

1. Выберите пункт *Свойства проекта* в меню *Проект* (Gnome, OS X) или *Установки* (KDE, Windows).
2. Click on the CRS status icon in the lower right-hand corner of the status bar.
3. Turn OTF on by default in the *CRS* tab of the *Options* dialog by selecting *Enable 'on the fly' reprojection by default* or *Automatically enable 'on the fly' reprojection if layers have different CRS*.

If you have already loaded a layer and you want to enable OTF projection, the best practice is to open the *CRS* tab of the *Project Properties* dialog, select a CRS, and activate the *Enable 'on the fly' CRS transformation* checkbox. The CRS status icon will no longer be greyed out, and all layers will be OTF projected to the CRS shown next to the icon.

The *CRS* tab of the *Project Properties* dialog contains five important components, as shown in Figure_projection_2 and described below:

1. **Enable 'on the fly' CRS transformation** — This checkbox is used to enable or disable OTF projection. When off, each layer is drawn using the coordinates as read from the data source, and the components described below are inactive. When on, the coordinates in each layer are projected to the coordinate reference system defined for the map canvas.
2. **Filter** — If you know the EPSG code, the identifier, or the name for a coordinate reference system, you can use the search feature to find it. Enter the EPSG code, the identifier or the name.
3. **Recently used coordinate reference systems** — If you have certain CRSs that you frequently use in your everyday GIS work, these will be displayed in this list. Click on one of these items to select the associated CRS.
4. **Coordinate reference systems of the world** — This is a list of all CRSs supported by QGIS, including Geographic, Projected and Custom coordinate reference systems. To define a CRS, select it from the list by expanding the appropriate node and selecting the CRS. The active CRS is preselected.
5. **PROJ.4 text** — This is the CRS string used by the PROJ.4 projection engine. This text is read-only and provided for informational purposes.

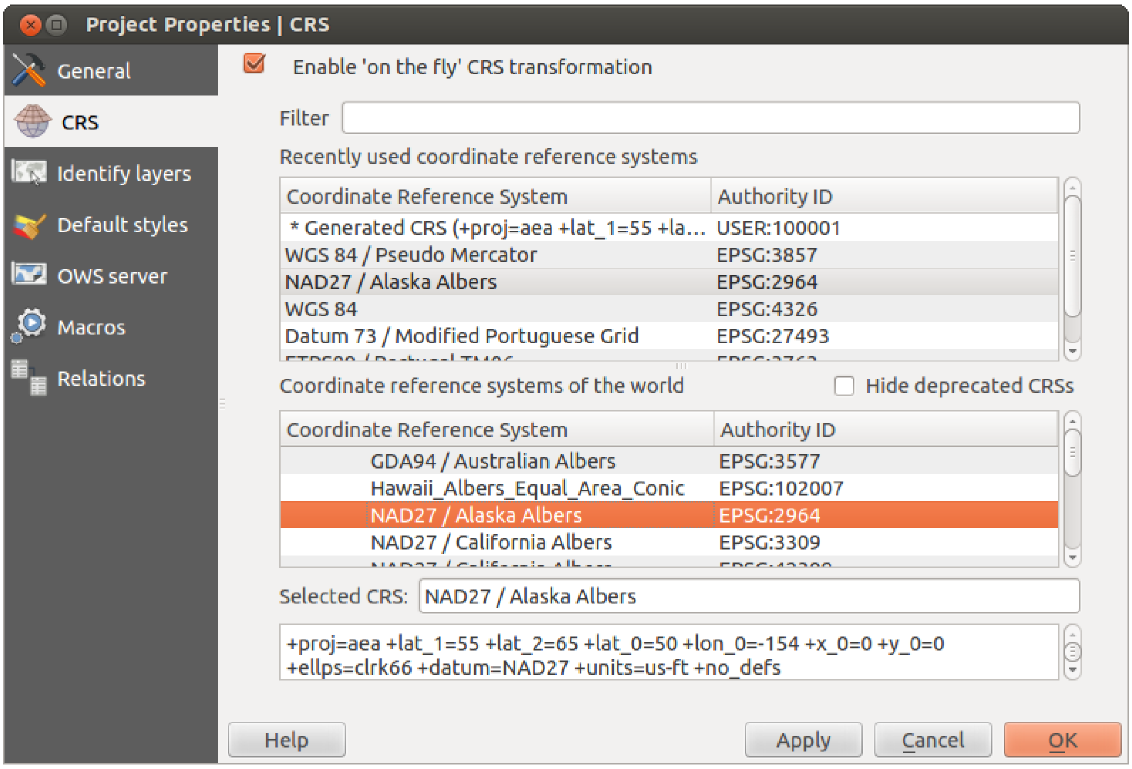

Рис. 10.2: Свойста проекта

Совет: Диалоговое окно Свойства проекта

If you open the *Project Properties* dialog from the *Project* menu, you must click on the *CRS* tab to view the CRS settings.

Opening the dialog from the CRS status icon will automatically bring the *CRS* tab to the front.

10.4 Пользовательские системы координат

If QGIS does not provide the coordinate reference system you need, you can define a custom CRS. To define a CRS, select *Custom CRS...* from the *Settings* menu. Custom CRSs are stored in your QGIS user database. In addition to your custom CRSs, this database also contains your spatial bookmarks and other custom data.

Defining a custom CRS in QGIS requires a good understanding of the PROJ.4 projection library. To begin, refer to “Cartographic Projection Procedures for the UNIX Environment - A User’s Manual” by Gerald I. Evenden, U.S. Geological Survey Open-File Report 90-284, 1990 (available at ftp://ftp.remotesensing.org/proj/OF90-284.pdf).

Данное руководство описывает использование `proj.4` и связанных утилит командной строки. Картографичские параметры, используемые в `proj.4`, описаны в руководстве и совпадают с используемыми в QGIS.

В диалоговом окне *Определение пользовательской системы координат* требуется всего два параметра для определения собственной проекции:

1. A descriptive name
2. The cartographic parameters in PROJ.4 format

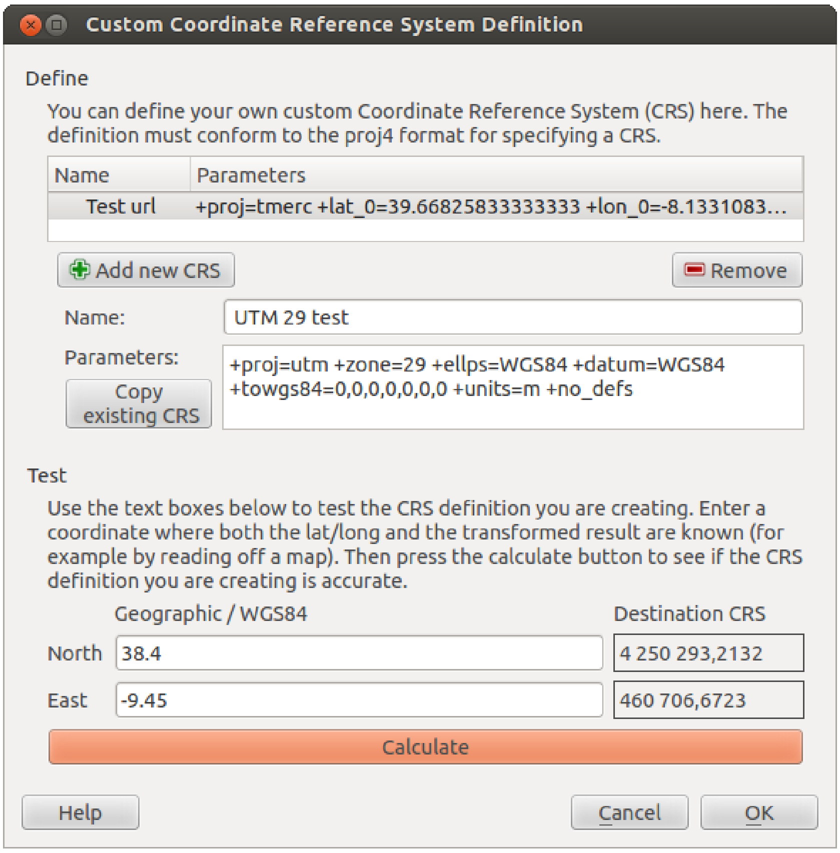

Рис. 10.3: Определение пользовательской системы координат

To create a new CRS, click the Add new CRS button and enter a descriptive name and the CRS parameters.

Note that the *Parameters* must begin with a `+proj=` block, to represent the new coordinate reference system.

You can test your CRS parameters to see if they give sane results. To do this, enter known WGS 84 latitude and longitude values in *North* and *East* fields, respectively. Click on **[Calculate]**, and compare the results with the known values in your coordinate reference system.

10.5 Default datum transformations

OTF depends on being able to transform data into a 'default CRS', and QGIS uses WGS84. For some CRS there are a number of transforms available. QGIS allows you to define the transformation used otherwise QGIS uses a default transformation.

In the *CRS* tab under *Settings* → *Options* you can:

- set QGIS to ask you when it needs define a transformation using *Ask for datum transformation when no default is defined*
- edit a list of user defaults for transformations.

QGIS asks which transformation to use by opening a dialogue box displaying PROJ.4 text describing the source and destination transforms. Further information may be found by hovering over a transform. User defaults can be saved by selecting *Remember selection*.

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Обозреватель QGIS

The QGIS Browser is a panel in QGIS that lets you easily navigate in your filesystem and manage geodata. You can have access to common vector files (e.g., ESRI shapefiles or MapInfo files), databases (e.g., PostGIS, Oracle, SpatiaLite or MS SQL Spatial) and WMS/WFS connections. You can also view your GRASS data (to get the data into QGIS, see *Интеграция с GRASS GIS*).

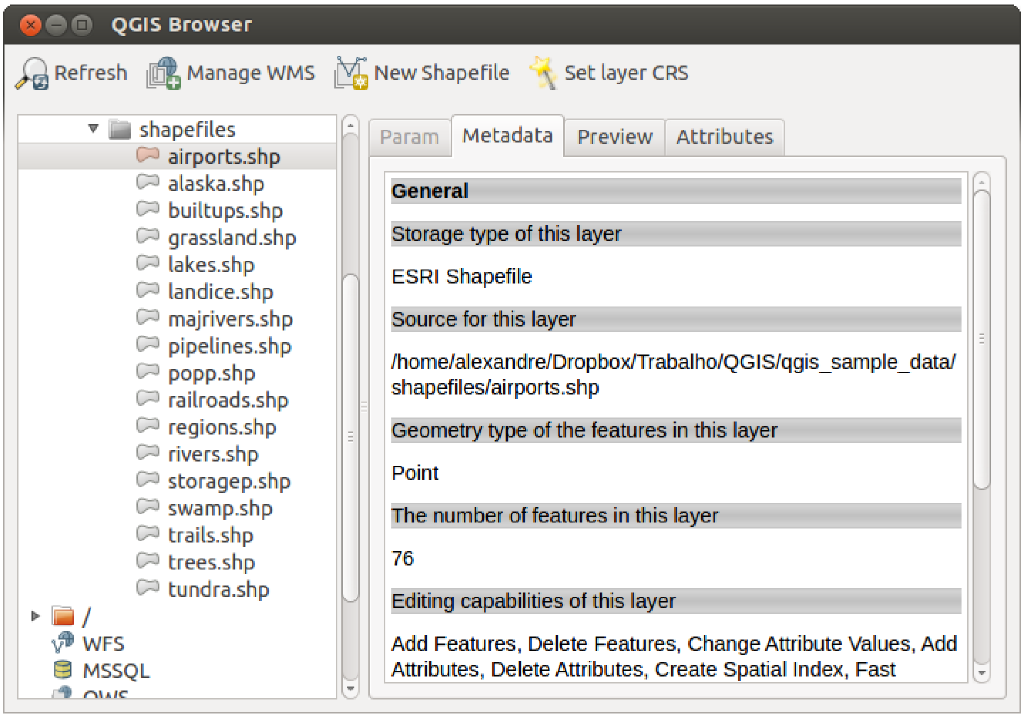

Рис. 11.1: QGIS browser as a stand alone application

Use the QGIS Browser to preview your data. The drag-and-drop function makes it easy to get your data into the map view and the map legend.

1. Activate the QGIS Browser: Right-click on the toolbar and check *Browser* or select it from *Settings* → *Panels*.
2. Drag the panel into the legend window and release it.
3. Перейдите на вкладку *Обозреватель*.
4. Browse in your filesystem and choose the `shapefile` folder from `qgis_sample_data` directory.
5. Press the `Shift` key and select the `airports.shp` and `alaska.shp` files.
6. Press the left mouse button, then drag and drop the files into the map canvas.

7. Вызовите контекстное меню слоя и выберите *Выбрать систему координат слоя для проекта* (см. раздел *Работа с проекциями*).

8. Нажмите кнопку Полный охват чтобы в области карты отобразились все слои.

There is a second browser available under *Settings* → *Panels*. This is handy when you need to move files or layers between locations.

1. Activate a second QGIS Browser: Right-click on the toolbar and check *Browser (2)*, or select it from *Settings* → *Panels*.

2. Переместите панель на область легенды.

3. Переключитесь на окно *Обозреватель (2)* и найдите необходимый shape-файл.

4. Select a file with the left mouse button. Now you can use the Add Selected Layers icon to add it into the current project.

QGIS automatically looks for the coordinate reference system (CRS) and zooms to the layer extent if you work in a blank QGIS project. If there are already files in your project, the file will just be added, and in the case that it has the same extent and CRS, it will be visualized. If the file has another CRS and layer extent, you must first right-click on the layer and choose *Set Project CRS from Layer*. Then choose *Zoom to Layer Extent*.

The Filter files function works on a directory level. Browse to the folder where you want to filter files and enter a search word or wildcard. The Browser will show only matching filenames – other data won't be displayed.

It's also possible to run the QGIS Browser as a stand-alone application.

Start the QGIS browser

- в командной строке выполните `qbrowser`
- Start the QGIS Browser using the Start menu or desktop shortcut.
- The QGIS Browser is available from your Applications folder.

In figure_browser_standalone_metadata, you can see the enhanced functionality of the stand-alone QGIS Browser. The *Param* tab provides the details of your connection-based datasets, like PostGIS or MSSQL Spatial. The *Metadata* tab contains general information about the file (see *Метаданные*). With the *Preview* tab, you can have a look at your files without importing them into your QGIS project. It's also possible to preview the attributes of your files in the *Attributes* tab.

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Глава 12

Работа с векторными данными

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12.1 Поддерживаемые форматы

QGIS uses the OGR library to read and write vector data formats, including ESRI shapefiles, MapInfo and MicroStation file formats, AutoCAD DXF, PostGIS, SpatiaLite, Oracle Spatial and MSSQL Spatial databases, and many more. GRASS vector and PostgreSQL support is supplied by native QGIS data provider plugins. Vector data can also be loaded in read mode from zip and gzip archives into QGIS. As of the date of this document, 69 vector formats are supported by the OGR library (see OGR-SOFTWARE-SUITE in *Литература и ссылки на web-ресурсы*). The complete list is available at http://www.gdal.org/ogr/ogr_formats.html.

Примечание: Not all of the listed formats may work in QGIS for various reasons. For example, some require external commercial libraries, or the GDAL/OGR installation of your OS may not have been built to support the format you want to use. Only those formats that have been well tested will appear in the list of file types when loading a vector into QGIS. Other untested formats can be loaded by selecting `*.*`.

Работа с векторными данными в формате GRASS описана в разделе *Интеграция с GRASS GIS*.

This section describes how to work with several common formats: ESRI shapefiles, PostGIS layers, SpatiaLite layers, OpenStreetMap vectors, and Comma Separated data (CSV). Many of the features available in QGIS work the same, regardless of the vector data source. This is by design, and it includes the identify, select, labeling and attributes functions.

12.1.1 Shape-файлы

The standard vector file format used in QGIS is the ESRI shapefile. Support is provided by the OGR Simple Feature Library (http://www.gdal.org/ogr/).

На самом деле, shape-файл состоит из нескольких файлов разных форматов. Из них три обязательны:

1. `.shp` file containing the feature geometries
2. `.dbf` file containing the attributes in dBase format
3. `.shx` index file

Shapefiles also can include a file with a `.prj` suffix, which contains the projection information. While it is very useful to have a projection file, it is not mandatory. A shapefile dataset can contain additional files. For further details, see the ESRI technical specification at http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf.

Добавление shape-файла к карте

To load a shapefile, start QGIS and click on the Add Vector Layer toolbar button, or simply press `Ctrl+Shift+V`. This will bring up a new window (see figure_vector_1).

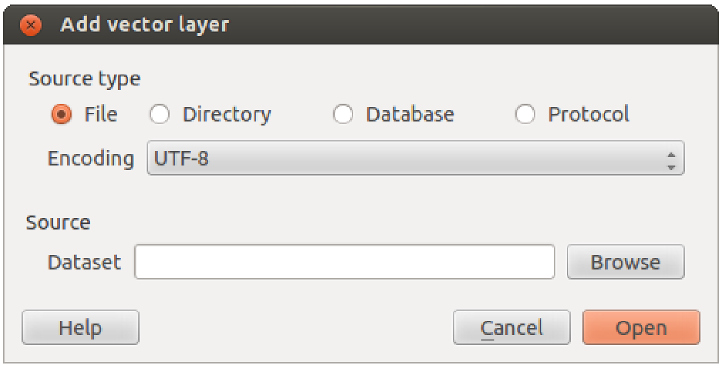

Рис. 12.1: Диалог «Добавить векторны слой»

From the available options check *File*. Click on **[Browse]**. That will bring up a standard open file dialog (see figure_vector_2), which allows you to navigate the file system and load a shapefile or other supported data source. The selection box *Filter* allows you to preselect some OGR-supported file formats.

You can also select the encoding for the shapefile if desired.

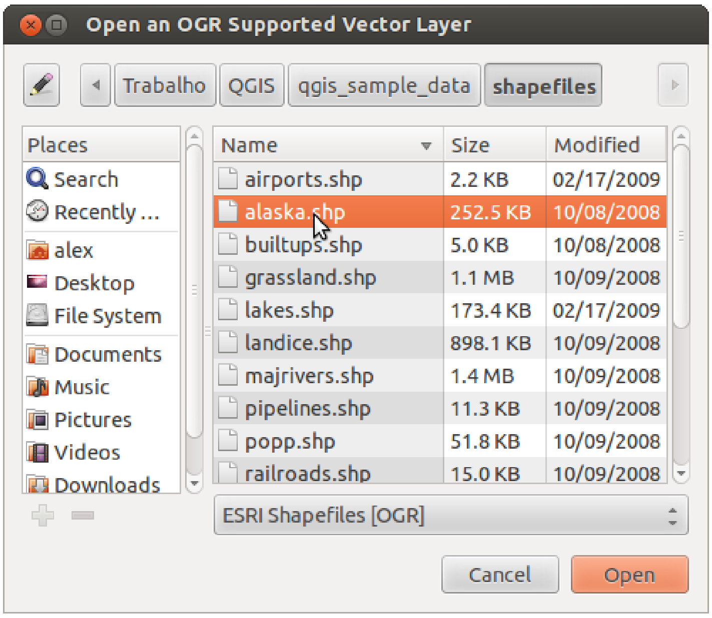

Рис. 12.2: Диалог «Открыть OGR-совместимый векторный слой»

Выбор shape-файла из списка и нажатие кнопки **[Открыть]** загружает файл в QGIS. Рисунок Figure_vector_3 демонстрирует QGIS после открытия файла `alaska.shp`.

Совет: Цвет слоя

Каждому вновь добавленному к карте слою присваивается случайный цвет. Если было открыто несколько слоёв, каждому присваивается свой цвет, отличный от других.

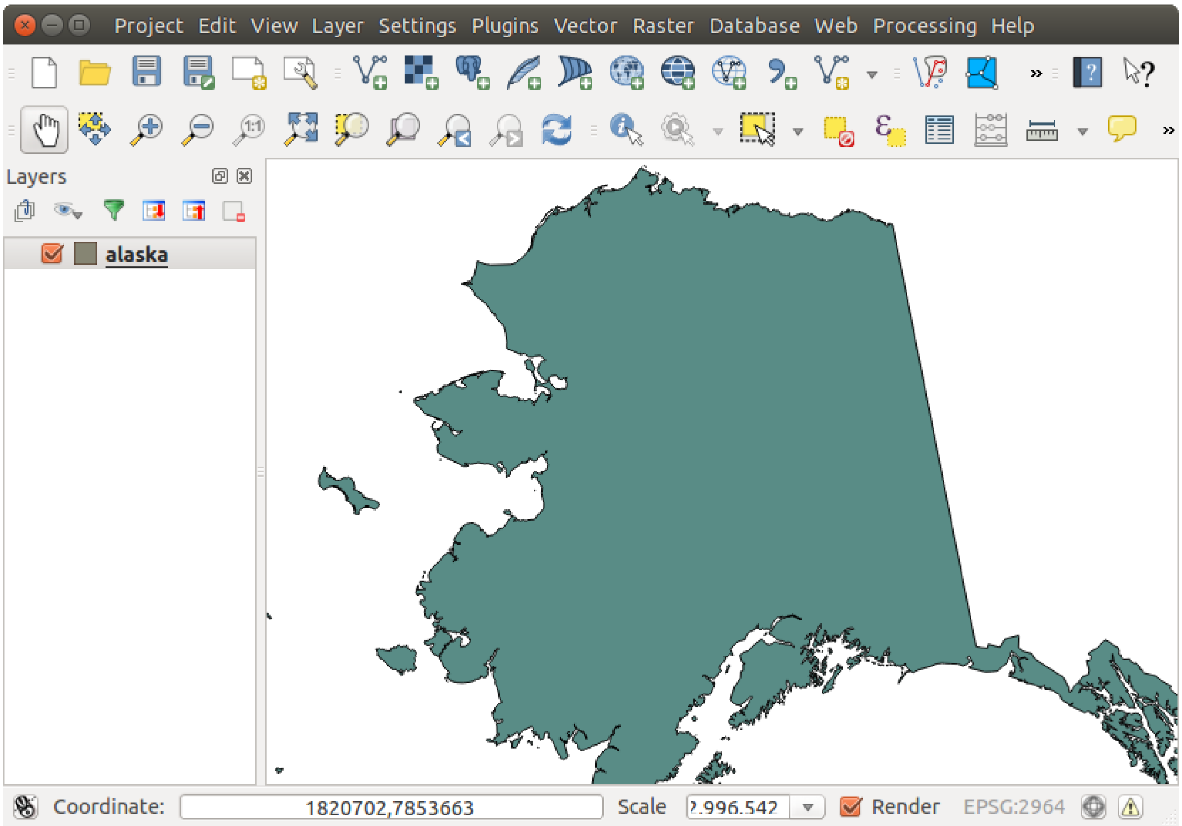

Рис. 12.3: QGIS с загруженным shape-файлом Аляски

Once a shapefile is loaded, you can zoom around it using the map navigation tools. To change the style of a layer, open the *Layer Properties* dialog by double clicking on the layer name or by right-clicking on the name in the legend and choosing *Properties* from the context menu. See section *Вкладка «Стиль»* for more information on setting symbology of vector layers.

Совет: Добавление слоя или проекта со внешнего носителя в OS X

On OS X, portable drives that are mounted beside the primary hard drive do not show up as expected under *File* → *Open Project*. We are working on a more OSX-native open/save dialog to fix this. As a workaround, you can type `/Volumes` in the *File name* box and press `Enter`. Then you can navigate to external drives and network mounts.

Улучшение производительности

Для увеличения производительности при отрисовке shape-файла можно создать пространственный индекс. Пространственный индекс улучшает скорость отрисовки как при изменении масштаба, так и при панорамировании (перемещении слоя в каком-либо направлении без изменения масштаба). Файл пространственного индекса, используемого QGIS, имеет расширение `.qix`.

Чтобы создать индекс, необходимо:

- Load a shapefile by clicking on the Add Vector Layer toolbar button or pressing `Ctrl+Shift+V`.
- Open the *Layer Properties* dialog by double-clicking on the shapefile name in the legend or by right-clicking and choosing *Properties* from the context menu.
- In the *General* tab, click the **[Create Spatial Index]** button.

Проблема загрузки shape-файла с файлом .prj

If you load a shapefile with a `.prj` file and QGIS is not able to read the coordinate reference system from that file, you will need to define the proper projection manually within the *General* tab of the *Layer Properties* dialog of the layer by clicking the **[Specify...]** button. This is due to the fact that `.prj` files often do not provide the complete projection parameters as used in QGIS and listed in the *CRS* dialog.

For the same reason, if you create a new shapefile with QGIS, two different projection files are created: a `.prj` file with limited projection parameters, compatible with ESRI software, and a `.qpj` file, providing the complete parameters of the used CRS. Whenever QGIS finds a `.qpj` file, it will be used instead of the `.prj`.

12.1.2 Добавление слоя MapInfo к карте

To load a MapInfo layer, click on the Add Vector Layer toolbar button; or type `Ctrl+Shift+V`, change the file type filter *Files of type* : to 'Mapinfo File [OGR] (*.mif *.tab *.MIF *.TAB)' and select the MapInfo layer you want to load.

12.1.3 Добавление на карту покрытия ArcInfo

To load an ArcInfo Binary Coverage, click on the Add Vector Layer toolbar button or press `Ctrl+Shift+V` to open the *Add Vector Layer* dialog. Select *Directory* as *Source type*. Change the file type filter *Files of type* to 'Arc/Info Binary Coverage'. Navigate to the directory that contains the coverage file, and select it.

Similarly, you can load directory-based vector files in the UK National Transfer Format, as well as the raw TIGER Format of the US Census Bureau.

12.1.4 Delimited Text Files

Tabular data is a very common and widely used format because of its simplicity and readability – data can be viewed and edited even in a plain text editor. A delimited text file is an attribute table with each column separated by a defined character and each row separated by a line break. The first row usually contains the column names. A common type of delimited text file is a CSV (Comma Separated Values), with each column separated by a comma.

Such data files can also contain positional information in two main forms:

- As point coordinates in separate columns
- As well-known text (WKT) representation of geometry

QGIS allows you to load a delimited text file as a layer or ordinal table. But first check that the file meets the following requirements:

1. The file must have a delimited header row of field names. This must be the first line in the text file.
2. The header row must contain field(s) with geometry definition. These field(s) can have any name.
3. The X and Y coordinates (if geometry is defined by coordinates) must be specified as numbers. The coordinate system is not important.

As an example of a valid text file, we import the elevation point data file `elevp.csv` that comes with the QGIS sample dataset (see section *Примеры данных*):

```
X;Y;ELEV
-300120;7689960;13
-654360;7562040;52
1640;7512840;3
[...]
```

Some items to note about the text file:

1. The example text file uses `;` (semicolon) as delimiter. Any character can be used to delimit the fields.
2. The first row is the header row. It contains the fields `X`, `Y` and `ELEV`.
3. No quotes (`"`) are used to delimit text fields.
4. The X coordinates are contained in the `X` field.
5. The Y coordinates are contained in the `Y` field.

Loading a delimited text file

Click the toolbar icon Add Delimited Text Layer in the *Manage layers* toolbar to open the *Create a Layer from a Delimited Text File* dialog, as shown in figure_delimited_text_1.

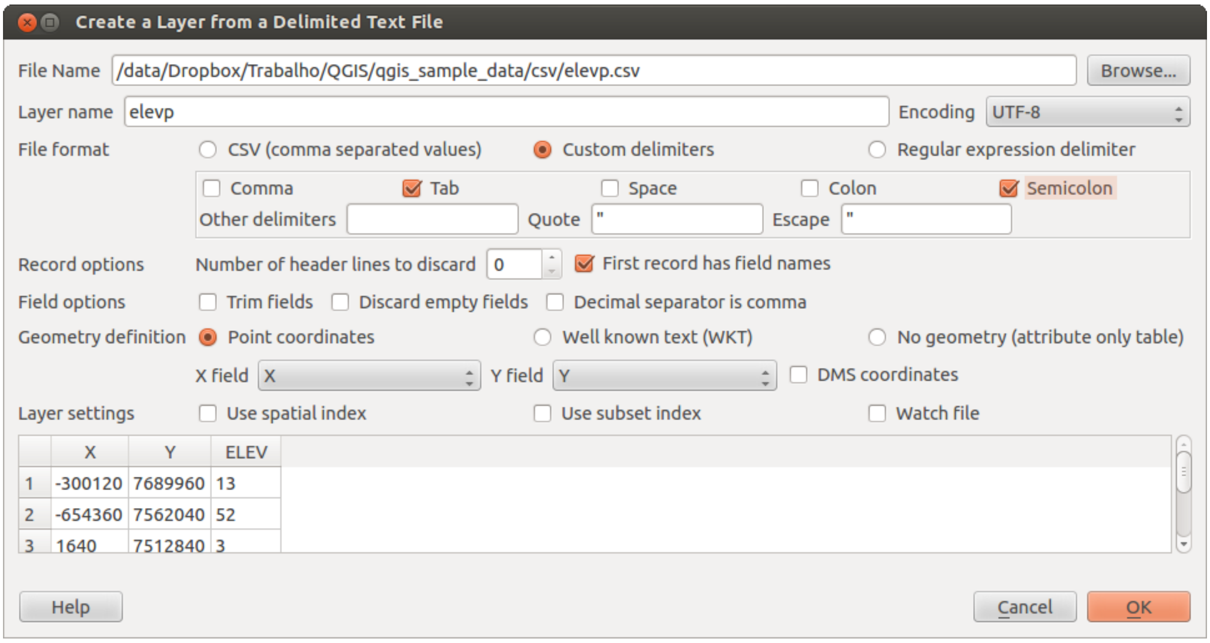

Рис. 12.4: Delimited Text Dialog

First, select the file to import (e.g., `qgis_sample_data/csv/elevp.csv`) by clicking on the **[Browse]** button. Once the file is selected, QGIS attempts to parse the file with the most recently used delimiter. To enable QGIS to properly parse the file, it is important to select the correct delimiter. You can specify a delimiter by activating *Custom delimiters*, or by activating *Regular expression delimiter* and entering text into the *Expression* field. For example, to change the delimiter to tab, use `\t` (this is a regular expression for the tab character).

Once the file is parsed, set *Geometry definition* to *Point coordinates* and choose the `X` and `Y` fields from the dropdown lists. If the coordinates are defined as degrees/minutes/seconds, activate the *DMS coordinates* checkbox.

Finally, enter a layer name (e.g., `elevp`), as shown in figure_delimited_text_1. To add the layer to the map, click **[OK]**. The delimited text file now behaves as any other map layer in QGIS.

There is also a helper option that allows you to trim leading and trailing spaces from fields — *Trim fields*. Also, it is possible to *Discard empty fields*. If necessary, you can force a comma to be the decimal separator by activating *Decimal separator is comma*.

If spatial information is represented by WKT, activate the *Well Known Text* option and select the field with the WKT definition for point, line or polygon objects. If the file contains non-spatial data, activate *No geometry (attribute only table)* and it will be loaded as an ordinal table.

Additionaly, you can enable:

- *Use spatial index* to improve the performance of displaying and spatially selecting features.
- *Use subset index*.
- *Watch file* to watch for changes to the file by other applications while QGIS is running.

12.1.5 OpenStreetMap data

In recent years, the OpenStreetMap project has gained popularity because in many countries no free geodata such as digital road maps are available. The objective of the OSM project is to create a free editable map of the world from GPS data, aerial photography or local knowledge. To support this objective, QGIS provides suppport for OSM data.

Загрузка данных OpenStreetMap

QGIS integrates OpenStreetMap import as a core functionality.

- To connect to the OSM server and download data, open the menu *Vector* → *Openstreetmap* → *Load data*. You can skip this step if you already obtained an `.osm` XML file using JOSM, Overpass API or any other source.
- The menu *Vector* → *Openstreetmap* → *Import topology from an XML file* will convert your `.osm` file into a SpatiaLite database and create a corresponding database connection.
- The menu *Vector* → *Openstreetmap* → *Export topology to SpatiaLite* then allows you to open the database connection, select the type of data you want (points, lines, or polygons) and choose tags to import. This creates a SpatiaLite geometry layer that you can add to your project by clicking on the Add SpatiaLite Layer toolbar button or by selecting the *Add SpatiaLite Layer...* option from the *Layer* menu (see section *Слои SpatiaLite*).

12.1.6 Слои PostGIS

PostGIS layers are stored in a PostgreSQL database. The advantages of PostGIS are the spatial indexing, filtering and query capabilities it provides. Using PostGIS, vector functions such as select and identify work more accurately than they do with OGR layers in QGIS.

Настройка подключения к базе данных PostGIS (PostgreSQL)

The first time you use a PostGIS data source, you must create a connection to the PostgreSQL database that contains the data. Begin by clicking on the Add PostGIS Layer toolbar button, selecting the *Add PostGIS Layer...* option from the *Layer* menu, or typing `Ctrl+Shift+D`. You can also open the *Add Vector Layer* dialog and select *Database*. The *Add PostGIS Table(s)* dialog will be displayed. To access the connection manager, click on the **[New]** button to display the *Create a New PostGIS Connection* dialog. The parameters required for a connection are:

- **Name**: A name for this connection. It can be the same as *Database*.
- **Service**: Service parameter to be used alternatively to hostname/port (and potentially database). This can be defined in `pg_service.conf`.
- **Host**: Name of the database host. This must be a resolvable host name such as would be used to open a telnet connection or ping the host. If the database is on the same computer as QGIS, simply enter *'localhost'* here.
- **Порт**: номер порта, который «слушает» сервер базы данных PostgreSQL. По умолчанию используется порт 5432
- **База данных**: имя базы данных
- **SSL mode**: How the SSL connection will be negotiated with the server. Note that massive speedups in PostGIS layer rendering can be achieved by disabling SSL in the connection editor. The following options are available:
  - Disable: Only try an unencrypted SSL connection.
  - Allow: Try a non-SSL connection. If that fails, try an SSL connection.
  - Prefer (the default): Try an SSL connection. If that fails, try a non-SSL connection.
  - Require: Only try an SSL connection.
- **Username**: User name used to log in to the database.
- **Пароль**: пароль, используемый вместе с *именем пользователя* для подключения к базе данных

Optionally, you can activate the following checkboxes:

- *Сохранить пользователя*
- *Сохранить пароль*
- *Искать только в таблице «geometry_columns»*
- *Don't resolve type of unrestricted columns (GEOMETRY)*
- *Искать только в схеме «public»*
- *Показать таблицы без геометрии*
- *Использовать расчётные метаданные таблицы*

Когда параметры установлены, можно проверить соединение путём нажатия на кнопку **[Проверить соединение]**.

Добавление слоя PostGIS к карте

Once you have one or more connections defined, you can load layers from the PostgreSQL database. Of course, this requires having data in PostgreSQL. See section *Импорт данных в PostgreSQL* for a discussion on importing data into the database.

Для открытия слоя PostGIS проделайте следующие шаги:

- Если диалог *Добавить слои PostGIS* ещё не открыт, нажмите кнопку Добавить слой PostGIS на панели инструментов или нажмите `Ctrl+Shift+D`.
- Выберите соединение из выпадающего списка и нажмите кнопку **[Подключиться]**
- Select or unselect *Also list tables with no geometry*.

- Optionally, use some *Search Options* to define which features to load from the layer, or use the **[Build query]** button to start the *Query builder* dialog.
- Найдите слой, который желаете добавить в список доступных слоёв
- Select it by clicking on it. You can select multiple layers by holding down the `Shift` key while clicking. See section *Конструктор поисковых запросов* for information on using the PostgreSQL Query Builder to further define the layer.
- Нажмите кнопку **[Добавить]**, чтобы добавить слой к карте

Совет: Слои PostGIS

Normally, a PostGIS layer is defined by an entry in the geometry_columns table. From version 0.9.0 on, QGIS can load layers that do not have an entry in the geometry_columns table. This includes both tables and views. Defining a spatial view provides a powerful means to visualize your data. Refer to your PostgreSQL manual for information on creating views.

Некоторые особенности работы со слоями PostgreSQL

This section contains some details on how QGIS accesses PostgreSQL layers. Most of the time, QGIS should simply provide you with a list of database tables that can be loaded, and it will load them on request. However, if you have trouble loading a PostgreSQL table into QGIS, the information below may help you understand any QGIS messages and give you direction on changing the PostgreSQL table or view definition to allow QGIS to load it.

QGIS requires that PostgreSQL layers contain a column that can be used as a unique key for the layer. For tables, this usually means that the table needs a primary key, or a column with a unique constraint on it. In QGIS, this column needs to be of type int4 (an integer of size 4 bytes). Alternatively, the ctid column can be used as primary key. If a table lacks these items, the oid column will be used instead. Performance will be improved if the column is indexed (note that primary keys are automatically indexed in PostgreSQL).

If the PostgreSQL layer is a view, the same requirement exists, but views do not have primary keys or columns with unique constraints on them. You have to define a primary key field (has to be integer) in the QGIS dialog before you can load the view. If a suitable column does not exist in the view, QGIS will not load the layer. If this occurs, the solution is to alter the view so that it does include a suitable column (a type of integer and either a primary key or with a unique constraint, preferably indexed).

QGIS offers a checkbox **Select at id** that is activated by default. This option gets the ids without the attributes which is faster in most cases. It can make sense to disable this option when you use expensive views.

12.1.7 Импорт данных в PostgreSQL

Data can be imported into PostgreSQL/PostGIS using several tools, including the SPIT plugin and the command line tools shp2pgsql and ogr2ogr.

DB Manager

QGIS comes with a core plugin named DB Manager. It can be used to load shapefiles and other data formats, and it includes support for schemas. See section *Модуль «DB Manager»* for more information.

shp2pgsql

PostGIS includes an utility called **shp2pgsql** that can be used to import shapefiles into a PostGIS-enabled database. For example, to import a shapefile named `lakes.shp` into a PostgreSQL database named **gis_data**, use the following command:

```
shp2pgsql -s 2964 lakes.shp lakes_new | psql gis_data
```

This creates a new layer named `lakes_new` in the `gis_data` database. The new layer will have a spatial reference identifier (SRID) of 2964. See section *Работа с проекциями* for more information on spatial reference systems and projections.

Совет: Экспорт наборов данных из PostGIS

Like the import tool **shp2pgsql**, there is also a tool to export PostGIS datasets as shapefiles: **pgsql2shp**. This is shipped within your PostGIS distribution.

ogr2ogr

Besides **shp2pgsql** and **DB Manager**, there is another tool for feeding geodata in PostGIS: **ogr2ogr**. This is part of your GDAL installation.

Для импорта shape-файла в PostGIS проделайте следующее (в):

```
ogr2ogr -f "PostgreSQL" PG:"dbname=postgis host=myhost.de user=postgres
password=topsecret" alaska.shp
```

This will import the shapefile `alaska.shp` into the PostGIS database *postgis* using the user *postgres* with the password *topsecret* on host server *myhost.de*.

Note that OGR must be built with PostgreSQL to support PostGIS. You can verify this by typing (in)

```
ogrinfo --formats | grep -i post
```

If you prefer to use PostgreSQL's **COPY** command instead of the default **INSERT INTO** method, you can export the following environment variable (at least available on and):

```
export PG_USE_COPY=YES
```

ogr2ogr does not create spatial indexes like **shp2pgsl** does. You need to create them manually, using the normal SQL command **CREATE INDEX** afterwards as an extra step (as described in the next section *Повышение производительности*).

Повышение производительности

Retrieving features from a PostgreSQL database can be time-consuming, especially over a network. You can improve the drawing performance of PostgreSQL layers by ensuring that a PostGIS spatial index exists on each layer in the database. PostGIS supports creation of a GiST (Generalized Search Tree) index to speed up spatial searches of the data (GiST index information is taken from the PostGIS documentation available at http://postgis.refractions.net).

Ниже представлен порядок создания GiST-индекса:

```
CREATE INDEX [indexname] ON [tablename]
  USING GIST ( [geometryfield] GIST_GEOMETRY_OPS );
```

Заметьте, что для больших таблиц создание индекса может занять продолжительное время. После создания индекса следует произвести выполнить команду `VACUUM ANALYZE`. Дополнительную информацию можно найти в документации к PostGIS (POSTGIS-PROJECT *Литература и ссылки на web-ресурсы*).

Приведём пример создания GiST-индекса ():

```
gsherman@madison:~/current$ psql gis_data
Welcome to psql 8.3.0, the PostgreSQL interactive terminal.

Type:  \copyright for distribution terms
       \h for help with SQL commands
       \? for help with psql commands
       \g or terminate with semicolon to execute query
       \q to quit

gis_data=# CREATE INDEX sidx_alaska_lakes ON alaska_lakes
gis_data-# USING GIST (the_geom GIST_GEOMETRY_OPS);
CREATE INDEX
gis_data=# VACUUM ANALYZE alaska_lakes;
VACUUM
gis_data=# \q
gsherman@madison:~/current$
```

12.1.8 Векторные слои, пересекающие долготу 180°

Many GIS packages don't wrap vector maps with a geographic reference system (lat/lon) crossing the 180 degrees longitude line (http://postgis.refractions.net/documentation/manual-2.0/ST_Shift_Longitude.html). As result, if we open such a map in QGIS, we will see two far, distinct locations, that should appear near each other. In Figure_vector_4, the tiny point on the far left of the map canvas (Chatham Islands) should be within the grid, to the right of the New Zealand main islands.

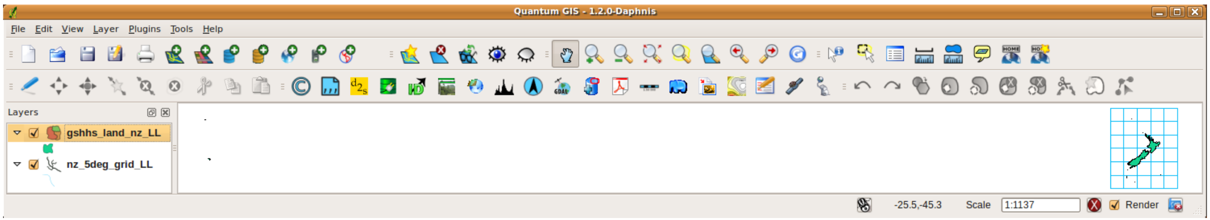

Рис. 12.5: Карта в системе координат широта/долгота, пересекающая долготу 180°

A work-around is to transform the longitude values using PostGIS and the **ST_Shift_Longitude** function. This function reads every point/vertex in every component of every feature in a geometry, and if the longitude coordinate is $< 0°$, it adds 360° to it. The result is a 0° - 360° version of the data to be plotted in a 180°-centric map.

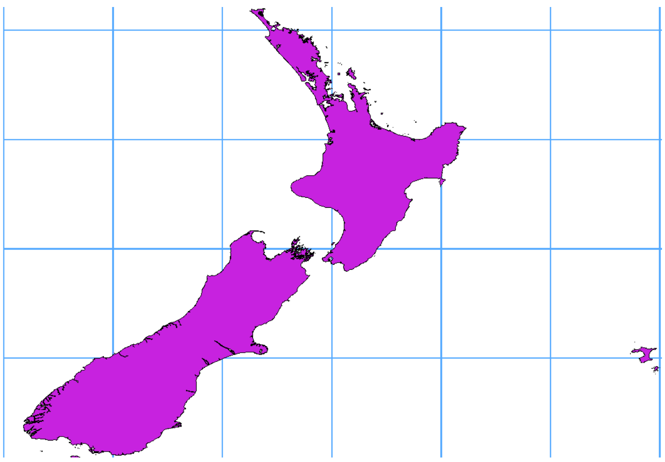

Рис. 12.6: Карта, пересекающая долготу 180°, после применения функции ST_Shift_Longitude

Использование

- Import data into PostGIS (*Импорт данных в PostgreSQL*) using, for example, the DB Manager plugin.
- Use the PostGIS command line interface to issue the following command (in this example, "TABLE" is the actual name of your PostGIS table): `gis_data=# update TABLE set the_geom=ST_Shift_Longitude(the_geom);`
- If everything went well, you should receive a confirmation about the number of features that were updated. Then you'll be able to load the map and see the difference (Figure_vector_5).

12.1.9 Слои SpatiaLite

The first time you load data from a SpatiaLite database, begin by clicking on the Add SpatiaLite Layer toolbar button, or by selecting the *Add SpatiaLite Layer...* option from the *Layer* menu, or by typing `Ctrl+Shift+L`. This will bring up a window that will allow you either to connect to a SpatiaLite database already known to QGIS, which you can choose from the drop-down menu, or to define a new connection to a new database. To define a new connection, click on **[New]** and use the file browser to point to your SpatiaLite database, which is a file with a `.sqlite` extension.

If you want to save a vector layer to SpatiaLite format, you can do this by right clicking the layer in the legend. Then, click on *Save as..*, define the name of the output file, and select 'SpatiaLite' as format and the CRS. Also, you can select 'SQLite' as format and then add `SPATIALITE=YES` in the OGR data source creation option field. This tells OGR to create a SpatiaLite database. See also http://www.gdal.org/ogr/drv_sqlite.html.

QGIS также поддерживает обновляемые представления в базах данных SpatiaLite.

Создание нового слоя SpatiaLite

Процесс создания новых слоёв в базе SpatiaLite описан в разделе *Создание нового слоя SpatiaLite*.

Совет: Модули для работы с данными SpatiaLite

For SpatiaLite data management, you can also use several Python plugins: QSpatiaLite, SpatiaLite Manager or DB Manager (core plugin, recommended). If necessary, they can be downloaded and installed with the Plugin Installer.

12.1.10 Слои MSSQL Spatial

QGIS also provides native MS SQL 2008 support. The first time you load MSSQL Spatial data, begin by clicking on the Add MSSQL Spatial Layer toolbar button or by selecting the *Add MSSQL Spatial Layer...* option from the *Layer* menu, or by typing `Ctrl+Shift+M`.

12.1.11 Oracle Spatial Layers

The spatial features in Oracle Spatial aid users in managing geographic and location data in a native type within an Oracle database. QGIS now has support for such layers.

Настройка подключения к базе данных PostGIS (PostgreSQL)

The first time you use an Oracle Spatial data source, you must create a connection to the database that contains the data. Begin by clicking on the Add Orcale Spatial Layer toolbar button, selecting the *Add Orcale Spatial Layer...* option from the *Layer* menu, or typing `Ctrl+Shift+O`. To access the connection manager, click on the **[New]** button to display the *Create a New Oracle Spatial Connection* dialog. The parameters required for a connection are:

- **Name**: A name for this connection. It can be the same as *Database*
- **Database**: SID or SERVICE_NAME of the Oracle instance.
- **Host**: Name of the database host. This must be a resolvable host name such as would be used to open a telnet connection or ping the host. If the database is on the same computer as QGIS, simply enter *'localhost'* here.
- **Port**: Port number the PostgreSQL database server listens on. The default port is 1521.
- **Username**: Username used to login to the database.
- **Пароль**: пароль, используемый вместе с *именем пользователя* для подключения к базе данных

Optionally, you can activate following checkboxes:

- *Save Username* Indicates whether to save the database username in the connection configuration.
- *Save Password* Indicates whether to save the database password in the connection settings.
- *Only look in meta data table* Restricts the displayed tables to those that are in the all_sdo_geom_metadata view. This can speed up the initial display of spatial tables.
- *Only look for user's tables* When searching for spatial tables, restrict the search to tables that are owned by the user.
- *Also list tables with no geometry* Indicates that tables without geometry should also be listed by default.
- *Use estimated table statistics for the layer metadata* When the layer is set up, various metadata are required for the Oracle table. This includes information such as the table row count, geometry type and spatial extents of the data in the geometry column. If the table contains a large number of rows, determining this metadata can be time-consuming. By activating this option, the following fast table metadata operations are done: Row count is determined from `all_tables.num_rows`. Table extents are always determined with the SDO_TUNE.EXTENTS_OF function, even if a layer filter is applied. Table geometry is determined from the first 100 non-null geometry rows in the table.
- *Only existing geometry types* Only list the existing geometry types and don't offer to add others.

Когда параметры установлены, можно проверить соединение путём нажатия на кнопку **[Проверить соединение]**.

Совет: Пользовательские настройки и безопасность

В зависимости от используемой операционной системы и настроек компьютера, хранение пароля в настройках QGIS может создавать угрозу безопасности. QGIS хранит пользовательские настройки:

- The settings are stored in your home directory in `~/.qgis2`.
- The settings are stored in the registry.

Loading an Oracle Spatial Layer

Once you have one or more connections defined, you can load layers from the Oracle database. Of course, this requires having data in Oracle.

To load a layer from Oracle Spatial, perform the following steps:

- If the *Add Oracle Spatial layers* dialog is not already open, click on the Add Oracle Spatial Layer toolbar button.
- Выберите соединение из выпадающего списка и нажмите кнопку **[Подключиться]**
- Select or unselect *Also list tables with no geometry*.
- Optionally, use some *Search Options* to define which features to load from the layer or use the **[Build query]** button to start the *Query builder* dialog.
- Найдите слой, который желаете добавить в список доступных слоёв
- Select it by clicking on it. You can select multiple layers by holding down the `Shift` key while clicking. See section *Конструктор поисковых запросов* for information on using the Oracle Query Builder to further define the layer.
- Нажмите кнопку **[Добавить]**, чтобы добавить слой к карте

Совет: Oracle Spatial Layers

Normally, an Oracle Spatial layer is defined by an entry in the **USER_SDO_METADATA** table.

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12.2 The Symbol Library

12.2.1 Presentation

The Symbol Library is the place where users can create generic symbols to be used in several QGIS projects. It allows users to export and import symbols, groups symbols and add, edit and remove symbols. You can open it with the *Settings* → *Style Library* or from the **Style** tab in the vector layer's *Properties*.

Share and import symbols

Users can export and import symbols in two main formats: qml (QGIS format) and SLD (OGC standard). Note that SLD format is not fully supported by QGIS.

share item displays a drop down list to let the user import or export symbols.

Groups and smart groups

Groups are categories of Symbols and smart groups are dynamic groups.

To create a group, right-click on an existing group or on the main **Groups** directory in the left of the library. You can also select a group and click on the add item button.

To add a symbol into a group, you can either right click on a symbol then choose *Apply group* and then the group name added before. There is a second way to add several symbols into group: just select a group and click and choose **Group Symbols**. All symbols display a checkbox that allow you to add the symbol into the selected groups. When finished, you can click on the same button, and choose **Finish Grouping**.

Create **Smart Symbols** is similar to creating group, but instead select **Smart Groups**. The dialog box allow user to choose the expression to select symbols in order to appear in the smart group (contains some tags, member of a group, have a string in its name, etc.)

Add, edit, remove symbol

With the *Style manager* from the **[Symbol]** menu you can manage your symbols. You can add item, edit item, remove item and share item. 'Marker' symbols, 'Line' symbols, 'Fill' patterns and 'colour ramps' can be used to create the symbols. The symbols are then assigned to 'All Symbols', 'Groups' or 'Smart groups'.

For each kind of symbols, you will find always the same dialog structure:

- at the top left side a symbol representation
- under the symbol representation the symbol tree show the symbol layers
- at the right you can setup some parameter (unit,transparency, color, size and rotation)
- under these parameteres you find some symbol from the symbol library

The symbol tree allow adding, removing or protect new simple symbol. You can move up or down the symbol layer.

More detailed settings can be made when clicking on the second level in the *Symbol layers* dialog. You can define *Symbol layers* that are combined afterwards. A symbol can consist of several *Symbol layers*. Settings will be shown later in this chapter.

Совет: Note that once you have set the size in the lower levels of the *Symbol layers* dialog, the size of the whole symbol can be changed with the *Size* menu in the first level again. The size of the lower levels changes accordingly, while the size ratio is maintained.

12.2.2 Marker Symbols

Marker symbols have several symbol layer types:

- Ellipse marker
- Font marker
- Simple marker (default)
- SVG marker
- Vector Field marker

The following settings are possible:

- *Symbol layer type*: You have the option to use Ellipse markers, Font markers, Simple markers, SVG markers and Vector Field markers.
- *colors*
- *Size*
- *Outline style*
- *Outline width*
- *Angle*
- *Offset X,Y*: You can shift the symbol in the x- or y-direction.

- *Anchor point*
- *Data defined properties ...*

12.2.3 Line Symbols

Line marker symbols have only two symbol layer types:

- Marker line
- Simple line (default)

The default symbol layer type draws a simple line whereas the other display a marker point regularly on the line. You can choose different location vertex, interval or central point. Marker line can have offset along the line or offset line. Finally, *rotation* allows you to change the orientation of the symbol.

The following settings are possible:

- *colour*
- *Pen width*
- *Offset*
- *Pen style*
- *Join style*
- *Cap style*
- *Use custom dash pattern*
- *Dash pattern unit*
- *Data defined properties ...*

12.2.4 Polygon Symbols

Polygon marker symbols have also several symbol layer types:

- Centroid fill
- Gradient fill
- Line pattern fill
- Point pattern fill
- SVG fill
- Shapeburst fille
- Simple fill (default)
- Outline: Marker line (same as line marker)
- Outline: simple line (same as line marker)

The following settings are possible:

- *Colors* for the border and the fill.
- *Fill style*
- *Border style*
- *Border width*
- *Offset X,Y*
- *Data defined properties ...*

Using the color combo box, you can drag and drop color for one color button to another button, copy-paste color, pick color from somewhere, choose a color from the palette or from recent or standard color. The combo box allow you to fill in the feature with transparency. You can also just clic on the button to open the palettte dialog. Note that you can import color from some external software like GIMP.

'Gradient Fill' *Symbol layer type* allows you to select between a *Two color* and *Color ramp* setting. You can use the *Feature centroid* as *Referencepoint*. All fills 'Gradient Fill' *Symbol layer type* is also available through the *Symbol* menu of the Categorized and Graduated Renderer and through the *Rule properties* menu of the Rule-based renderer. Other possibility is to choose a 'shapeburst fill' which is a buffered gradient fill, where a gradient is drawn from the boundary of a polygon towards the polygon's centre. Configurable parameters include distance from the boundary to shade, use of color ramps or simple two color gradients, optional blurring of the fill and offsets.

It is possible to only draw polygon borders inside the polygon. Using 'Outline: Simple line' select *Draw line only inside polygon*.

12.2.5 Color ramp

You can create a custom color ramp choosing *New color ramp...* from the *color ramp* drop-down menu. A dialog will prompt for the ramp type: Gradient, Random, colorBrewer, or cpt-city. The first three have options for number of steps and/or multiple stops in the color ramp. You can use the *Invert* option while classifying the data with a color ramp. See figure_symbology_3 for an example of custom color ramp and figure_symbology_3a for the cpt-city dialog.

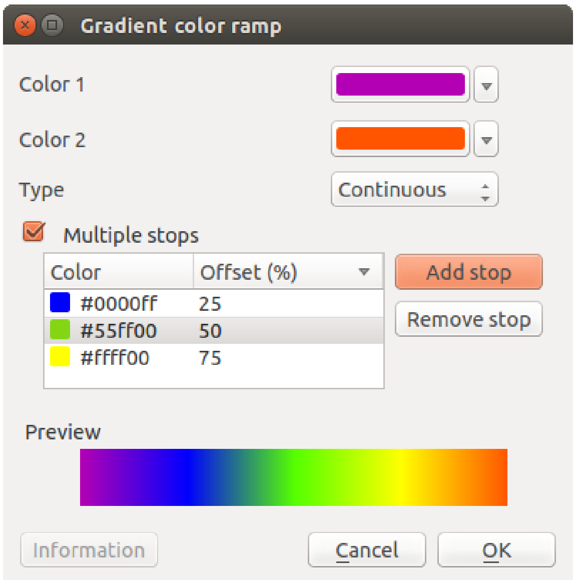

Рис. 12.7: Example of custom gradient color ramp with multiple stops

The cpt-city option opens a new dialog with hundreds of themes included 'out of the box'.

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12.3 Свойства векторного слоя

The *Layer Properties* dialog for a vector layer provides information about the layer, symbology settings and labeling options. If your vector layer has been loaded from a PostgreSQL/PostGIS datastore, you can also alter the underlying SQL for the layer by invoking the *Query Builder* dialog on the *General* tab. To access the *Layer Properties* dialog, double-click on a layer in the legend or right-click on the layer and select *Properties* from the pop-up menu.

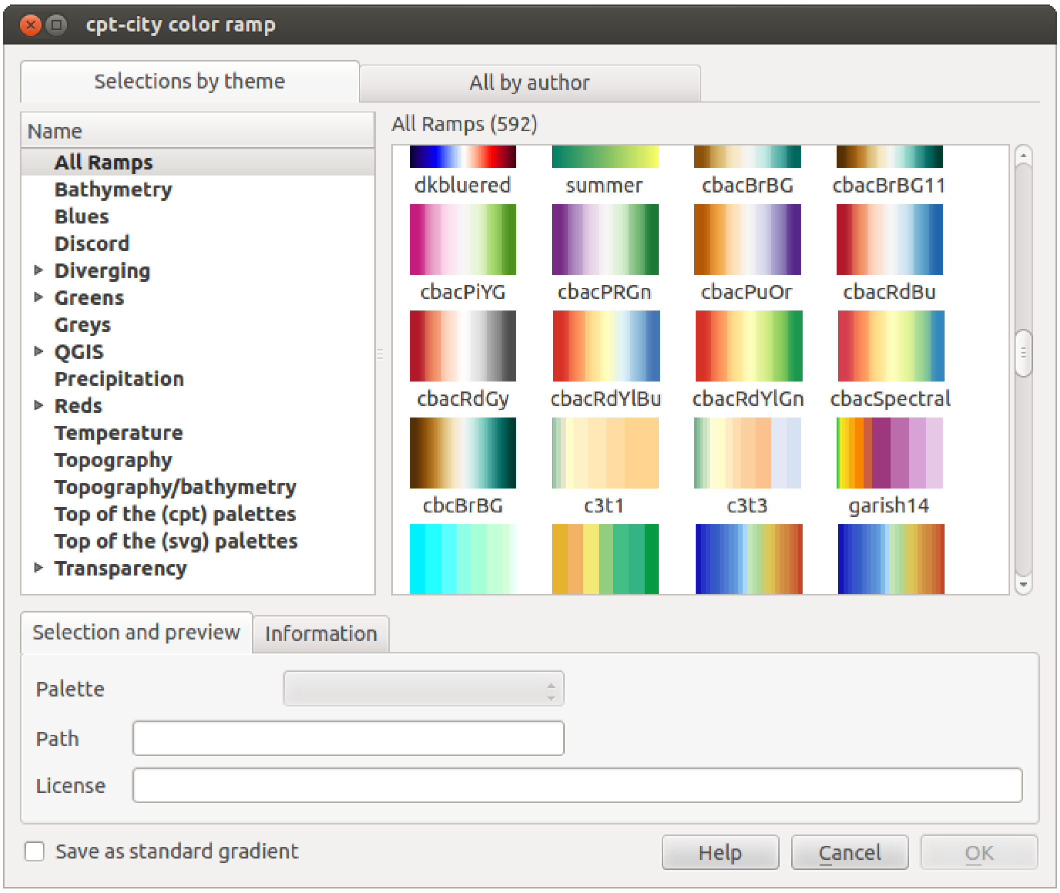

Рис. 12.8: cpt-city dialog with hundreds of color ramps

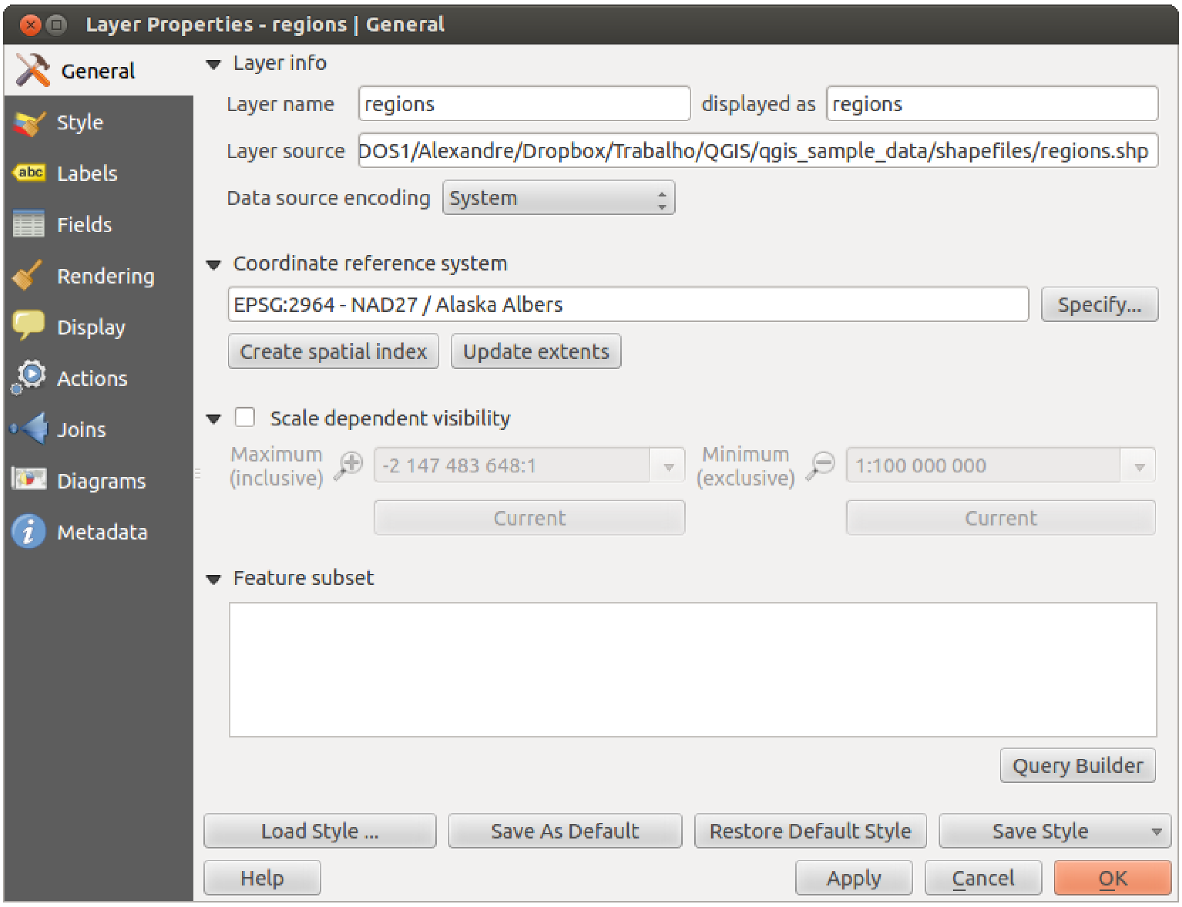

Рис. 12.9: Свойства векторного слоя

12.3.1 Вкладка «Стиль»

The Style menu provides you with a comprehensive tool for rendering and symbolizing your vector data. You can use *Layer rendering* → tools that are common to all vector data, as well as special symbolizing tools that were designed for the different kinds of vector data.

Отрисовка (тип легенды)

The renderer is responsible for drawing a feature together with the correct symbol. There are four types of renderers: single symbol, categorized, graduated and rule-based. There is no continuous color renderer, because it is in fact only a special case of the graduated renderer. The categorized and graduated renderers can be created by specifying a symbol and a color ramp - they will set the colors for symbols appropriately. For point layers, there is a point displacement renderer available. For each data type (points, lines and polygons), vector symbol layer types are available. Depending on the chosen renderer, the *Style* menu provides different additional sections. On the bottom right of the symbology dialog, there is a **[Symbol]** button, which gives access to the Style Manager (see *Presentation*). The Style Manager allows you to edit and remove existing symbols and add new ones.

After having made any needed changes, the symbol can be added to the list of current style symbols (using **[Symbol]** *Save in symbol library*), and then it can easily be used in the future. Furthermore, you can use the **[Save Style]** button to save the symbol as a QGIS layer style file (.qml) or SLD file (.sld). SLDs can be exported from any type of renderer – single symbol, categorized, graduated or rule-based – but when importing an SLD, either a single symbol or rule-based renderer is created. That means that categorized or graduated styles are converted to rule-based. If you want to preserve those renderers, you have to stick to the QML format. On the other hand, it can be very handy sometimes to have this easy way of converting styles to rule-based.

If you change the renderer type when setting the style of a vector layer the settings you made for the symbol will be maintained. Be aware that this procedure only works for one change. If you repeat changing the renderer type the settings for the symbol will get lost.

If the datasource of the layer is a database (PostGIS or Spatialite for example), you can save your layer style inside a table of the database. Just clic on :guilabel:‘ Save Style‘ comboxbox and choose **Save in database** item then fill in the dialog to define a style name, add a description, an ui file and if the style is a default style. When loading a layer from the database, if a style already exists for this layer, QGIS will load the layer and its style. You can add several style in the database. Only one will be the default style anyway.

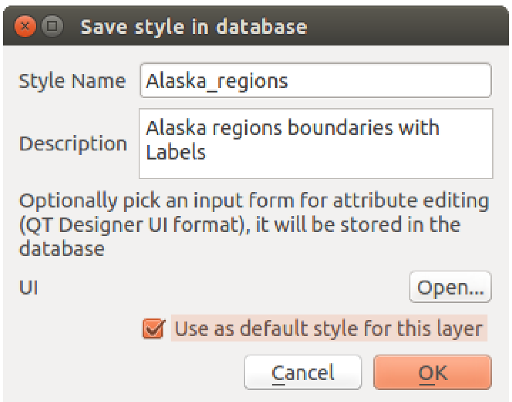

Рис. 12.10: Save Style in database Dialog

Совет: Изменение нескольких стилей

The Symbology allows you to select multiple symbols and right click to change color, transparency, size, or width of selected entries.

Отрисовка обычным знаком

The Single Symbol Renderer is used to render all features of the layer using a single user-defined symbol. The properties, which can be adjusted in the *Style* menu, depend partially on the type of layer, but all types share the following dialog structure. In the top-left part of the menu, there is a preview of the current symbol to be rendered. On the right part of the menu, there is a list of symbols already defined for the current style, prepared to be used by selecting them from the list. The current symbol can be modified using the menu on the right side. If you click on the first level in the *Symbol layers* dialog on the left side, it's possible to define basic parameters like *Size*, *Transparency*, *color* and *Rotation*. Here, the layers are joined together.

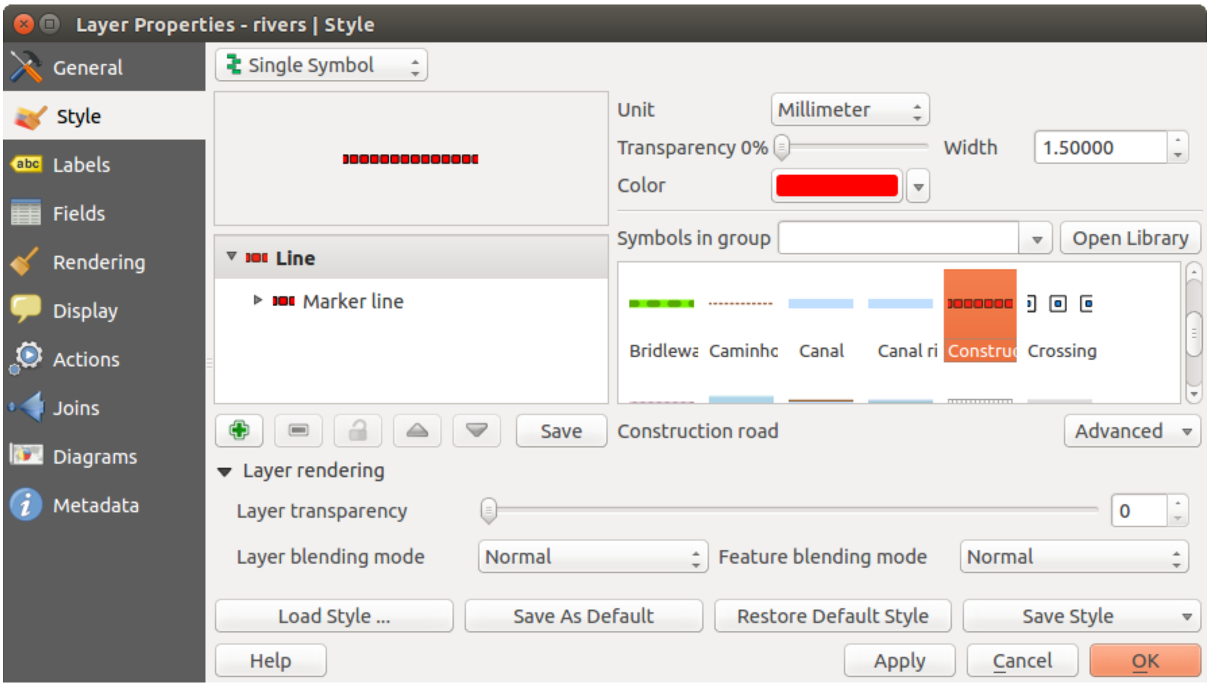

Рис. 12.11: Single symbol line properties

Отрисовка уникальными значениями

The Categorized Renderer is used to render all features from a layer, using a single user-defined symbol whose color reflects the value of a selected feature's attribute. The *Style* menu allows you to select:

- The attribute (using the Column listbox or the *Set column expression* function, see *Expressions*)
- Знак (в диалоге *Выбор условного знака*)
- The colors (using the color Ramp listbox)

Then click on **Classify** button to create classes from the distinct value of the attribute column. Each classes can be disabled unchecking the checkbox at the left of the class name.

You can change symbol, value and/or label of the clic, just double clicking on the item you want to change.

Right-clic shows a contextual menu to **Copy/Paste**, **Change color**, **Change transparency**, **Change output unit**, **Change symbol width**.

The **[Advanced]** button in the lower-right corner of the dialog allows you to set the fields containing rotation and size scale information. For convenience, the center of the menu lists the values of all currently selected attributes together, including the symbols that will be rendered.

The example in figure_symbology_2 shows the category rendering dialog used for the rivers layer of the QGIS sample dataset.

Отрисовка градуированным знаком

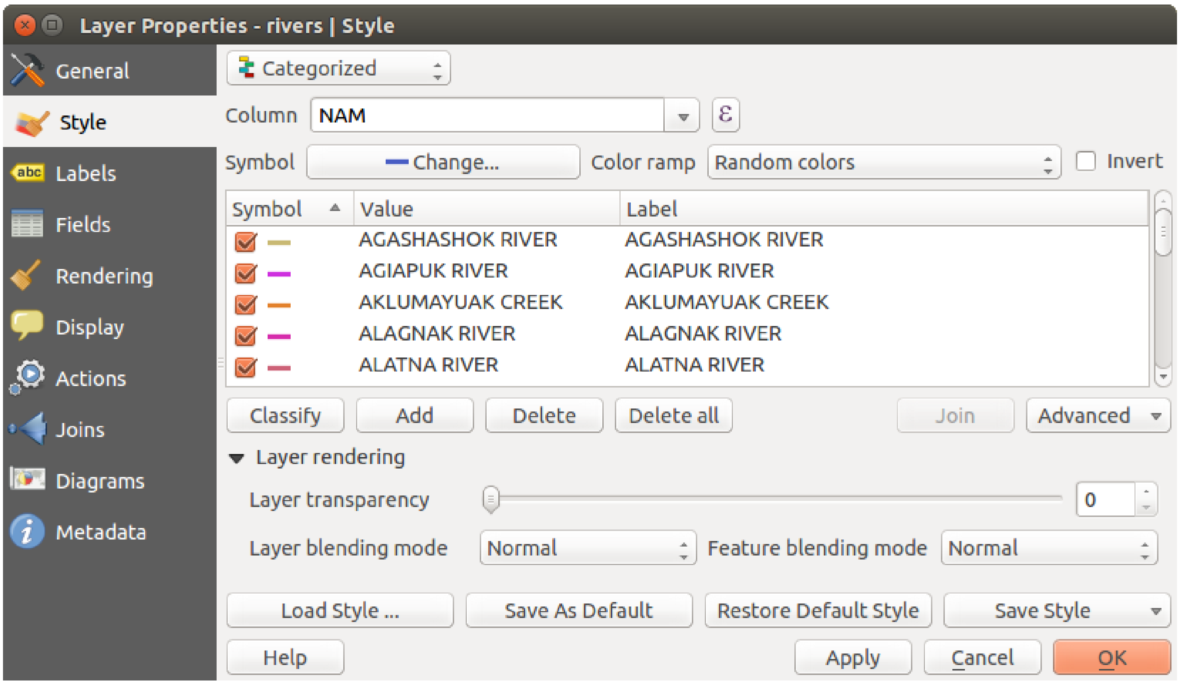

Рис. 12.12: Опции отрисовки «градуированным знаком»

The Graduated Renderer is used to render all the features from a layer, using a single user-defined symbol whose color reflects the assignment of a selected feature's attribute to a class.

Like the Categorized Renderer, the Graduated Renderer allows you to define rotation and size scale from specified columns.

Also, analogous to the Categorized Renderer, the *Style* tab allows you to select:

- The attribute (using the Column listbox or the *Set column expression* function, see *Expressions* chapter)
- Знак (в диалоге *Выбор условного знака*)
- The colors (using the color Ramp list)

Additionally, you can specify the number of classes and also the mode for classifying features within the classes (using the Mode list). The available modes are:

- Equal Interval: each class has the same size (e.g. values from 0 to 16 and 4 classes, each class has a size of 4);
- Quantile: each class will have the same number of element inside (the idea of a boxplot);
- Natural Breaks (Jenks): the variance within each class is minimal while the variance between classes is maximal;
- Standard Deviation: classes are built depending on the standard deviation of the values;
- Pretty Breaks: the same of natural breaks but the extremes number of each class are integers.

The listbox in the center part of the *Style* menu lists the classes together with their ranges, labels and symbols that will be rendered.

Click on **Classify** button to create classes using the choosen mode. Each classes can be disabled unchecking the checkbox at the left of the class name.

You can change symbol, value and/or label of the clic, just double clicking on the item you want to change.

Right-clic shows a contextual menu to **Copy/Paste**, **Change color**, **Change transparency**, **Change output unit**, **Change symbol width**.

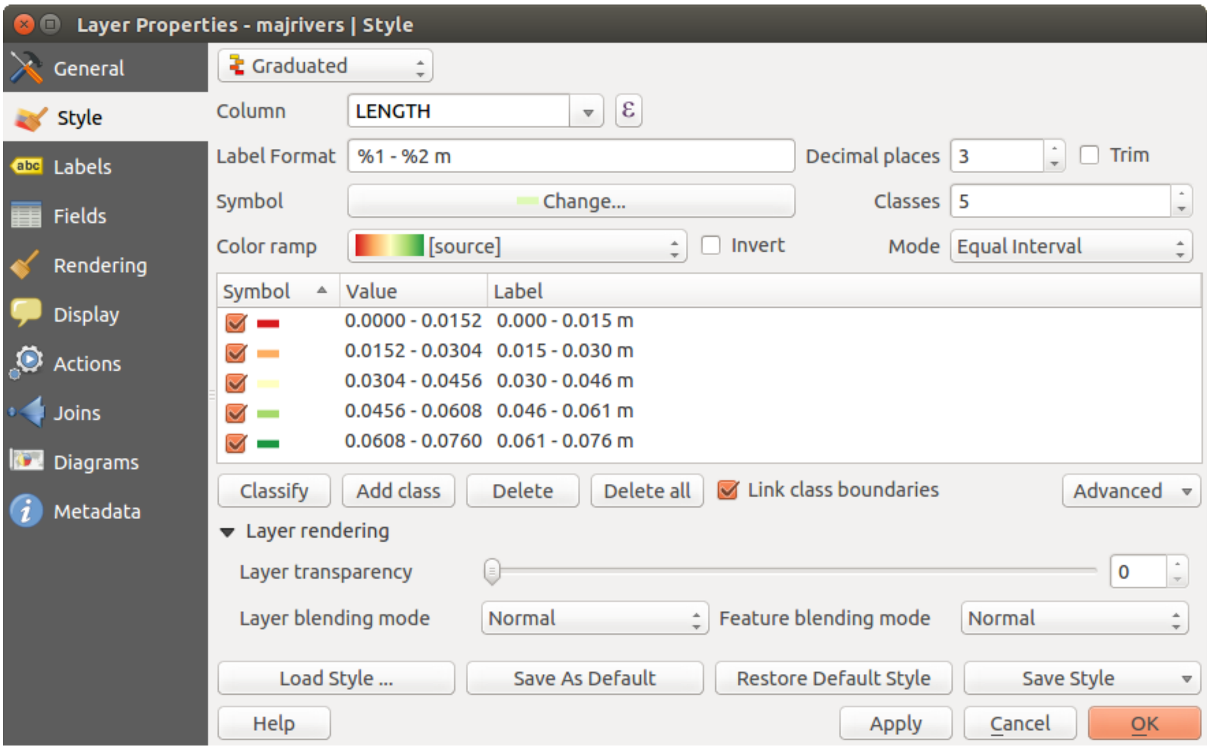

Рис. 12.13: Опции отрисовки «уникальными значениями»

The example in figure_symbology_4 shows the graduated rendering dialog for the rivers layer of the QGIS sample dataset.

Совет: Thematic maps using an expression

Categorized and graduated thematic maps can now be created using the result of an expression. In the properties dialog for vector layers, the attribute chooser has been augmented with a *Set column expression* function. So now you no longer need to write the classification attribute to a new column in your attribute table if you want the classification attribute to be a composite of multiple fields, or a formula of some sort.

Отрисовка на основе правил

The Rule-based Renderer is used to render all the features from a layer, using rule based symbols whose color reflects the assignment of a selected feature's attribute to a class. The rules are based on SQL statements. The dialog allows rule grouping by filter or scale, and you can decide if you want to enable symbol levels or use only the first-matched rule.

The example in figure_symbology_5 shows the rule-based rendering dialog for the rivers layer of the QGIS sample dataset.

To create a rule, activate an existing row by double-clicking on it, or click on '+' and click on the new rule. In the *Rule properties* dialog, you can define a label for the rule. Press the ... button to open the expression string builder. In the **Function List**, click on *Fields and Values* to view all attributes of the attribute table to be searched. To add an attribute to the field calculator **Expression** field, double click its name in the *Fields and Values* list. Generally, you can use the various fields, values and functions to construct the calculation expression, or you can just type it into the box (see *Expressions*). You can create a new rule by copying and pasting an existing rule with the right mouse button. You can also use the 'ELSE' rule that will be run if none of the other rules on that level match. Since QGIS 2.6 the label for the rules appears in a pseudotree in the map legend. Just double-klick the rules in the map legend and the Style menu of the layer properties appears showing the rule that is the background for the symbol in the pseudotree.

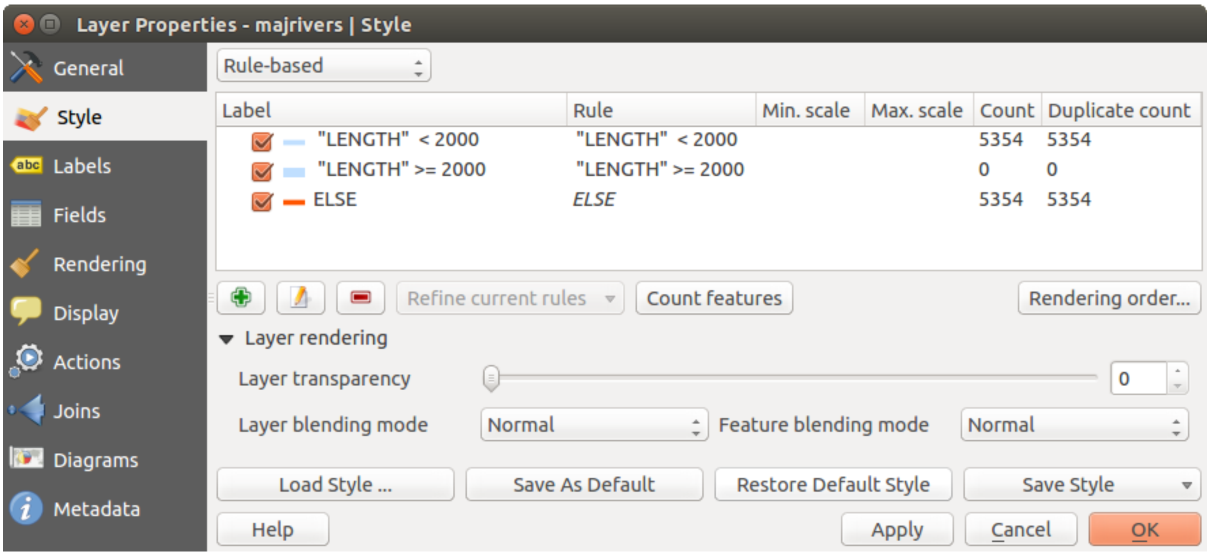

Рис. 12.14: Опции отрисовки «по правилам»

Смещение точек

The Point Displacement Renderer works to visualize all features of a point layer, even if they have the same location. To do this, the symbols of the points are placed on a displacement circle around a center symbol.

Совет: Export vector symbology

You have the option to export vector symbology from QGIS into Google *.kml, *.dxf and MapInfo *.tab files. Just open the right mouse menu of the layer and click on *Save selection as* → to specify the name of the output file and its format. In the dialog, use the *Symbology export* menu to save the symbology either as *Feature symbology* → or as *Symbol layer symbology* →. If you have used symbol layers, it is recommended to use the second setting.

Inverted Polygon

Inverted polygon renderer allows user to define a symbol to fill in outside of the layer's polygons. As before you can select a subrenderers. These subrenderers are the same as for the main renderers.

Color Picker

Regardless the type of style to be used, the *select color* dialog will show when you click to choose a color - either border or fill color. This dialog has four different tabs which allow you to select colors by color ramp, color wheel, color swatches or color picker.

Whatever method you use, the selected color is always described through color sliders for HSV (Hue, Saturation, Value) and RGB (Red, Green, Blue) values. There is also an *opacity* slider to set transparency level. On the lower left part of the dialog you can see a comparison between the *current* and the *new* color you are presently selecting and on the lower right part you have the option to add the color you just tweaked into a color slot button.

With color ramp or with color wheel, you can browse to all possible color combinations. There are other possibilities though. By using *color swatches* you can choose from a preselected list. This selected list is populated with one of three methods: *Recent colors*, *Standard colors* or *Project colors*

Another option is to use the color picker which allows you to sample a color from under your mouse pointer at any part of QGIS or even from another application by pressing the space bar. Please note that

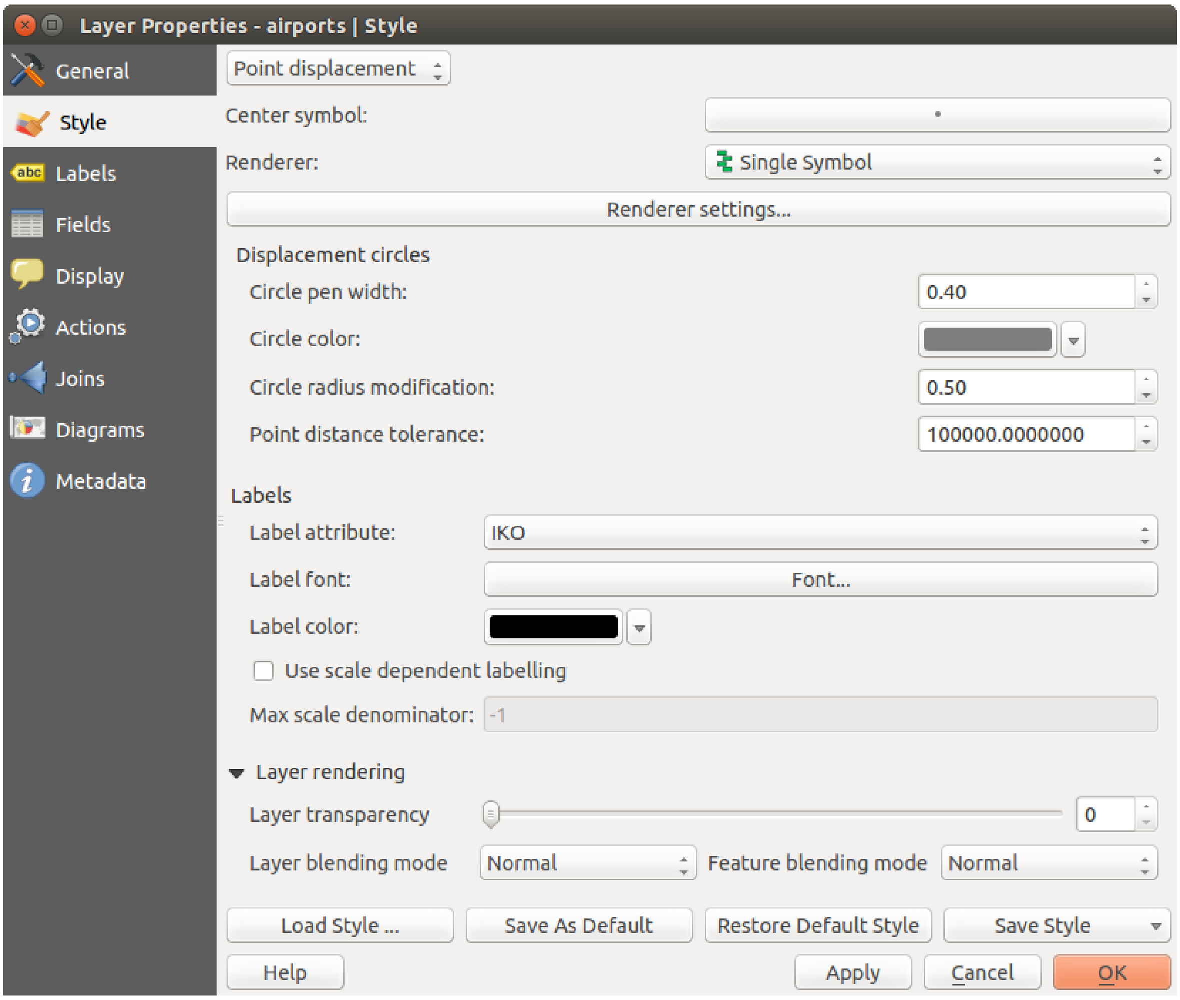

Рис. 12.15: Диалог «Смещение точек»

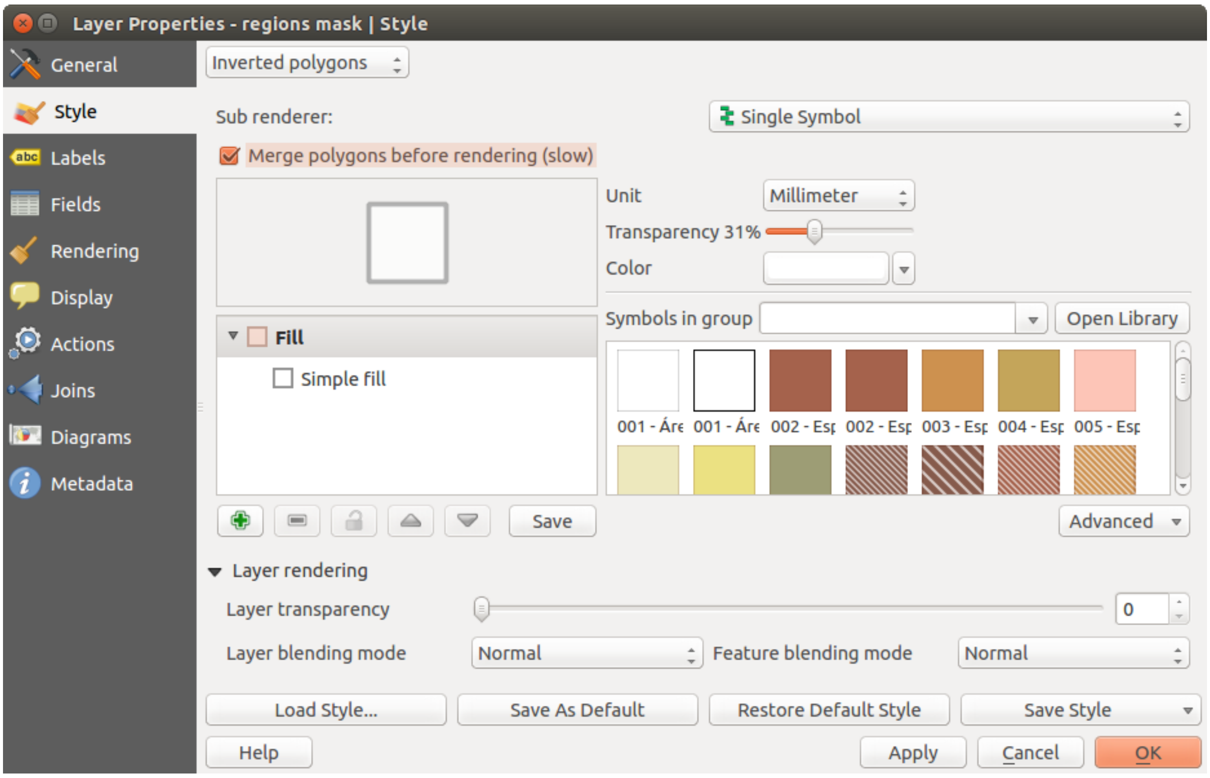

Рис. 12.16: Inverted Polygon dialog

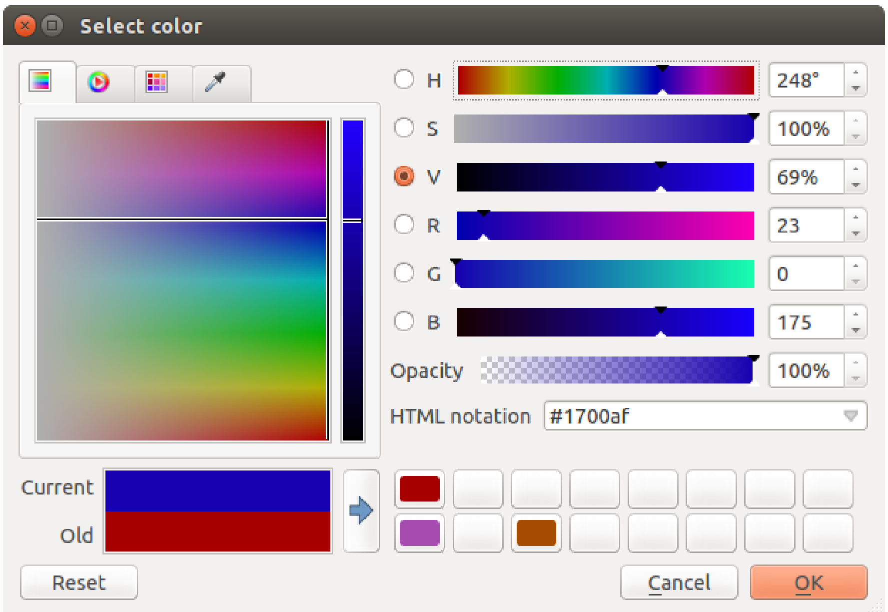

Рис. 12.17: Color picker ramp tab

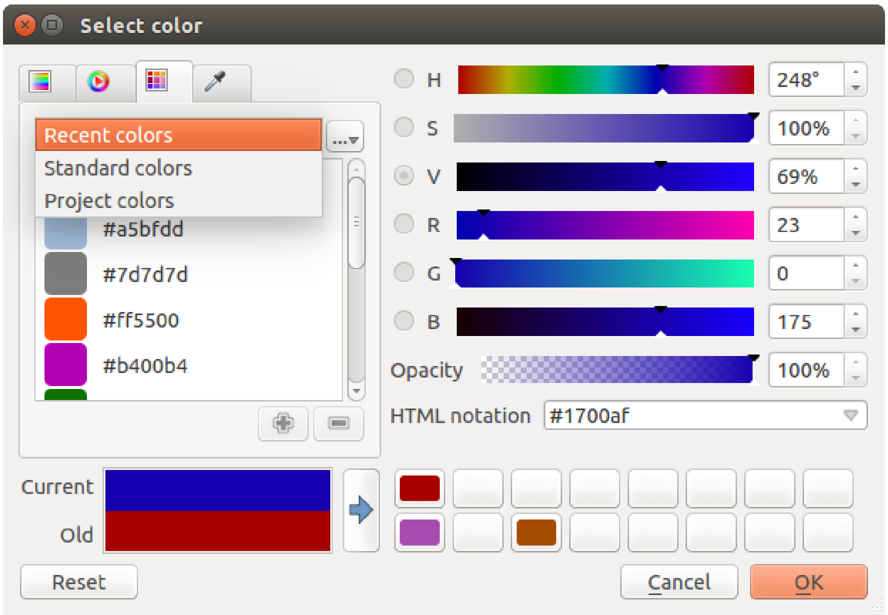

Рис. 12.18: Color picker swatcher tab

the color picker is OS dependent and is currently not supported by OSX.

Совет: quick color picker + copy/paste colors

You can quickly choose from *Recent colors*, from *Standard colors* or simply *copy* or *paste* a color by clicking the drop-down arrow that follows a current color box.

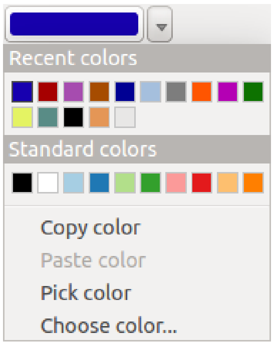

Рис. 12.19: Quick color picker menu

Отрисовка

- *Layer transparency* : You can make the underlying layer in the map canvas visible with this tool. Use the slider to adapt the visibility of your vector layer to your needs. You can also make a precise definition of the percentage of visibility in the the menu beside the slider.
- *Layer blending mode* and *Feature blending mode*: You can achieve special rendering effects with these tools that you may previously only know from graphics programs. The pixels of your overlaying and underlaying layers are mixed through the settings described below.
  - Normal: This is the standard blend mode, which uses the alpha channel of the top pixel to blend with the pixel beneath it. The colors aren't mixed.
  - Lighten: This selects the maximum of each component from the foreground and background pixels. Be aware that the results tend to be jagged and harsh.

- Screen: Light pixels from the source are painted over the destination, while dark pixels are not. This mode is most useful for mixing the texture of one layer with another layer (e.g., you can use a hillshade to texture another layer).
- Dodge: Dodge will brighten and saturate underlying pixels based on the lightness of the top pixel. So, brighter top pixels cause the saturation and brightness of the underlying pixels to increase. This works best if the top pixels aren't too bright; otherwise the effect is too extreme.
- Addition: This blend mode simply adds pixel values of one layer with the other. In case of values above one (in the case of RGB), white is displayed. This mode is suitable for highlighting features.
- Darken: This creates a resultant pixel that retains the smallest components of the foreground and background pixels. Like lighten, the results tend to be jagged and harsh.
- Multiply: Here, the numbers for each pixel of the top layer are multiplied with the corresponding pixels for the bottom layer. The results are darker pictures.
- Burn: Darker colors in the top layer cause the underlying layers to darken. Burn can be used to tweak and colorise underlying layers.
- Overlay: This mode combines the multiply and screen blending modes. In the resulting picture, light parts become lighter and dark parts become darker.
- Soft light: This is very similar to overlay, but instead of using multiply/screen it uses color burn/dodge. This is supposed to emulate shining a soft light onto an image.
- Hard light: Hard light is also very similar to the overlay mode. It's supposed to emulate projecting a very intense light onto an image.
- Difference: Difference subtracts the top pixel from the bottom pixel, or the other way around, to always get a positive value. Blending with black produces no change, as the difference with all colors is zero.
- Subtract: This blend mode simply subtracts pixel values of one layer from the other. In case of negative values, black is displayed.

12.3.2 Подписи

The Labels core application provides smart labeling for vector point, line and polygon layers, and it only requires a few parameters. This new application also supports on-the-fly transformed layers. The core functions of the application have been redesigned. In QGIS, there are a number of other features that improve the labeling. The following menus have been created for labeling the vector layers:

- Text
- Formatting
- Buffer
- Background
- Shadow
- Placement
- Rendering

Let us see how the new menus can be used for various vector layers. **Создание подписей для точечных слоёв**

Start QGIS and load a vector point layer. Activate the layer in the legend and click on the Layer Labeling Options icon in the QGIS toolbar menu.

The first step is to activate the *Label this layer with* checkbox and select an attribute column to use for labeling. Click if you want to define labels based on expressions - See labeling_with_expressions.

The following steps describe a simple labeling without using the *Data defined override* functions, which are situated next to the drop-down menus.

You can define the text style in the *Text* menu (see Figure_labels_1). Use the *Type case* option to influence the text rendering. You have the possibility to render the text 'All uppercase', 'All lowercase' or 'Capitalize first letter'. Use the blend modes to create effects known from graphics programs (see blend_modes).

In the *Formatting* menu, you can define a character for a line break in the labels with the 'Wrap on character' function. Use the *Formatted numbers* option to format the numbers in an attribute table. Here, decimal places may be inserted. If you enable this option, three decimal places are initially set by default.

To create a buffer, just activate the *Draw text buffer* checkbox in the *Buffer* menu. The buffer color is variable. Here, you can also use blend modes (see blend_modes).

If the *color buffer's fill* checkbox is activated, it will interact with partially transparent text and give mixed color transparency results. Turning off the buffer fill fixes that issue (except where the interior aspect of the buffer's stroke intersects with the text's fill) and also allows you to make outlined text.

In the *Background* menu, you can define with *Size X* and *Size Y* the shape of your background. Use *Size type* to insert an additional 'Buffer' into your background. The buffer size is set by default here. The background then consists of the buffer plus the background in *Size X* and *Size Y*. You can set a *Rotation* where you can choose between 'Sync with label', 'Offset of label' and 'Fixed'. Using 'Offset of label' and 'Fixed', you can rotate the background. Define an *Offset X,Y* with X and Y values, and the background will be shifted. When applying *Radius X,Y*, the background gets rounded corners. Again, it is possible to mix the background with the underlying layers in the map canvas using the *Blend mode* (see blend_modes).

Use the *Shadow* menu for a user-defined *Drop shadow*. The drawing of the background is very variable. Choose between 'Lowest label component', 'Text', 'Buffer' and 'Background'. The *Offset* angle depends on the orientation of the label. If you choose the *Use global shadow* checkbox, then the zero point of the angle is always oriented to the north and doesn't depend on the orientation of the label. You can influence the appearance of the shadow with the *Blur radius*. The higher the number, the softer the shadows. The appearance of the drop shadow can also be altered by choosing a blend mode (see blend_modes).

Choose the *Placement* menu for the label placement and the labeling priority. Using the *Offset from point* setting, you now have the option to use *Quadrants* to place your label. Additionally, you can alter the angle of the label placement with the *Rotation* setting. Thus, a placement in a certain quadrant with a certain rotation is possible.

In the *Rendering* menu, you can define label and feature options. Under *Label options*, you find the scale-based visibility setting now. You can prevent QGIS from rendering only selected labels with the *Show all labels for this layer (including colliding labels)* checkbox. Under *Feature options*, you can define whether every part of a multipart feature is to be labeled. It's possible to define whether the number of features to be labeled is limited and to *Discourage labels from covering features*.

Создание подписей для линейных слоёв

The first step is to activate the *Label this layer* checkbox in the *Label settings* tab and select an attribute column to use for labeling. Click ε... if you want to define labels based on expressions - See labeling_with_expressions.

After that, you can define the text style in the *Text* menu. Here, you can use the same settings as for point layers.

Also, in the *Formatting* menu, the same settings as for point layers are possible.

The *Buffer* menu has the same functions as described in section labeling_point_layers.

The *Background* menu has the same entries as described in section labeling_point_layers.

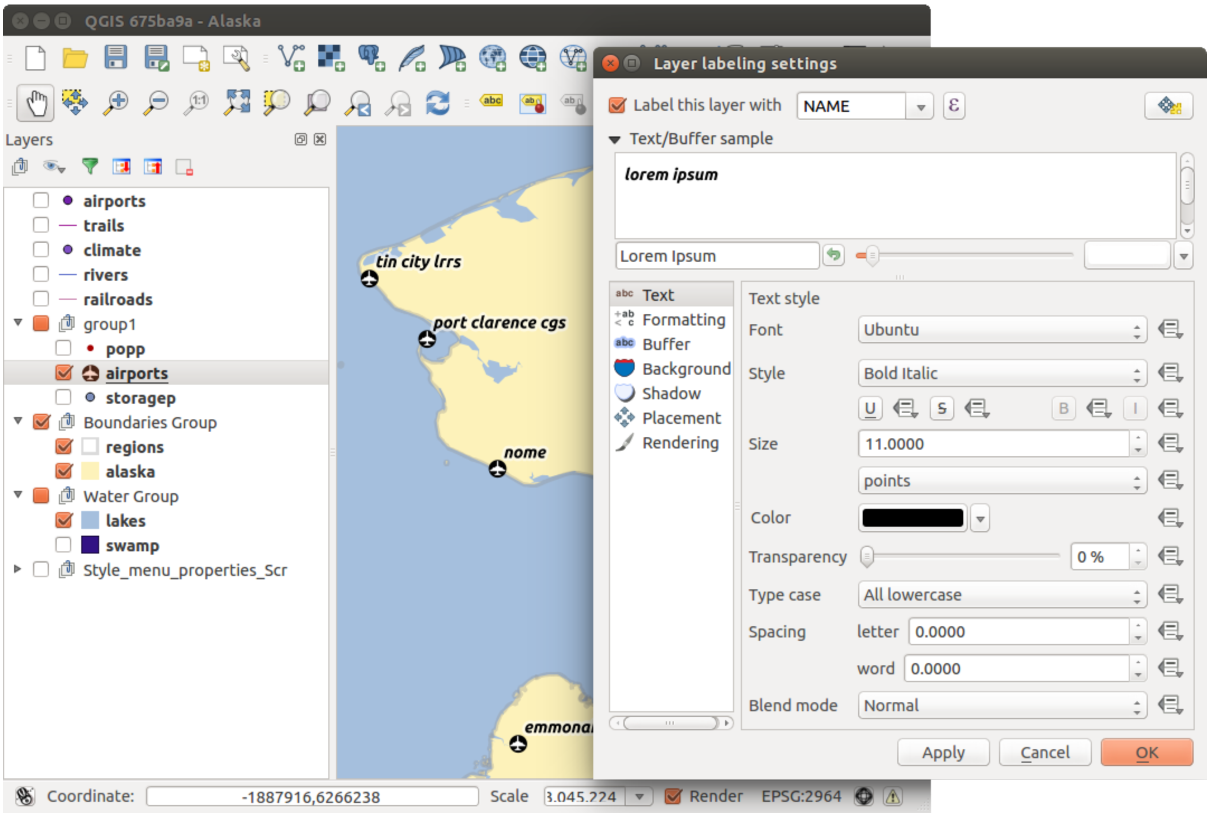

Рис. 12.20: Элегантные подписи для точечных векторных слоёв

Also, the *Shadow* menu has the same entries as described in section labeling_point_layers.

In the *Placement* menu, you find special settings for line layers. The label can be placed *Parallel*, *Curved* or *Horizontal*. With the *Parallel* and *Curved* option, you can define the position *Above line*, *On line* and *Below line*. It's possible to select several options at once. In that case, QGIS will look for the optimal position of the label. Remember that here you can also use the line orientation for the position of the label. Additionally, you can define a *Maximum angle between curved characters* when selecting the *Curved* option (see Figure_labels_2).

You can set up a minimum distance for repeating labels. Distance can be in mm or in map units.

Some Placement setup will display more options, for example, *Curved* and *Parallel* Placements will allow the user to set up the position of the label (above, belw or on the line), *distance* from the line and for *Curved*, the user can also setup inside/outside max angle between curved label.

The *Rendering* menu has nearly the same entries as for point layers. In the *Feature options*, you can now *Suppress labeling of features smaller than*.

Создание подписей для полигональных слоёв

The first step is to activate the *Label this layer* checkbox and select an attribute column to use for labeling. Click ε... if you want to define labels based on expressions - See labeling_with_expressions.

In the *Text* menu, define the text style. The entries are the same as for point and line layers.

The *Formatting* menu allows you to format multiple lines, also similar to the cases of point and line layers.

As with point and line layers, you can create a text buffer in the *Buffer* menu.

Use the *Background* menu to create a complex user-defined background for the polygon layer. You can use the menu also as with the point and line layers.

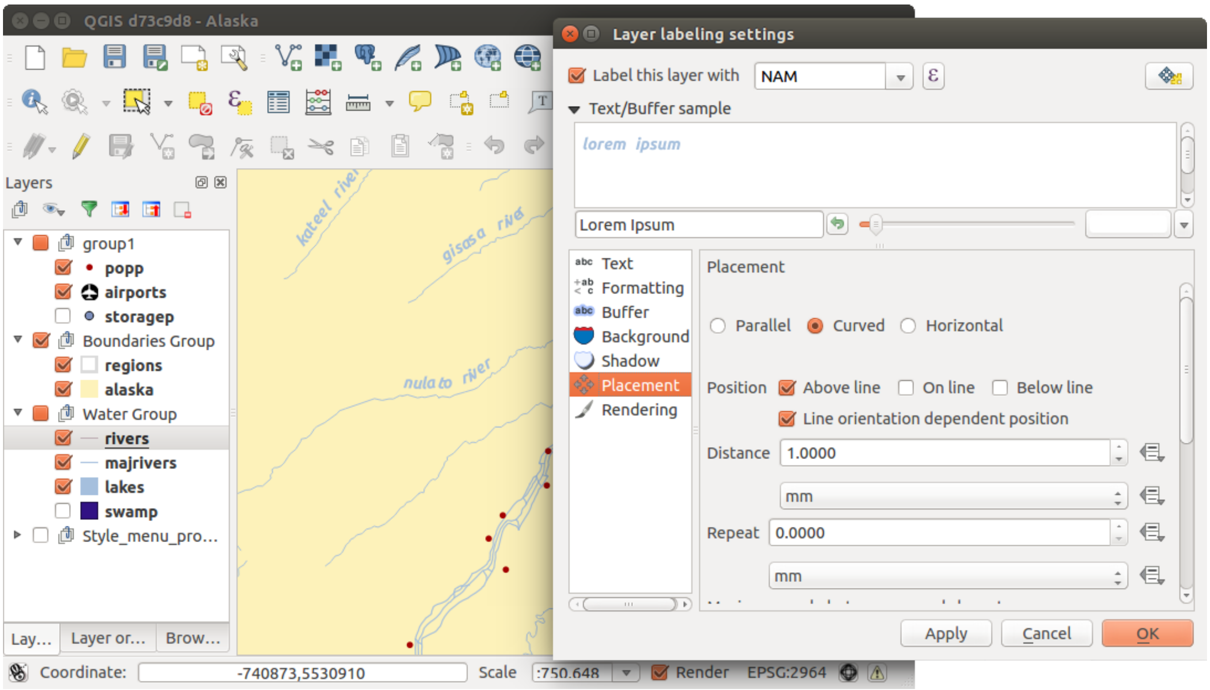

Рис. 12.21: Элегантные подписи для линейных векторных слоёв

The entries in the *Shadow* menu are the same as for point and line layers.

In the *Placement* menu, you find special settings for polygon layers (see Figure_labels_3). *Offset from centroid*, *Horizontal (slow)*, *Around centroid*, *Free* and *Using perimeter* are possible.

In the *Offset from centroid* settings, you can specify if the centroid is of the *visible polygon* or *whole polygon*. That means that either the centroid is used for the polygon you can see on the map or the centroid is determined for the whole polygon, no matter if you can see the whole feature on the map. You can place your label with the quadrants here, and define offset and rotation. The *Around centroid* setting makes it possible to place the label around the centroid with a certain distance. Again, you can define *visible polygon* or *whole polygon* for the centroid. With the *Using perimeter* settings, you can define a position and a distance for the label. For the position, *Above line*, *On line*, *Below line* and *Line orientation dependent position* are possible.

Related to the choose of Label Placement, several options will appear. As for Point Placement you can choose the distance for the polygon outline, repeat the label around the polygon perimeter.

The entries in the *Rendering* menu are the same as for line layers. You can also use *Suppress labeling of features smaller than* in the *Feature options*. **Define labels based on expressions**

QGIS allows to use expressions to label features. Just click the icon in the Labels menu of the properties dialog. In figure_labels_4 you see a sample expression to label the alaska regions with name and area size, based on the field 'NAME_2', some descriptive text and the function '$area()' in combination with 'format_number()' to make it look nicer.

Expression based labeling is easy to work with. All you have to take care of is, that you need to combine all elements (strings, fields and functions) with a string concatenation sign '||' and that fields a written in "double quotes" and strings in 'single quotes'. Let's have a look at some examples:

```
# label based on two fields 'name' and 'place' with a comma as separater
"name" || ', ' || "place"

-> John Smith, Paris
```

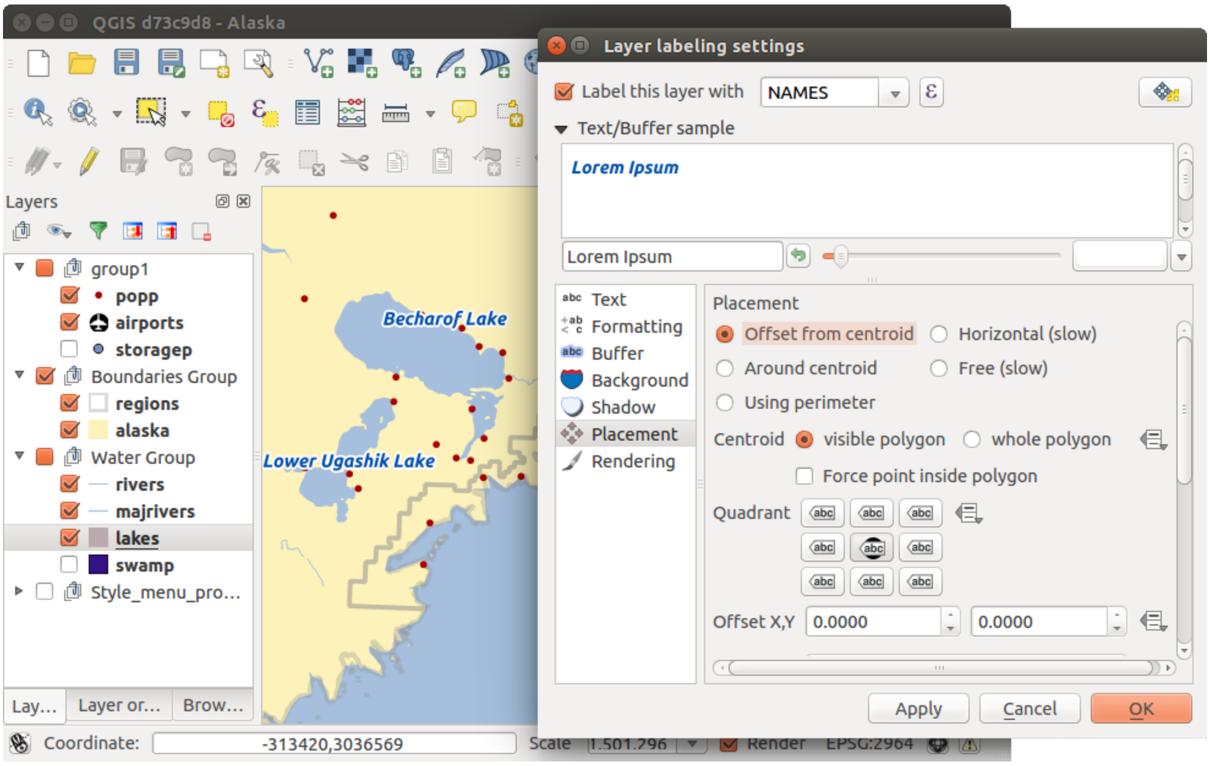

Рис. 12.22: Элегантные подписи для площадных векторных слоёв

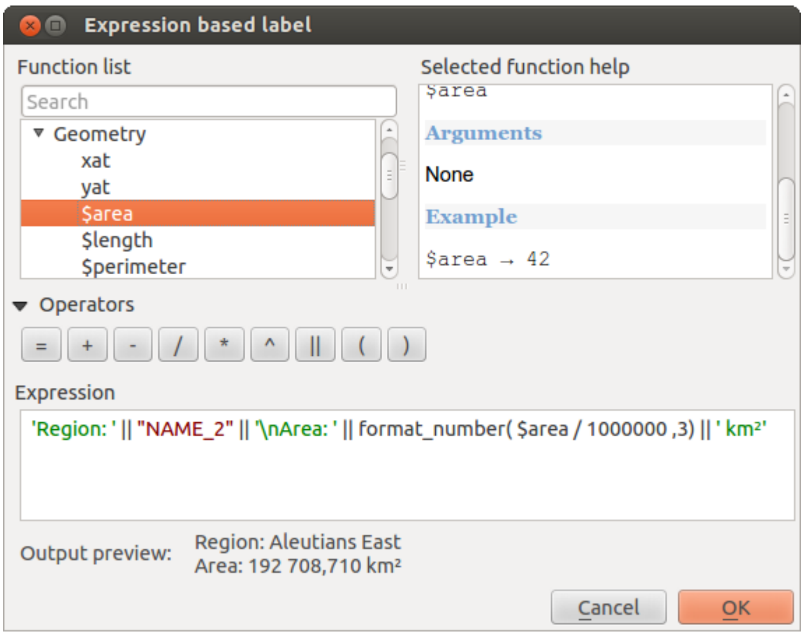

Рис. 12.23: Using expressions for labeling

```
# label based on two fields 'name' and 'place' separated by comma
'My name is ' || "name" || 'and I live in ' || "place"

-> My name is John Smith and I live in Paris

# label based on two fields 'name' and 'place' with a descriptive text
# and a line break (\n)
'My name is ' || "name" || '\nI live in ' || "place"

-> My name is John Smith
   I live in Paris

# create a multi-line label based on a field and the $area function
# to show the place name and its area size based on unit meter.
'The area of ' || "place" || 'has a size of ' || $area || 'm²'

-> The area of Paris has a size of 105000000 m²

# create a CASE ELSE condition. If the population value in field
# population is <= 50000 it is a town, otherwise a city.
'This place is a ' || CASE WHEN "population <= 50000" THEN 'town' ELSE 'city' END

-> This place is a town
```

As you can see in the expression builder, you have hundreds if functions available to create simple and very complex expressions to label your data in QGIS. See *Expressions* chapter for more information and example on expressions.

Using data-defined override for labeling

With the data-defined override functions, the settings for the labeling are overridden by entries in the attribute table. You can activate and deactivate the function with the right-mouse button. Hover over the symbol and you see the information about the data-defined override, including the current definition field. We now describe an example using the data-defined override function for the Move label function (see figure_labels_5).

1. Import `lakes.shp` from the QGIS sample dataset.
2. Double-click the layer to open the Layer Properties. Click on *Labels* and *Placement*. Select *Offset from centroid*.
3. Look for the *Data defined* entries. Click the icon to define the field type for the *Coordinate*. Choose 'xlabel' for X and 'ylabel' for Y. The icons are now highlighted in yellow.
4. Zoom into a lake.
5. Go to the Label toolbar and click the icon. Now you can shift the label manually to another position (see figure_labels_6). The new position of the label is saved in the 'xlabel' and 'ylabel' columns of the attribute table.

12.3.3 Поля

Within the *Fields* menu, the field attributes of the selected dataset can be manipulated. The buttons New Column and Delete Column can be used when the dataset is in Editing mode.

Элемент редактирования

Within the *Fields* menu, you also find an **edit widget** column. This column can be used to define values or a range of values that are allowed to be added to the specific attribute table column. If you click on the **[edit widget]** button, a dialog opens, where you can define different widgets. These widgets are:

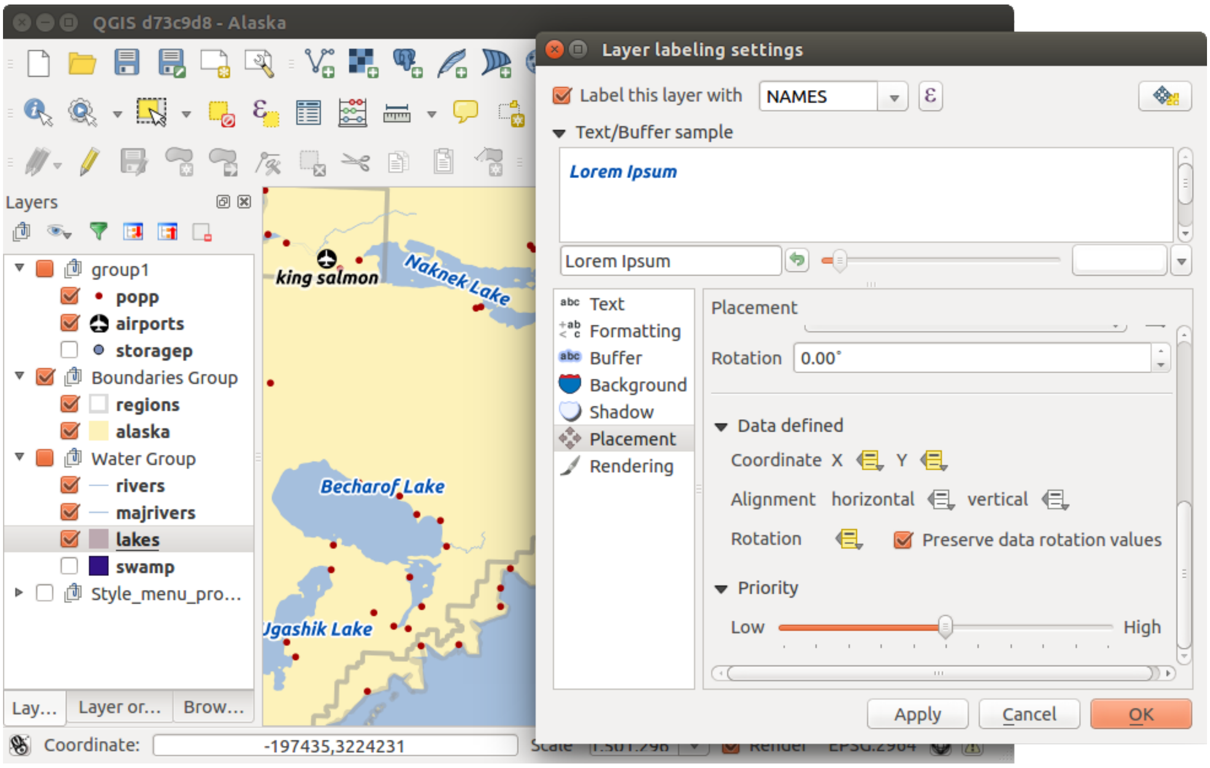

Рис. 12.24: Labeling of vector polygon layers with data-defined override

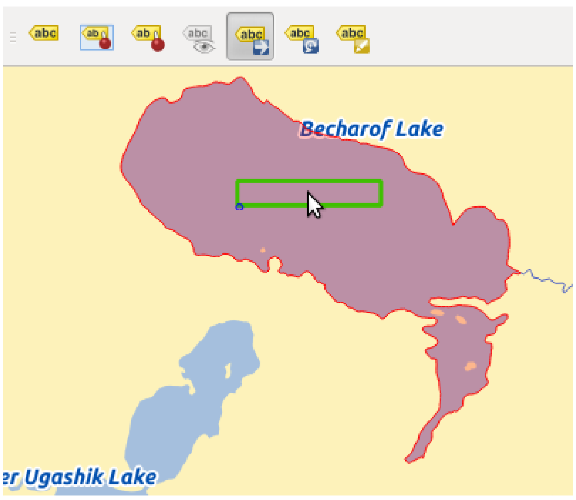

Рис. 12.25: Move labels

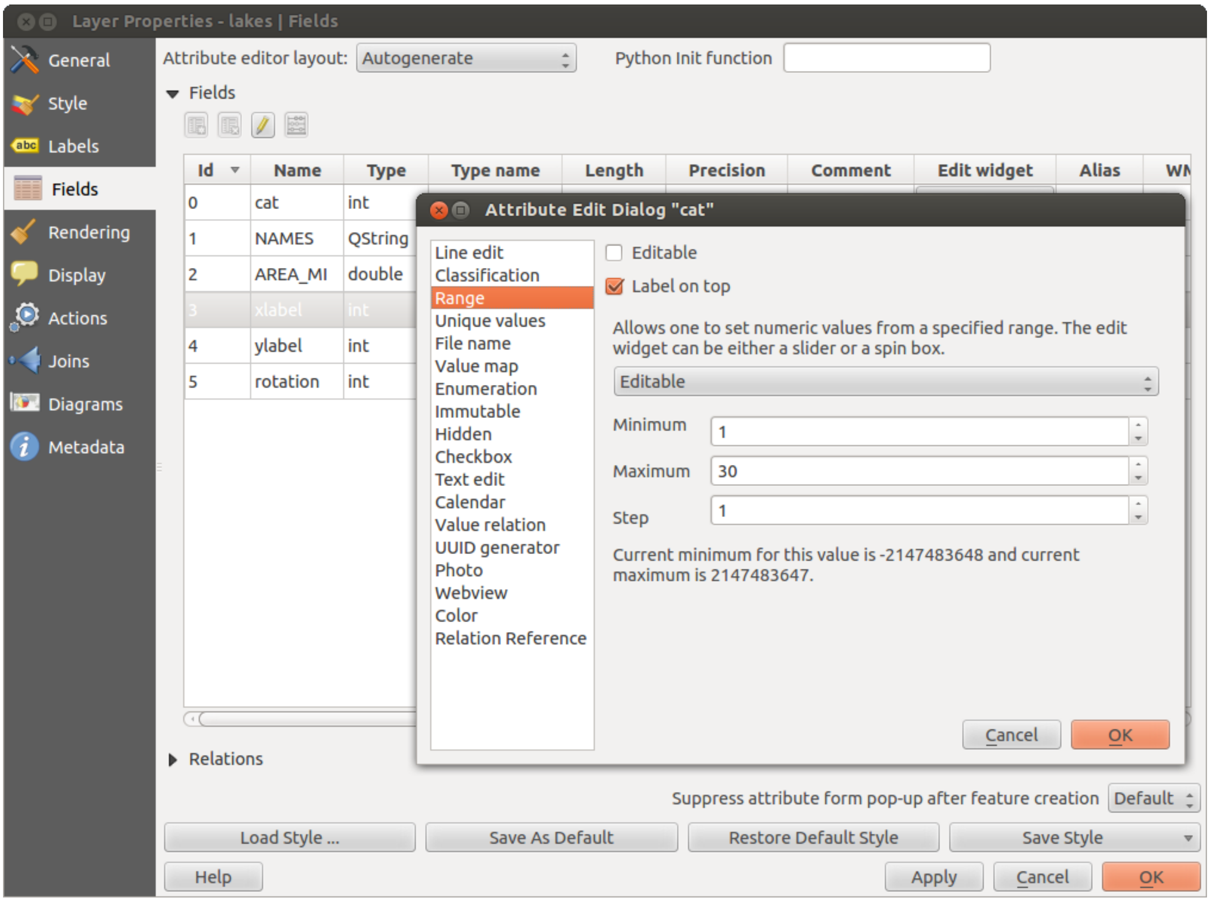

Рис. 12.26: Диалог выбора элемента редактирования поля

- **Checkbox**: Displays a checkbox, and you can define what attribute is added to the column when the checkbox is activated or not.
- **Classification**: Displays a combo box with the values used for classification, if you have chosen 'unique value' as legend type in the *Style* menu of the properties dialog.
- **Color**: Displays a color button allowing user to choose a color from the color dialog window.
- **Date/Time**: Displays a line fields which can opens a calendar widget to enter a date, a time or both. Column type must be text. You can select a custom format, pop-up a calendar, etc.
- **Enumeration**: Opens a combo box with values that can be used within the columns type. This is currently only supported by the PostgreSQL provider.
- **Имя файла**: Упрощает процесс выбор файлов за счёт добавления соответствующего диалога.
- **Hidden**: A hidden attribute column is invisible. The user is not able to see its contents.
- **Изображение**: Виджет для вывода изображения.
- **Range**: Allows you to set numeric values from a specific range. The edit widget can be either a slider or a spin box.
- **Relation Reference**: This widged lets you embed the feature form of the referenced layer on the feature form of the actual layer. See *Creating one to many relations*.
- **Text edit** (default): This opens a text edit field that allows simple text or multiple lines to be used. If you choose multiple lines you can also choose html content.
- **Unique values**: You can select one of the values already used in the attribute table. If 'Editable' is activated, a line edit is shown with autocompletion support, otherwise a combo box is used.
- **Генератор UUID**: атрибут только для чтения, в которое будет записан UUID (Universally Unique Identifiers), если поле пустое.
- **Value map**: A combo box with predefined items. The value is stored in the attribute, the description is shown in the combo box. You can define values manually or load them from a layer or a CSV file.
- **Связанное значение**: позволяет выбирать значения из связанной таблицы в выпадающем списке. Необходимо указать таблицу, ключево поле и поле значений.
- **Webview**: Field contains a URL. The width and height of the field is variable.

With the **Attribute editor layout**, you can now define built-in forms for data entry jobs (see figure_fields_2). Choose 'Drag and drop designer' and an attribute column. Use the icon to create a category that will then be shown during the digitizing session (see figure_fields_3). The next step will be to assign the relevant fields to the category with the icon. You can create more categories and use the same fields again. When creating a new category, QGIS will insert a new tab for the category in the built-in form.

Other options in the dialog are 'Autogenerate' and 'Provide ui-file'. 'Autogenerate' just creates editors for all fields and tabulates them. The 'Provide ui-file' option allows you to use complex dialogs made with the Qt-Designer. Using a UI-file allows a great deal of freedom in creating a dialog. For detailed information, see http://nathanw.net/2011/09/05/qgis-tips-custom-feature-forms-with-python-logic/.

QGIS dialogs can have a Python function that is called when the dialog is opened. Use this function to add extra logic to your dialogs. An example is (in module MyForms.py):

```
def open(dialog,layer,feature):
geom = feature.geometry()
control = dialog.findChild(QWidged,"My line edit")
```

Reference in Python Init Function like so: MyForms.open

MyForms.py must live on PYTHONPATH, in .qgis2/python, or inside the project folder.

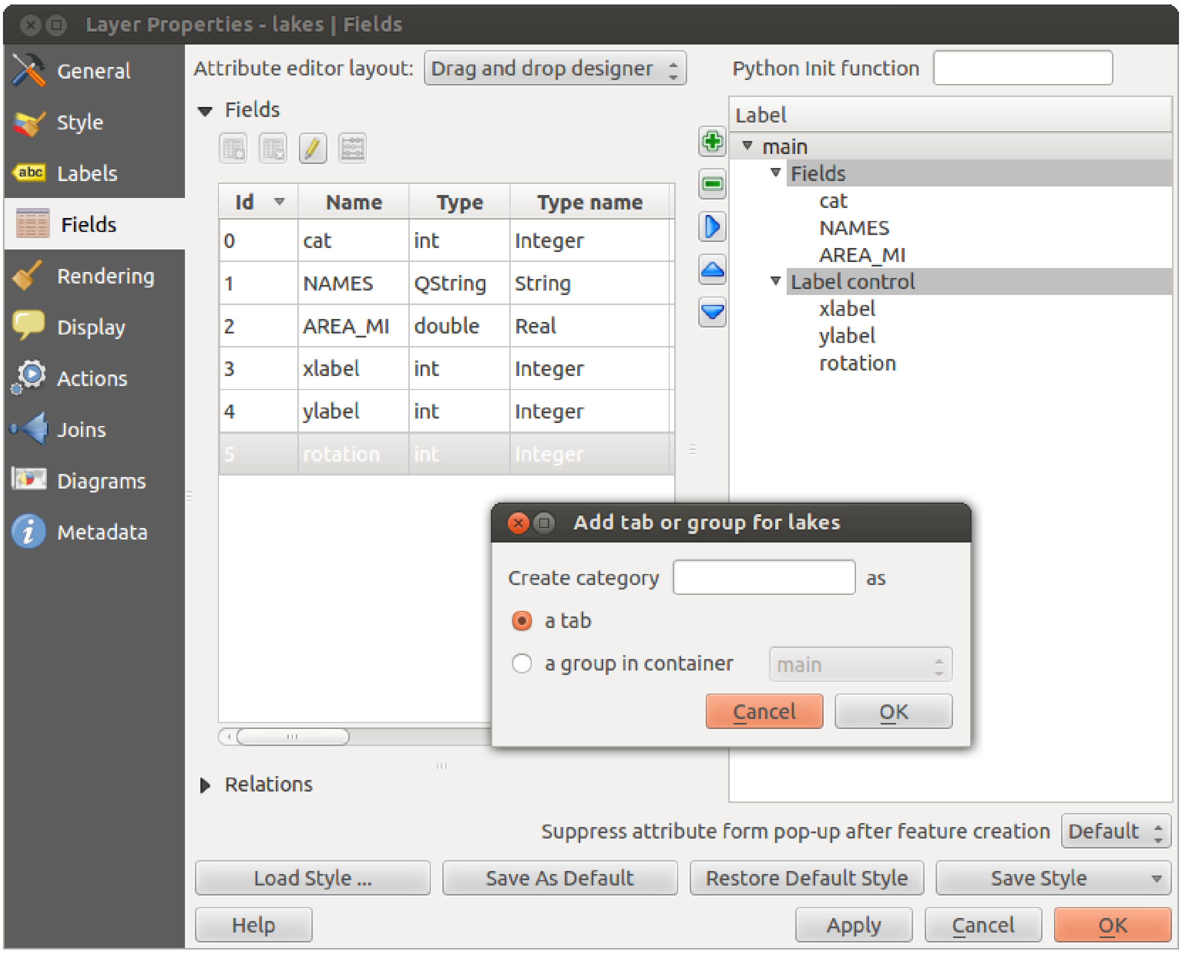

Рис. 12.27: Dialog to create categories with the **Attribute editor layout**

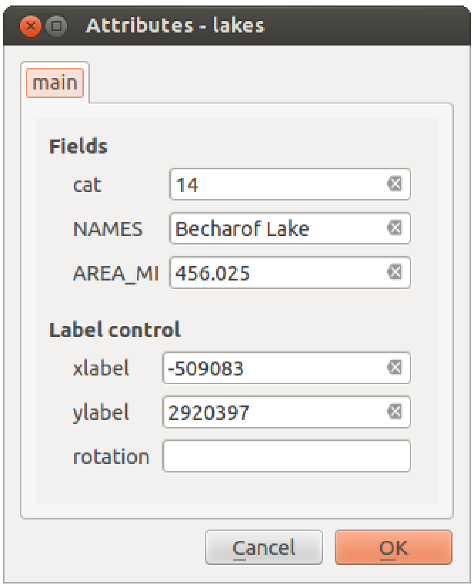

Рис. 12.28: Resulting built-in form in a data entry session

12.3.4 Общие

Вкладка *Общие* очень схожа с аналогичной вкладкой диалога свойств растрового слоя. Она позволяет:

Информация

- изменять отображаемое в легенде имя слоя
- Define the *Layer source* of the vector layer
- Define the *Data source encoding* to define provider-specific options and to be able to read the file

Система координат

- *Specify* the coordinate reference system. Here, you can view or change the projection of the specific vector layer.
- Create a *Spatial Index* (only for OGR-supported formats)
- обновить информацию об охвате слоя, при помощи кнопки **[Обновить границы]**
- View or change the projection of the specific vector layer, clicking on *Specify ...*

Scale dependent visibility

- You can set the *Maximum (inclusive)* and *Minimum (exclusive)* scale. The scale can also be set by the **[Current]** buttons.

Подмножество объектов

- With the **[Query Builder]** button, you can create a subset of the features in the layer that will be visualized (also refer to section *Конструктор поисковых запросов*).

12.3.5 Rendering Menu

QGIS 2.2 introduces support for on-the-fly feature generalisation. This can improve rendering times when drawing many complex features at small scales. This feature can be enabled or disabled in the layer settings using the *Simplify geometry* option. There is also a new global setting that enables generalisation by default for newly added layers (see section *Параметры*). **Note**: Feature generalisation may introduce artefacts into your rendered output in some cases. These may include slivers between polygons and inaccurate rendering when using offset-based symbol layers.

12.3.6 Вывод

This menu is specifically created for Map Tips. It includes a new feature: Map Tip display text in HTML. While you can still choose a *Field* to be displayed when hovering over a feature on the map, it is now possible to insert HTML code that creates a complex display when hovering over a feature. To activate Map Tips, select the menu option *View* → *MapTips*. Figure Display 1 shows an example of HTML code.

12.3.7 Действия

QGIS позволяет выполнять действия с использованием атрибутов элемента. Эту вкладку можно использовать для выполнения любого количества действий, например, запуск программы с параметрами, взятыми из атрибутов элемента, или передача параметров в веб-утилиту генерации отчётов.

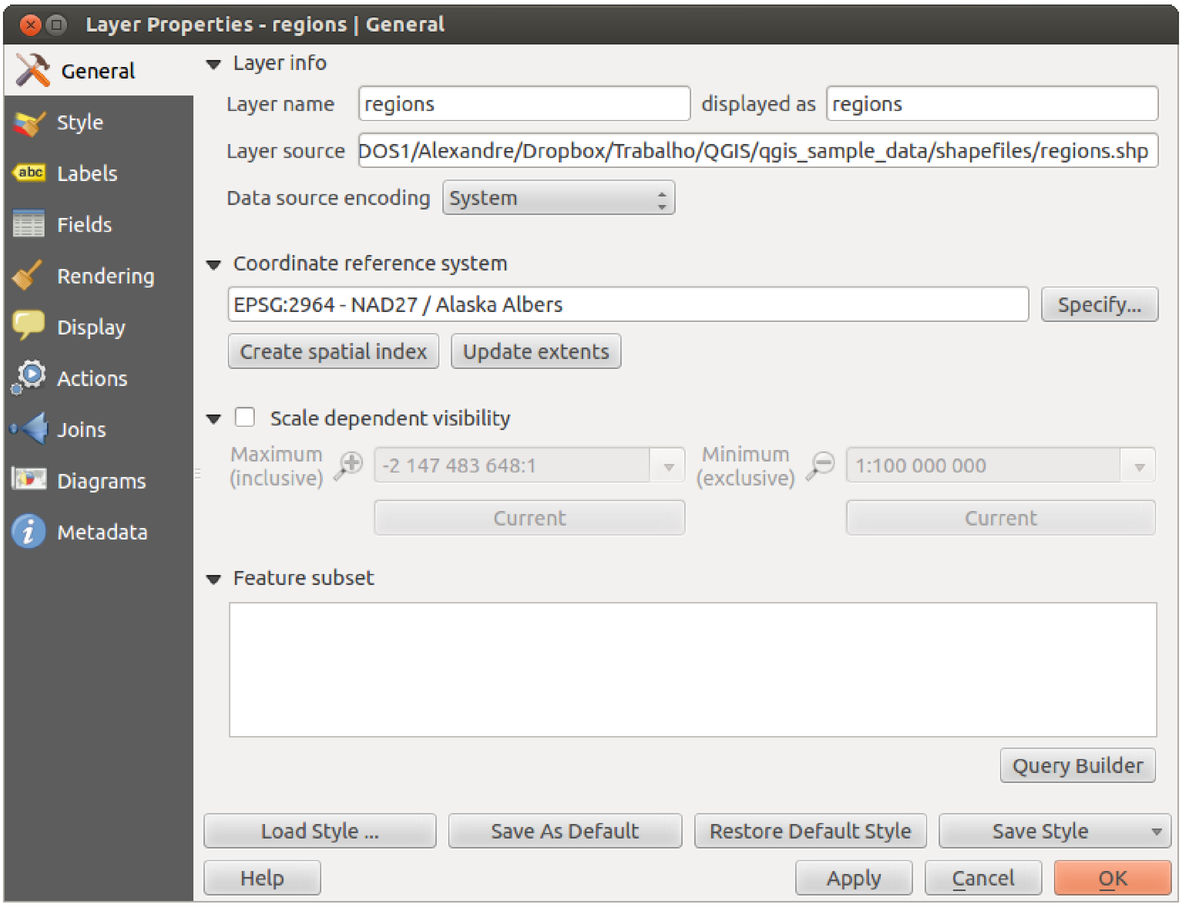

Рис. 12.29: General menu in vector layers properties dialog

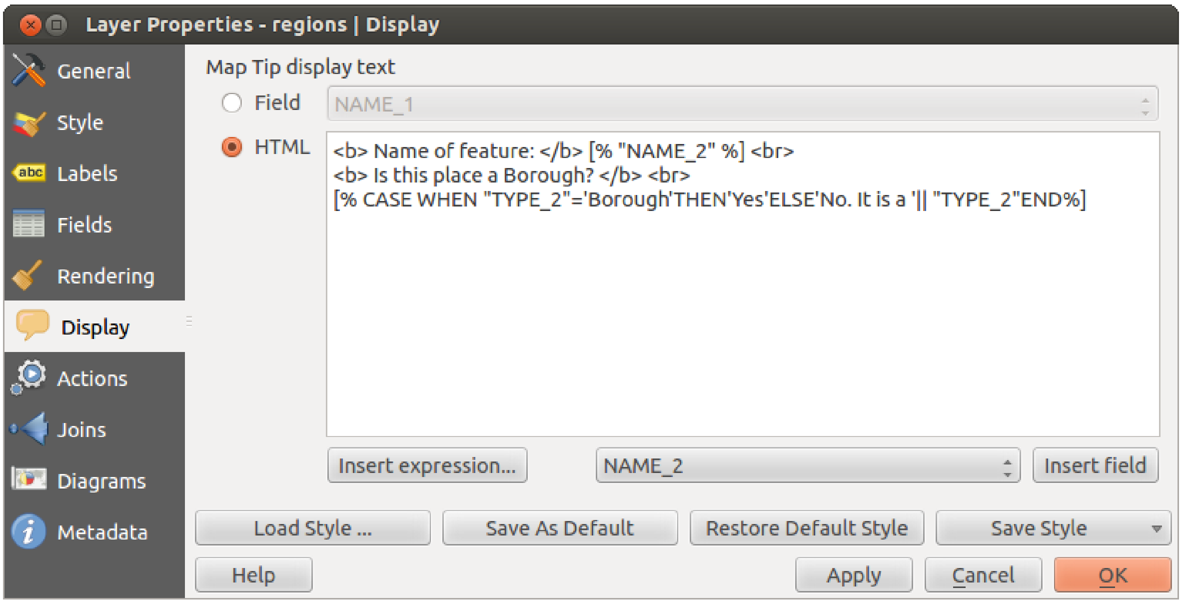

Рис. 12.30: HTML code for map tip

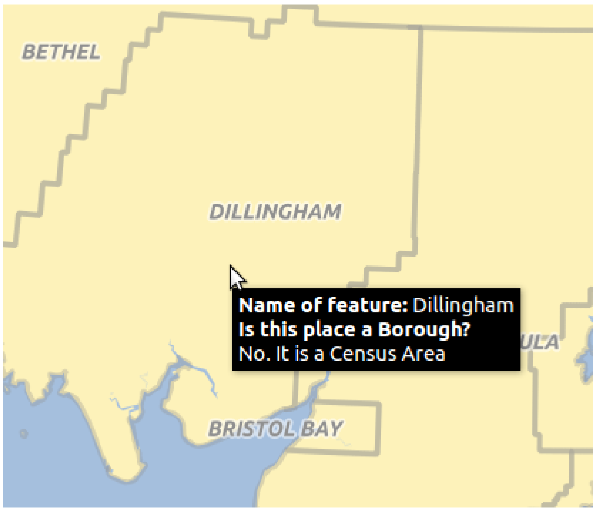

Рис. 12.31: Map tip made with HTML code

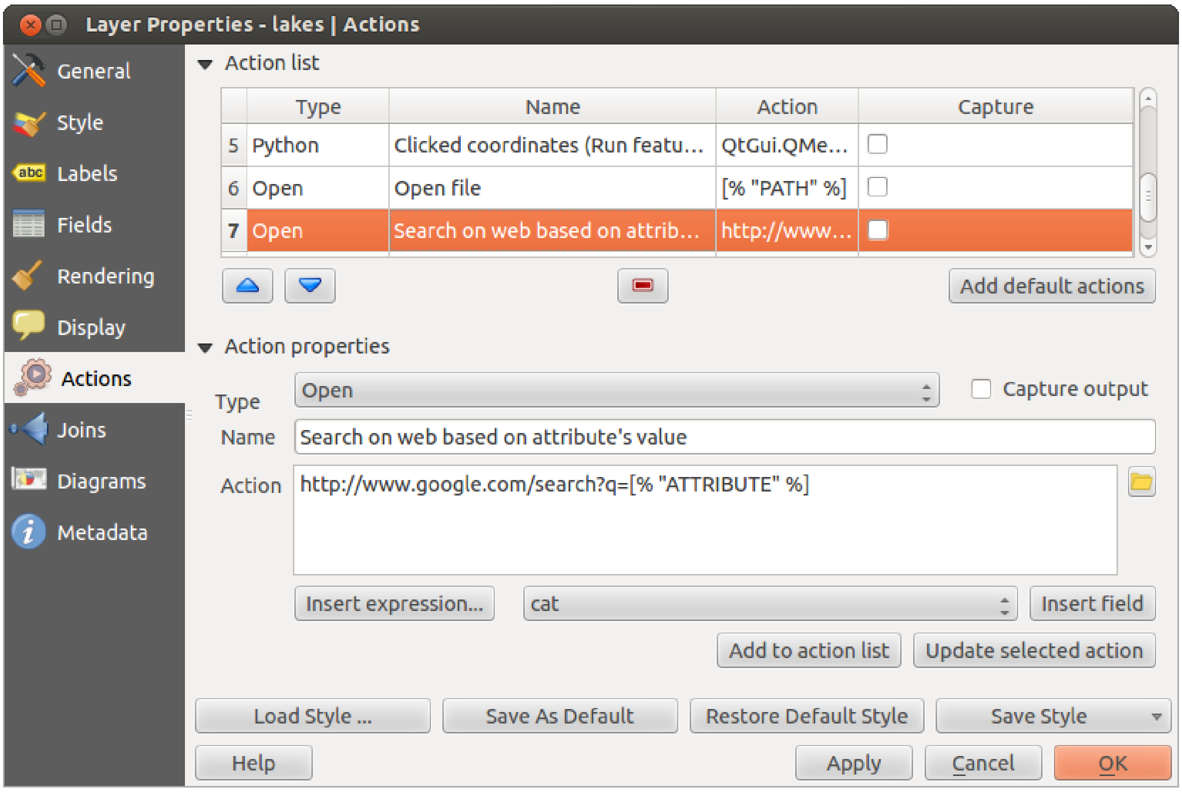

Рис. 12.32: Overview action dialog with some sample actions

Actions are useful when you frequently want to run an external application or view a web page based on one or more values in your vector layer. They are divided into six types and can be used like this:

- Generic, Mac, Windows and Unix actions start an external process.
- Python actions execute a Python expression.
- Generic and Python actions are visible everywhere.
- Mac, Windows and Unix actions are visible only on the respective platform (i.e., you can define three 'Edit' actions to open an editor and the users can only see and execute the one 'Edit' action for their platform to run the editor).

There are several examples included in the dialog. You can load them by clicking on **[Add default actions]**. One example is performing a search based on an attribute value. This concept is used in the following discussion.

Задание действий

Attribute actions are defined from the vector *Layer Properties* dialog. To define an action, open the vector *Layer Properties* dialog and click on the *Actions* menu. Go to the *Action properties*. Select 'Generic' as type and provide a descriptive name for the action. The action itself must contain the name of the application that will be executed when the action is invoked. You can add one or more attribute field values as arguments to the application. When the action is invoked, any set of characters that start with a `%` followed by the name of a field will be replaced by the value of that field. The special characters %% will be replaced by the value of the field that was selected from the identify results or attribute table (see using_actions below). Double quote marks can be used to group text into a single argument to the program, script or command. Double quotes will be ignored if preceded by a backslash.

If you have field names that are substrings of other field names (e.g., `col1` and `col10`), you should indicate that by surrounding the field name (and the % character) with square brackets (e.g., `[%col10]`). This will prevent the `%col10` field name from being mistaken for the `%col1` field name with a `0` on the end. The brackets will be removed by QGIS when it substitutes in the value of the field. If you want the substituted field to be surrounded by square brackets, use a second set like this: `[[%col10]]`.

Using the *Identify Features* tool, you can open the *Identify Results* dialog. It includes a *(Derived)* item that contains information relevant to the layer type. The values in this item can be accessed in a similar way to the other fields by preceeding the derived field name with `(Derived).`. For example, a point layer has an `X` and `Y` field, and the values of these fields can be used in the action with `%(Derived).X` and `%(Derived).Y`. The derived attributes are only available from the *Identify Results* dialog box, not the *Attribute Table* dialog box.

Два примера действий показаны ниже:

- `konqueror http://www.google.com/search?q=%nam`
- `konqueror http://www.google.com/search?q=%%`

In the first example, the web browser konqueror is invoked and passed a URL to open. The URL performs a Google search on the value of the `nam` field from our vector layer. Note that the application or script called by the action must be in the path, or you must provide the full path. To be certain, we could rewrite the first example as: `/opt/kde3/bin/konqueror http://www.google.com/search?q=%nam`. This will ensure that the konqueror application will be executed when the action is invoked.

The second example uses the %% notation, which does not rely on a particular field for its value. When the action is invoked, the %% will be replaced by the value of the selected field in the identify results or attribute table. **Использование действий**

Actions can be invoked from either the *Identify Results* dialog, an *Attribute Table* dialog or from *Run Feature Action* (recall that these dialogs can be opened by clicking Identify Features or Open Attribute Table or Run Feature Action). To invoke an action, right click on the record and choose the action from the pop-up menu. Actions are listed in the popup menu by the name you assigned when defining the action. Click on the action you wish to invoke.

If you are invoking an action that uses the %% notation, right-click on the field value in the *Identify Results* dialog or the *Attribute Table* dialog that you wish to pass to the application or script.

Here is another example that pulls data out of a vector layer and inserts it into a file using bash and the `echo` command (so it will only work on or perhaps). The layer in question has fields for a species name `taxon_name`, latitude `lat` and longitude `long`. We would like to be able to make a spatial selection of localities and export these field values to a text file for the selected record (shown in yellow in the QGIS map area). Here is the action to achieve this:

```
bash -c "echo \"%taxon_name %lat %long\" >> /tmp/species_localities.txt"
```

После вызова этого действия для нескольких записей таблицы, результирующий файл будет выглядеть примерно так:

```
Acacia mearnsii -34.0800000000 150.0800000000
Acacia mearnsii -34.9000000000 150.1200000000
Acacia mearnsii -35.2200000000 149.9300000000
Acacia mearnsii -32.2700000000 150.4100000000
```

As an exercise, we can create an action that does a Google search on the `lakes` layer. First, we need to determine the URL required to perform a search on a keyword. This is easily done by just going to Google and doing a simple search, then grabbing the URL from the address bar in your browser. From this little effort, we see that the format is http://google.com/search?q=qgis, where `QGIS` is the search term. Armed with this information, we can proceed:

1. Убедитесь, что слой `lakes` загружен.
2. Open the *Layer Properties* dialog by double-clicking on the layer in the legend, or right-click and choose *Properties* from the pop-up menu.
3. Click on the *Actions* menu.
4. Введите имя действия, например, `Google Search`.
5. Для действия нам нужно задать имя внешней запускаемой программы. В этот раз мы будем использовать веб-браузер Firefox. Если программы нет в текущей директории, необходимо задать полный путь к ней.
6. Following the name of the external application, add the URL used for doing a Google search, up to but not including the search term: `http://google.com/search?q=`
7. Теперь текст в поле *Действие* должен выглядеть так: `firefox http://google.com/search?q=`
8. Щёлкните на выпадающем списке, содержащем имена полей слоя `lakes`. Он расположен непосредственно слева от кнопки **[Вставить поле]**.
9. From the drop-down box, select 'NAMES' and click **[Insert Field]**.
10. Теперь текст вашего действия выглядит так:

    ```
    firefox http://google.com/search?q=%NAMES
    ```

11. To finalize the action, click the **[Add to action list]** button.

This completes the action, and it is ready to use. The final text of the action should look like this:

```
firefox http://google.com/search?q=%NAMES
```

Теперь мы можем использовать это действие. Закройте диалог *Свойства слоя* и приблизьтесь к области интереса. Убедитесь, что слой `lakes` активный и выберите озеро. В окне результатов вы теперь видите, что ваше действие показывается:

When we click on the action, it brings up Firefox and navigates to the URL http://www.google.com/search?q=Tustumena. It is also possible to add further attribute fields to the action. Therefore, you can add a `+` to the end of the action text, select another field and click on

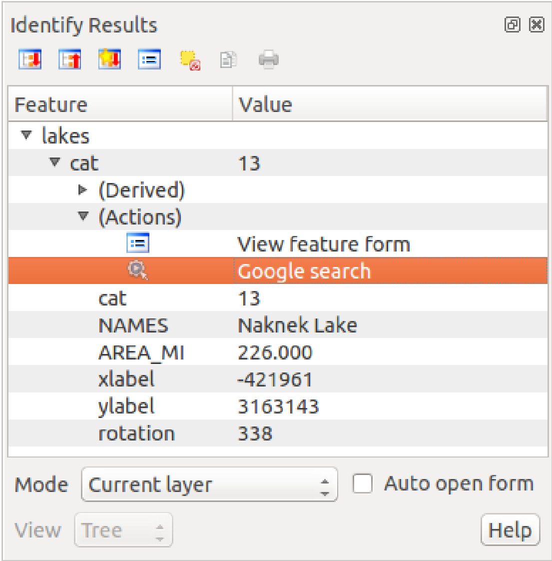

Рис. 12.33: Select feature and choose action

[Insert Field]. In this example, there is just no other field available that would make sense to search for.

You can define multiple actions for a layer, and each will show up in the *Identify Results* dialog.

There are all kinds of uses for actions. For example, if you have a point layer containing locations of images or photos along with a file name, you could create an action to launch a viewer to display the image. You could also use actions to launch web-based reports for an attribute field or combination of fields, specifying them in the same way we did in our Google search example.

We can also make more complex examples, for instance, using **Python** actions.

Usually, when we create an action to open a file with an external application, we can use absolute paths, or eventually relative paths. In the second case, the path is relative to the location of the external program executable file. But what about if we need to use relative paths, relative to the selected layer (a file-based one, like a shapefile or SpatiaLite)? The following code will do the trick:

```
command = "firefox";
imagerelpath = "images_test/test_image.jpg";
layer = qgis.utils.iface.activeLayer();
import os.path;
layerpath = layer.source() if layer.providerType() == 'ogr'
  else (qgis.core.QgsDataSourceURI(layer.source()).database()
  if layer.providerType() == 'spatialite' else None);
path = os.path.dirname(str(layerpath));
image = os.path.join(path,imagerelpath);
import subprocess;
subprocess.Popen( [command, image ] );
```

We just have to remember that the action is one of type *Python* and the *command* and *imagerelpath* variables must be changed to fit our needs.

But what about if the relative path needs to be relative to the (saved) project file? The code of the Python action would be:

```
command="firefox";
imagerelpath="images/test_image.jpg";
projectpath=qgis.core.QgsProject.instance().fileName();
import os.path; path=os.path.dirname(str(projectpath)) if projectpath != '' else None;
image=os.path.join(path, imagerelpath);
import subprocess;
subprocess.Popen( [command, image ] );
```

Another Python action example is the one that allows us to add new layers to the project. For instance, the following examples will add to the project respectively a vector and a raster. The names of the files to be added to the project and the names to be given to the layers are data driven (*filename* and *layername* are column names of the table of attributes of the vector where the action was created):

```
qgis.utils.iface.addVectorLayer('/yourpath/[% "filename" %].shp','[% "layername" %]',
  'ogr')
```

To add a raster (a TIF image in this example), it becomes:

```
qgis.utils.iface.addRasterLayer('/yourpath/[% "filename" %].tif','[% "layername" %]
')
```

12.3.8 Связи

The *Joins* menu allows you to join a loaded attribute table to a loaded vector layer. After clicking , the *Add vector join* dialog appears. As key columns, you have to define a join layer you want to connect with the target vector layer. Then, you have to specify the join field that is common to both the join layer and the target layer. Now you can also specify a subset of fields from the joined layer based on the checkbox *Choose which fields are joined*. As a result of the join, all information from the join layer and the target layer are displayed in the attribute table of the target layer as joined information. If you specified a subset of fields only these fields are displayed in the attribute table of the target layer.

QGIS currently has support for joining non-spatial table formats supported by OGR (e.g., CSV, DBF and Excel), delimited text and the PostgreSQL provider (see figure_joins_1).

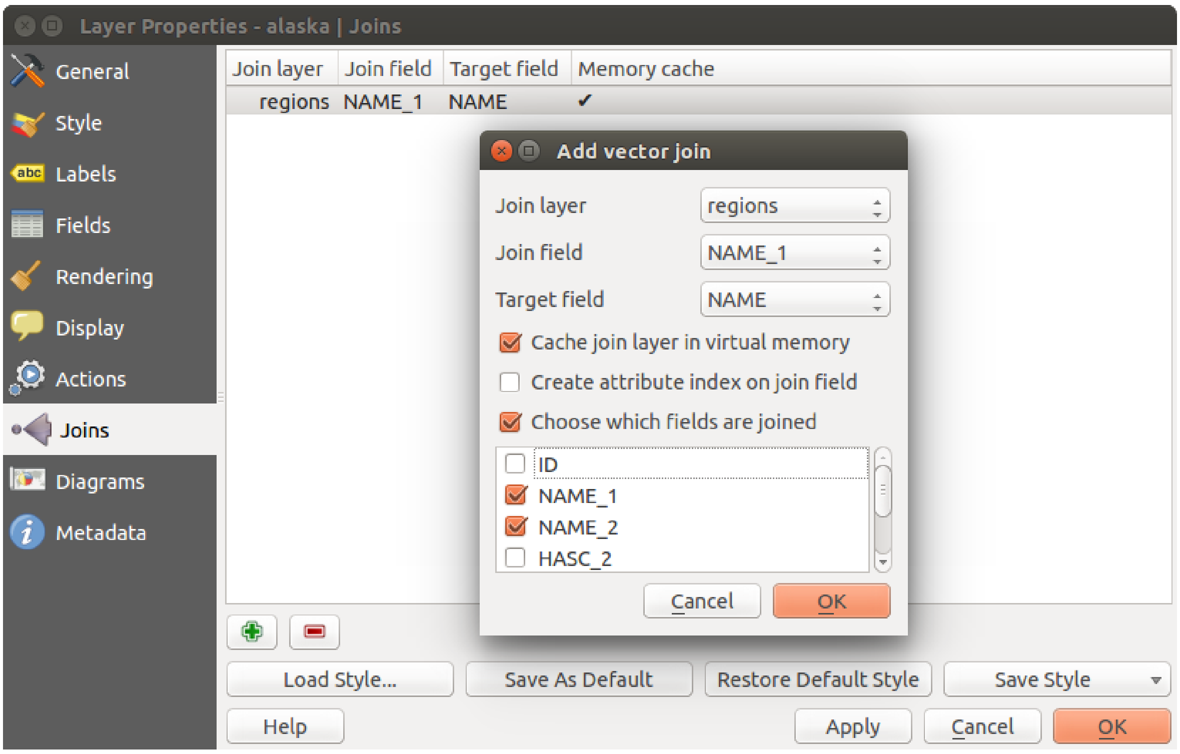

Рис. 12.34: Join an attribute table to an existing vector layer

Additionally, the add vector join dialog allows you to:

- *Сохранить связанный слой в виртуальной памяти*
- *Создать индекс на основе объединяемого поля*

12.3.9 Диаграммы

The *Diagrams* menu allows you to add a graphic overlay to a vector layer (see figure_diagrams_1).

The current core implementation of diagrams provides support for pie charts, text diagrams and histograms.

The menu is divided into four tabs: *Appearance*, *Size*, *Postion* and *Options*.

In the cases of the text diagram and pie chart, text values of different data columns are displayed one below the other with a circle or a box and dividers. In the *Size* tab, diagram size is based on a fixed size or on linear scaling according to a classification attribute. The placement of the diagrams, which is done in the *Position* tab, interacts with the new labeling, so position conflicts between diagrams and labels are detected and solved. In addition, chart positions can be fixed manually.

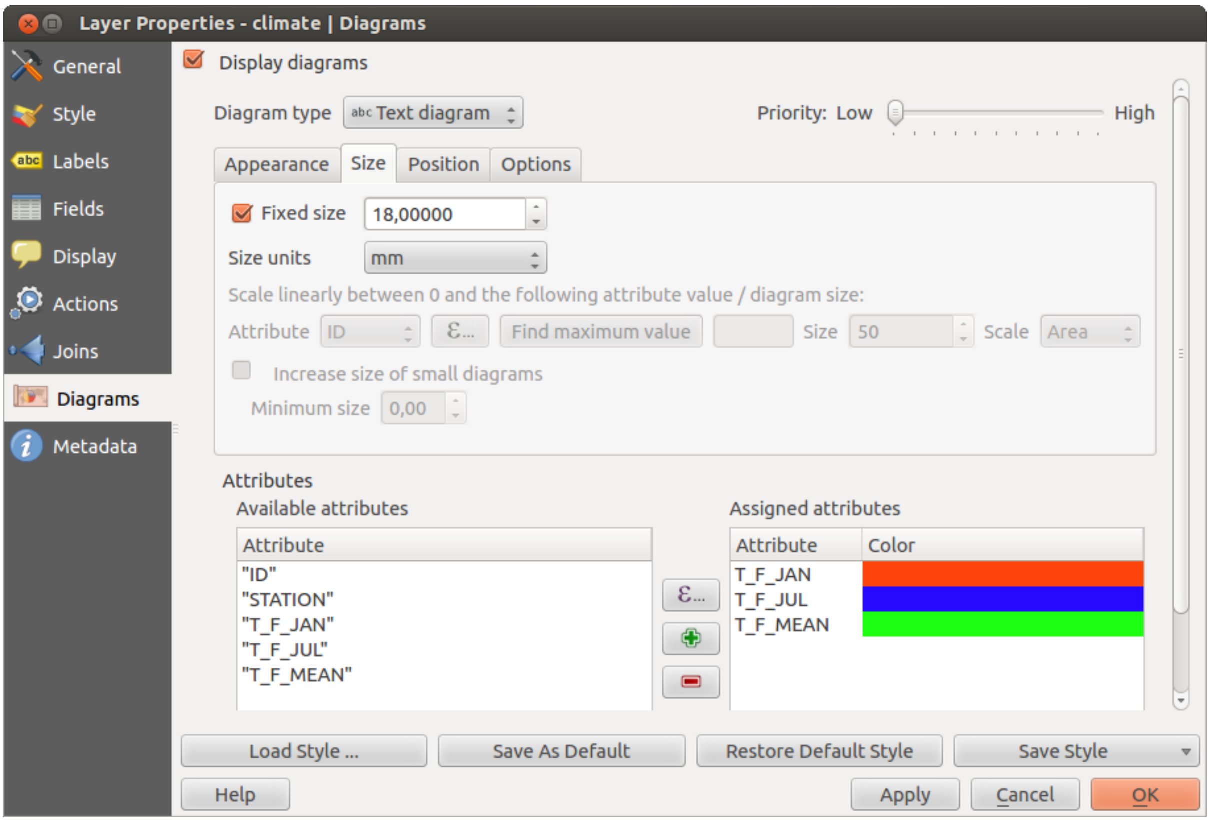

Рис. 12.35: Vector properties dialog with diagram menu

We will demonstrate an example and overlay on the Alaska boundary layer a text diagram showing temperature data from a climate vector layer. Both vector layers are part of the QGIS sample dataset (see section *Примеры данных*).

1. First, click on the Load Vector icon, browse to the QGIS sample dataset folder, and load the two vector shape layers `alaska.shp` and `climate.shp`.
2. Сделайте двойной щелчок на слое `climate` в легенде карты и откройте диалог *Свойства слоя*.
3. Click on the *Diagrams* menu, activate *Display diagrams*, and from the *Diagram type* combo box, select 'Text diagram'.
4. In the *Appearance* tab, we choose a light blue as background color, and in the *Size* tab, we set a fixed size to 18 mm.
5. In the *Position* tab, placement could be set to 'Around Point'.

6. In the diagram, we want to display the values of the three columns T_F_JAN, T_F_JUL and T_F_MEAN. First select T_F_JAN as *Attributes* and click the button, then T_F_JUL, and finally T_F_MEAN.
7. Теперь нажмите кнопку **[Применить]** для отображения диаграммы в главном окне QGIS.
8. You can adapt the chart size in the *Size* tab. Deactivate the *Fixed size* and set the size of the diagrams on the basis of an attribute with the **[Find maximum value]** button and the *Size* menu. If the diagrams appear too small on the screen, you can activate the *Increase size of small diagrams* checkbox and define the minimum size of the diagrams.
9. Change the attribute colors by double clicking on the color values in the *Assigned attributes* field. Figure_diagrams_2 gives an idea of the result.
10. Finally, click **[Ok]**.

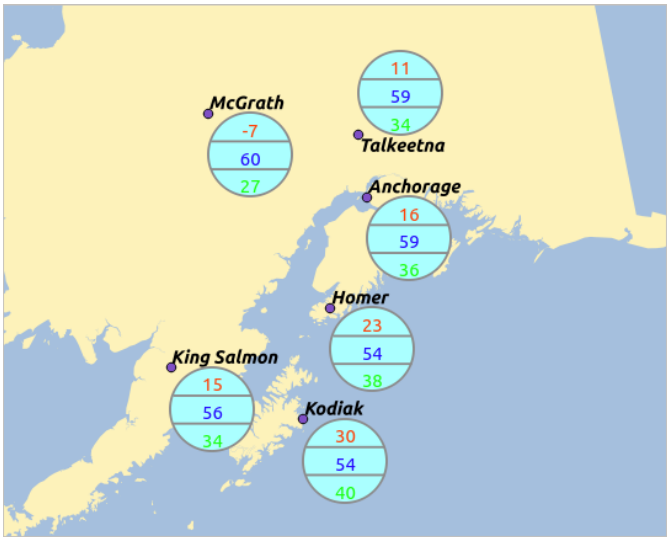

Рис. 12.36: Diagram from temperature data overlayed on a map

Remember that in the *Position* tab, a *Data defined position* of the diagrams is possible. Here, you can use attributes to define the position of the diagram. You can also set a scale-dependent visibility in the *Appearance* tab.

The size and the attributes can also be an expression. Use the button to add an expression. See *Expressions* chapter for more information and example.

12.3.10 Метаданные

The *Metadata* menu consists of *Description*, *Attribution*, *MetadataURL* and *Properties* sections.

In the *Properties* section, you get general information about the layer, including specifics about the type and location, number of features, feature type, and editing capabilities. The *Extents* table provides you with layer extent information and the *Layer Spatial Reference System*, which is information about the CRS of the layer. This is a quick way to get information about the layer.

Additionally, you can add or edit a title and abstract for the layer in the *Description* section. It's also possible to define a *Keyword list* here. These keyword lists can be used in a metadata catalogue. If you want to use a title from an XML metadata file, you have to fill in a link in the *DataUrl* field. Use *Attribution* to get attribute data from an XML metadata catalogue. In *MetadataUrl*, you can define the general path to the XML metadata catalogue. This information will be saved in the QGIS project file for subsequent sessions and will be used for QGIS server.

.

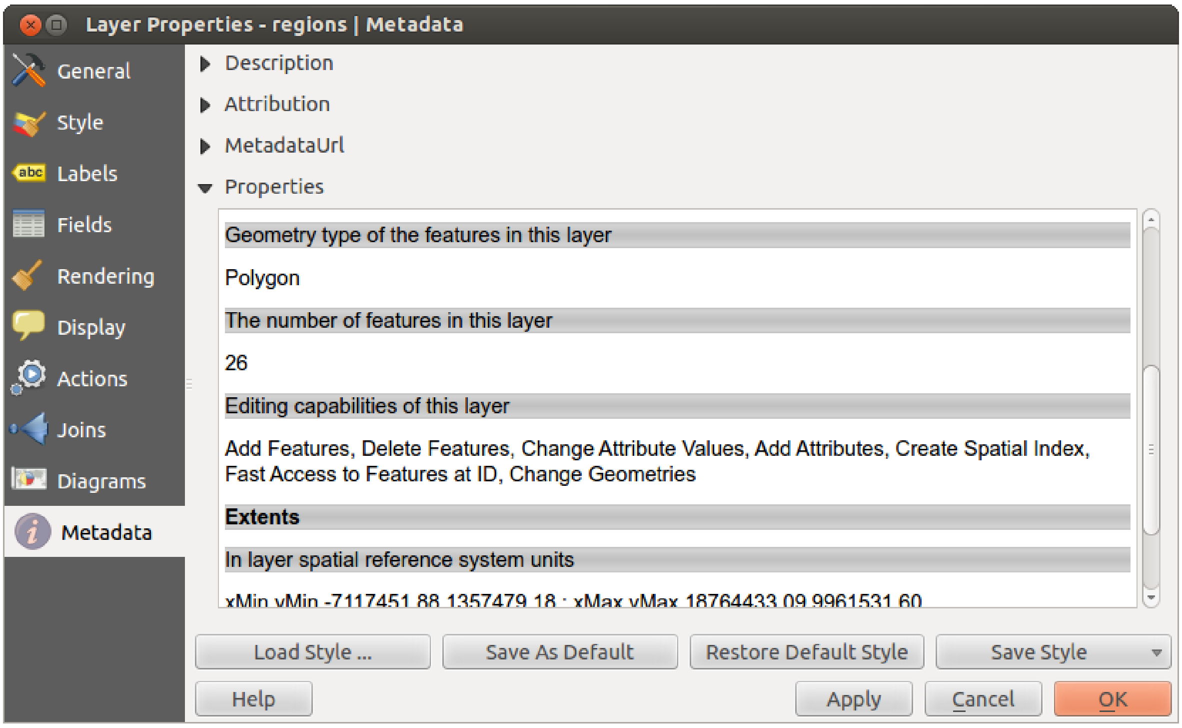

Рис. 12.37: Metadata menu in vector layers properties dialog

12.4 Expressions

The **Expressions** feature are available through the field calculator or the add a new column button in the attribut table or the Field tab in the Layer properties ; through the graduaded, categorized and rule-based rendering in the Style tab of the Layer properties ; through the expression-based labeling ... in the Labeling core application ; through the feature selection and through the diagram tab of the Layer properties.

There are powerful way to manipulate attribute value in order to dynamicly change the final value in order to change the geometry style, the content of the label, the value for diagram, select some feature or create virtual column.

12.4.1 Functions List

The **Function List** contains functions as well as fields and values. View the help function in the **Selected Function Help**. In **Expression** you see the calculation expressions you create with the **Function List**. For the most commonly used operators, see **Operators**.

In the **Function List**, click on *Fields and Values* to view all attributes of the attribute table to be searched. To add an attribute to the Field calculator **Expression** field, double click its name in the *Fields and Values* list. Generally, you can use the various fields, values and functions to construct the calculation expression, or you can just type it into the box. To display the values of a field, you just right click on the appropriate field. You can choose between *Load top 10 unique values* and *Load all unique values*. On the right side, the **Field Values** list opens with the unique values. To add a value to the Field calculator **Expression** box, double click its name in the **Field Values** list.

The *Operators*, *Math*, *Conversions*, *String*, *Geometry* and *Record* groups provide several functions. In *Operators*, you find mathematical operators. Look in *Math* for mathematical functions. The *Conversions* group contains functions that convert one data type to another. The *String* group provides functions for data strings. In the *Geometry* group, you find functions for geometry objects. With *Record* group functions, you can add a numeration to your data set. To add a function to the Field calculator

Expression box, click on the > and then double click the function.

Operators

This group contains operators (e.g., +, -, *).

```
a + b       a plus b
a - b       a minus b
a * b       a multiplied by b
a / b       a divided by b
a % b       a modulo b (for example, 7 % 2 = 1, or 2 fits into 7 three
            times with remainder 1)
a ^ b       a power b (for example, 2^2=4 or 2^3=8)
a = b       a and b are equal
a > b       a is larger than b
a < b       a is smaller than b
a <> b      a and b are not equal
a != b      a and b are not equal
a <= b      a is less than or equal to b
a >= b      a is larger than or equal to b
a ~ b       a matches the regular expression b
+ a         positive sign
- a         negative value of a
||          joins two values together into a string 'Hello' || ' world'
LIKE        returns 1 if the string matches the supplied pattern
ILIKE       returns 1 if the string matches case-insensitive the supplied
            pattern (ILIKE can be used instead of LIKE to make the match
            case-insensitive)
IS          returns 1 if a is the same as b
OR          returns 1 when condition a or b is true
AND         returns 1 when condition a and b are true
NOT         returns 1 if a is not the same as b
column name "column name"     value of the field column name, take
                              care to not be confused with simple
                              quote, see below
'string'                      a string value, take care to not be
                              confused with double quote, see above
NULL                          null value
a IS NULL                     a has no value
a IS NOT NULL                 a has a value
a IN (value[,value])          a is below the values listed
a NOT IN (value[,value])      a is not below the values listed
```

Some example:

- Joins a string and a value from a column name:

  ```
  'My feature's id is: ' || "gid"
  ```

- Test if the "description" attribute field starts with the 'Hello' string in the value (note the position of the % caracter):

  ```
  "description" LIKE 'Hello%'
  ```

Conditionals

This group contains functions to handle conditional checks in expressions.

```
CASE                          evaluates multiple expressions and returns a
                              result
CASE ELSE                     evaluates multiple expressions and returns a
                              result
```

coalesce	returns the first non-NULL value from the expression list
regexp_match	returns true if any part of a string matches the supplied regular expression

Some example:

- Send back a value if the first condition is true, else another value:

```
CASE WHEN "software" LIKE '%QGIS%' THEN 'QGIS' ELSE 'Other'
```

Mathematical Functions

This group contains math functions (e.g., square root, sin and cos).

sqrt(a)	square root of a
abs	returns the absolute value of a number
sin(a)	sine of a
cos(a)	cosine of a
tan(a)	tangent of a
asin(a)	arcsin of a
acos(a)	arccos of a
atan(a)	arctan of a
atan2(y,x)	arctan of y/x using the signs of the two arguments to determine the quadrant of the result
exp	exponential of a value
ln	value of the natural logarithm of the passed expression
log10	value of the base 10 logarithm of the passed expression
log	value of the logarithm of the passed value and base
round	round to number of decimal places
rand	random integer within the range specified by the minimum and maximum argument (inclusive)
randf	random float within the range specified by the minimum and maximum argument (inclusive)
max	largest value in a set of values
min	smallest value in a set of values
clamp	restricts an input value to a specified range
scale_linear	transforms a given value from an input domain to an output range using linear interpolation
scale_exp	transforms a given value from an input domain to an output range using an exponential curve
floor	rounds a number downwards
ceil	rounds a number upwards
$pi	pi as value for calculations

Conversions

This group contains functions to convert one data type to another (e.g., string to integer, integer to string).

toint	converts a string to integer number
toreal	converts a string to real number

tostring	converts number to string
todatetime	converts a string into Qt data time type
todate	converts a string into Qt data type
totime	converts a string into Qt time type
tointerval	converts a string to an interval type (can be used to take days, hours, months, etc. off a date)

Date and Time Functions

This group contains functions for handling date and time data.

$now	current date and time
age	difference between two dates
year	extract the year part from a date, or the number of years from an interval
month	extract the month part from a date, or the number of months from an interval
week	extract the week number from a date, or the number of weeks from an interval
day	extract the day from a date, or the number of days from an interval
hour	extract the hour from a datetime or time, or the number of hours from an interval
minute	extract the minute from a datetime or time, or the number of minutes from an interval
second	extract the second from a datetime or time, or the number of minutes from an interval

Some example:

- Get the month and the year of today in the format "10/2014"

```
month($now) || '/' || year($now)
```

String Functions

This group contains functions that operate on strings (e.g., that replace, convert to upper case).

lower	convert string a to lower case
upper	convert string a to upper case
title	converts all words of a string to title case (all words lower case with leading capital letter)
trim	removes all leading and trailing white space (spaces, tabs, etc.) from a string
wordwrap	returns a string wrapped to a maximum/ minimum number of characters
length	length of string a
replace	returns a string with the supplied string replaced
regexp_replace(a,this,that)	returns a string with the supplied regular expression replaced
regexp_substr	returns the portion of a string which matches a supplied regular expression
substr(*a*,from,len)	returns a part of a string
concat	concatenates several strings to one
strpos	returns the index of a regular expression in a string
left	returns a substring that contains the n leftmost characters of the string

right	returns a substring that contains the n rightmost characters of the string
rpad	returns a string with supplied width padded using the fill character
lpad	returns a string with supplied width padded using the fill character
format	formats a string using supplied arguments
format_number	returns a number formatted with the locale separator for thousands (also truncates the number to the number of supplied places)
format_date	formats a date type or string into a custom string format

Color Functions

This group contains functions for manipulating colors.

color_rgb	returns a string representation of a color based on its red, green, and blue components
color_rgba	returns a string representation of a color based on its red, green, blue, and alpha (transparency) components
ramp_color	returns a string representing a color from a color ramp
color_hsl	returns a string representation of a color based on its hue, saturation, and lightness attributes
color_hsla	returns a string representation of a color based on its hue, saturation, lightness and alpha (transparency) attributes
color_hsv	returns a string representation of a color based on its hue, saturation, and value attributes
color_hsva	returns a string representation of a color based on its hue, saturation, value and alpha (transparency) attributes
color_cmyk	returns a string representation of a color based on its cyan, magenta, yellow and black components
color_cmyka	returns a string representation of a color based on its cyan, magenta, yellow, black and alpha (transparency) components

Geometry Functions

This group contains functions that operate on geometry objects (e.g., length, area).

$geometry	returns the geometry of the current feature (can be used for processing with other functions)
$area	returns the area size of the current feature
$length	returns the length size of the current feature
$perimeter	returns the perimeter length of the current feature
$x	returns the x coordinate of the current feature
$y	returns the y coordinate of the current feature
xat	retrieves the nth x coordinate of the current feature. n given as a parameter of the function
yat	retrieves the nth y coordinate of the current feature. n given as a parameter of the function
xmin	returns the minimum x coordinate of a geometry. Calculations are in the Spatial Reference System of this Geometry
xmax	returns the maximum x coordinate of a geometry. Calculations are in the Spatial Reference System of this Geometry
ymin	returns the minimum y coordinate of a geometry. Calculations are in the Spatial Reference System of this

	Geometry
ymax	returns the maximum y coordinate of a geometry. Calculations are in the Spatial Reference System of this Geometry
geomFromWKT	returns a geometry created from a well-known text (WKT) representation
geomFromGML	returns a geometry from a GML representation of geometry
bbox	
disjoint	returns 1 if the geometries do not share any space together
intersects	returns 1 if the geometries spatially intersect (share any portion of space) and 0 if they don't
touches	returns 1 if the geometries have at least one point in common, but their interiors do not intersect
crosses	returns 1 if the supplied geometries have some, but not all, interior points in common
contains	returns true if and only if no points of b lie in the exterior of a, and at least one point of the interior of b lies in the interior of a
overlaps	returns 1 if the geometries share space, are of the same dimension, but are not completely contained by each other
within	returns 1 if geometry a is completely inside geometry b
buffer	returns a geometry that represents all points whose distance from this geometry is less than or equal to distance
centroid	returns the geometric center of a geometry
bounds	returns a geometry which represents the bounding box of an input geometry. Calculations are in the Spatial Reference System of this Geometry.
bounds_width	returns the width of the bounding box of a geometry. Calculations are in the Spatial Reference System of this Geometry.
bounds_height	returns the height of the bounding box of a geometry. Calculations are in the Spatial Reference System of this Geometry.
convexHull	returns the convex hull of a geometry (this represents the minimum convex geometry that encloses all geometries within the set)
difference	returns a geometry that represents that part of geometry a that does not intersect with geometry b
distance	returns the minimum distance (based on spatial ref) between two geometries in projected units
intersection	returns a geometry that represents the shared portion of geometry a and geometry b
symDifference	returns a geometry that represents the portions of a and b that do not intersect
combine	returns the combination of geometry a and geometry b
union	returns a geometry that represents the point set union of the geometries
geomToWKT	returns the well-known text (WKT) representation of the geometry without SRID metadata

Record Functions

This group contains functions that operate on record identifiers.

$rownum	returns the number of the current row
$id	returns the feature id of the current row
$currentfeature	returns the current feature being evaluated. This can be used with the 'attribute' function to evaluate attribute values from the current

```
                         feature.
$scale                   returns the current scale of the map canvas
$uuid                    generates a Universally Unique Identifier (UUID)
                         for each row. Each UUID is 38 characters long.
getFeature               returns the first feature of a layer matching a
                         given attribute value.
attribute                returns the value of a specified attribute from
                         a feature.
$map                     returns the id of the current map item if the map
                         is being drawn in a composition, or "canvas" if
                         the map is being drawn within the main QGIS
                         window.
```

Fields and Values

Contains a list of fields from the layer. Sample values can also be accessed via right-click.

Select the field name from the list, then right-click to access a context menu with options to load sample values from the selected field.

Fields name should be double-quoted. Values or string should be simple-quoted.

.

12.5 Редактирование

QGIS предоставляет разнообразные возможности для редактирования векторных данных OGR, Spatialite, PostGIS, MSSQL Spatial и Oracle Spatial.

Примечание: The procedure for editing GRASS layers is different - see section *Оцифровка и правка векторных слоёв GRASS* for details.

Совет: Параллельное редактирование

This version of QGIS does not track if somebody else is editing a feature at the same time as you are. The last person to save their edits wins.

12.5.1 Настройка порога прилипания и радиуса поиска

Перед началом редактирования узлов необходимо установить величину порога прилипания и радиуса поиска, что позволит оптимизировать редактирование геометрии векторных слоёв.

Порог прилипания

Snapping tolerance is the distance QGIS uses to `search` for the closest vertex and/or segment you are trying to connect to when you set a new vertex or move an existing vertex. If you aren't within the snapping tolerance, QGIS will leave the vertex where you release the mouse button, instead of snapping it to an existing vertex and/or segment. The snapping tolerance setting affects all tools that work with tolerance.

1. A general, project-wide snapping tolerance can be defined by choosing *Settings* → *Options*. On Mac, go to *QGIS* → *Preferences...*. On Linux: *Edit* → *Options*. In the *Digitizing* tab, you can select between 'to vertex', 'to segment' or 'to vertex and segment' as default snap mode. You can also define a default snapping tolerance and a search radius for vertex edits. The tolerance can be set either in map units or in pixels. The advantage of choosing pixels is that the snapping tolerance doesn't have to be changed after zoom operations. In our small digitizing project (working with

the Alaska dataset), we define the snapping units in feet. Your results may vary, but something on the order of 300 ft at a scale of 1:10000 should be a reasonable setting.

2. A layer-based snapping tolerance can be defined by choosing *Settings* → (or *File* →) *Snapping options...* to enable and adjust snapping mode and tolerance on a layer basis (see figure_edit_1).

Note that this layer-based snapping overrides the global snapping option set in the Digitizing tab. So, if you need to edit one layer and snap its vertices to another layer, then enable snapping only on the `snap to` layer, then decrease the global snapping tolerance to a smaller value. Furthermore, snapping will never occur to a layer that is not checked in the snapping options dialog, regardless of the global snapping tolerance. So be sure to mark the checkbox for those layers that you need to snap to.

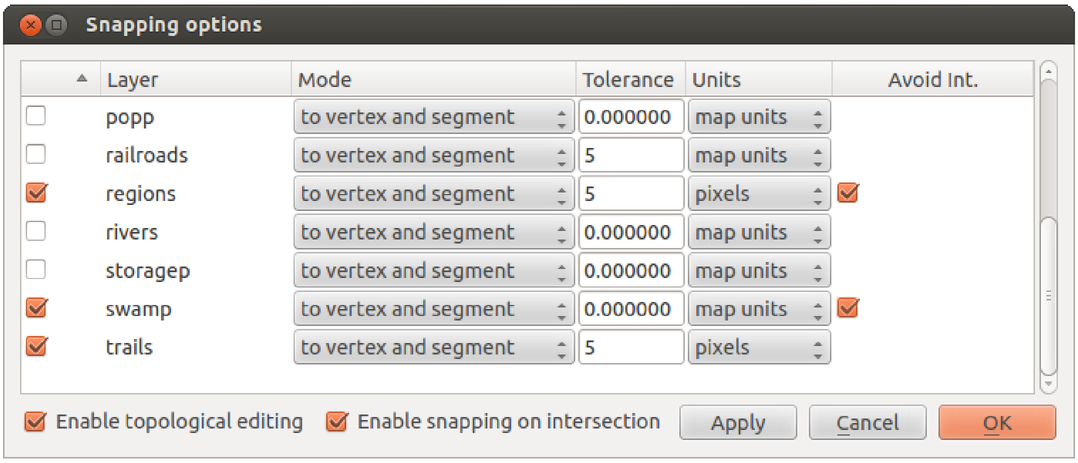

Рис. 12.38: Edit snapping options on a layer basis

Радиус поиска

Search radius is the distance QGIS uses to `search` for the closest vertex you are trying to move when you click on the map. If you aren't within the search radius, QGIS won't find and select any vertex for editing, and it will pop up an annoying warning to that effect. Snap tolerance and search radius are set in map units or pixels, so you may find you need to experiment to get them set right. If you specify too big of a tolerance, QGIS may snap to the wrong vertex, especially if you are dealing with a large number of vertices in close proximity. Set search radius too small, and it won't find anything to move.

The search radius for vertex edits in layer units can be defined in the *Digitizing* tab under *Settings* → *Options*. This is the same place where you define the general, project- wide snapping tolerance.

12.5.2 Масштабирование и прокрутка карты

Перед редактированием слоя следует увеличить район исследований на карте. Это спасёт от ожидания прорисовки всех вершин слоя.

Помимо использования кнопок Прокрутка карты и Увеличить / Уменьшить на панели инструментов, навигация также может осуществляться с помощью «колеса» мыши, клавиши «Пробел» и стрелок.

Зуммирование и прокрутка карты с помощью «колеса» мыши

While digitizing, you can press the mouse wheel to pan inside of the main window, and you can roll the mouse wheel to zoom in and out on the map. For zooming, place the mouse cursor inside the map area and roll it forward (away from you) to zoom in and backwards (towards you) to zoom out. The mouse cursor position will be the center of the zoomed area of interest. You can customize the behavior of the mouse wheel zoom using the *Map tools* tab under the *Settings* → *Options* menu.

Прокрутка карты с помощью стрелок

Panning the map during digitizing is possible with the arrow keys. Place the mouse cursor inside the map area, and click on the right arrow key to pan east, left arrow key to pan west, up arrow key to pan north, and down arrow key to pan south.

You can also use the space bar to temporarily cause mouse movements to pan the map. The `PgUp` and `PgDown` keys on your keyboard will cause the map display to zoom in or out without interrupting your digitizing session.

12.5.3 Топологическое редактирование

Besides layer-based snapping options, you can also define topological functionalities in the *Snapping options...* dialog in the *Settings* (or *File*) menu. Here, you can define *Enable topological editing*, and/or for polygon layers, you can activate the column *Avoid Int.*, which avoids intersection of new polygons.

Включение топологического редактирования

The option *Enable topological editing* is for editing and maintaining common boundaries in polygon mosaics. QGIS 'detects' a shared boundary in a polygon mosaic, so you only have to move the vertex once, and QGIS will take care of updating the other boundary.

Предотвращение пересечения новых полигонов

The second topological option in the *Avoid Int.* column, called *Avoid intersections of new polygons*, avoids overlaps in polygon mosaics. It is for quicker digitizing of adjacent polygons. If you already have one polygon, it is possible with this option to digitize the second one such that both intersect, and QGIS then cuts the second polygon to the common boundary. The advantage is that you don't have to digitize all vertices of the common boundary.

Активация прилипания к пересечениям

Another option is to use *Enable snapping on intersection*. It allows you to snap on an intersection of background layers, even if there's no vertex on the intersection.

12.5.4 Редактирование существующего слоя

By default, QGIS loads layers read-only. This is a safeguard to avoid accidentally editing a layer if there is a slip of the mouse. However, you can choose to edit any layer as long as the data provider supports it, and the underlying data source is writable (i.e., its files are not read-only).

In general, tools for editing vector layers are divided into a digitizing and an advanced digitizing toolbar, described in section *Дополнительные функции оцифровки*. You can select and unselect both under *View* → *Toolbars* →. Using the basic digitizing tools, you can perform the following functions:

Иконка	Назначение	Иконка	Назначение
	Текущие правки		Режим редактирования
	Добавить объект: создать точку		Добавить объект: создать линию
	Добавить объект: создать полигон		Переместить объект
	Редактирование узлов		Удалить выделенное
	Вырезать объекты		Копировать объекты
	Вставить объекты		Сохранить правки

Основные инструменты редактирования векторного слоя

All editing sessions start by choosing the Toggle editing option. This can be found in the context menu after right clicking on the legend entry for a given layer.

Alternatively, you can use the Toggle Editing Toggle editing button from the digitizing toolbar to start or stop the editing mode. Once the layer is in edit mode, markers will appear at the vertices, and additional tool buttons on the editing toolbar will become available.

Совет: Регулярное сохранение

Не забывайте нажимать Сохранить правки регулярно. Это позволит не только сохранить последние изменения, но и удостовериться, что источники данных могут принять все сделанные изменения.

Добавление объектов

Можно использовать кнопки на панели инструментов: Создать точку, Создать линию или Создать полигон, чтобы переключить QGIS в режим редактирования.

Для каждого объекта сначала идет оцифровка формы, а затем добавляются атрибуты. Чтобы начать оцифровку и создать первую точку нового объекта, надо нажать левой кнопкой мыши в области карты.

Для продолжения линий и полигонов надо продолжать нажимать на левую кнопку мыши для создания каждого дополнительного узла. Чтобы закончить редактирование объекта, просто щелкните правой кнопки мыши в любом месте карты. Это подтверждение того, что редактирование данного объекта окончено.

The attribute window will appear, allowing you to enter the information for the new feature. Figure_edit_2 shows setting attributes for a fictitious new river in Alaska. In the *Digitizing* menu under the *Settings* → *Options* menu, you can also activate *Suppress attributes pop-up windows after each created feature* and *Reuse last entered attribute values*.

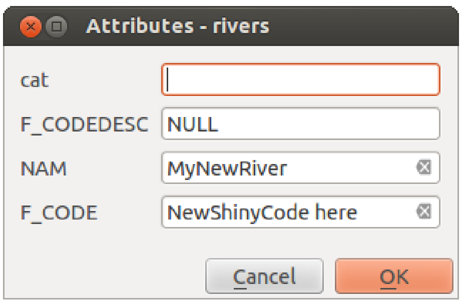

Рис. 12.39: Диалог ввода атрибутивных значений после оцифровки нового объекта

With the Move Feature(s) icon on the toolbar, you can move existing features.

Совет: Типы значений атрибутов

For editing, the attribute types are validated during entry. Because of this, it is not possible to enter a number into a text column in the dialog *Enter Attribute Values* or vice versa. If you need to do so, you should edit the attributes in a second step within the *Attribute table* dialog.

Текущие правки

This feature allows the digitization of multiple layers. Choose *Save for Selected Layers* to save all changes you made in multiple layers. You also have the opportunity to *Rollback for Selected Layers*, so that the digitization may be withdrawn for all selected layers. If you want to stop editing the selected layers, *Cancel for Selected Layer(s)* is an easy way.

The same functions are available for editing all layers of the project.

Редактирование узлов

For shapefile-based layers as well as SpatialLite, PostgreSQL/PostGIS, MSSQL Spatial, and Oracle Spatial tables, the Node Tool provides manipulation capabilities of feature vertices similar to CAD programs. It is possible to simply select multiple vertices at once and to move, add or delete them altogether. The node tool also works with 'on the fly' projection turned on, and it supports the topological editing feature. This tool is, unlike other tools in QGIS, persistent, so when some operation is done, selection stays active for this feature and tool. If the node tool is unable to find any features, a warning will be displayed.

It is important to set the property *Settings* → *Options* → *Digitizing* → *Search Radius:* 1,00 to a number greater than zero (i.e., 10). Otherwise, QGIS will not be able to tell which vertex is being edited.

Совет: Маркировка вершин

The current version of QGIS supports three kinds of vertex markers: 'Semi-transparent circle', 'Cross' and 'None'. To change the marker style, choose *Options* from the *Settings* menu, click on the *Digitizing* tab and select the appropriate entry.

Основные операции

Включите инструмент Редактирование узлов и выделите объект простым нажатием на него. На месте каждой вершины этого объекта появятся красные рамки.

- **Selecting vertices**: You can select vertices by clicking on them one at a time, by clicking on an edge to select the vertices at both ends, or by clicking and dragging a rectangle around some vertices. When a vertex is selected, its color changes to blue. To add more vertices to the current selection, hold down the `Ctrl` key while clicking. Hold down `Ctrl` or `Shift` when clicking to toggle the selection state of vertices (vertices that are currently unselected will be selected as usual, but also vertices that are already selected will become unselected).
- **Adding vertices**: To add a vertex, simply double click near an edge and a new vertex will appear on the edge near to the cursor. Note that the vertex will appear on the edge, not at the cursor position; therefore, it should be moved if necessary.

- **Удаление узлов**: После выделения вершин для их удаления надо нажать клавишу `Delete`, вершины будут удалены. Обратите внимание, что, согласно стандарту Quantum GIS, необходимое количество узлов для каждого типа объекта все же останется. Чтобы полностью удалить объект, надо использовать другой инструмент, а именно Удалить выделенное.
- **Перемещение узлов**: Выделите все вершины, которые собираетесь перемещать. Все выделенные вершины будут перенесены в направлении курсора. Если активна функция прилипания, все вершины могут перескочить на ближайшие узлы или линии.

Each change made with the node tool is stored as a separate entry in the Undo dialog. Remember that all operations support topological editing when this is turned on. On-the-fly projection is also supported, and the node tool provides tooltips to identify a vertex by hovering the pointer over it.

Вырезать, копировать и вставить объекты

Выделенные объекты можно удалять, копировать и вставлять из слоя в слой одного проекта QGIS при условии, что для них включен Режим редактирования.

Features can also be pasted to external applications as text. That is, the features are represented in CSV format, with the geometry data appearing in the OGC Well-Known Text (WKT) format.

However, in this version of QGIS, text features from outside QGIS cannot be pasted to a layer within QGIS. When would the copy and paste function come in handy? Well, it turns out that you can edit more than one layer at a time and copy/paste features between layers. Why would we want to do this? Say we need to do some work on a new layer but only need one or two lakes, not the 5,000 on our `big_lakes` layer. We can create a new layer and use copy/paste to plop the needed lakes into it.

As an example, we will copy some lakes to a new layer:

1. Загрузите слой, из которого вы собираетесь копировать (исходный слой)
2. Загрузите или создайте слой, в который вы будете копировать (целевой слой)
3. Начаните редактирование целевого слоя
4. Активируйте исходный слой щелчком мыши по нему в легенде
5. Используя инструмент Выбрать объекты, выделите объект(ы) в исходном слое
6. Нажмите кнопку Копировать объекты
7. Сделайте активным целевой слой, щелкнув по нему в легенде кнопкой мыши
8. Нажмите Вставить объекты
9. Завершите редактирование и сохраните изменения

What happens if the source and target layers have different schemas (field names and types are not the same)? QGIS populates what matches and ignores the rest. If you don't care about the attributes being copied to the target layer, it doesn't matter how you design the fields and data types. If you want to make sure everything - the feature and its attributes - gets copied, make sure the schemas match.

Совет: Соответствие вставляемых объектов

If your source and destination layers use the same projection, then the pasted features will have geometry identical to the source layer. However, if the destination layer is a different projection, then QGIS cannot guarantee the geometry is identical. This is simply because there are small rounding-off errors involved when converting between projections.

Удаление выделенных объектов

Если надо удалить весь полигон, вначале его необходимо выделить, используя обычный инструмент Выбрать объекты. Также можно выделить несколько объектов для удаления. После выбора соответствующих объектов используйте инструмент Удалить выделенное, объекты будут удалены.

The Cut Features tool on the digitizing toolbar can also be used to delete features. This effectively deletes the feature but also places it on a "spatial clipboard". So, we cut the feature to delete. We could then use the Paste Features tool to put it back, giving us a one-level undo capability. Cut, copy, and paste work on the currently selected features, meaning we can operate on more than one at a time.

Сохранение отредактированных слоев

When a layer is in editing mode, any changes remain in the memory of QGIS. Therefore, they are not committed/saved immediately to the data source or disk. If you want to save edits to the current layer but want to continue editing without leaving the editing mode, you can click the Save Layer Edits button. When you turn editing mode off with Toggle editing (or quit QGIS for that matter), you are also asked if you want to save your changes or discard them.

If the changes cannot be saved (e.g., disk full, or the attributes have values that are out of range), the QGIS in-memory state is preserved. This allows you to adjust your edits and try again.

Совет: Целостность данных

Создание резервной копии данных перед началом редактирования — это всегда хорошая идея. Несмотря на то, что авторы QGIS сделали все возможное для сохранения ваших данных, они по-прежнему не дают никаких гарантий в этом отношении.

12.5.5 Дополнительные функции оцифровки

Иконка	Назначение	Иконка	Назначение
	Отменить		Вернуть
	Повернуть объект		Упростить объект
	Добавить кольцо		Добавить часть
	Fill Ring		Удалить кольцо
	Удалить часть		Корректировать объекты
	Параллельная кривая		Разбить объекты
	Split Parts		ОБъединить выбранные объекты
	Объединить атрибуты выбранных объектов		Повернуть значки

Дополнительные возможности редактирования векторного слоя

Отменить и Вернуть

The Undo and Redo tools allows you to undo or redo vector editing operations. There is also a dockable widget, which shows all operations in the undo/redo history (see Figure_edit_3). This widget is not displayed by default; it can be displayed by right clicking on the toolbar and activating the Undo/Redo checkbox. Undo/Redo is however active, even if the widget is not displayed.

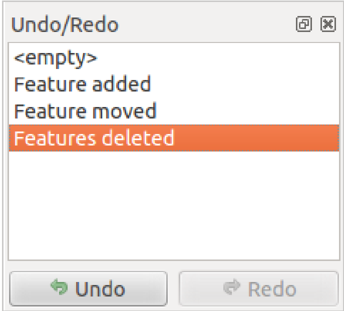

Рис. 12.40: Отмена и возврат операций редактирования

When Undo is hit, the state of all features and attributes are reverted to the state before the reverted operation happened. Changes other than normal vector editing operations (for example, changes done by a plugin), may or may not be reverted, depending on how the changes were performed.

To use the undo/redo history widget, simply click to select an operation in the history list. All features will be reverted to the state they were in after the selected operation.

Повернуть объект

Use Rotate Feature(s) to rotate one or multiple selected features in the map canvas. You first need to select the features and then press the Rotate Feature(s) icon. The centroid of the feature(s) appears and will be the rotation anchor point. If you selected multiple features, the rotation anchor point will be the common center of the features. Press and drag the left mouse button in the desired direction to rotate the selected features.

It's also possible to create a user-defined rotation anchor point around which the selected feature will rotate. Select the features to rotate and activate the Rotate Feature(s) tool. Press and hold the `Ctrl` button and move the mouse pointer (without pressing the mouse button) to the place where you want the rotation anchor to be moved. Release the `Ctrl` button when the desired rotation anchor point is reached. Now, press and drag the left mouse button in the desired direction to rotate the selected feature(s).

Упростить объект

The Simplify Feature tool allows you to reduce the number of vertices of a feature, as long as the geometry doesn't change and geometry type is not a multi geometry. First, select a feature. It will be highlighted by a red rubber band and a slider will appear. Moving the slider, the red rubber band will change its shape to show how the feature is being simplified. Click **[OK]** to store the new, simplified geometry. If a feature cannot be simplified (e.g. multi-polygons), a message will appear.

Добавить кольцо

You can create ring polygons using the Add Ring icon in the toolbar. This means that inside an existing area, it is possible to digitize further polygons that will occur as a 'hole', so only the area between the boundaries of the outer and inner polygons remains as a ring polygon.

Добавить часть

You can add part polygons to a selected multipolygon. The new part polygon must be digitized outside the selected multi-polygon.

Fill Ring

You can use the Fill Ring function to add a ring to a polygon and add a new feature to the layer at the same time. Thus you need not first use the Add Ring icon and then the Add feature function anymore.

Удалить кольцо

The Delete Ring tool allows you to delete ring polygons inside an existing area. This tool only works with polygon layers. It doesn't change anything when it is used on the outer ring of the polygon. This tool can be used on polygon and multi-polygon features. Before you select the vertices of a ring, adjust the vertex edit tolerance.

Удалить часть

The Delete Part tool allows you to delete parts from multifeatures (e.g., to delete polygons from a multi-polygon feature). It won't delete the last part of the feature; this last part will stay untouched. This tool works with all multi-part geometries: point, line and polygon. Before you select the vertices of a part, adjust the vertex edit tolerance.

Корректировать объекты

You can reshape line and polygon features using the Reshape Features icon on the toolbar. It replaces the line or polygon part from the first to the last intersection with the original line. With polygons, this can sometimes lead to unintended results. It is mainly useful to replace smaller parts of a polygon, not for major overhauls, and the reshape line is not allowed to cross several polygon rings, as this would generate an invalid polygon.

Рассмотрим редактирование границы полигона при помощи этого инструмента. Сначала необходимо поставить точку внутри полигона, рядом с местом, где необходимо добавить новую вершину. Затем провести линию через контур и добавить новые вершины. Для завершения операции поместите указатель внутри контура и нажмите правую клавишу мыши. Инструмент автоматически добавит новые вершины в местах пересечения контура. Аналогичным образом можно «вырезать» часть полигона. В этом случаем начинать и заканчивать построение необходимо вне контура.

Примечание: The reshape tool may alter the starting position of a polygon ring or a closed line. So, the point that is represented 'twice' will not be the same any more. This may not be a problem for most applications, but it is something to consider.

Параллельная кривая

The Offset Curve tool creates parallel shifts of line layers. The tool can be applied to the edited layer (the geometries are modified) or also to background layers (in which case it creates copies of the lines

/ rings and adds them to the the edited layer). It is thus ideally suited for the creation of distance line layers. The displacement is shown at the bottom left of the taskbar.

To create a shift of a line layer, you must first go into editing mode and then select the feature. You can make the Offset Curve tool active and drag the cross to the desired distance. Your changes may then be saved with the Save Layer Edits tool.

QGIS options dialog (Digitizing tab then **Curve offset tools** section) allows you to configure some parameters like **Join style**, **Quadrant segments**, **Miter limit**.

Разбить объекты

Можно разбить объекты, используя инструмент Разбить объекты на панели инструментов. Чтобы разбить объект, просто нарисуйте линию через него.

Split parts

In QGIS 2.0 it is now possible to split the parts of a multi part feature so that the number of parts is increased. Just draw a line across the part you want to split using the Split Parts icon.

Объединить выбранные объекты

The Merge Selected Features tool allows you to merge features that have common boundaries. A new dialog will allow you to choose which value to choose between each selected features or select a fonction (Minimum, Maximum, Median, Sum, Skip Attribute) to use for each column.

Объединить атрибуты выбранных объектов

The Merge Attributes of Selected Features tool allows you to merge attributes of features with common boundaries and attributes without merging their boundaries. First, select several features at once. Then press the Merge Attributes of Selected Features button. Now QGIS asks you which attributes are to be applied to all selected objects. As a result, all selected objects have the same attribute entries.

Повернуть значки

Rotate Point Symbols allows you to change the rotation of point symbols in the map canvas. You must first define a rotation column from the attribute table of the point layer in the *Advanced* menu of the *Style* menu of the *Layer Properties*. Also, you will need to go into the 'SVG marker' and choose *Data defined properties ...*. Activate *Angle* and choose 'rotation' as field. Without these settings, the tool is inactive.

To change the rotation, select a point feature in the map canvas and rotate it, holding the left mouse button pressed. A red arrow with the rotation value will be visualized (see Figure_edit_4). When you release the left mouse button again, the value will be updated in the attribute table.

Примечание: Если удерживать кнопку `Ctrl` нажатой, поворот будет осуществляться с шагом 15 градусов.

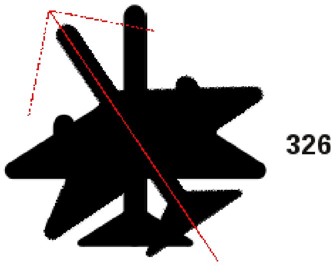

Рис. 12.41: Поворот точечного символа

12.5.6 Создание нового векторного слоя

QGIS allows you to create new shapefile layers, new SpatiaLite layers, and new GPX layers. Creation of a new GRASS layer is supported within the GRASS plugin. Please refer to section *Создание нового векторного слоя GRASS* for more information on creating GRASS vector layers.

Создание нового shape-файла

To create a new shape layer for editing, choose *New* → *New Shapefile Layer...* from the *Layer* menu. The *New Vector Layer* dialog will be displayed as shown in Figure_edit_5. Choose the type of layer (point, line or polygon) and the CRS (coordinate reference system).

Note that QGIS does not yet support creation of 2.5D features (i.e., features with X,Y,Z coordinates).

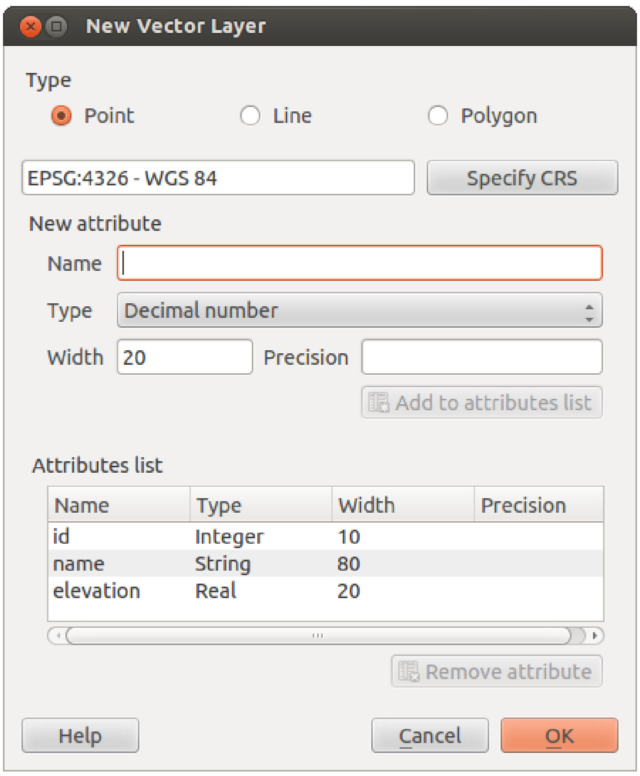

Рис. 12.42: Диалог создания нового shape-файла

To complete the creation of the new shapefile layer, add the desired attributes by clicking on the **[Add**

to attributes list] button and specifying a name and type for the attribute. A first 'id' column is added as default but can be removed, if not wanted. Only *Type: real* , *Type: integer* , *Type: string* and *Type:date* attributes are supported. Additionally and according to the attribute type, you can also define the width and precision of the new attribute column. Once you are happy with the attributes, click **[OK]** and provide a name for the shapefile. QGIS will automatically add a `.shp` extension to the name you specify. Once the layer has been created, it will be added to the map, and you can edit it in the same way as described in section *Редактирование существующего слоя* above.

Создание нового слоя SpatiaLite

Чтобы создать новый редактируемый слой SpatiaLite, выберите *Создать* → *Создать слой SpatiaLite...* из меню *Слой*. Появится диалог *Создать слой SpatiaLite*, как показано на Figure_edit_6.

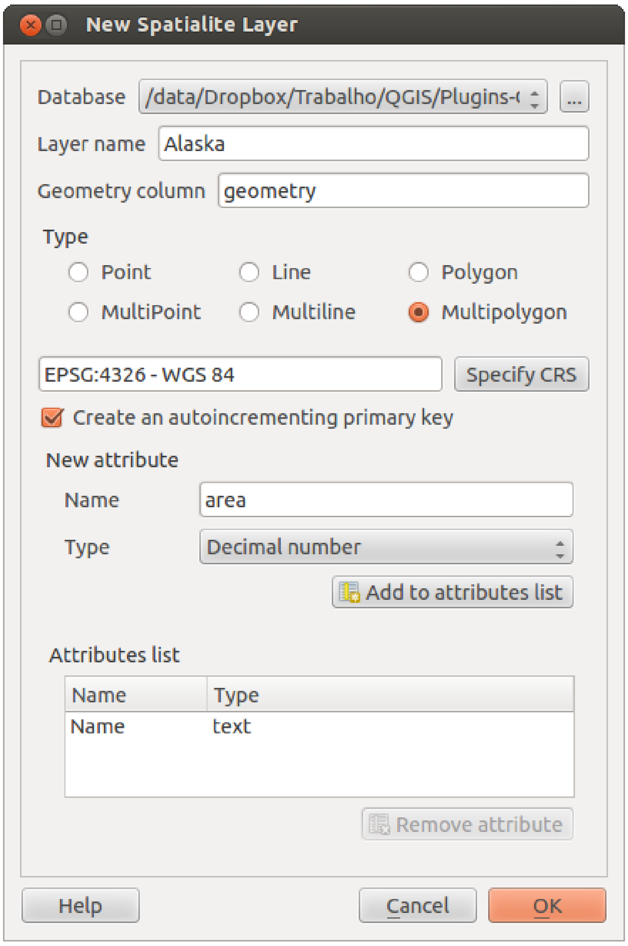

Рис. 12.43: Диалоговое окно «Создать слой SpatiaLite»

The first step is to select an existing SpatiaLite database or to create a new SpatiaLite database. This can be done with the browse button to the right of the database field. Then, add a name for the new layer, define the layer type, and specify the coordinate reference system with **[Specify CRS]**. If desired, you can select *Create an autoincrementing primary key*.

To define an attribute table for the new SpatiaLite layer, add the names of the attribute columns you want to create with the corresponding column type, and click on the **[Add to attribute list]** button. Once you are happy with the attributes, click **[OK]**. QGIS will automatically add the new layer to the legend, and you can edit it in the same way as described in section *Редактирование существующего слоя* above.

Further management of SpatiaLite layers can be done with the DB Manager. See *Модуль «DB Manager»*.

Создание нового слоя GPX

To create a new GPX file, you need to load the GPS plugin first. *Plugins* → *Plugin Manager...* opens the Plugin Manager Dialog. Activate the *GPS Tools* checkbox.

When this plugin is loaded, choose *New* → *Create new GPX Layer...* from the *Layer* menu. In the *Save new GPX file as* dialog, you can choose where to save the new GPX layer.

12.5.7 Работа с таблицей атрибутов

The attribute table displays features of a selected layer. Each row in the table represents one map feature, and each column contains a particular piece of information about the feature. Features in the table can be searched, selected, moved or even edited.

To open the attribute table for a vector layer, make the layer active by clicking on it in the map legend area. Then, from the main *Layer* menu, choose *Open Attribute Table*. It is also possible to right click on the layer and choose *Open Attribute Table* from the drop-down menu, and to click on the *Open Attribute Table* button in the Attributes toolbar.

This will open a new window that displays the feature attributes for the layer (figure_attributes_1). The number of features and the number of selected features are shown in the attribute table title.

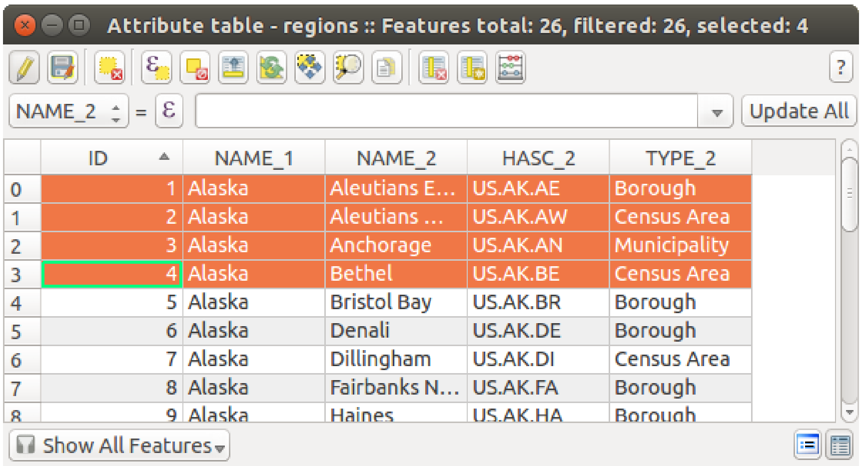

Рис. 12.44: Таблица атрибутов слоя regions

Выделение объектов в таблице атрибутов

Выделенная строка в таблице атрибутов представляет все атрибуты выделенного объекта слоя. Таблица атрибутов отражает все изменения в выделении объектов слоя через главное окно карты или наоборот. Смена выделения в таблице атрибутов приводит к изменению выделения в главном окне карты, также выделение другого объекта слоя приводит к выделению соответствующей ему строки таблицы.

Строки можно выделить, если нажать кнопкой мыши на номер строки, расположенный слева от неё. Выделение строки не меняет текущего положения курсора. **Несколько строк** можно выделить, удерживая клавишу `Ctrl`. Также доступно **Сквозное выделение**, для этого необходимо удерживать клавишу `Shift` и выбрать несколько строк, также нажимая на их номера-заголовки, расположенные слева. Все строки между текущим положением курсора и выбранными строками будут выделены. Перемещение курсора атрибутивной таблице, путем нажатия на ячейки, не изменяет выделение. А изменение выделения на карте не приводит к изменению положения курсора атрибутивной таблицы.

Каждый столбец может быть отсортирован. Для этого надо нажать кнопкой мыши на его заголовоке. Небольшая стрелка отражает порядок сортировки (направленная вниз стрелка означает убывание величины от верхних строк к нижним, а направленная вверх стрелка означает возрастание величины от верхних строк к нижним).

For a **simple search by attributes** on only one column, choose the *Column filter* → from the menu in the bottom left corner. Select the field (column) on which the search should be performed from the drop-down menu, and hit the **[Apply]** button. Then, only the matching features are shown in the attribute table.

To make a selection, you have to use the Select features using an Expression icon on top of the attribute table. Select features using an Expression allows you to define a subset of a table using a *Function List* like in the Field Calculator (see *Калькулятор полей*). The query result can then be saved as a new vector layer. For example, if you want to find regions that are boroughs from `regions.shp` of the QGIS sample data, you have to open the *Fields and Values* menu and choose the field that you want to query. Double-click the field 'TYPE_2' and also **[Load all unique values]** . From the list, choose and double-click 'Borough'. In the *Expression* field, the following query appears:

```
"TYPE_2"  =  'Borough'
```

Here you can also use the *Function list* → *Recent (Selection)* to make a selection that you used before. The expression builder remembers the last 20 used expressions.

The matching rows will be selected, and the total number of matching rows will appear in the title bar of the attribute table, as well as in the status bar of the main window. For searches that display only selected features on the map, use the Query Builder described in section *Конструктор поисковых запросов*.

Чтобы отобразить только выбранные строки, нажмите на кнопке в нижнем левом углу атрибутивной таблицы и выберите режим *Выделенные объекты*.

The other buttons at the top of the attribute table window provide the following functionality:

- Toggle editing mode to edit single values and to enable functionalities described below (also with `Ctrl+E`)
- Save Edits (also with `Ctrl+S`)
- Unselect all (also with `Ctrl+U`)
- Move selected to top (also with `Ctrl+T`)
- Invert selection (also with `Ctrl+R`)
- Copy selected rows to clipboard (also with `Ctrl+C`)
- Zoom map to the selected rows (also with `Ctrl+J`)
- Pan map to the selected rows (also with `Ctrl+P`)
- Delete selected features (also with `Ctrl+D`)
- New Column for PostGIS layers and for OGR layers with GDAL version >= 1.6 (also with `Ctrl+W`)

- Delete Column for PostGIS layers and for OGR layers with GDAL version >= 1.9 (also with `Ctrl+L`)
- Open field calculator (also with `Ctrl+I`)

Below these buttons is the Field Calculator bar, which allows calculations to be quickly applied attributes visible in the table. This bar uses the same expressions as the Field Calculator (see *Калькулятор полей*).

Совет: Игнорирование геометрии в формате WKT

If you want to use attribute data in external programs (such as Excel), use the Copy selected rows to clipboard button. You can copy the information without vector geometries if you deactivate *Settings* → *Options* → Data sources menu *Copy geometry in WKT representation from attribute table.*

Сохранение выделенных объектов в качестве нового слоя

The selected features can be saved as any OGR-supported vector format and also transformed into another coordinate reference system (CRS). Just open the right mouse menu of the layer and click on *Save as* to define the name of the output file, its format and CRS (see section *Легенда*). To save the selection ensure that the *Save only selected features* is selected. It is also possible to specify OGR creation options within the dialog.

Paste into new layer

Features that are on the clipboard may be pasted into a new layer. To do this, first make a layer editable. Select some features, copy them to the clipboard, and then paste them into a new layer using *Edit* → *Paste Features as* and choosing *New vector layer* or *New memory layer*.

This applies to features selected and copied within QGIS and also to features from another source defined using well-known text (WKT).

Работа с непространственными атрибутивными таблицами

QGIS allows you also to load non-spatial tables. This currently includes tables supported by OGR and delimited text, as well as the PostgreSQL, MSSQL and Oracle provider. The tables can be used for field lookups or just generally browsed and edited using the table view. When you load the table, you will see it in the legend field. It can be opened with the Open Attribute Table tool and is then editable like any other layer attribute table.

As an example, you can use columns of the non-spatial table to define attribute values, or a range of values that are allowed, to be added to a specific vector layer during digitizing. Have a closer look at the edit widget in section *Поля* to find out more.

12.5.8 Creating one to many relations

Relations are a technique often used in databases. The concept is, that features (rows) of different layers (tables) can belong to each other.

As an example you have a layer with all regions of alaska (polygon) which provides some attributes about its name and region type and a unique id (which acts as primary key).

Foreign keys

Then you get another point layer or table with information about airports that are located in the regions and you also want to keep track of these. If you want to add them to the region layer, you need to create a one to many relation using foreign keys, because there are several airports in most regions.

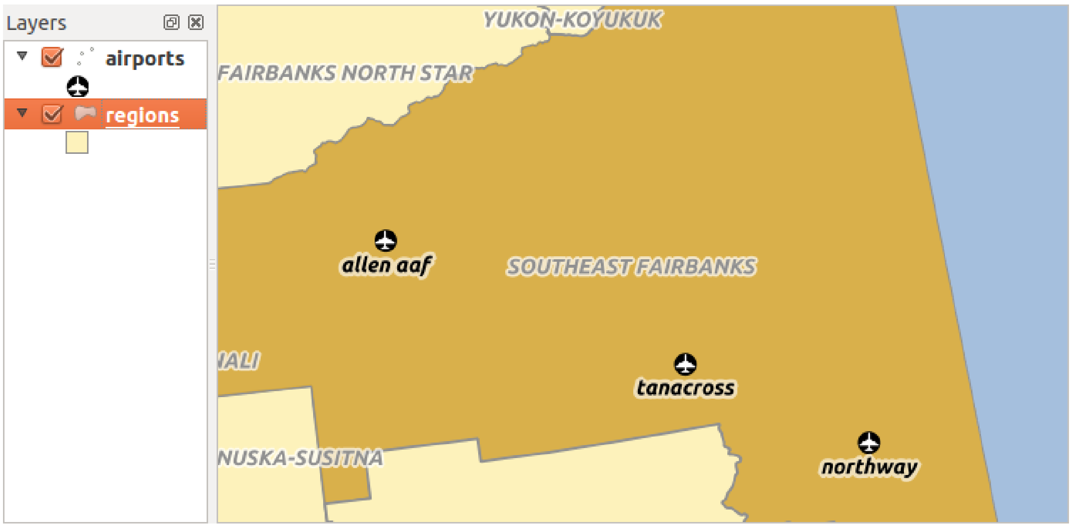

Рис. 12.45: Alaska region with airports

In addition to the already existing attributes in the airports attribute table another field fk_region which acts as a foreign key (if you have a database, you will probably want to define a constraint on it).

This field fk_region will always contain an id of a region. It can be seen like a pointer to the region it belongs to. And you can design a custom edit form for the editing and QGIS takes care about the setup. It works with different providers (so you can also use it with shape and csv files) and all you have to do is to tell QGIS the relations between your tables.

Layers

QGIS makes no difference between a table and a vector layer. Basically, a vector layer is a table with a geometry. So can add your table as a vector layer. To demostrate you can load the 'region' shapefile (with geometries) and the 'airport' csv table (without geometries) and a foreign key (fk_region) to the layer region. This means, that each airport belongs to exactly one region while each region can have any number of airports (a typical one to many relation).

Definition (Relation Manager)

The first thing we are going to do is to let QGIS know about the relations between the layer. This is done in *Settings* → *Project Properties*. Open the *Relations* menu and click on *Add*.

- **name** is going to be used as a title. It should be a human readable string, describing, what the relation is used for. We will just call say "Airports" in this case.
- **referencing layer** is the one with the foreign key field on it. In our case this is the airports layer
- **referencing field** will say, which field points to the other layer so this is fk_region in this case
- **referenced layer** is the one with the primary key, pointed to, so here it is the regions layer
- **referenced field** is the primary key of the referenced layer so it is ID
- **id** will be used for internal purposes and has to be unique. You may need it to build custom forms once this is supported. If you leave it empty, one will be generated for you but you can assign one yourself to get one that is easier to handle.

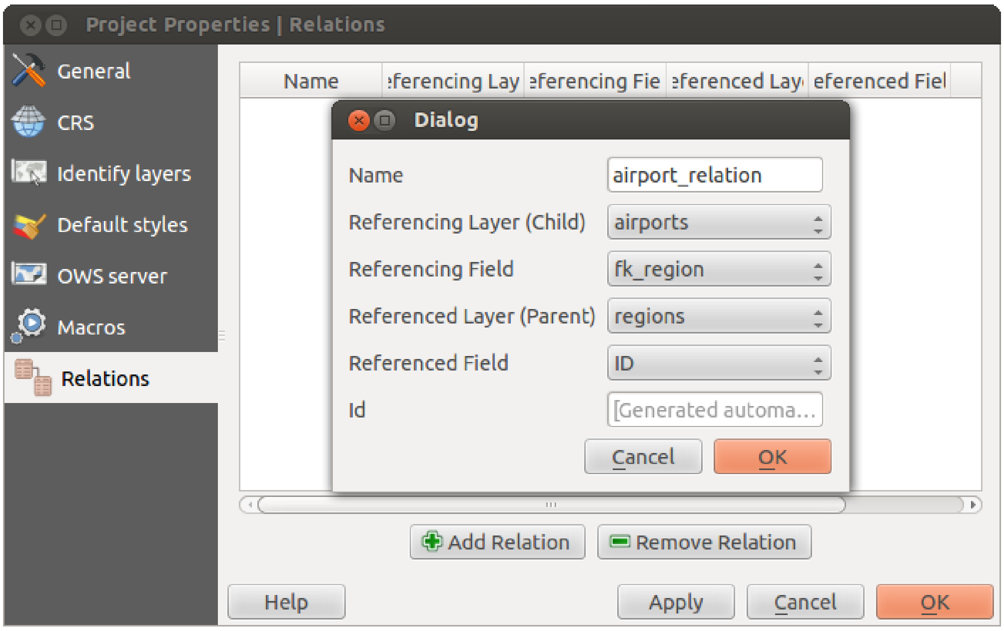

Рис. 12.46: Relation Manager

Forms

Now that QGIS knows about the relation, it will be used to improve the forms it generates. As we did not change the default form method (autogenerated) it will just add a new widget in our form. So let's select the layer region in the legend and use the identify tool. Depending on your settings, the form might open directly or you will have to choose to open it in the identification dialog under actions.

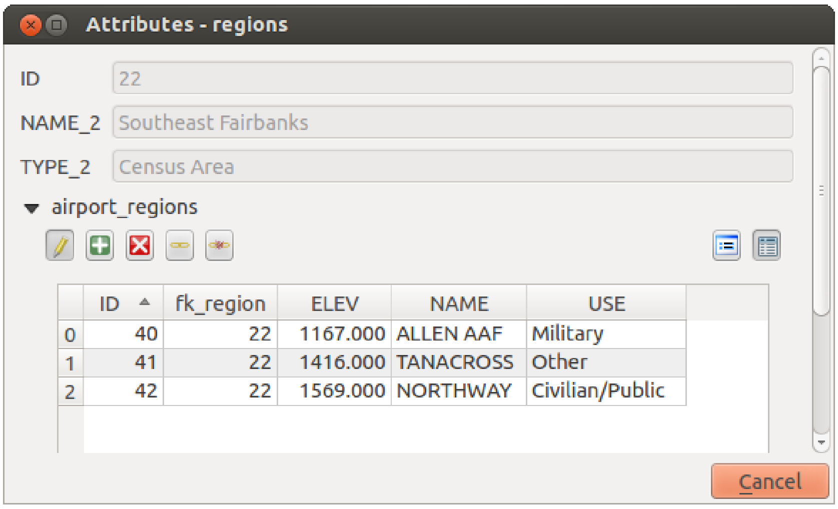

Рис. 12.47: Identification dialog regions with relation to airports

As you can see, the airports assigned to this particular region are all shown in a table. And there are also some buttons available. Let's review them shortly

- The button is for toggling the edit mode. Be aware that it toggles the edit mode of the airport layer, although we are in the feature form of a feature from the region layer. But the table is representing features of the airport layer.
- The button will add a new feature to the airport layer. And it will assign the new airport to the current region by default.

- The button will delete the selected airport permanently.
- The symbol will open a new dialog where you can select any existing airport which will then be assigned to the current region. This may be handy if you created the airport on the wrong region by accident.
- The symbol will unlink the selected airport from the current region, leaving them unassigned (the foreign key is set to NULL) effectively.
- The two buttons to the right switch between table view and form view where the later let's you view all the airports in their respective form.

If you work on the airport table, a new widget type is available which lets you embed the feature form of the referenced region on the feature form of the airports. It can be used when you open the layer properties of the airports table, switch to the *Fields* menu and change the widget type of the foreign key field 'fk_region' to Relation Reference.

If you look at the feature dialog now, you will see, that the form of the region is embedded inside the airports form and will even have a combobox, which allows you to assign the current airport to another region.

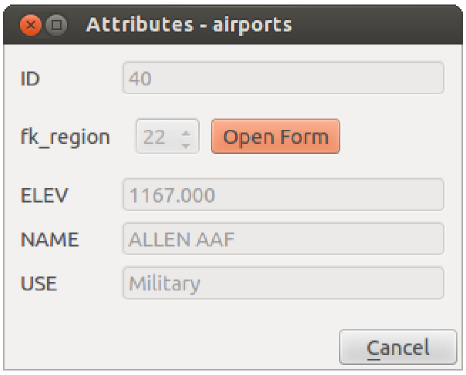

Рис. 12.48: Identification dialog airport with relation to regions

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12.6 Конструктор поисковых запросов

The Query Builder allows you to define a subset of a table using a SQL-like WHERE clause and to display the result in the main window. The query result can then be saved as a new vector layer.

12.6.1 Запрос

Open the **Query Builder** by opening the Layer Properties and going to the *General* menu. Under *Feature subset*, click on the **[Query Builder]** button to open the *Query builder*. For example, if you have a `regions` layer with a `TYPE_2` field, you could select only regions that are `borough` in the *Provider specific filter expression* box of the Query Builder. Figure_attributes_2 shows an example of the Query Builder populated with the `regions.shp` layer from the QGIS sample data. The Fields, Values and Operators sections help you to construct the SQL-like query.

The **Fields list** contains all attribute columns of the attribute table to be searched. To add an attribute column to the SQL WHERE clause field, double click its name in the Fields list. Generally, you can use the various fields, values and operators to construct the query, or you can just type it into the SQL box.

The **Values list** lists the values of an attribute table. To list all possible values of an attribute, select the attribute in the Fields list and click the **[all]** button. To list the first 25 unique values of an attribute

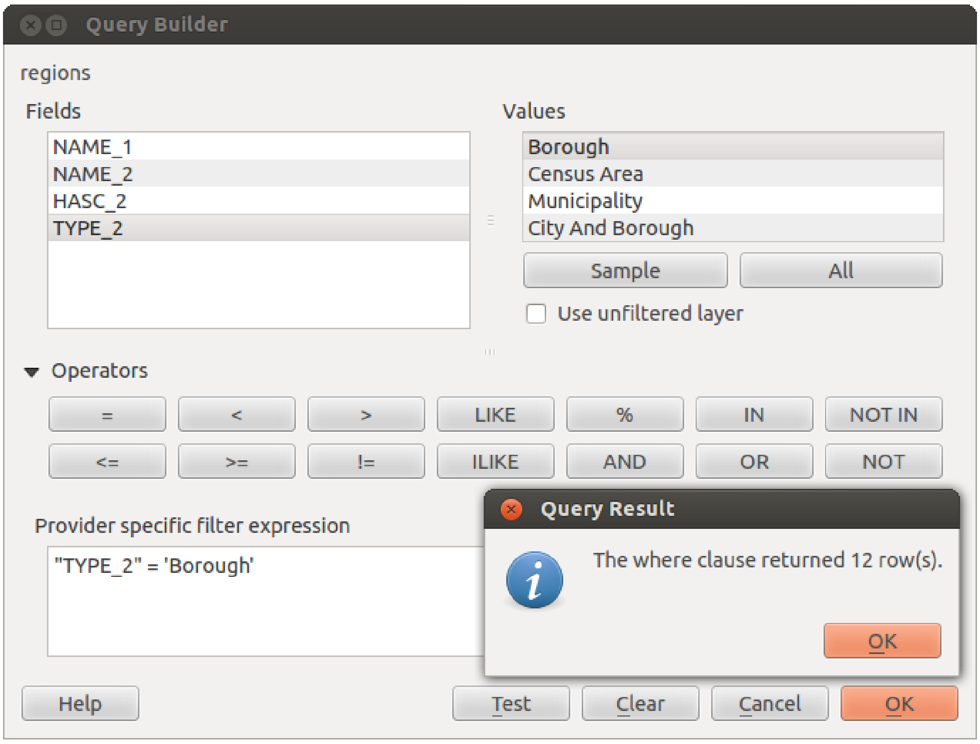

Рис. 12.49: Конструктор запросов

column, select the attribute column in the Fields list and click the **[Sample]** button. To add a value to the SQL WHERE clause field, double click its name in the Values list.

The **Operators section** contains all usable operators. To add an operator to the SQL WHERE clause field, click the appropriate button. Relational operators (= , > , ...), string comparison operator (`LIKE`), and logical operators (`AND`, `OR`, ...) are available.

The **[Test]** button shows a message box with the number of features satisfying the current query, which is useful in the process of query construction. The **[Clear]** button clears the text in the SQL WHERE clause text field. The **[OK]** button closes the window and selects the features satisfying the query. The **[Cancel]** button closes the window without changing the current selection.

QGIS treats the resulting subset acts as if it where the entire layer. For example if you applied the filter above for 'Borough', you can not display, query, save or edit Ankorage, because that is a 'Manicpality' and therefore not part of the subset.

The only exception is that unless your layer is part of a database, using a subset will prevent you from editing the layer.

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12.7 Калькулятор полей

The Field Calculator button in the attribute table allows you to perform calculations on the basis of existing attribute values or defined functions, for instance, to calculate length or area of geometry features. The results can be written to a new attribute field, a virtual field, or they can be used to update values in an existing field.

Совет: Virtual Fields

- Virtual fields are not permanent and are not saved.
- To make a field virtual it must be done when the field is made.

The field calculator is now available on any layer that supports edit. When you click on the field calculator icon the dialog opens (see figure_attributes_3). If the layer is not in edit mode, a warning is displayed and using the field calculator will cause the layer to be put in edit mode before the calculation is made.

The quick field calculation bar in top of the attribute table is only visible if the layer is editable.

In quick field calculation bar, you first select the existing field name then open the expression dialog to create your expression or write it directly in the field then click on **Update All** button.

In the field calculator dialog, you first must select whether you want to only update selected features, create a new attribute field where the results of the calculation will be added or update an existing field.

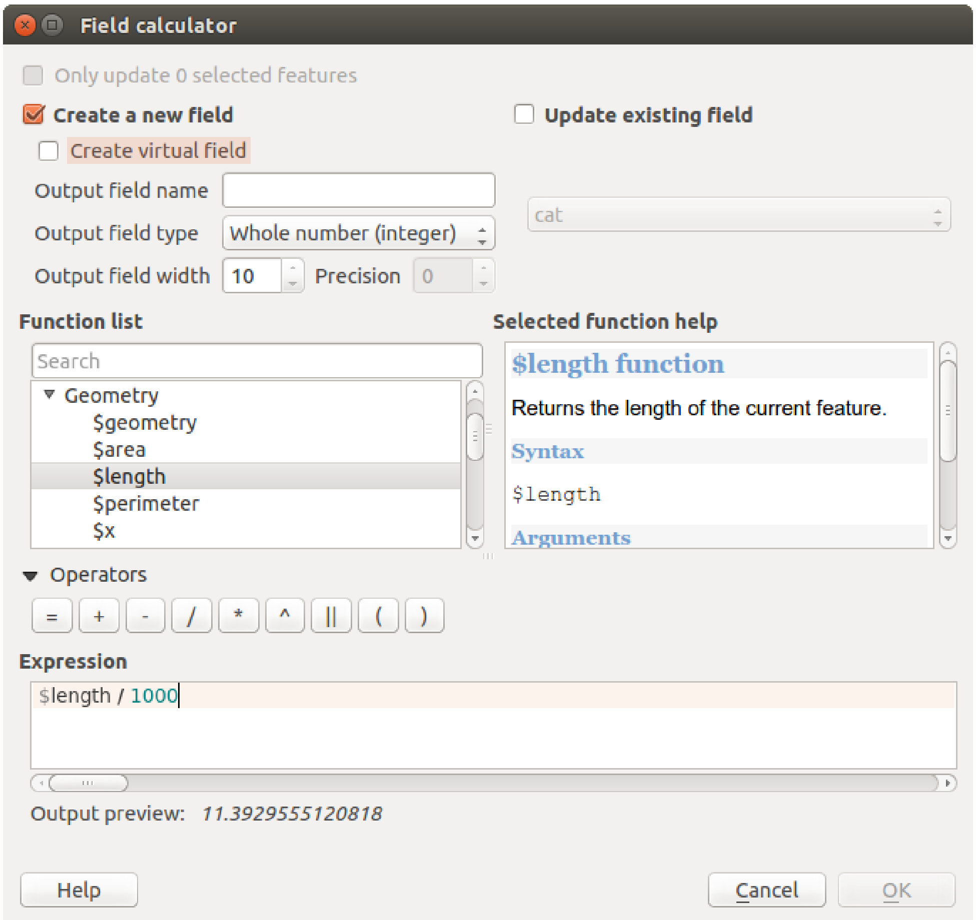

Рис. 12.50: Калькулятор полей

If you choose to add a new field, you need to enter a field name, a field type (integer, real or string), the total field width, and the field precision (see figure_attributes_3). For example, if you choose a field width of 10 and a field precision of 3, it means you have 6 digits before the dot, then the dot and another 3 digits for the precision.

A short example illustrates how the field calculator works. We want to calculate the length in km of the `railroads` layer from the QGIS sample dataset:

1. Load the shapefile `railroads.shp` in QGIS and press Open Attribute Table.
2. Включите Режим редактирования и вызовите Калькулятор полей.
3. Select the *Create a new field* checkbox to save the calculations into a new field.

4. Add `length` as Output field name and `real` as Output field type, and define Output field width to be 10 and Precision, 3.
5. Now double click on function `$length` in the *Geometry* group to add it into the Field calculator expression box.
6. Дополните выражение, введя `/ 1000` в поле **Выражение** и нажмите **[OK]**.
7. You can now find a new field `length` in the attribute table.

The available functions are listed in *Expressions* chapter.

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Глава 13

Работа с растровыми данными

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13.1 Работа с растровыми данными

This section describes how to visualize and set raster layer properties. QGIS uses the GDAL library to read and write raster data formats, including ArcInfo Binary Grid, ArcInfo ASCII Grid, GeoTIFF, ERDAS IMAGINE, and many more. GRASS raster support is supplied by a native QGIS data provider plugin. The raster data can also be loaded in read mode from zip and gzip archives into QGIS.

As of the date of this document, more than 100 raster formats are supported by the GDAL library (see GDAL-SOFTWARE-SUITE in *Литература и ссылки на web-ресурсы*). A complete list is available at http://www.gdal.org/formats_list.html.

Примечание: Not all of the listed formats may work in QGIS for various reasons. For example, some require external commercial libraries, or the GDAL installation of your OS may not have been built to support the format you want to use. Only those formats that have been well tested will appear in the list of file types when loading a raster into QGIS. Other untested formats can be loaded by selecting the `[GDAL] All files (*)` filter.

Working with GRASS raster data is described in section *Интеграция с GRASS GIS*.

13.1.1 Что такое растровые данные?

Raster data in GIS are matrices of discrete cells that represent features on, above or below the earth's surface. Each cell in the raster grid is the same size, and cells are usually rectangular (in QGIS they will always be rectangular). Typical raster datasets include remote sensing data, such as aerial photography, or satellite imagery and modelled data, such as an elevation matrix.

Unlike vector data, raster data typically do not have an associated database record for each cell. They are geocoded by pixel resolution and the x/y coordinate of a corner pixel of the raster layer. This allows QGIS to position the data correctly in the map canvas.

QGIS makes use of georeference information inside the raster layer (e.g., GeoTiff) or in an appropriate world file to properly display the data.

13.1.2 Загрузка растровых данных в QGIS

Raster layers are loaded either by clicking on the Add Raster Layer icon or by selecting the *Layer* → *Add Raster Layer* menu option. More than one layer can be loaded at the same time by holding down the `Ctrl` or `Shift` key and clicking on multiple items in the *Open a GDAL Supported Raster Data Source* dialog.

Once a raster layer is loaded in the map legend, you can click on the layer name with the right mouse button to select and activate layer-specific features or to open a dialog to set raster properties for the layer.

Контекстное меню для растровых слоев

- *Zoom to Layer Extent*
- *Увеличить до наилучшего масштаба (100%)*
- *Stretch Using Current Extend*
- *Показать в обзоре*
- *Удалить*
- *Дублировать*
- *Изменить систему координат*
- *Выбрать систему координат слоя для проекта*
- *Сохранить как…*
- *Свойства*
- *Переименовать*
- *Копировать стиль*
- *Добавить группу*
- *Развернуть все*
- *Свернуть все*
- *Обновлять порядок отрисовки*

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13.2 Свойства растра

To view and set the properties for a raster layer, double click on the layer name in the map legend, or right click on the layer name and choose *Properties* from the context menu. This will open the *Raster Layer Properties* dialog (see figure_raster_1).

There are several menus in the dialog:

- *Общие*
- *Стиль*
- *Прозрачность*
- *Пирамиды*
- *Гистограмма*
- *Метаданные*

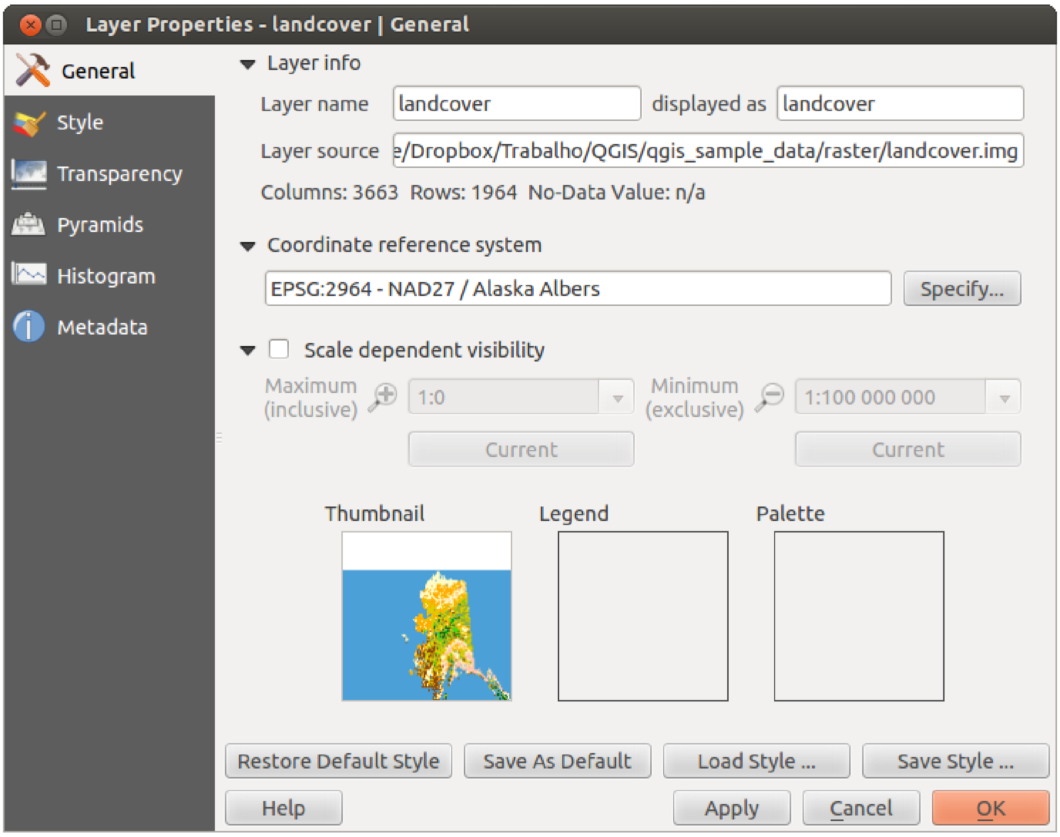

Рис. 13.1: Свойства растрового слоя

13.2.1 General Menu

Layer Info

The *General* menu displays basic information about the selected raster, including the layer source path, the display name in the legend (which can be modified), and the number of columns, rows and no-data values of the raster.

Coordinate reference system

Here, you find the coordinate reference system (CRS) information printed as a PROJ.4 string. If this setting is not correct, it can be modified by clicking the **[Specify]** button.

Scale Dependent visibility

Additionally scale-dependent visibility can be set in this tab. You will need to check the checkbox and set an appropriate scale where your data will be displayed in the map canvas.

At the bottom, you can see a thumbnail of the layer, its legend symbol, and the palette.

13.2.2 Style Menu

Band rendering

QGIS offers four different *Render types*. The renderer chosen is dependent on the data type.

1. Multiband color - if the file comes as a multiband with several bands (e.g., used with a satellite image with several bands)
2. Paletted - if a single band file comes with an indexed palette (e.g., used with a digital topographic map)
3. Singleband gray - (one band of) the image will be rendered as gray; QGIS will choose this renderer if the file has neither multibands nor an indexed palette nor a continous palette (e.g., used with a shaded relief map)
4. Singleband pseudocolor - this renderer is possible for files with a continuous palette, or color map (e.g., used with an elevation map)

Multiband color

With the multiband color renderer, three selected bands from the image will be rendered, each band representing the red, green or blue component that will be used to create a color image. You can choose several *Contrast enhancement* methods: 'No enhancement', 'Stretch to MinMax', 'Stretch and clip to MinMax' and 'Clip to min max'.

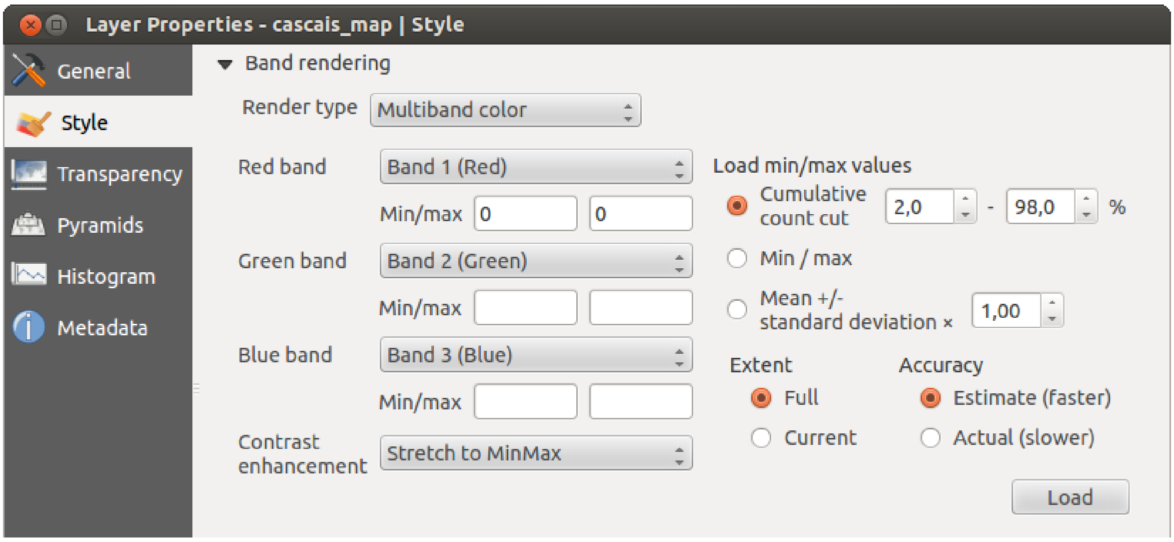

Рис. 13.2: Raster Renderer - Multiband color

This selection offers you a wide range of options to modify the appearance of your raster layer. First of all, you have to get the data range from your image. This can be done by choosing the *Extent* and pressing **[Load]**. QGIS can *Estimate (faster)* the *Min* and *Max* values of the bands or use the *Actual (slower) Accuracy*.

Now you can scale the colors with the help of the *Load min/max values* section. A lot of images have a few very low and high data. These outliers can be eliminated using the *Cumulative count cut* setting. The standard data range is set from 2% to 98% of the data values and can be adapted manually. With this setting, the gray character of the image can disappear. With the scaling option *Min/max*, QGIS creates a color table with all of the data included in the original image (e.g., QGIS creates a color table with 256 values, given the fact that you have 8 bit bands). You can also calculate your color table using the *Mean +/- standard deviation x* 1,00. Then, only the values within the standard deviation or within multiple standard deviations are considered for the color table. This is useful when you have one or two cells with abnormally high values in a raster grid that are having a negative impact on the rendering of the raster.

All calculations can also be made for the *Current* extent.

Совет: Просмотр одного канала многоканального растра

If you want to view a single band of a multiband image (for example, Red), you might think you would set the Green and Blue bands to "Not Set". But this is not the correct way. To display the Red band, set the image type to 'Singleband gray', then select Red as the band to use for Gray.

Paletted

This is the standard render option for singleband files that already include a color table, where each pixel value is assigned to a certain color. In that case, the palette is rendered automatically. If you want to change colors assigned to certain values, just double-click on the color and the *Select color* dialog appears. Also, in QGIS 2.2. it's now possible to assign a label to the color values. The label appears in the legend of the raster layer then.

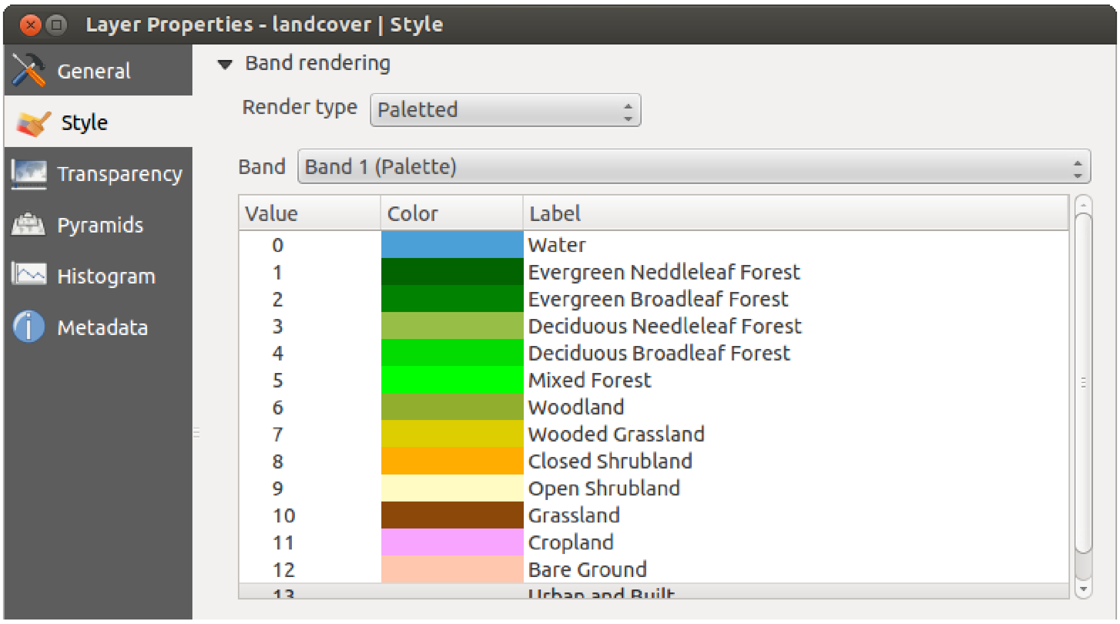

Рис. 13.3: Raster Renderer - Paletted

Улучшение контраста

Примечание: When adding GRASS rasters, the option *Contrast enhancement* will always be set automatically to *stretch to min max*, regardless of if this is set to another value in the QGIS general options.

Singleband gray

This renderer allows you to render a single band layer with a *Color gradient*: 'Black to white' or 'White to black'. You can define a *Min* and a *Max* value by choosing the *Extent* first and then pressing **[Load]**. QGIS can *Estimate (faster)* the *Min* and *Max* values of the bands or use the *Actual (slower) Accuracy*.

With the *Load min/max values* section, scaling of the color table is possible. Outliers can be eliminated using the *Cumulative count cut* setting. The standard data range is set from 2% to 98% of the data values and can be adapted manually. With this setting, the gray character of the image can disappear. Further settings can be made with *Min/max* and *Mean +/- standard deviation x* 1,00. While the first one creates a color table with all of the data included in the original image, the second creates a color table that only considers values within the standard deviation or within multiple standard deviations. This is useful when you have one or two cells with abnormally high values in a raster grid that are having a negative impact on the rendering of the raster.

Singleband pseudocolor

This is a render option for single-band files, including a continous palette. You can also create individual color maps for the single bands here. Three types of color interpolation are available:

1. Дискретная

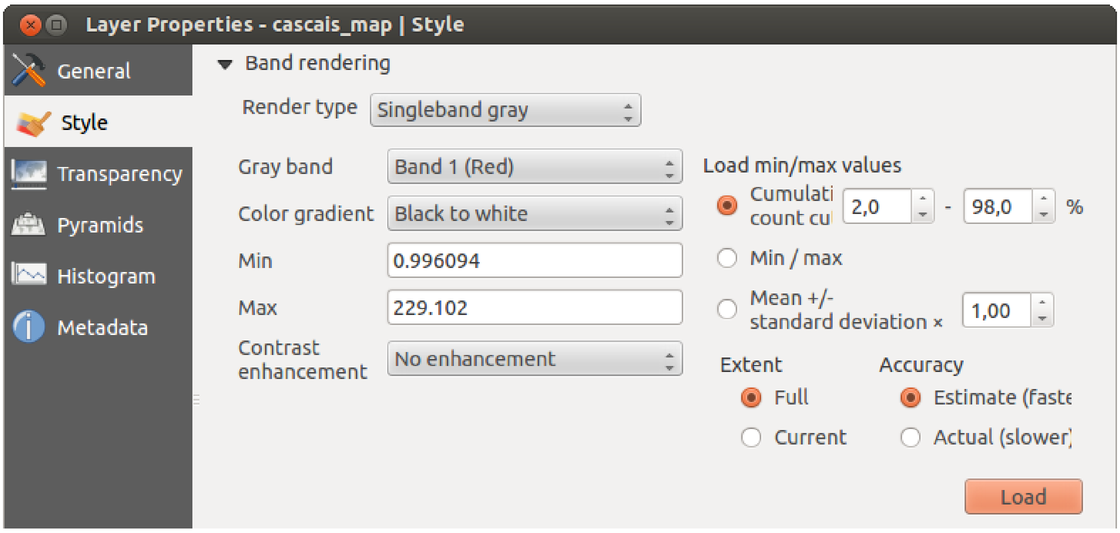

Рис. 13.4: Raster Renderer - Singleband gray

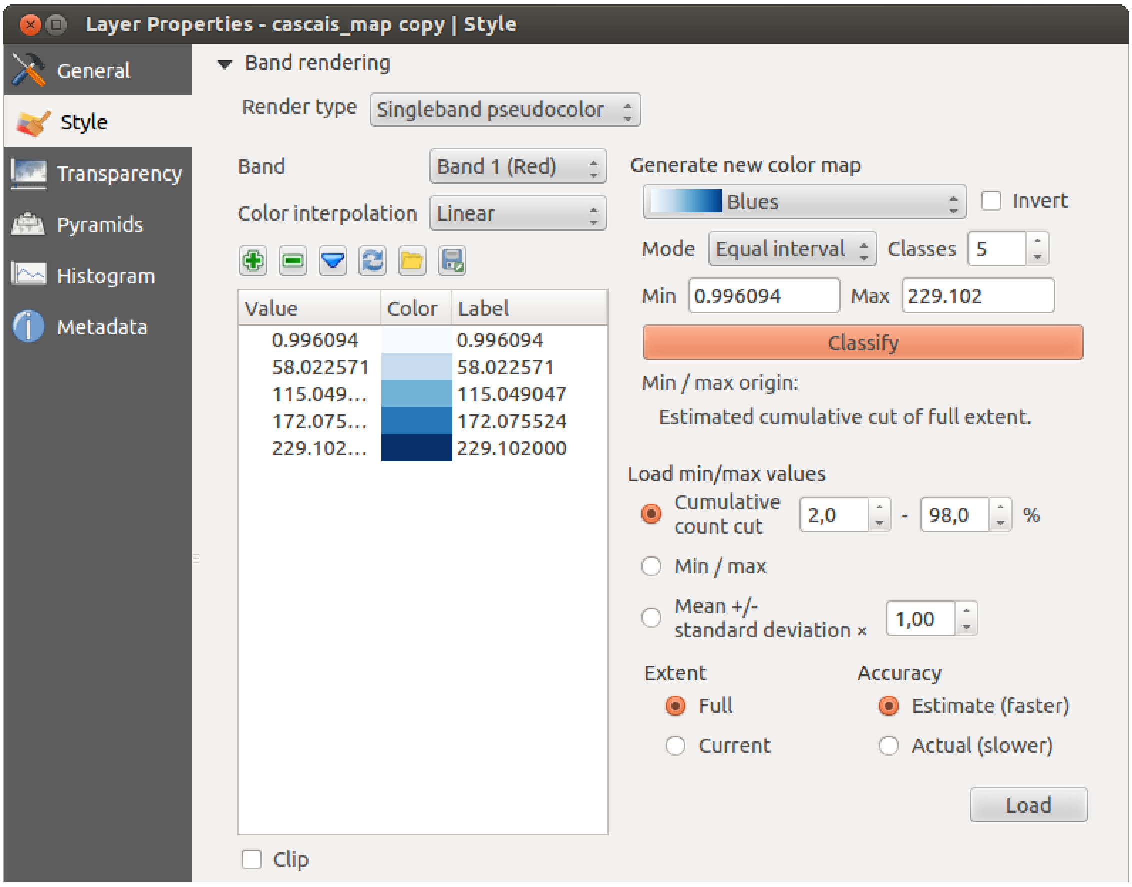

Рис. 13.5: Raster Renderer - Singleband pseudocolor

2. Линейная
3. Точная

In the left block, the button Add values manually adds a value to the individual color table. The button Remove selected row deletes a value from the individual color table, and the Sort colormap items button sorts the color table according to the pixel values in the value column. Double clicking on the value column lets you insert a specific value. Double clicking on the color column opens the dialog *Change color*, where you can select a color to apply on that value. Further, you can also add labels for each color, but this value won't be displayed when you use the identify feature tool. You can also click on the button Load color map from band, which tries to load the table from the band (if it has any). And you can use the buttons Load color map from file or Export color map to file to load an existing color table or to save the defined color table for other sessions.

In the right block, *Generate new color map* allows you to create newly categorized color maps. For the *Classification mode* 'Equal interval', you only need to select the *number of classes* 1,00 and press the button *Classify*. You can invert the colors of the color map by clicking the *Invert* checkbox. In the case of the *Mode* 'Continous', QGIS creates classes automatically depending on the *Min* and *Max*. Defining *Min/Max* values can be done with the help of the *Load min/max values* section. A lot of images have a few very low and high data. These outliers can be eliminated using the *Cumulative count cut* setting. The standard data range is set from 2% to 98% of the data values and can be adapted manually. With this setting, the gray character of the image can disappear. With the scaling option *Min/max*, QGIS creates a color table with all of the data included in the original image (e.g., QGIS creates a color table with 256 values, given the fact that you have 8 bit bands). You can also calculate your color table using the *Mean +/- standard deviation x* 1,00. Then, only the values within the standard deviation or within multiple standard deviations are considered for the color table.

Color rendering

For every *Band rendering*, a *Color rendering* is possible.

You can also achieve special rendering effects for your raster file(s) using one of the blending modes (see *Свойства векторного слоя*).

Further settings can be made in modifiying the *Brightness*, the *Saturation* and the *Contrast*. You can also use a *Grayscale* option, where you can choose between 'By lightness', 'By luminosity' and 'By average'. For one hue in the color table, you can modify the 'Strength'.

Resampling

The *Resampling* option makes its appearance when you zoom in and out of an image. Resampling modes can optimize the appearance of the map. They calculate a new gray value matrix through a geometric transformation.

When applying the 'Nearest neighbour' method, the map can have a pixelated structure when zooming in. This appearance can be improved by using the 'Bilinear' or 'Cubic' method, which cause sharp features to be blurred. The effect is a smoother image. This method can be applied, for instance, to digital topographic raster maps.

13.2.3 Transparency Menu

QGIS has the ability to display each raster layer at a different transparency level. Use the transparency slider to indicate to what extent the underlying layers (if any) should be visible though the current raster layer. This is very useful if you like to overlay more than one raster layer (e.g.,

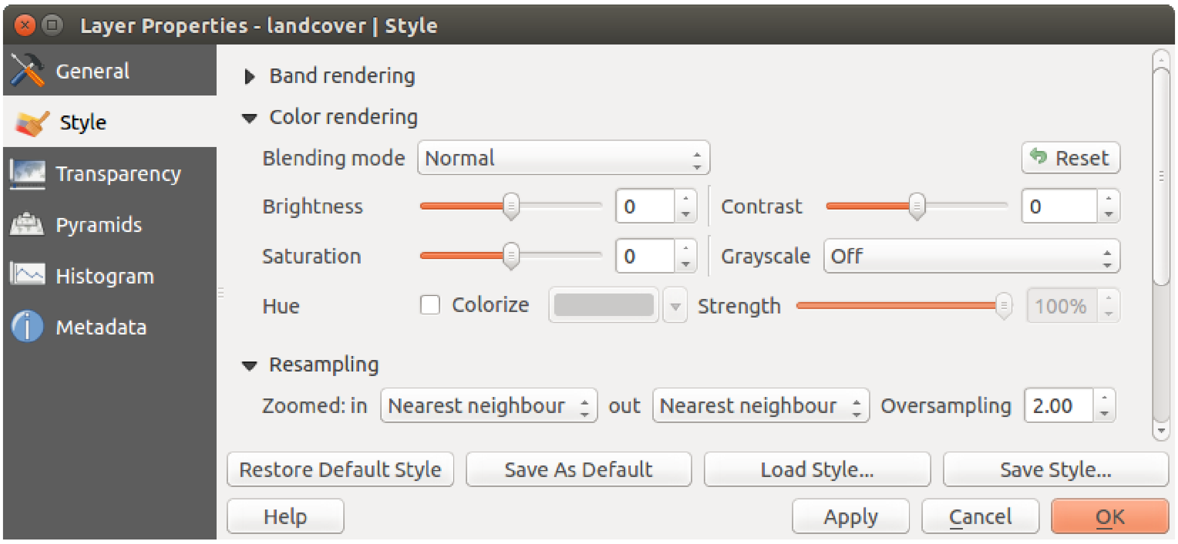

Рис. 13.6: Raster Rendering - Resampling

a shaded relief map overlayed by a classified raster map). This will make the look of the map more three dimensional.

Additionally, you can enter a raster value that should be treated as *NODATA* in the *Additional no data value* menu.

Более гибко степень прозрачности можно настроить в панели *Параметры прозрачности*, которая позволяет указать индивидуальную прозрачность каждого пикселя.

As an example, we want to set the water of our example raster file `landcover.tif` to a transparency of 20%. The following steps are neccessary:

1. Load the raster file `landcover.tif`.
2. Open the *Properties* dialog by double-clicking on the raster name in the legend, or by right-clicking and choosing *Properties* from the pop-up menu.
3. Select the *Transparency* menu.
4. From the *Transparency band* menu, choose 'None'.
5. Click the Add values manually button. A new row will appear in the pixel list.
6. Enter the raster value in the 'From' and 'To' column (we use 0 here), and adjust the transparency to 20%.
7. Нажать **[Применить]** и посмотреть результат на карте.

You can repeat steps 5 and 6 to adjust more values with custom transparency.

As you can see, it is quite easy to set custom transparency, but it can be quite a lot of work. Therefore, you can use the button Export to file to save your transparency list to a file. The button Import from file loads your transparency settings and applies them to the current raster layer.

13.2.4 Pyramids Menu

Large resolution raster layers can slow navigation in QGIS. By creating lower resolution copies of the data (pyramids), performance can be considerably improved, as QGIS selects the most suitable resolution to use depending on the level of zoom.

Для сохранения пирамид необходимы права на запись в каталог, в котором хранятся оригинальные данные.

При построении пирамид можно выбрать один из алгоритмов пересчета:

- Ближайший сосед
- Среднее значение
- Gauss
- Cubic
- Mode
- None

If you choose 'Internal (if possible)' from the *Overview format* menu, QGIS tries to build pyramids internally. You can also choose 'External' and 'External (Erdas Imagine)'.

Рис. 13.7: The Pyramids Menu

Please note that building pyramids may alter the original data file, and once created they cannot be removed. If you wish to preserve a 'non-pyramided' version of your raster, make a backup copy prior to building pyramids.

13.2.5 Histogram Menu

The *Histogram* menu allows you to view the distribution of the bands or colors in your raster. The histogram is generated automatically when you open the *Histogram* menu. All existing bands will be displayed together. You can save the histogram as an image with the button. With the *Visibility* option in the *Prefs/Actions* menu, you can display histograms of the individual bands. You will need to select the option *Show selected band*. The *Min/max options* allow you to 'Always show min/max markers', to 'Zoom to min/max' and to 'Update style to min/max'. With the *Actions* option, you can 'Reset' and 'Recompute histogram' after you have chosen the *Min/max options*.

13.2.6 Metadata Menu

The *Metadata* menu displays a wealth of information about the raster layer, including statistics about each band in the current raster layer. From this menu, entries may be made for the *Description*,

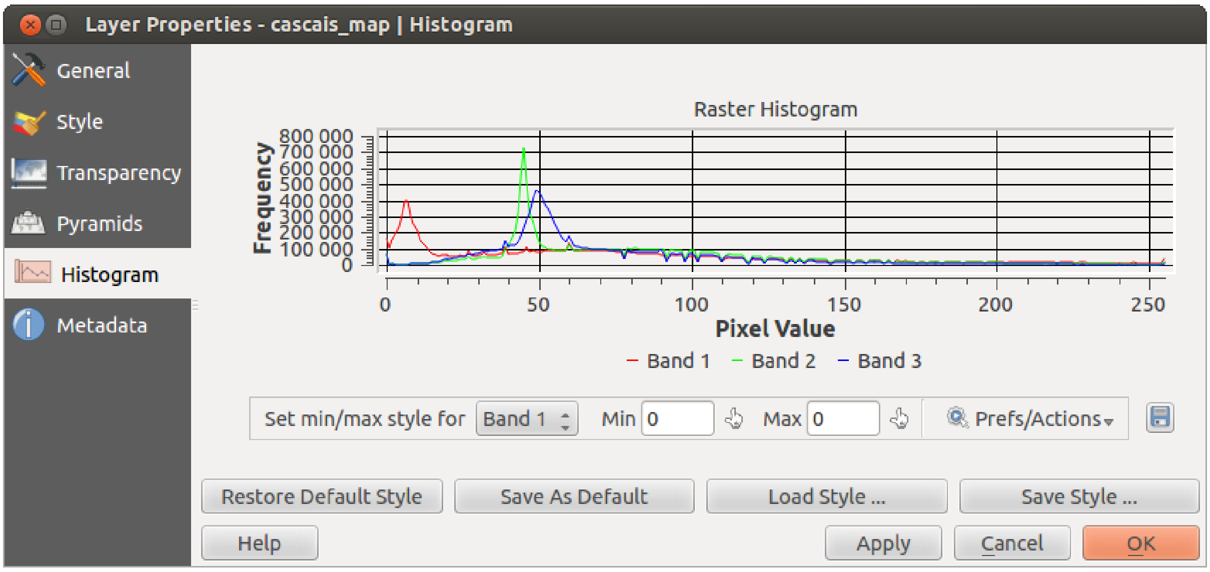

Рис. 13.8: Raster Histogram

Attribution, *MetadataUrl* and *Properties*. In *Properties*, statistics are gathered on a 'need to know' basis, so it may well be that a given layer's statistics have not yet been collected.

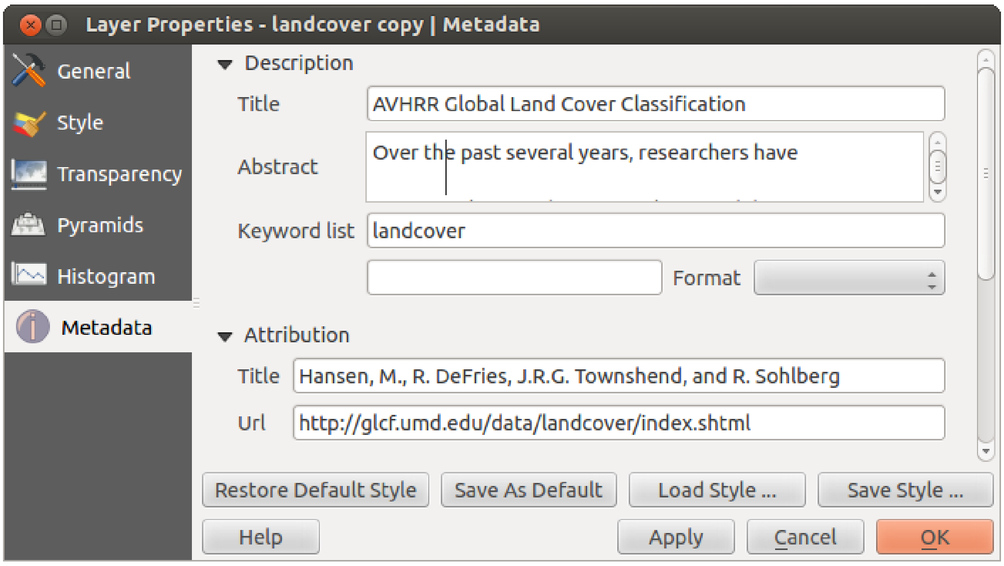

Рис. 13.9: Raster Metadata

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13.3 Калькулятор растров

The *Raster Calculator* in the *Raster* menu allows you to perform calculations on the basis of existing raster pixel values (see figure_raster_10). The results are written to a new raster layer with a GDAL-supported format.

The **Raster bands** list contains all loaded raster layers that can be used. To add a raster to the raster calculator expression field, double click its name in the Fields list. You can then use the operators to construct calculation expressions, or you can just type them into the box.

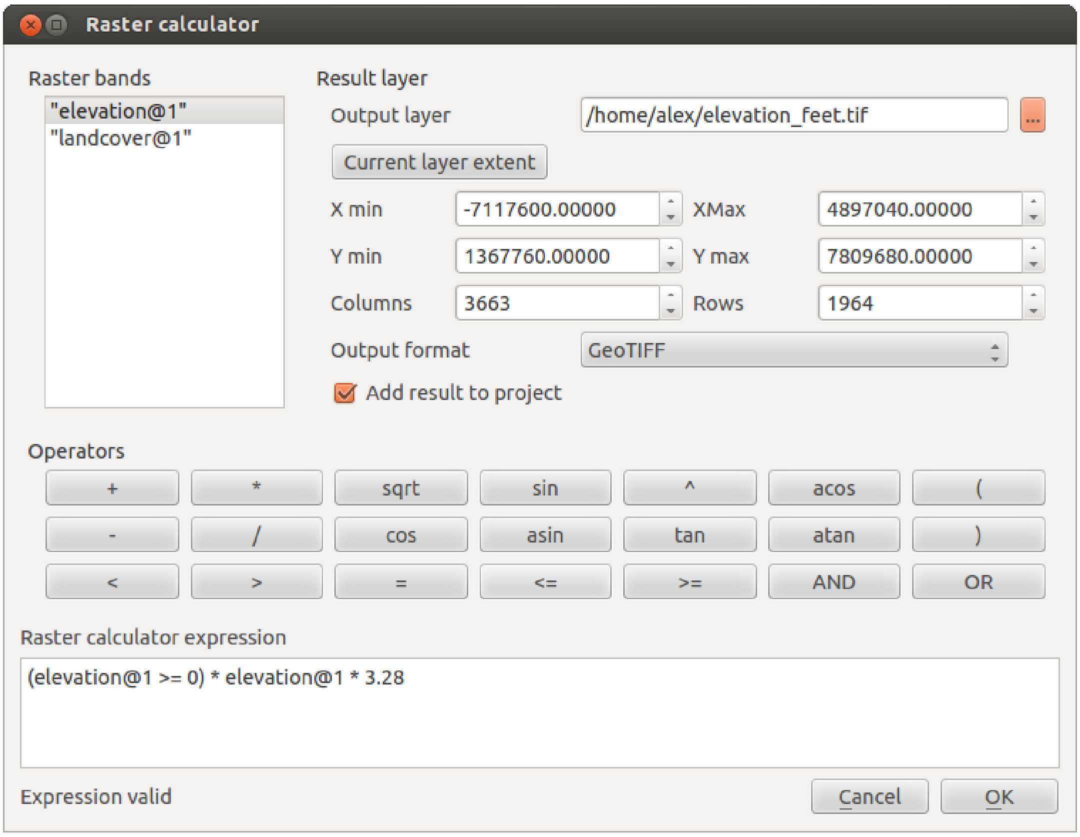

Рис. 13.10: Калькулятор растров

In the **Result layer** section, you will need to define an output layer. You can then define the extent of the calculation area based on an input raster layer, or based on X,Y coordinates and on columns and rows, to set the resolution of the output layer. If the input layer has a different resolution, the values will be resampled with the nearest neighbor algorithm.

The **Operators** section contains all available operators. To add an operator to the raster calculator expression box, click the appropriate button. Mathematical calculations (`+`, `-`, `*`, ...) and trigonometric functions (`sin`, `cos`, `tan`, ...) are available. Stay tuned for more operators to come!

With the *Add result to project* checkbox, the result layer will automatically be added to the legend area and can be visualized.

13.3.1 Примеры

Convert elevation values from meters to feet

Creating an elevation raster in feet from a raster in meters, you need to use the conversion factor for meters to feet: 3.28. The expression is:

```
"elevation@1" * 3.28
```

Использование маски

If you want to mask out parts of a raster – say, for instance, because you are only interested in elevations above 0 meters – you can use the following expression to create a mask and apply the result to a raster in one step.

```
("elevation@1" >= 0) * "elevation@1"
```

In other words, for every cell greater than or equal to 0, set its value to 1. Otherwise set it to 0. This creates the mask on the fly.

If you want to classify a raster – say, for instance into two elevation classes, you can use the following expression to create a raster with two values 1 and 2 in one step.

```
("elevation@1" < 50) * 1 + ("eleevation@1" >= 50) * 2
```

In other words, for every cell less than 50 set its value to 1. For every cell greater than or equal 50 set its value to 2.

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Глава 14

Работа с данными OGC

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14.1 QGIS как клиент OGC

The Open Geospatial Consortium (OGC) is an international organization with membership of more than 300 commercial, governmental, nonprofit and research organizations worldwide. Its members develop and implement standards for geospatial content and services, GIS data processing and exchange.

Describing a basic data model for geographic features, an increasing number of specifications are developed by OGC to serve specific needs for interoperable location and geospatial technology, including GIS. Further information can be found at http://www.opengeospatial.org/.

Наиболее важные спецификации OGC:

- **WMS** — Web Map Service (*Клиент WMS/WMTS*)
- **WMTS** — Web Map Tile Service (*Клиент WMS/WMTS*)
- **WFS** — Web Feature Service (*Клиент WFS и WFS-T*)
- **WFS-T** — Web Feature Service - Transactional (*Клиент WFS и WFS-T*)
- **WCS** — Web Coverage Service (*Клиент WCS*)
- **SFS** — Simple Features for SQL (*Слои PostGIS*)
- **GML** — Geography Markup Language

OGC services are increasingly being used to exchange geospatial data between different GIS implementations and data stores. QGIS can deal with the above specifications as a client, being **SFS** (through support of the PostgreSQL / PostGIS data provider, see section *Слои PostGIS*).

14.1.1 Клиент WMS/WMTS

Обзор поддержки WMS

QGIS currently can act as a WMS client that understands WMS 1.1, 1.1.1 and 1.3 servers. In particular, it has been tested against publicly accessible servers such as DEMIS.

A WMS server acts upon requests by the client (e.g., QGIS) for a raster map with a given extent, set of layers, symbolization style, and transparency. The WMS server then consults its local data sources, rasterizes the map, and sends it back to the client in a raster format. For QGIS, this format would typically be JPEG or PNG.

WMS is generically a REST (Representational State Transfer) service rather than a full-blown Web service. As such, you can actually take the URLs generated by QGIS and use them in a web browser to retrieve the same images that QGIS uses internally. This can be useful for troubleshooting, as there are several brands of WMS server on the market and they all have their own interpretation of the WMS standard.

WMS-слои добавляются очень просто, необходимо только знать URL WMS-сервера, иметь с ним связь и возможность использования сервером протокола HTTP в качестве механизма передачи данных.

Обзор поддержки WMTS

QGIS can also act as a WMTS client. WMTS is an OGC standard for distributing tile sets of geospatial data. This is a faster and more efficient way of distributing data than WMS because with WMTS, the tile sets are pre-generated, and the client only requests the transmission of the tiles, not their production. A WMS request typically involves both the generation and transmission of the data. A well-known example of a non-OGC standard for viewing tiled geospatial data is Google Maps.

Чтобы отображать данные в масштабе максимально приближённом к заданному пользователем, тайлы WMTS генерируются для различных масштабных уровней. Затем тайлы отдаются ГИС, запросившей их.

Следующий рисунок иллюстрирует концепцию набора тайлов:

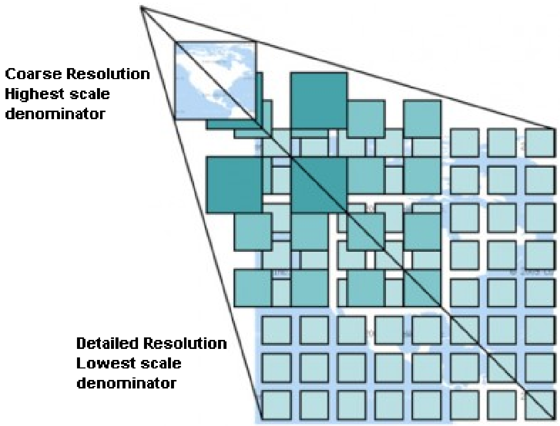

Рис. 14.1: Концепция набора тайлов WMTS

The two types of WMTS interfaces that QGIS supports are via Key-Value-Pairs (KVP) and RESTful. These two interfaces are different, and you need to specify them to QGIS differently.

1) In order to access a **WMTS KVP** service, a QGIS user must open the WMS/WMTS interface and add the following string to the URL of the WMTS tile service:

```
"?SERVICE=WMTS&REQUEST=GetCapabilities"
```

An example of this type of address is

```
http://opencache.statkart.no/gatekeeper/gk/gk.open_wmts?\
  service=WMTS&request=GetCapabilities
```

For testing the topo2 layer in this WMTS works nicely. Adding this string indicates that a WMTS web service is to be used instead of a WMS service.

2. The **RESTful WMTS** service takes a different form, a straightforward URL. The format recommended by the OGC is:

```
{WMTSBaseURL}/1.0.0/WMTSCapabilities.xml
```

This format helps you to recognize that it is a RESTful address. A RESTful WMTS is accessed in QGIS by simply adding its address in the WMS setup in the URL field of the form. An example of this type of address for the case of an Austrian basemap is http://maps.wien.gv.at/basemap/1.0.0/WMTSCapabilities.xml.

Примечание: You can still find some old services called WMS-C. These services are quite similar to WMTS (i.e., same purpose but working a little bit differently). You can manage them the same as you do WMTS services. Just add ?tiled=true at the end of the url. See http://wiki.osgeo.org/wiki/Tile_Map_Service_Specification for more information about this specification.

When you read WMTS, you can often think WMS-C also.

Выбор WMS/WMTS-серверов

The first time you use the WMS feature in QGIS, there are no servers defined.

Begin by clicking the Add WMS layer button on the toolbar, or selecting *Layer* → *Add WMS Layer...*.

The dialog *Add Layer(s) from a Server* for adding layers from the WMS server appears. You can add some servers to play with by clicking the **[Add default servers]** button. This will add two WMS demo servers for you to use: the WMS servers of the DM Solutions Group and Lizardtech. To define a new WMS server in the *Layers* tab, select the **[New]** button. Then enter the parameters to connect to your desired WMS server, as listed in table_OGC_1:

Имя	A name for this connection. This name will be used in the Server Connections drop-down box so that you can distinguish it from other WMS servers.
URL	URL of the server providing the data. This must be a resolvable host name – the same format as you would use to open a telnet connection or ping a host.
Пользователь	Username to access a secured WMS server. This parameter is optional.
Пароль	Password for a basic authenticated WMS server. This parameter is optional.
Игнорировать URI запроса GetMap	☑ *Ignore GetMap URI reported in capabilities*. Use given URI from URL field above.
Игнорировать URI запроса GetFeatureInfo	☑ *Ignore GetFeatureInfo URI reported in capabilities*. Use given URI from URL field above.

Таблица OGC 1: Параметры WMS-соединения

If you need to set up a proxy server to be able to receive WMS services from the internet, you can add your proxy server in the options. Choose *Settings* → *Options* and click on the *Network & Proxy* tab. There, you can add your proxy settings and enable them by setting ☑ *Use proxy for web access*. Make sure that you select the correct proxy type from the *Proxy type* drop-down menu.

Once the new WMS server connection has been created, it will be preserved for future QGIS sessions.

Совет: URL WMS серверов

Be sure, when entering the WMS server URL, that you have the base URL only. For example, you shouldn't have fragments such as `request=GetCapabilities` or `version=1.0.0` in your URL.

Загрузка WMS/WMTS-слоёв

Once you have successfully filled in your parameters, you can use the **[Connect]** button to retrieve the capabilities of the selected server. This includes the image encoding, layers, layer styles and projections. Since this is a network operation, the speed of the response depends on the quality of your network connection to the WMS server. While downloading data from the WMS server, the download progress is visualized in the lower left of the WMS dialog.

Your screen should now look a bit like figure_OGR_1, which shows the response provided by the DM Solutions Group WMS server.

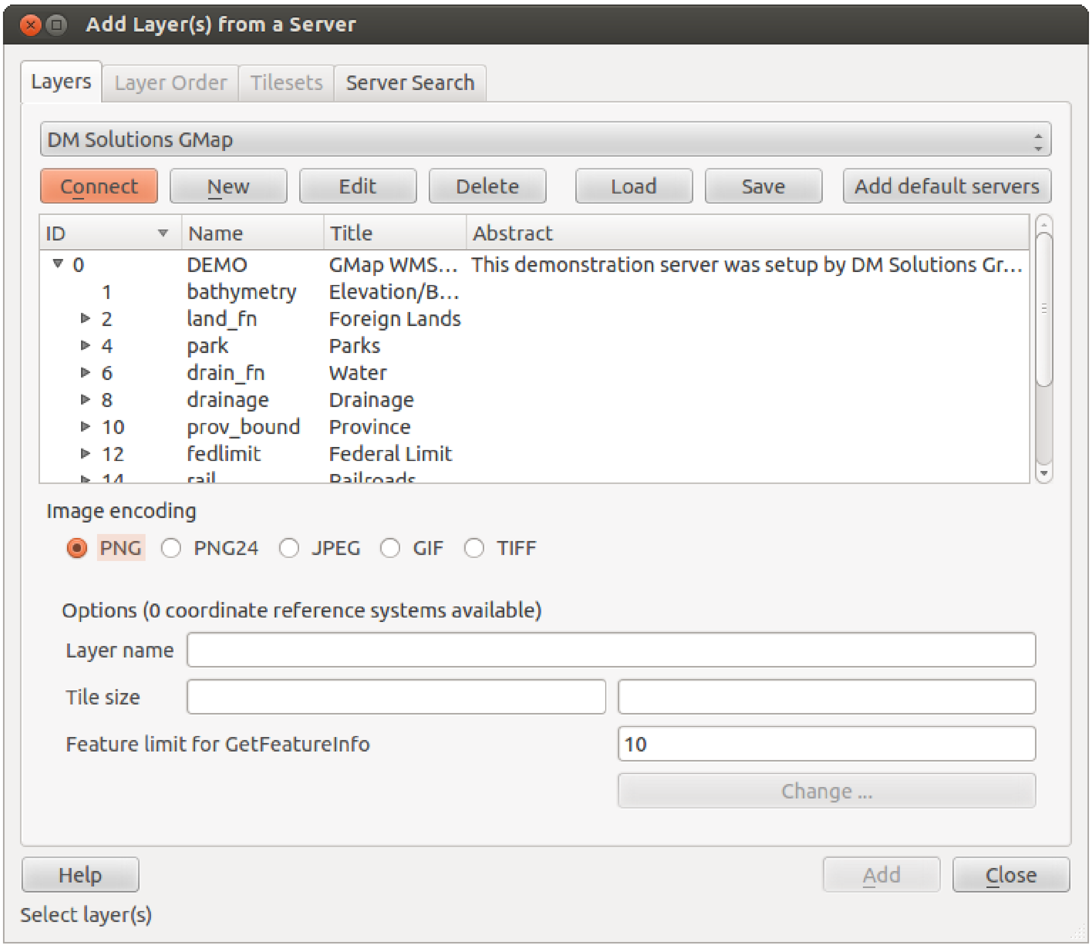

Рис. 14.2: Диалоговое окно добавления WMS-сервера, представлены доступные слои

Формат изображений

The *Image encoding* section lists the formats that are supported by both the client and server. Choose one depending on your image accuracy requirements.

Совет: Формат изображений

Обычно WMS-серверы предлагают на выбор один из двух форматов — JPEG или PNG. JPEG — это формат, использующий алгоритм сжатия с потерями, в то время как PNG — без потерь.

Use JPEG if you expect the WMS data to be photographic in nature and/or you don't mind some loss in picture quality. This trade-off typically reduces by five times the data transfer requirement compared with PNG.

Use PNG if you want precise representations of the original data and you don't mind the increased data transfer requirements.

Параметры

The Options area of the dialog provides a text field where you can add a *Layer name* for the WMS layer. This name will appear in the legend after loading the layer.

Below the layer name, you can define *Tile size* if you want to set tile sizes (e.g., 256x256) to split up the WMS request into multiple requests.

Поле *Максимально количество объектов в GetFeatureInfo* задает число объектов, запрашиваемых у сервера.

If you select a WMS from the list, a field with the default projection provided by the mapserver appears. If the **[Change...]** button is active, you can click on it and change the default projection of the WMS to another CRS provided by the WMS server.

Слои

The *Layer Order* tab lists the selected layers available from the current connected WMS server. You may notice that some layers are expandable; this means that the layer can be displayed in a choice of image styles.

You can select several layers at once, but only one image style per layer. When several layers are selected, they will be combined at the WMS server and transmitted to QGIS in one go.

Совет: Порядок WMS-слоёв

WMS layers rendered by a server are overlaid in the order listed in the Layers section, from top to bottom of the list. If you want to change the overlay order, you can use the *Layer Order* tab.

Прозрачность

In this version of QGIS, the *Global transparency* setting from the *Layer Properties* is hard coded to be always on, where available.

Совет: Прозрачность WMS-слоёв

Доступность прозрачности WMS-слоёв зависит от используемого формата изображения: так PNG и GIF поддерживают прозрачность, в то время как JPEG — нет.

Система координат

A coordinate reference system (CRS) is the OGC terminology for a QGIS projection.

Each WMS layer can be presented in multiple CRSs, depending on the capability of the WMS server.

To choose a CRS, select **[Change...]** and a dialog similar to Figure Projection 3 in *Работа с проекциями* will appear. The main difference with the WMS version of the dialog is that only those CRSs supported by the WMS server will be shown.

Поиск серверов

Within QGIS, you can search for WMS servers. Figure_OGC_2 shows the *Server Search* tab with the *Add Layer(s) from a Server* dialog.

As you can see, it is possible to enter a search string in the text field and hit the **[Search]** button. After a short while, the search result will be populated into the list below the text field. Browse the result list and inspect your search results within the table. To visualize the results, select a table entry, press the **[Add selected row to WMS list]** button and change back to the *Layers* tab. QGIS has automatically updated your server list, and the selected search result is already enabled in the list of saved WMS servers in the *Layers* tab. You only need to request the list of layers by clicking the **[Connect]** button. This option is quite handy when you want to search maps by specific keywords.

Basically, this option is a front end to the API of http://geopole.org.

Мозаики

When using WMTS (Cached WMS) services like

```
http://opencache.statkart.no/gatekeeper/gk/gk.open_wmts?\
  service=WMTS&request=GetCapabilities
```

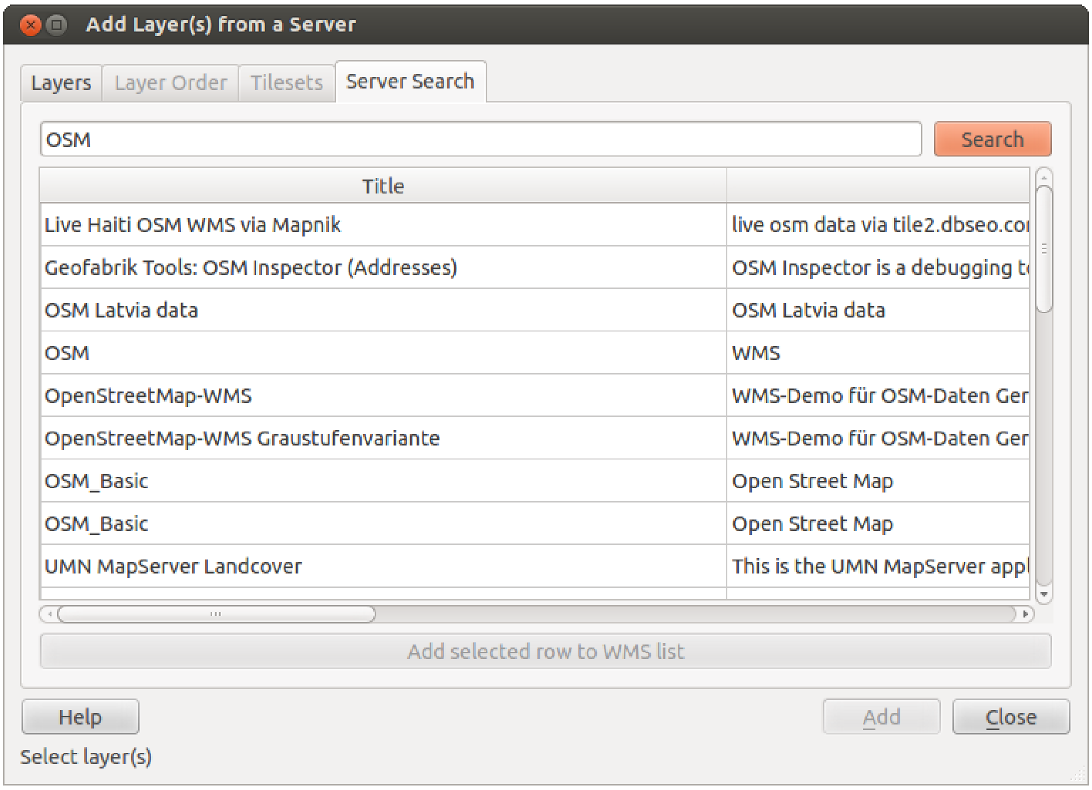

Рис. 14.3: Поиск WMS-серверов по ключевым словам

you are able to browse through the *Tilesets* tab given by the server. Additional information like tile size, formats and supported CRS are listed in this table. In combination with this feature, you can use the tile scale slider by selecting *Settings* → *Panels* (KDE and Windows) or *View* → *Panels* (Gnome and MacOSX), then choosing *Tile scale*. This gives you the available scales from the tile server with a nice slider docked in.

Использование инструмента определения объектов

Если слой, предоставляемый WMS-сервером, даёт возможность осуществления запросов, то появляется возможность использовать инструмент Определить объекты для получения информации о пикселах карты. При каждой попытке получения такой информации происходит обращение к WMS-серверу. Результат запроса представляется в виде простого текста, а его форматирование определяется настройками того или иного WMS-сервера. **Выбор формата**

If multiple output formats are supported by the server, a combo box with supported formats is automatically added to the identify results dialog and the selected format may be stored in the project for the layer. **Поддержка формата GML**

The Identify tool supports WMS server response (GetFeatureInfo) in GML format (it is called Feature in the QGIS GUI in this context). If "Feature" format is supported by the server and selected, results of the Identify tool are vector features, as from a regular vector layer. When a single feature is selected in the tree, it is highlighted in the map and it can be copied to the clipboard and pasted to another vector layer. See the example setup of the UMN Mapserver below to support GetFeatureInfo in GML format.

```
# in layer METADATA add which fields should be included and define geometry (example):

"gml_include_items"   "all"
"ows_geometries"      "mygeom"
"ows_mygeom_type"     "polygon"
```

```
# Then there are two possibilities/formats available, see a) and b):

# a) basic (output is generated by Mapserver and does not contain XSD)
# in WEB METADATA define formats (example):
"wms_getfeatureinfo_formatlist" "application/vnd.ogc.gml,text/html"

# b) using OGR (output is generated by OGR, it is send as multipart and contains XSD)
# in MAP define OUTPUTFORMAT (example):
OUTPUTFORMAT
    NAME "OGRGML"
    MIMETYPE "ogr/gml"
    DRIVER "OGR/GML"
    FORMATOPTION "FORM=multipart"
END

# in WEB METADATA define formats (example):
"wms_getfeatureinfo_formatlist" "OGRGML,text/html"
```

Просмотр свойств

Once you have added a WMS server, you can view its properties by right-clicking on it in the legend and selecting *Properties*. **Метаданные**

The tab *Metadata* displays a wealth of information about the WMS server, generally collected from the capabilities statement returned from that server. Many definitions can be gleaned by reading the WMS standards (see OPEN-GEOSPATIAL-CONSORTIUM in *Литература и ссылки на web-ресурсы*), but here are a few handy definitions:

- **Свойства сервера**
  - **Версия WMS** — Версия WMS, поддерживаемая сервером.
  - **Форматы изображения** — Список MIME-типов, поддерживаемых сервером. QGIS доступны любые форматы, с поддержкой которых была собрана библиотека Qt, обычно это `image/png` и `image/jpeg`.
  - **Identity Formats** — The list of MIME-types the server can respond with when you use the Identify tool. Currently, QGIS supports the `text-plain` type.
- **Свойства слоя**
  - **Выбранные слои** — Показывает, был или не был выбран слой при добавлении сервера в проект.
  - **Visible** — Whether or not this layer is selected as visible in the legend (not yet used in this version of QGIS).
  - **Можно определять** — Возможно или нет осуществлять запросы к слою с помощью инструмента идентификации.
  - **Can be Transparent** — Whether or not this layer can be rendered with transparency. This version of QGIS will always use transparency if this is `Yes` and the image encoding supports transparency.
  - **Можно увеличивать** — Доступна или нет возможность увеличения слоя на стороне сервера. Текущая версия QGIS подразумевает, что этот параметр для любого слоя установлен в значение `Да`. Не отвечающие данному требованию слои могут быть отрисованы некорректно.
  - **Количество каскадов** — Одни WMS-серверы могут работать как прокси-серверы для других. Эта запись показывает, сколько раз запрос к данному серверу был послан на другие WMS-серверы до моментв получения результата.
  - **Фикс. ширина, Фикс. высота** — Установлен или нет фиксированный размер слоя в пикселях. Текущая версия QGIS подразумевает, что этот параметр для любого слоя не

установлен. Не отвечающие данному требованию слои могут быть отрисованы некорректно.

- **WGS 84 Bounding Box** — The bounding box of the layer, in WGS 84 coordinates. Some WMS servers do not set this correctly (e.g., UTM coordinates are used instead). If this is the case, then the initial view of this layer may be rendered with a very 'zoomed-out' appearance by QGIS. The WMS webmaster should be informed of this error, which they may know as the WMS XML elements `LatLonBoundingBox`, `EX_GeographicBoundingBox` or the CRS:84 `BoundingBox`.
- **Доступен в CRS** — Проекции, в которых слой может быть отрисован WMS-сервером. Перечислены в «родном» для WMS формате.
- **Доступен в стилях** — Стили в которых может быть отрисован слой WMS-сервером.

Show WMS legend graphic in table of contents and composer

The QGIS WMS data provider is able to display a legend graphic in the table of contents' layer list and in the map composer. The WMS legend will be shown only if the WMS server has GetLegendGraphic capability and the layer has getCapability url specified, so you additionally have to select a styling for the layer.

If a legendGraphic is available, it is shown below the layer. It is little and you have to click on it to open it in real dimension (due to QgsLegendInterface architectural limitation). Clicking on the layer's legend will open a frame with the legend at full resolution.

In the print composer, the legend will be integrated at it's original (dowloaded) dimension. Resolution of the legend graphic can be set in the item properties under Legend -> WMS LegendGraphic to match your printing requirements

The legend will display contextual information based on your current scale. The WMS legend will be shown only if the WMS server has GetLegendGraphic capability and the layer has getCapability url specified, so you have to select a styling.

Ограничения клиента WMS

Not all possible WMS client functionality had been included in this version of QGIS. Some of the more noteworthy exceptions follow.

Редактирование свойств WMS-слоя

Once you've completed the Add WMS layer procedure, there is no way to change the settings. A work-around is to delete the layer completely and start again.

Защищённые WMS-серверы

Currently, publicly accessible and secured WMS services are supported. The secured WMS servers can be accessed by public authentication. You can add the (optional) credentials when you add a WMS server. See section *Выбор WMS/WMTS-серверов* for details.

Совет: Доступ к защищённым слоям OGC

If you need to access secured layers with secured methods other than basic authentication, you can use InteProxy as a transparent proxy, which does support several authentication methods. More information can be found in the InteProxy manual at http://inteproxy.wald.intevation.org.

Совет: QGIS WMS Mapserver

Since Version 1.7.0, QGIS has its own implementation of a WMS 1.3.0 Mapserver. Read more about this in chapter *QGIS как сервер OGC*.

14.1.2 Клиент WCS

A Web Coverage Service (WCS) provides access to raster data in forms that are useful for client-side rendering, as input into scientific models, and for other clients. The WCS may be compared to the WFS and the WMS. As WMS and WFS service instances, a WCS allows clients to choose portions of a server's information holdings based on spatial constraints and other query criteria.

QGIS has a native WCS provider and supports both version 1.0 and 1.1 (which are significantly different), but currently it prefers 1.0, because 1.1 has many issues (i.e., each server implements it in a different way with various particularities).

The native WCS provider handles all network requests and uses all standard QGIS network settings (especially proxy). It is also possible to select cache mode ('always cache', 'prefer cache', 'prefer network', 'always network'), and the provider also supports selection of time position, if temporal domain is offered by the server.

14.1.3 Клиент WFS и WFS-T

In QGIS, a WFS layer behaves pretty much like any other vector layer. You can identify and select features, and view the attribute table. Since QGIS 1.6, editing WFS-T is also supported.

In general, adding a WFS layer is very similar to the procedure used with WMS. The difference is that there are no default servers defined, so we have to add our own.

Добавление слоя WFS

As an example, we use the DM Solutions WFS server and display a layer. The URL is: http://www2.dmsolutions.ca/cgi-bin/mswfs_gmap

1. Click on the Add WFS Layer tool on the Layers toolbar. The *Add WFS Layer from a Server* dialog appears.
2. Click on **[New]**.
3. Enter 'DM Solutions' as name.
4. Enter the URL (see above).
5. Click **[OK]**.
6. Choose 'DM Solutions' from the *Server Connections* drop-down list.
7. Click **[Connect]**.
8. Wait for the list of layers to be populated.
9. Select the *Parks* layer in the list.
10. Click **[Apply]** to add the layer to the map.

Note that any proxy settings you may have set in your preferences are also recognized.

You'll notice the download progress is visualized in the lower left of the QGIS main window. Once the layer is loaded, you can identify and select a province or two and view the attribute table.

Only WFS 1.0.0 is supported. At this time, there have not been many tests against WFS versions implemented in other WFS servers. If you encounter problems with any other WFS server, please do not hesitate to contact the development team. Please refer to section *Справка и поддержка* for further information about the mailing lists.

Совет: Поиск WFS серверов

Дополнительные WFS-серверы можно найти, используя Google или любую другую поисковую систему. Существует множество списков, содержащих URL WFS-серверов, некоторые из которых поддерживаются, а некоторые уже нет.

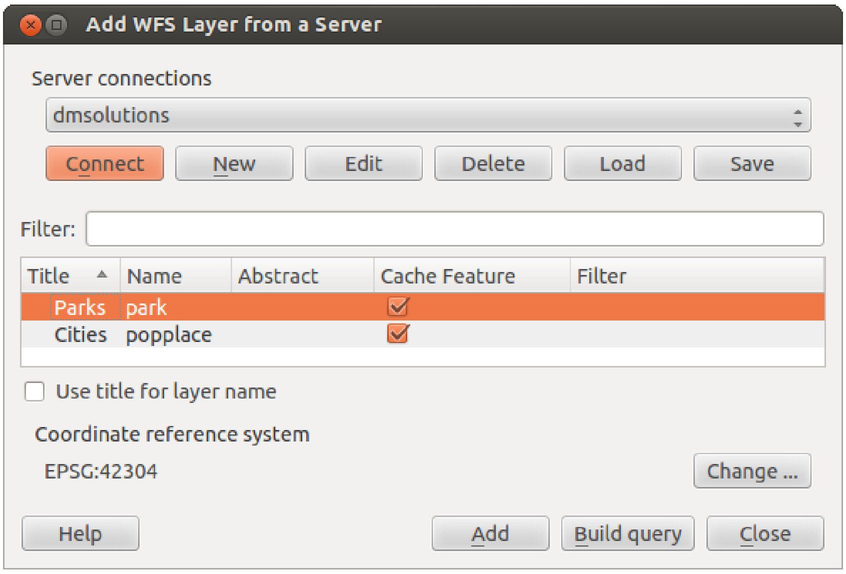

Рис. 14.4: Добавление слоя WFS

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14.2 QGIS как сервер OGC

QGIS Server is an open source WMS 1.3, WFS 1.0.0 and WCS 1 1.1.1 implementation that, in addition, implements advanced cartographic features for thematic mapping. The QGIS Server is a FastCGI/CGI (Common Gateway Interface) application written in C++ that works together with a web server (e.g., Apache, Lighttpd). It is funded by the EU projects Orchestra, Sany and the city of Uster in Switzerland.

QGIS Server uses QGIS as back end for the GIS logic and for map rendering. Furthermore, the Qt library is used for graphics and for platform-independent C++ programming. In contrast to other WMS software, the QGIS Server uses cartographic rules as a configuration language, both for the server configuration and for the user-defined cartographic rules.

As QGIS desktop and QGIS Server use the same visualization libraries, the maps that are published on the web look the same as in desktop GIS.

In one of the following manuals, we will provide a sample configuration to set up a QGIS Server. For now, we recommend to read one of the following URLs to get more information:

- http://karlinapp.ethz.ch/qgis_wms/
- http://hub.qgis.org/projects/quantum-gis/wiki/QGIS_Server_Tutorial
- http://linfiniti.com/2010/08/qgis-mapserver-a-wms-server-for-the-masses/

14.2.1 Пример установки на Debian Squeeze

At this point, we will give a short and simple sample installation how-to for Debian Squeeze. Many other OSs provide packages for QGIS Server, too. If you have to build it all from source, please refer to the URLs above.

Apart from QGIS and QGIS Server, you need a web server, in our case apache2. You can install all packages with `aptitude` or `apt-get install` together with other necessary dependency packages. After installation, you should test to confirm that the web server and QGIS Server work as expected. Make sure the apache server is running with `/etc/init.d/apache2 start`. Open a web browser and type URL: `http://localhost`. If apache is up, you should see the message 'It works!'.

Now we test the QGIS Server installation. The `qgis_mapserv.fcgi` is available at `/usr/lib/cgi-bin/qgis_mapserv.fcgi` and provides a standard WMS that shows the state boundaries of Alaska. Add the WMS with the URL `http://localhost/cgi-bin/qgis_mapserv.fcgi` as described in *Выбор WMS/WMTS-серверов*.

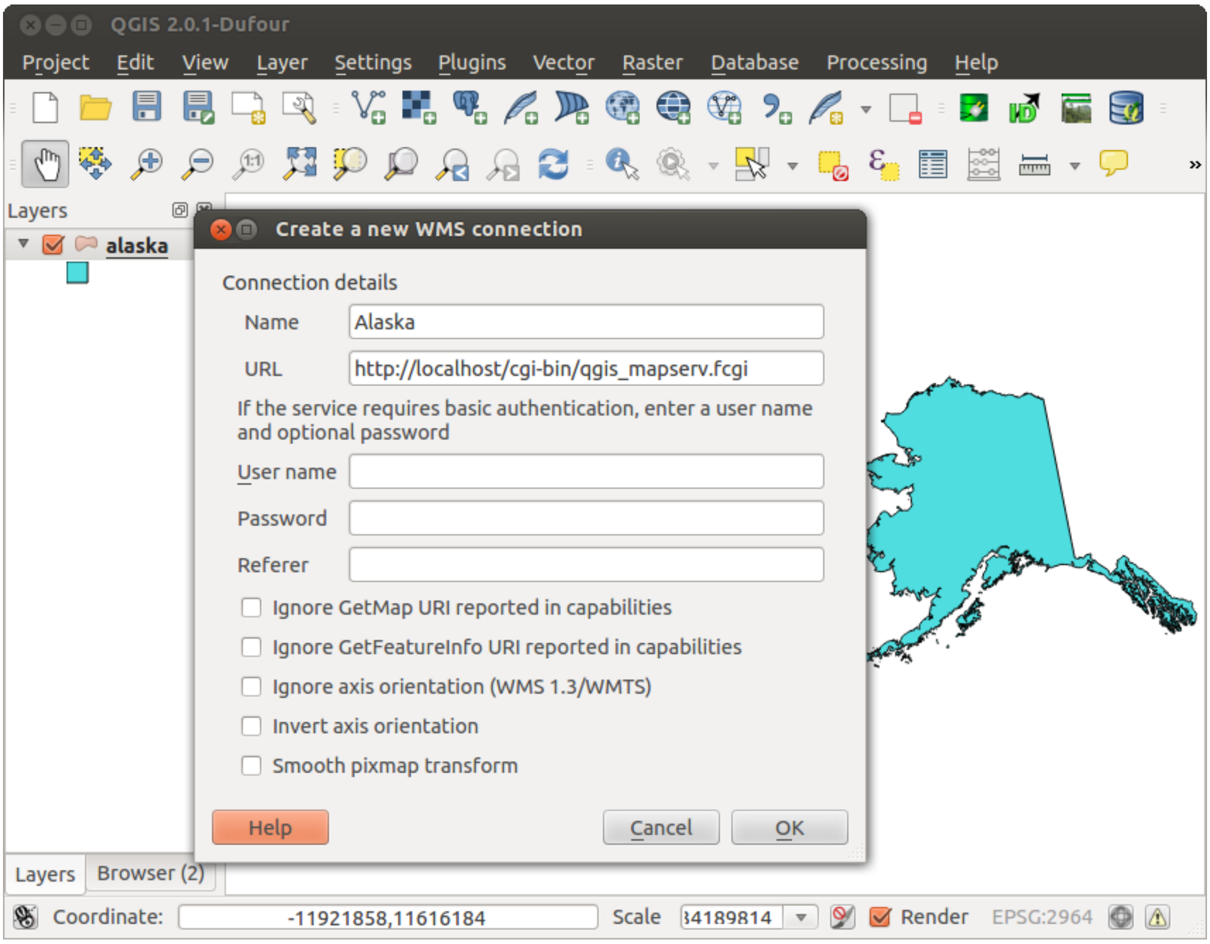

Рис. 14.5: Standard WMS with USA boundaries included in the QGIS Server (KDE)

14.2.2 Creating a WMS/WFS/WCS from a QGIS project

To provide a new QGIS Server WMS, WFS or WCS, we have to create a QGIS project file with some data. Here, we use the 'Alaska' shapefile from the QGIS sample dataset. Define the colors and styles of the layers in QGIS and the project CRS, if not already defined.

Then, go to the *OWS Server* menu of the *Project* → *Project Properties* dialog and provide some information about the OWS in the fields under *Service Capabilities*. This will appear in the GetCapabilities response of the WMS, WFS or WCS. If you don't check *Service capabilities*, QGIS Server will use the information given in the `wms_metadata.xml` file located in the `cgi-bin` folder.

WMS capabilities

In the *WMS capabilities* section, you can define the extent advertised in the WMS GetCapabilities response by entering the minimum and maximum X and Y values in the fields under *Advertised extent*. Clicking *Use Current Canvas Extent* sets these values to the extent currently displayed in the QGIS map canvas. By checking *CRS restrictions*, you can restrict in which coordinate reference systems

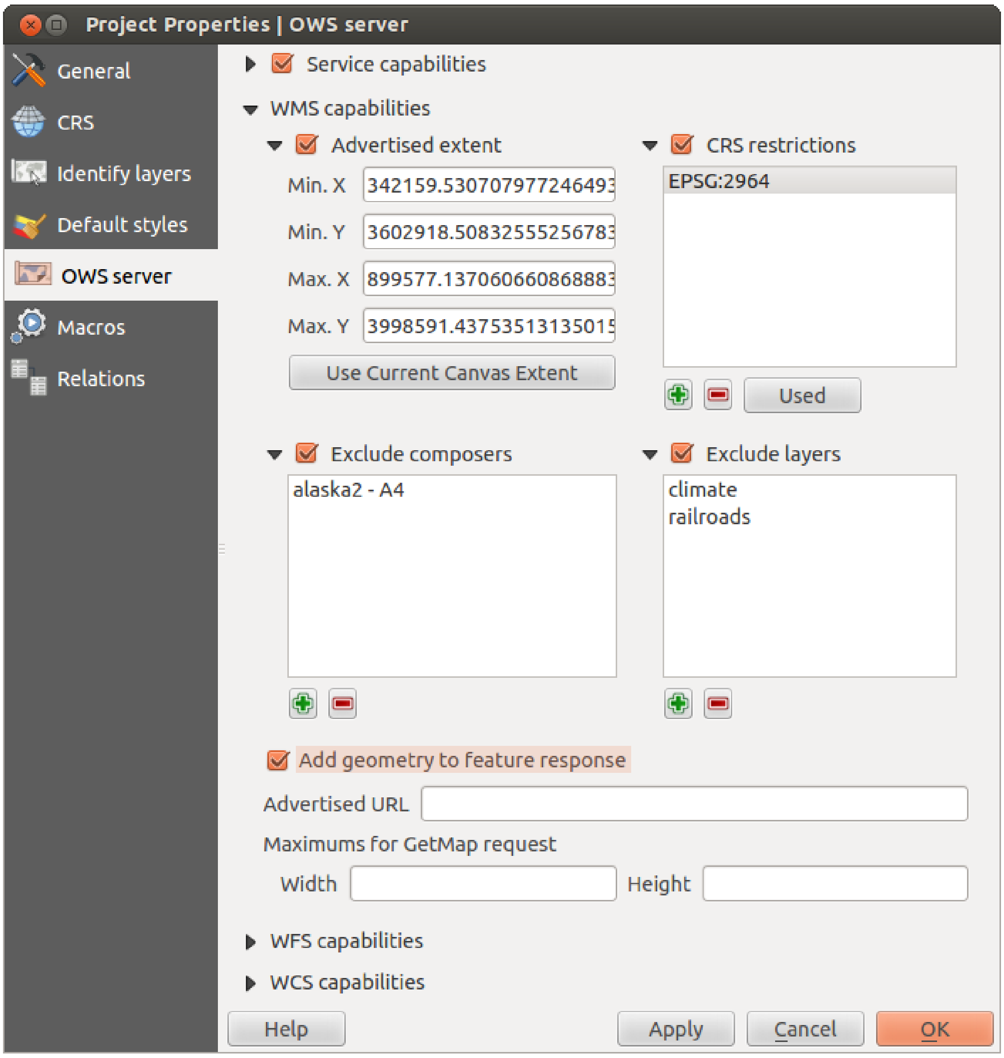

Рис. 14.6: Definitions for a QGIS Server WMS/WFS/WCS project (KDE)

(CRS) QGIS Server will offer to render maps. Use the button below to select those CRS from the Coordinate Reference System Selector, or click *Used* to add the CRS used in the QGIS project to the list.

If you have print composers defined in your project, they will be listed in the GetCapabilities response, and they can be used by the GetPrint request to create prints, using one of the print composer layouts as a template. This is a QGIS-specific extension to the WMS 1.3.0 specification. If you want to exclude any print composer from being published by the WMS, check *Exclude composers* and click the button below. Then, select a print composer from the *Select print composer* dialog in order to add it to the excluded composers list.

If you want to exclude any layer or layer group from being published by the WMS, check *Exclude Layers* and click the button below. This opens the *Select restricted layers and groups* dialog, which allows you to choose the layers and groups that you don't want to be published. Use the `Shift` or `Ctrl` key if you want to select multiple entries at once.

You can receive requested GetFeatureInfo as plain text, XML and GML. Default is XML, text or GML format depends the output format choosen for the GetFeatureInfo request.

If you wish, you can check *Add geometry to feature response*. This will include in the GetFeatureInfo response the geometries of the features in a text format. If you want QGIS Server to advertise specific request URLs in the WMS GetCapabilities response, enter the corresponding URL in the *Advertised URL* field. Furthermore, you can restrict the maximum size of the maps returned by the GetMap request by entering the maximum width and height into the respective fields under *Maximums for GetMap request*.

If one of your layers uses the Map Tip display (i.e. to show text using expressions) this will be listed inside the GetFeatureInfo output. If the layer uses a Value Map for one of his attributes, also this information will be shown in the GetFeatureInfo output.

WFS capabilities

In the *WFS capabilities* area, you can select the layers that you want to publish as WFS, and specify if they will allow the update, insert and delete operations. If you enter a URL in the *Advertised URL* field of the *WFS capabilities* section, QGIS Server will advertise this specific URL in the WFS GetCapabilities response.

WCS capabilities

In the *WCS capabilities* area, you can select the layers that you want to publish as WCS. If you enter a URL in the *Advertised URL* field of the *WCS capabilities* section, QGIS Server will advertise this specific URL in the WCS GetCapabilities response.

Now, save the session in a project file `alaska.qgs`. To provide the project as a WMS/WFS, we create a new folder `/usr/lib/cgi-bin/project` with admin privileges and add the project file `alaska.qgs` and a copy of the `qgis_mapserv.fcgi` file - that's all.

Now we test our project WMS, WFS and WCS. Add the WMS, WFS and WCS as described in *Загрузка WMS/WMTS-слоёв*, *Клиент WFS и WFS-T* and *Клиент WCS* to QGIS and load the data. The URL is:

```
http://localhost/cgi-bin/project/qgis_mapserv.fcgi
```

Настройка сервера OWS

For vector layers, the *Fields* menu of the *Layer → Properties* dialog allows you to define for each attribute if it will be published or not. By default, all the attributes are published by your WMS and WFS. If you want a specific attribute not to be published, uncheck the corresponding checkbox in the *WMS* or *WFS* column.

You can overlay watermarks over the maps produced by your WMS by adding text annotations or SVG annotations to the project file. See section Annotation Tools in *Основные инструменты* for instructions on creating annotations. For annotations to be displayed as watermarks on the WMS output, the *Fixed map position* check box in the *Annotation text* dialog must be unchecked. This can be accessed by double clicking the annotation while one of the annotation tools is active. For SVG annotations, you will need either to set the project to save absolute paths (in the *General* menu of the *Project → Project Properties* dialog) or to manually modify the path to the SVG image in a way that it represents a valid relative path.

Extra parameters supported by the WMS GetMap request

In the WMS GetMap request, QGIS Server accepts a couple of extra parameters in addition to the standard parameters according to the OCG WMS 1.3.0 specification:

- **MAP** parameter: Similar to MapServer, the `MAP` parameter can be used to specify the path to the QGIS project file. You can specify an absolute path or a path relative to the location of the server executable (`qgis_mapserv.fcgi`). If not specified, QGIS Server searches for .qgs files in the directory where the server executable is located.

  Пример:

  ```
  http://localhost/cgi-bin/qgis_mapserv.fcgi?\
    REQUEST=GetMap&MAP=/home/qgis/mymap.qgs&...
  ```

- **DPI** parameter: The `DPI` parameter can be used to specify the requested output resolution.

  Пример:

  ```
  http://localhost/cgi-bin/qgis_mapserv.fcgi?REQUEST=GetMap&DPI=300&...
  ```

- **OPACITIES** parameter: Opacity can be set on layer or group level. Allowed values range from 0 (fully transparent) to 255 (fully opaque).

  Пример:

  ```
  http://localhost/cgi-bin/qgis_mapserv.fcgi?\
    REQUEST=GetMap&LAYERS=mylayer1,mylayer2&OPACITIES=125,200&...
  ```

QGIS Server logging

To log requests send to server, set the following environment variables:

- **QGIS_SERVER_LOG_FILE**: Specify path and filename. Make sure that server has proper permissions for writing to file. File should be created automatically, just send some requests to server. If it's not there, check permissions.
- **QGIS_SERVER_LOG_LEVEL**: Specify desired log level. Available values are:
  - 0 INFO (log all requests),
  - 1 WARNING,
  - 2 CRITICAL (log just critical errors, suitable for production purposes).

  Пример:

  ```
  SetEnv QGIS_SERVER_LOG_FILE /var/tmp/qgislog.txt
  SetEnv QGIS_SERVER_LOG_LEVEL 0
  ```

Note

- When using Fcgid module use FcgidInitialEnv instead of SetEnv!
- Server logging is enabled also if executable is compiled in release mode.

Environment variables

- **QGIS_OPTIONS_PATH**: The variable specifies path to directory with settings. It works the same ways as QGIS application –optionspath option. It is looking for settings file in <QGIS_OPTIONS_PATH>/QGIS/QGIS2.ini. For exaple, to set QGIS server on Apache to use /path/to/config/QGIS/QGIS2.ini settings file, add to Apache config:

  ```
  SetEnv QGIS_OPTIONS_PATH "/path/to/config/"
  ```

.

Работа с данными GPS

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15.1 Модуль GPS

15.1.1 Что такое GPS?

GPS, the Global Positioning System, is a satellite-based system that allows anyone with a GPS receiver to find their exact position anywhere in the world. GPS is used as an aid in navigation, for example in airplanes, in boats and by hikers. The GPS receiver uses the signals from the satellites to calculate its latitude, longitude and (sometimes) elevation. Most receivers also have the capability to store locations (known as **waypoints**), sequences of locations that make up a planned **route** and a tracklog or **track** of the receiver's movement over time. Waypoints, routes and tracks are the three basic feature types in GPS data. QGIS displays waypoints in point layers, while routes and tracks are displayed in linestring layers.

15.1.2 Загрузка GPS данных из файла

Существуют десятки различных форматов файлов для хранения GPS данных. Формат, используемый в QGIS, называется GPX (формат обмена данными GPS), являющийся стандартным обменным форматом, который может содержать любое количество маршрутных точек, маршрутов и треков в одном файле.

To load a GPX file, you first need to load the plugin. *Plugins* → *Plugin Manager...* opens the Plugin Manager Dialog. Activate the *GPS Tools* checkbox. When this plugin is loaded, two buttons with a small handheld GPS device will show up in the toolbar:

- Create new GPX Layer
- GPS Tools

For working with GPS data, we provide an example GPX file available in the QGIS sample dataset: `qgis_sample_data/gps/national_monuments.gpx`. See section *Примеры данных* for more information about the sample data.

1. Select *Vector* → *GPS* → *GPS Tools* or click the GPS Tools icon in the toolbar and open the *Load GPX file* tab (see figure_GPS_1).
2. Используйте кнопку **[Обзор...]** для перехода в каталог `qgis_sample_data/gps/`, выберите файл GPX `national_monuments.gpx` и нажмите кнопку **[Открыть]**.

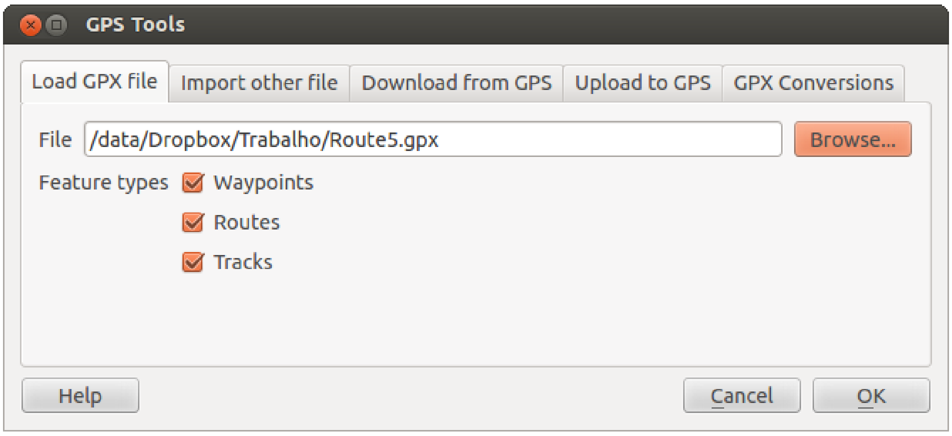

Рис. 15.1: Диалоговое окно «Инструменты GPS»

Use the **[Browse...]** button to select the GPX file, then use the checkboxes to select the feature types you want to load from that GPX file. Each feature type will be loaded in a separate layer when you click **[OK]**. The file `national_monuments.gpx` only includes waypoints.

Примечание: GPS units allow you to store data in different coordinate systems. When downloading a GPX file (from your GPS unit or a web site) and then loading it in QGIS, be sure that the data stored in the GPX file uses WGS 84 (latitude/longitude). QGIS expects this, and it is the official GPX specification. See http://www.topografix.com/GPX/1/1/.

15.1.3 Программа GPSBabel

Since QGIS uses GPX files, you need a way to convert other GPS file formats to GPX. This can be done for many formats using the free program GPSBabel, which is available at http://www.gpsbabel.org. This program can also transfer GPS data between your computer and a GPS device. QGIS uses GPSBabel to do these things, so it is recommended that you install it. However, if you just want to load GPS data from GPX files you will not need it. Version 1.2.3 of GPSBabel is known to work with QGIS, but you should be able to use later versions without any problems.

15.1.4 Импортирование данных GPS

To import GPS data from a file that is not a GPX file, you use the tool *Import other file* in the GPS Tools dialog. Here, you select the file that you want to import (and the file type), which feature type you want to import from it, where you want to store the converted GPX file and what the name of the new layer should be. Note that not all GPS data formats will support all three feature types, so for many formats you will only be able to choose between one or two types.

15.1.5 Загрузка данных GPS из устройства

QGIS can use GPSBabel to download data from a GPS device directly as new vector layers. For this we use the *Download from GPS* tab of the GPS Tools dialog (see Figure_GPS_2). Here, we select the type of GPS device, the port that it is connected to (or USB if your GPS supports this), the feature type that you want to download, the GPX file where the data should be stored, and the name of the new layer.

The device type you select in the GPS device menu determines how GPSBabel tries to communicate with your GPS device. If none of the available types work with your GPS device, you can create a new type (see section *Определение новых типов устройств*).

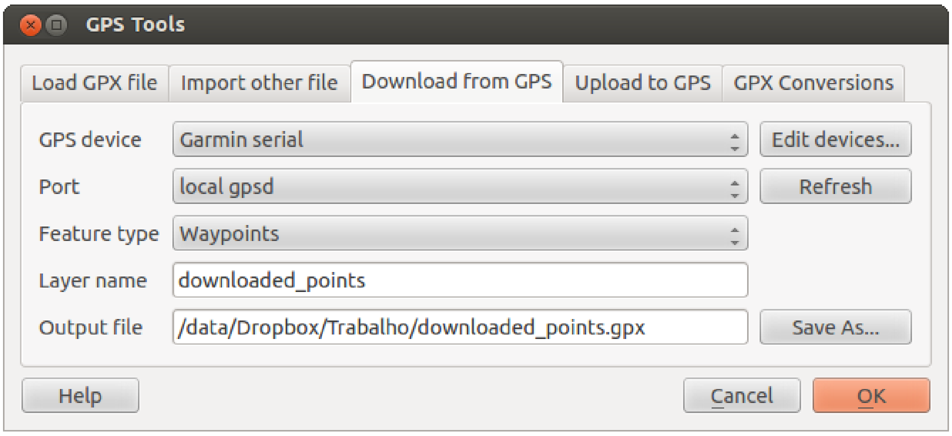

Рис. 15.2: Инструмент загрузки

The port may be a file name or some other name that your operating system uses as a reference to the physical port in your computer that the GPS device is connected to. It may also be simply USB, for USB-enabled GPS units.

- On Linux, this is something like `/dev/ttyS0` or `/dev/ttyS1`.
- On Windows, it is `COM1` or `COM2`.

When you click **[OK]**, the data will be downloaded from the device and appear as a layer in QGIS.

15.1.6 Выгрузка данных GPS в устройство

You can also upload data directly from a vector layer in QGIS to a GPS device using the *Upload to GPS* tab of the GPS Tools dialog. To do this, you simply select the layer that you want to upload (which must be a GPX layer), your GPS device type, and the port (or USB) that it is connected to. Just as with the download tool, you can specify new device types if your device isn't in the list.

This tool is very useful in combination with the vector-editing capabilities of QGIS. It allows you to load a map, create waypoints and routes, and then upload them and use them on your GPS device.

15.1.7 Определение новых типов устройств

There are lots of different types of GPS devices. The QGIS developers can't test all of them, so if you have one that does not work with any of the device types listed in the *Download from GPS* and *Upload to GPS* tools, you can define your own device type for it. You do this by using the GPS device editor, which you start by clicking the **[Edit devices]** button in the download or the upload tab.

To define a new device, you simply click the **[New device]** button, enter a name, enter download and upload commands for your device, and click the **[Update device]** button. The name will be listed in the device menus in the upload and download windows – it can be any string. The download command is the command that is used to download data from the device to a GPX file. This will probably be a GPSBabel command, but you can use any other command line program that can create a GPX file. QGIS will replace the keywords `%type`, `%in`, and `%out` when it runs the command.

`%type` will be replaced by `-w` if you are downloading waypoints, `-r` if you are downloading routes and `-t` if you are downloading tracks. These are command-line options that tell GPSBabel which feature type to download.

`%in` will be replaced by the port name that you choose in the download window and `%out` will be replaced by the name you choose for the GPX file that the downloaded data should be stored in. So, if you create a device type with the download command `gpsbabel %type -i garmin -o gpx %in %out` (this is actually the download command for the predefined device type 'Garmin serial') and then use it to download waypoints from port /dev/ttyS0 to the file output.gpx, QGIS will replace the keywords and run the command gpsbabel -w -i garmin -o gpx /dev/ttyS0 output.gpx.

Команда выгрузки — это команда, применяемая для выгрузки данных в устройство. В ней используются те же ключевые слова, однако %in уже заменяется на название файла GPX для выгруженного слоя, а %out — на название порта.

You can learn more about GPSBabel and its available command line options at http://www.gpsbabel.org.

Once you have created a new device type, it will appear in the device lists for the download and upload tools.

15.1.8 Download of points/tracks from GPS units

As described in previous sections QGIS uses GPSBabel to download points/tracks directly in the project. QGIS comes out of the box with a pre-defined profile to download from Garmin devices. Unfortunately there is a bug #6318 that does not allow create other profiles, so downloading directly in QGIS using the GPS Tools is at the moment limited to Garmin USB units.

Garmin GPSMAP 60cs

MS Windows

Install the Garmin USB drivers from http://www8.garmin.com/support/download_details.jsp?id=591

Connect the unit. Open GPS Tools and use type=garmin serial and port=usb: Fill the fields *Layer name* and *Output file*. Sometimes it seems to have problems saving in a certain folder, using something like c:\temp usually works.

Ubuntu/Mint GNU/Linux

It is first needed an issue about the permissions of the device, as described at https://wiki.openstreetmap.org/wiki/USB_Garmin_on_GNU/Linux. You can try to create a file /etc/udev/rules.d/51-garmin.rules containing this rule

```
ATTRS{idVendor}=="091e", ATTRS{idProduct}=="0003", MODE="666"
```

After that is necessary to be sure that the garmin_gps kernel module is not loaded

```
rmmod garmin_gps
```

and then you can use the GPS Tools. Unfortunately there seems to be a bug #7182 and usually QGIS freezes several times before the operation work fine.

BTGP-38KM datalogger (only Bluetooth)

MS Windows

The already referred bug does not allow to download the data from within QGIS, so it is needed to use GPSBabel from the command line or using its interface. The working command is

```
gpsbabel -t -i skytraq,baud=9600,initbaud=9600 -f COM9 -o gpx -F C:/GPX/aaa.gpx
```

Ubuntu/Mint GNU/Linux

Use same command (or settings if you use GPSBabel GUI) as in Windows. On Linux it maybe somehow common to get a message like

```
skytraq: Too many read errors on serial port
```

it is just a matter to turn off and on the datalogger and try again.

BlueMax GPS-4044 datalogger (both BT and USB)

MS Windows

Примечание: It needs to install its drivers before using it on Windows 7. See in the manufacturer site for the proper download.

Downloading with GPSBabel, both with USB and BT returns always an error like

```
gpsbabel -t -i mtk -f COM12 -o gpx -F C:/temp/test.gpx
mtk_logger: Can't create temporary file data.bin
Error running gpsbabel: Process exited unsucessfully with code 1
```

Ubuntu/Mint GNU/Linux

With USB

After having connected the cable use the `dmesg` command to understand what port is being used, for example `/dev/ttyACM3`. Then as usual use GPSBabel from the CLI or GUI

```
gpsbabel -t -i mtk -f /dev/ttyACM3 -o gpx -F /home/user/bluemax.gpx
```

With Bluetooth

Use Blueman Device Manager to pair the device and make it available through a system port, then run GPSBabel

```
gpsbabel -t -i mtk -f /dev/rfcomm0 -o gpx -F /home/user/bluemax_bt.gpx
```

.

15.2 GPS-слежение

To activate live GPS tracking in QGIS, you need to select *Settings* → *Panels* *GPS information*. You will get a new docked window on the left side of the canvas.

There are four possible screens in this GPS tracking window:

- GPS position coordinates and an interface for manually entering vertices and features
- GPS signal strength of satellite connections
- GPS polar screen showing number and polar position of satellites
- GPS options screen (see figure_gps_options)

With a plugged-in GPS receiver (has to be supported by your operating system), a simple click on **[Connect]** connects the GPS to QGIS. A second click (now on **[Disconnect]**) disconnects the GPS receiver from your computer. For GNU/Linux, gpsd support is integrated to support connection to most GPS receivers. Therefore, you first have to configure gpsd properly to connect QGIS to it.

Предупреждение: If you want to record your position to the canvas, you have to create a new vector layer first and switch it to editable status to be able to record your track.

15.2.1 Координаты текущего местоположения

If the GPS is receiving signals from satellites, you will see your position in latitude, longitude and altitude together with additional attributes.

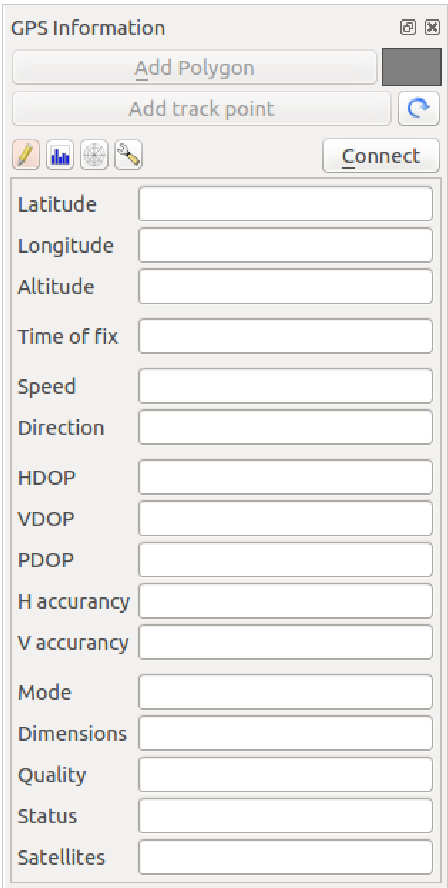

Рис. 15.3: Координаты текущего местоположения и другие данные

15.2.2 Мощность сигнала GPS

Here, you can see the signal strength of the satellites you are receiving signals from.

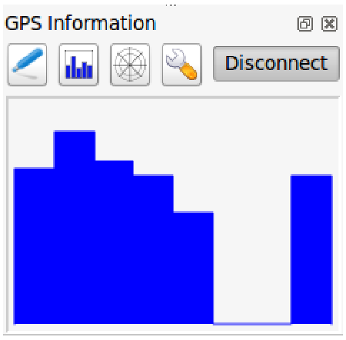

Рис. 15.4: Мощность сигнала GPS

15.2.3 Положение спутников GPS

Если вы хотите знать, где на небесной сфере располагаются все присоединенные спутники, переключитесь на окно *Положение спутников*. Также здесь можно увидеть идентификационные номера (ID) спутников, с которых вы получаете сигнал.

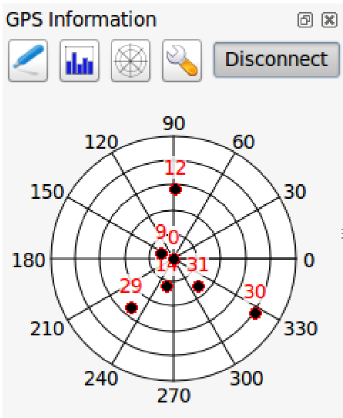

Рис. 15.5: Положение спутников GPS

15.2.4 Параметры GPS

In case of connection problems, you can switch between:

- *Автоопределение*
- *Встроенный приёмник*
- *Серийный порт*
- *gpsd* (selecting the Host, Port and Device your GPS is connected to)

Нажатие кнопки **[Подключиться]** снова инициирует соединение с GPS-приемником.

You can activate *Automatically save added features* when you are in editing mode. Or you can activate *Automatically add points* to the map canvas with a certain width and color.

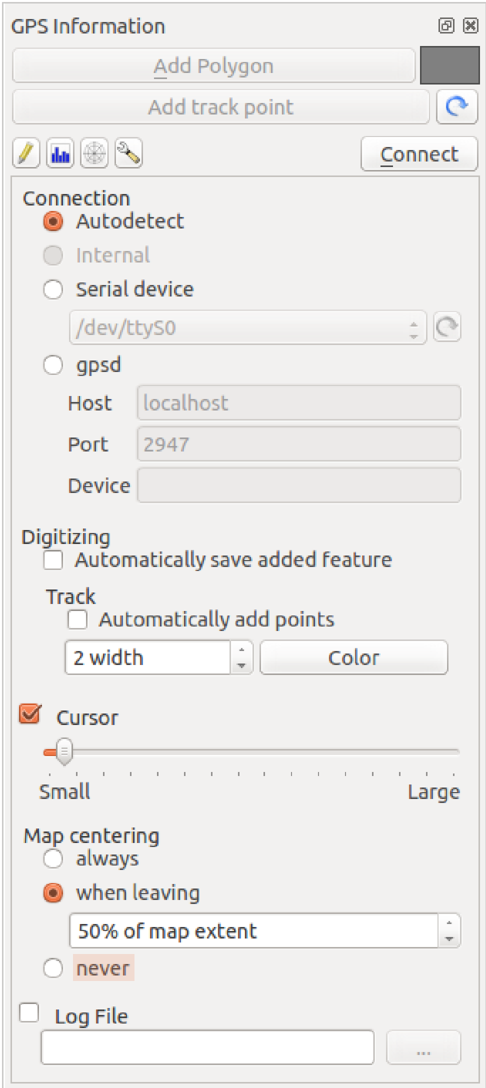

Рис. 15.6: Настройки GPS-слежения

Activating Cursor, you can use a slider to shrink and grow the position cursor on the canvas.

Activating *Map centering* allows you to decide in which way the canvas will be updated. This includes 'always', 'when leaving', if your recorded coordinates start to move out of the canvas, or 'never', to keep map extent.

Finally, you can activate *Log file* and define a path and a file where log messages about the GPS tracking are logged.

If you want to set a feature manually, you have to go back to Position and click on **[Add Point]** or **[Add track point]**.

15.2.5 Connect to a Bluetooth GPS for live tracking

With QGIS you can connect a Bluetooth GPS for field data collection. To perform this task you need a GPS Bluetooth device and a Bluetooth receiver on your computer.

At first you must let your GPS device be recognized and paired to the computer. Turn on the GPS, go to the Bluetooth icon on your notification area and search for a New Device.

On the right side of the Device selection mask make sure that all devices are selected so your GPS unit will probably appear among those available. In the next step a serial connection service should be available, select it and click on **[Configure]** button.

Remember the number of the COM port assigned to the GPS connection as resulting by the Bluetooth properties.

After the GPS has been recognized, make the pairing for the connection. Usually the autorization code is `0000`.

Now open *GPS information* panel and switch to GPS options screen. Select the COM port assigned to the GPS connection and click the **[Connect]**. After a while a cursor indicating your position should appear.

If QGIS can't receive GPS data, then you should restart your GPS device, wait 5-10 seconds then try to connect again. Usually this solution work. If you receive again a connection error make sure you don't have another Bluetooth receiver near you, paired with the same GPS unit.

15.2.6 Using GPSMAP 60cs

MS Windows

Easiest way to make it work is to use a middleware (freeware, not open) called GPSGate.

Launch the program, make it scan for GPS devices (works for both USB and BT ones) and then in QGIS just click **[Connect]** in the Live tracking panel using the *Autodetect* mode.

Ubuntu/Mint GNU/Linux

As for Windows the easiest way is to use a server in the middle, in this case GPSD, so

```
sudo apt-get install gpsd
```

Then load the `garmin_gps` kernel module

```
sudo modprobe garmin_gps
```

And then connect the unit. Then check with `dmesg` the actual device being used bu the unit, for example `/dev/ttyUSB0`. Now you can launch gpsd

```
gpsd /dev/ttyUSB0
```

And finally connect with the QGIS live tracking tool.

15.2.7 Using BTGP-38KM datalogger (only Bluetooth)

Using GPSD (under Linux) or GPSGate (under Windows) is effortless.

15.2.8 Using BlueMax GPS-4044 datalogger (both BT and USB)

MS Windows

The live tracking works for both USB and BT modes, by using GPSGate or even without it, just use the *Autodetect* mode, or point the tool the right port.

Ubuntu/Mint GNU/Linux

For USB

The live tracking works both with GPSD

```
gpsd /dev/ttyACM3
```

or without it, by connecting the QGIS live tracking tool directly to the device (for example `/dev/ttyACM3`).

For Bluetooth

The live tracking works both with GPSD

```
gpsd /dev/rfcomm0
```

or without it, by connecting the QGIS live tracking tool directly to the device (for example `/dev/rfcomm0`).

.

Интеграция с GRASS GIS

The GRASS plugin provides access to GRASS GIS databases and functionalities (see GRASS-PROJECT in *Литература и ссылки на web-ресурсы*). This includes visualizing GRASS raster and vector layers, digitizing vector layers, editing vector attributes, creating new vector layers and analysing GRASS 2-D and 3-D data with more than 400 GRASS modules.

In this section, we'll introduce the plugin functionalities and give some examples of managing and working with GRASS data. The following main features are provided with the toolbar menu when you start the GRASS plugin, as described in section sec_starting_grass:

- Открыть набор
- Новый набор
- Закрыть набор
- Добавить векторный слой GRASS
- Добавить растровый слой GRASS
- Создать новый векторный слой GRASS
- Редактировать векторный слой GRASS
- Открыть инструменты GRASS
- Показать текущий регион GRASS
- Изменить текущий регион GRASS

16.1 Запуск расширения GRASS

To use GRASS functionalities and/or visualize GRASS vector and raster layers in QGIS, you must select and load the GRASS plugin with the Plugin Manager. Therefore, go to the menu *Plugins* → *Manage Plugins*, select *GRASS* and click **[OK]**.

You can now start loading raster and vector layers from an existing GRASS `LOCATION` (see section sec_load_grassdata). Or, you can create a new GRASS `LOCATION` with QGIS (see section *Создание новой области GRASS*) and import some raster and vector data (see section *Импорт данных в область GRASS*) for further analysis with the GRASS Toolbox (see section *The GRASS Toolbox*).

16.2 Загрузка растровых и векторных слоёв GRASS

With the GRASS plugin, you can load vector or raster layers using the appropriate button on the toolbar menu. As an example, we will use the QGIS Alaska dataset (see section *Примеры данных*). It includes a small sample GRASS LOCATION with three vector layers and one raster elevation map.

1. Create a new folder called grassdata, download the QGIS 'Alaska' dataset qgis_sample_data.zip from http://download.osgeo.org/qgis/data/ and unzip the file into grassdata.
2. Start QGIS.
3. If not already done in a previous QGIS session, load the GRASS plugin clicking on *Plugins* → *Manage Plugins* and activate *GRASS*. The GRASS toolbar appears in the QGIS main window.
4. "В панели GRASS нажмите на иконку Открыть набор для появления диалога с выбором набора.
5. For Gisdbase, browse and select or enter the path to the newly created folder grassdata.
6. Теперь в выпадающем списке *Район* должен появиться пункт alaska, а в списке *Набор* — пункт demo.
7. Нажмите **[OK]**. Обратите внимание, что некоторые ранее недоступные инструменты на панели GRASS теперь доступны.
8. Нажмите на кнопку Добавить растровый слой GRASS, выберите название слоя gtopo30 и нажмите кнопку **[OK]**. Будет отображена карта рельефа.
9. Click on Add GRASS vector layer, choose the map name alaska and click **[OK]**. The Alaska boundary vector layer will be overlayed on top of the gtopo30 map. You can now adapt the layer properties as described in chapter *Свойства векторного слоя* (e.g., change opacity, fill and outline color).
10. Also load the other two vector layers, rivers and airports, and adapt their properties.

As you see, it is very simple to load GRASS raster and vector layers in QGIS. See the following sections for editing GRASS data and creating a new LOCATION. More sample GRASS LOCATIONs are available at the GRASS website at http://grass.osgeo.org/download/sample-data/.

Совет: Подключение данных GRASS

If you have problems loading data or QGIS terminates abnormally, check to make sure you have loaded the GRASS plugin properly as described in section *Запуск расширения GRASS*.

16.3 Область и набор GRASS

GRASS data are stored in a directory referred to as GISDBASE. This directory, often called grassdata, must be created before you start working with the GRASS plugin in QGIS. Within this directory, the GRASS GIS data are organized by projects stored in subdirectories called LOCATIONs. Each LOCATION is defined by its coordinate system, map projection and geographical boundaries. Each LOCATION can have several MAPSETs (subdirectories of the LOCATION) that are used to subdivide the project into different topics or subregions, or as workspaces for individual team members (see Neteler & Mitasova 2008 in *Литература и ссылки на web-ресурсы*). In order to analyze vector and raster layers with GRASS modules, you must import them into a GRASS LOCATION. (This is not strictly true – with the GRASS modules r.external and v.external you can create read-only links to external GDAL/OGR-supported datasets without importing them. But because this is not the usual way for beginners to work with GRASS, this functionality will not be described here.)

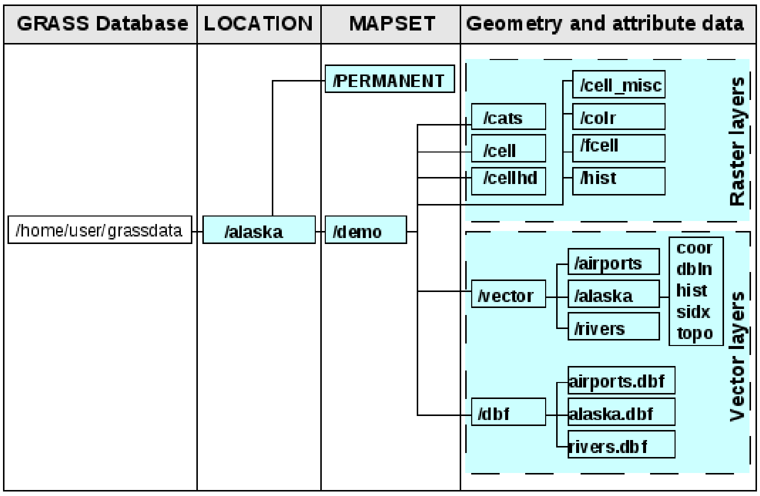

Рис. 16.1: Данные GRASS в районе «alaska»

16.3.1 Создание новой области GRASS

As an example, here is how the sample GRASS `LOCATION` `alaska`, which is projected in Albers Equal Area projection with unit feet was created for the QGIS sample dataset. This sample GRASS `LOCATION` `alaska` will be used for all examples and exercises in the following GRASS-related sections. It is useful to download and install the dataset on your computer (see *Примеры данных*).

1. Start QGIS and make sure the GRASS plugin is loaded.
2. Visualize the `alaska.shp` shapefile (see section *Добавление shape-файла к карте*) from the QGIS Alaska dataset (see *Примеры данных*).
3. На панели GRASS нажмите кнопку Новый набор для появления диалога с выбором `набора`.
4. Select an existing GRASS database (GISDBASE) folder `grassdata`, or create one for the new `LOCATION` using a file manager on your computer. Then click **[Next]**.
5. Можно использовать этот диалог для создания нового `набора` в существующей `области` (см. раздел *Добавление нового набора*) или для создания новой `области`. Выберите пункт *Создать новый район* (см. figure_grass_location_2).
6. Enter a name for the `LOCATION` – we used 'alaska' – and click **[Next]**.
7. Определите проекцию, выбрав пункт *Проекция* и включив список проекций.
8. We are using Albers Equal Area Alaska (feet) projection. Since we happen to know that it is represented by the EPSG ID 2964, we enter it in the search box. (Note: If you want to repeat this process for another `LOCATION` and projection and haven't memorized the EPSG ID, click on the CRS Status icon in the lower right-hand corner of the status bar (see section *Работа с проекциями*)).
9. In *Filter*, insert 2964 to select the projection.
10. Нажмите кнопку **[Next]**.
11. To define the default region, we have to enter the `LOCATION` bounds in the north, south, east, and west directions. Here, we simply click on the button **[Set current |qg| extent]**, to apply the extent of the loaded layer `alaska.shp` as the GRASS default region extent.
12. Нажмите кнопку **[Next]**.
13. We also need to define a `MAPSET` within our new `LOCATION` (this is necessary when creating a new `LOCATION`). You can name it whatever you like - we used 'demo'. GRASS automatically creates a special `MAPSET` called `PERMANENT`, designed to store the core data for the project, its default spatial

extent and coordinate system definitions (see Neteler & Mitasova 2008 in *Литература и ссылки на web-ресурсы*).

14. Проверьте общий вывод, чтобы быть уверенным в корректности введенного, и нажмите **[Finish]**.
15. The new `LOCATION`, 'alaska', and two `MAPSETs`, 'demo' and 'PERMANENT', are created. The currently opened working set is 'demo', as you defined.
16. Обратите внимание, что некоторые из инструментов на панели GRASS, которые раньше были отключены, теперь доступны.

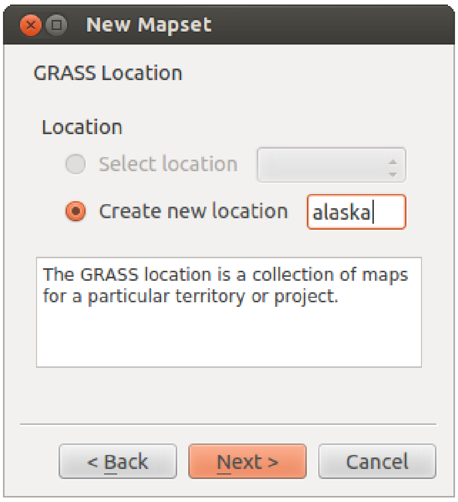

Рис. 16.2: Создание новой области GRASS или нового набора в QGIS

If that seemed like a lot of steps, it's really not all that bad and a very quick way to create a `LOCATION`. The `LOCATION` 'alaska' is now ready for data import (see section *Импорт данных в область GRASS*). You can also use the already-existing vector and raster data in the sample GRASS `LOCATION` 'alaska', included in the QGIS 'Alaska' dataset *Примеры данных*, and move on to section *Модель векторных данных GRASS*.

16.3.2 Добавление нового набора

A user has write access only to a GRASS `MAPSET` he or she created. This means that besides access to your own `MAPSET`, you can read maps in other users' `MAPSETs` (and they can read yours), but you can modify or remove only the maps in your own `MAPSET`.

All `MAPSETs` include a `WIND` file that stores the current boundary coordinate values and the currently selected raster resolution (see Neteler & Mitasova 2008 in *Литература и ссылки на web-ресурсы*, and section *Инструмент работы с регионом GRASS*).

1. Start QGIS and make sure the GRASS plugin is loaded.
2. На панели GRASS нажмите кнопку  Новый набор для появления диалога с выбором `набора`.
3. Select the GRASS database (GISDBASE) folder `grassdata` with the `LOCATION` 'alaska', where we want to add a further `MAPSET` called 'test'.
4. Нажмите кнопку **[Next]**.
5. Мы можем использовать этот диалог для создания нового `набора` в существующей `области` или для создания новой `области`. Выберите пункт  *Выбрать район* (см. figure_grass_location_2) и нажмите кнопку **[Next]**.
6. Enter the name `text` for the new `MAPSET`. Below in the wizard, you see a list of existing `MAPSETs` and corresponding owners.

7. Нажмите кнопку **[Next]**, проверьте общий вывод, чтобы быть уверенными в корректности введенного, и нажмите кнопку **[Finish]**.

16.4 Импорт данных в область GRASS

This section gives an example of how to import raster and vector data into the 'alaska' GRASS LOCATION provided by the QGIS 'Alaska' dataset. Therefore, we use the landcover raster map `landcover.img` and the vector GML file `lakes.gml` from the QGIS 'Alaska' dataset (see *Примеры данных*).

1. Start QGIS and make sure the GRASS plugin is loaded.
2. На панели GRASS нажмите кнопку Открыть набор для появления диалога с выбором `набора`.
3. Select as GRASS database the folder `grassdata` in the QGIS Alaska dataset, as LOCATION 'alaska', as MAPSET 'demo' and click **[OK]**.
4. Теперь нажмите кнопку Открыть инструменты GRASS. Появится окно инструментов GRASS (см. раздел *The GRASS Toolbox*).
5. To import the raster map `landcover.img`, click the module `r.in.gdal` in the *Modules Tree* tab. This GRASS module allows you to import GDAL-supported raster files into a GRASS LOCATION. The module dialog for `r.in.gdal` appears.
6. Browse to the folder `raster` in the QGIS 'Alaska' dataset and select the file `landcover.img`.
7. As raster output name, define `landcover_grass` and click **[Run]**. In the *Output* tab, you see the currently running GRASS command `r.in.gdal -o input=/path/to/landcover.img output=landcover_grass`.
8. When it says **Succesfully finished**, click **[View output]**. The `landcover_grass` raster layer is now imported into GRASS and will be visualized in the QGIS canvas.
9. To import the vector GML file `lakes.gml`, click the module `v.in.ogr` in the *Modules Tree* tab. This GRASS module allows you to import OGR-supported vector files into a GRASS LOCATION. The module dialog for `v.in.ogr` appears.
10. Browse to the folder `gml` in the QGIS 'Alaska' dataset and select the file `lakes.gml` as OGR file.
11. As vector output name, define `lakes_grass` and click **[Run]**. You don't have to care about the other options in this example. In the *Output* tab you see the currently running GRASS command `v.in.ogr -o dsn=/path/to/lakes.gml output=lakes\_grass`.
12. When it says **Succesfully finished**, click **[View output]**. The `lakes_grass` vector layer is now imported into GRASS and will be visualized in the QGIS canvas.

16.5 Модель векторных данных GRASS

Важно понять модель векторных данных GRASS до начала процесса оцифровки.

В общем виде, GRASS использует топологическую векторную модель.

Это означает, что площадные объекты представлены не замкнутыми полигонами, а одной или более границами. Граница между двумя смежными полигонами оцифровывается только один раз и является общей для обоих полигонов. Границы должны быть соединены без разрывов. Полигон определяется с помощью **центроида** внутри полигона.

Besides boundaries and centroids, a vector map can also contain points and lines. All these geometry elements can be mixed in one vector and will be represented in different so-called 'layers' inside one GRASS vector map. So in GRASS, a layer is not a vector or raster map but a level inside a vector layer. This is important to distinguish carefully. (Although it is possible to mix geometry elements, it is unusual and, even in GRASS, only used in special cases such as vector network analysis. Normally, you should prefer to store different geometry elements in different layers.)

It is possible to store several 'layers' in one vector dataset. For example, fields, forests and lakes can be stored in one vector. An adjacent forest and lake can share the same boundary, but they have separate attribute tables. It is also possible to attach attributes to boundaries. An example might be the case where the boundary between a lake and a forest is a road, so it can have a different attribute table.

The 'layer' of the feature is defined by the 'layer' inside GRASS. 'Layer' is the number which defines if there is more than one layer inside the dataset (e.g., if the geometry is forest or lake). For now, it can be only a number. In the future, GRASS will also support names as fields in the user interface.

Attributes can be stored inside the GRASS `LOCATION` as dBase or SQLite3 or in external database tables, for example, PostgreSQL, MySQL, Oracle, etc.

Атрибуты в таблицах баз данных соотносятся с геометрическими элементами с помощью значения «категорий».

«Категории» (ключ, ID) — это целые числа, присоединенные к геометрическим элементам, они используются как ссылка на ключевую колонку в базе данных.

Совет: Изучение модели векторных данных GRASS

Лучший способ изучить модель векторных данных GRASS и её возможности — скачать одно из пособий по GRASS, где модель векторных данных описана более подробно. Смотрите http://grass.osgeo.org/gdp/manuals.php для более подробной информации, книг и пособий на нескольких языках.

16.6 Создание нового векторного слоя GRASS

To create a new GRASS vector layer with the GRASS plugin, click the Create new GRASS vector toolbar icon. Enter a name in the text box, and you can start digitizing point, line or polygon geometries following the procedure described in section *Оцифровка и правка векторных слоёв GRASS*.

In GRASS, it is possible to organize all sorts of geometry types (point, line and area) in one layer, because GRASS uses a topological vector model, so you don't need to select the geometry type when creating a new GRASS vector. This is different from shapefile creation with QGIS, because shapefiles use the Simple Feature vector model (see section *Создание нового векторного слоя*).

Совет: Создание таблицы атрибутов для нового векторного слоя GRASS

Если вы хотите назначить атрибуты оцифрованным геометрическим объектам, убедитесь, что до начала оцифровки была создана таблица атрибутов с полями (см. рисунок figure_grass_digitizing_5).

16.7 Оцифровка и правка векторных слоёв GRASS

Средства оцифровки векторных слоёв GRASS доступны через кнопку Редактировать векторный слой GRASS на панели. Убедитесь, что векторный слой подгружен и он является выбранным слоем в легенде до того, как использовать инструменты правки. Рисунок figure_grass_digitizing_2 показывает диалог правки слоя GRASS, появляющийся при нажатии на кнопку редактирования. Инструменты и настройки обсуждаются в следующих разделах.

Совет: Оцифровка полигонов в GRASS

If you want to create a polygon in GRASS, you first digitize the boundary of the polygon, setting the mode to 'No category'. Then you add a centroid (label point) into the closed boundary, setting the mode to 'Next not used'. The reason for this is that a topological vector model links the attribute information of a polygon always to the centroid and not to the boundary.

Панель инструментов

In figure_grass_digitizing_1, you see the GRASS digitizing toolbar icons provided by the GRASS plugin. Table table_grass_digitizing_1 explains the available functionalities.

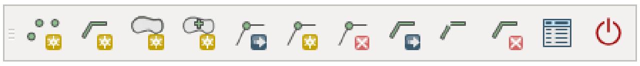

Рис. 16.3: Панель инструментов оцифровки GRASS

Иконка	Инструмент	Назначение
	Новая точка	Оцифровать новую точку
	Новая линия	Оцифровать новую линию (завершается выбором нового инструмента)
	Новая граница	Оцифровать новую границу (завершается выбором нового инструмента)
	Новый центроид	Оцифровать новый центроид (дать метку существующему полигону)
	Переместить вершину	Переместить одну вершину имеющейся линии или границы и определить новое положение
	Добавить вершину	Добавить новую вершину к существующей линии
	Удалить вершину	Удалить вершину из существующей линии (подтвердить выбор вершины ещё одним нажатием)
	Переместить элемент	Переместить выбранную границу, линию, точку или центроид на новую позицию и кликнуть в месте нового положения
	Разбить линию	Split an existing line into two parts
	Удалить элемент	Удалить существующую границу, линию, точку или центроид (подтвердить выбор элемента ещё одним нажатием)
	Изменить атрибуты	Изменить атрибуты выбранного элемента (заметьте, что один элемент может представлять много объектов, см. выше)
	Закрыть	Завершить сессию и сохранить текущий статус (с последующей перестройкой топологии)

Table GRASS Digitizing 1: Средства оцифровки GRASS

Вкладка «Категории»

Вкладка *Категории* позволяет определить способ присваивания значений категорий новым геометрическим элементам.

- **Mode**: The category value that will be applied to new geometry elements.
  - Next not used - Apply next not yet used category value to geometry element.
  - Manual entry - Manually define the category value for the geometry element in the 'Category' entry field.
  - No category - Do not apply a category value to the geometry element. This is used, for instance, for area boundaries, because the category values are connected via the centroid.

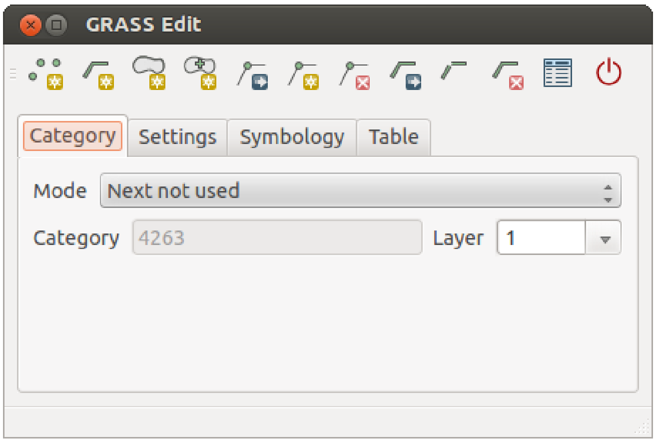

Рис. 16.4: Вкладка Категории в панели оцифровки GRASS

- **Category** - The number (ID) that is attached to each digitized geometry element. It is used to connect each geometry element with its attributes.
- **Field (layer)** - Each geometry element can be connected with several attribute tables using different GRASS geometry layers. The default layer number is 1.

Совет: Creating an additional GRASS 'layer' with |qg|

If you would like to add more layers to your dataset, just add a new number in the 'Field (layer)' entry box and press return. In the Table tab, you can create your new table connected to your new layer.

Вкладка «Параметры»

Вкладка *Параметры* позволяет задавать прилипание в пикселах экрана. Порог прилипания определяется тем, на каком расстоянии новые точки или конечные узлы линий должны быть «притянуты» к существующим узлам. Это помогает избегать разрывов и висячих узлов между границами. По умолчанию задан порог в 10 пикселов.

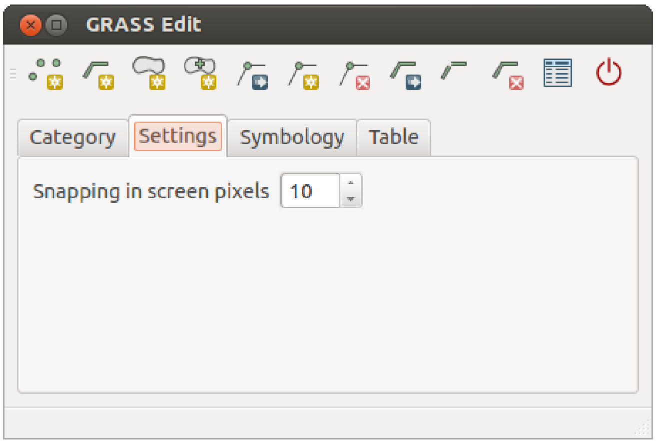

Рис. 16.5: Вкладка «Параметры» в панели оцифровки GRASS

Вкладка «Символика»

The *Symbology* tab allows you to view and set symbology and color settings for various geometry types and their topological status (e.g., closed / opened boundary).

Вкладка «Таблица»

The *Table* tab provides information about the database table for a given 'layer'. Here, you can add new columns to an existing attribute table, or create a new database table for a new GRASS vector layer

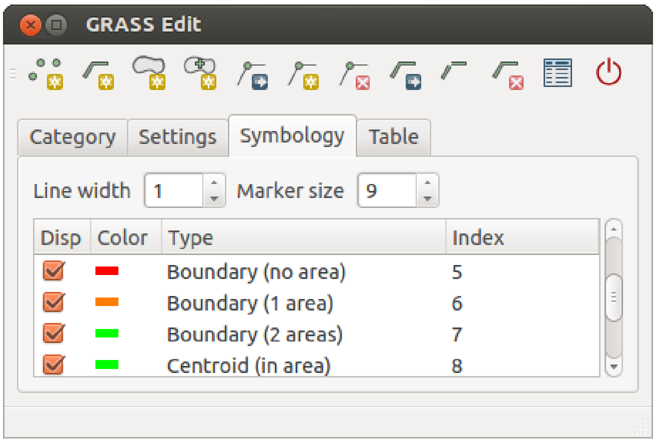

Рис. 16.6: GRASS Digitizing Symbology Tab

(see section *Создание нового векторного слоя GRASS*).

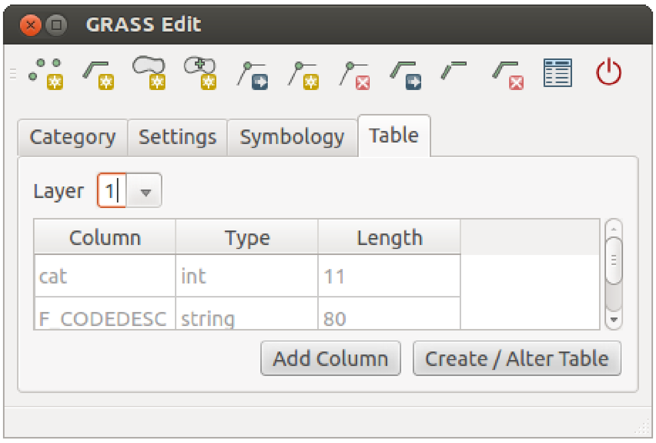

Рис. 16.7: Вкладка «Таблица» в панели оцифровки GRASS

Совет: Права редактирования GRASS

You must be the owner of the GRASS `MAPSET` you want to edit. It is impossible to edit data layers in a `MAPSET` that is not yours, even if you have write permission.

16.8 Инструмент работы с регионом GRASS

The region definition (setting a spatial working window) in GRASS is important for working with raster layers. Vector analysis is by default not limited to any defined region definitions. But all newly created rasters will have the spatial extension and resolution of the currently defined GRASS region, regardless of their original extension and resolution. The current GRASS region is stored in the `$LOCATION/$MAPSET/WIND` file, and it defines north, south, east and west bounds, number of columns and rows, horizontal and vertical spatial resolution.

It is possible to switch on and off the visualization of the GRASS region in the QGIS canvas using the Display current GRASS region button.

With the Edit current GRASS region icon, you can open a dialog to change the current region and the symbology of the GRASS region rectangle in the QGIS canvas. Type in the new region bounds and resolution, and click **[OK]**. The dialog also allows you to select a new region interactively with your mouse on the QGIS canvas. Therefore, click with the left mouse button in the QGIS canvas, open a rectangle, close it using the left mouse button again and click **[OK]**.

The GRASS module `g.region` provides a lot more parameters to define an appropriate region extent and resolution for your raster analysis. You can use these parameters with the GRASS Toolbox, described in section *The GRASS Toolbox*.

16.9 The GRASS Toolbox

The Open GRASS Tools box provides GRASS module functionalities to work with data inside a selected GRASS `LOCATION` and `MAPSET`. To use the GRASS Toolbox you need to open a `LOCATION` and `MAPSET` that you have write permission for (usually granted, if you created the `MAPSET`). This is necessary, because new raster or vector layers created during analysis need to be written to the currently selected `LOCATION` and `MAPSET`.

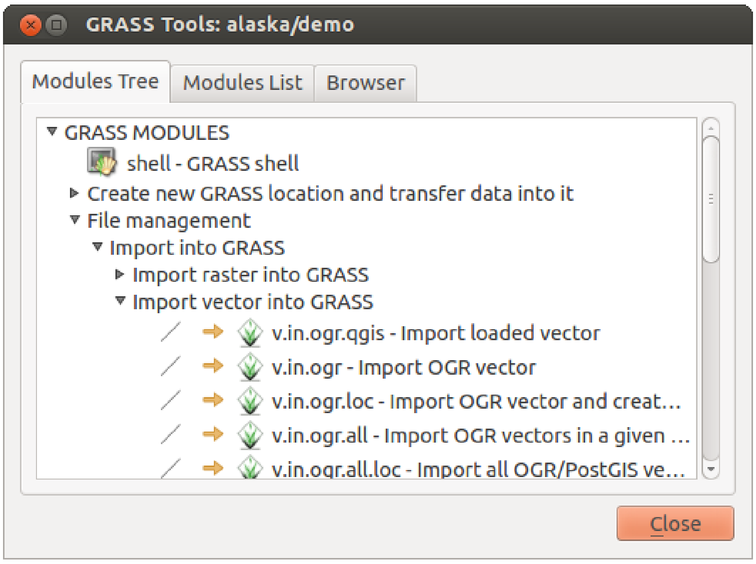

Рис. 16.8: Инструменты GRASS и дерево модулей

16.9.1 Работа с модулями GRASS

The GRASS shell inside the GRASS Toolbox provides access to almost all (more than 300) GRASS modules in a command line interface. To offer a more user-friendly working environment, about 200 of the available GRASS modules and functionalities are also provided by graphical dialogs within the GRASS plugin Toolbox.

A complete list of GRASS modules available in the graphical Toolbox in QGIS version 2.6 is available in the GRASS wiki at http://grass.osgeo.org/wiki/GRASS-QGIS_relevant_module_list.

It is also possible to customize the GRASS Toolbox content. This procedure is described in section *Настройка инструментов GRASS*.

As shown in figure_grass_toolbox_1, you can look for the appropriate GRASS module using the thematically grouped *Modules Tree* or the searchable *Modules List* tab.

By clicking on a graphical module icon, a new tab will be added to the Toolbox dialog, providing three new sub-tabs: *Options*, *Output* and *Manual*.

Параметры

The *Options* tab provides a simplified module dialog where you can usually select a raster or vector layer visualized in the QGIS canvas and enter further module-specific parameters to run the module.

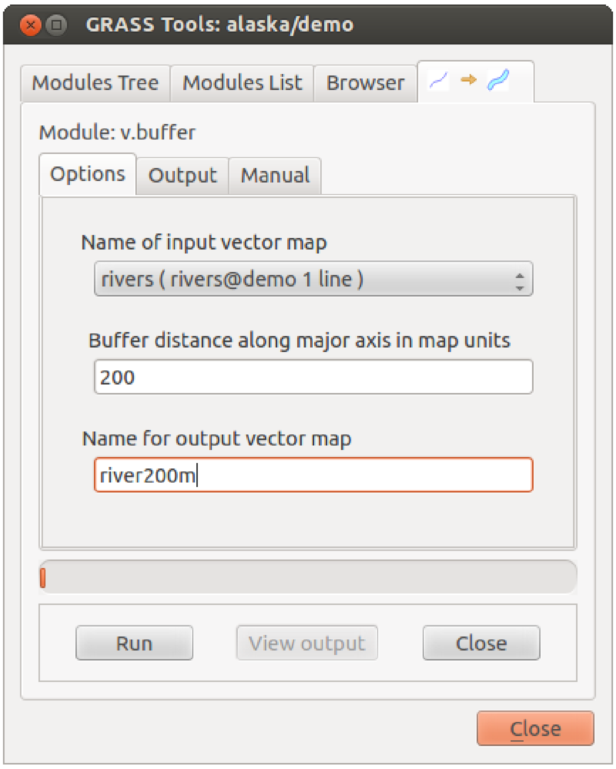

Рис. 16.9: Модули GRASS, вкладка «Параметры»

The provided module parameters are often not complete to keep the dialog clear. If you want to use further module parameters and flags, you need to start the GRASS shell and run the module in the command line.

A new feature since QGIS 1.8 is the support for a *Show Advanced Options* button below the simplified module dialog in the *Options* tab. At the moment, it is only added to the module `v.in.ascii` as an example of use, but it will probably be part of more or all modules in the GRASS Toolbox in future versions of QGIS. This allows you to use the complete GRASS module options without the need to switch to the GRASS shell.

Вывод

Вкладка *Вывод* предоставляет информацию о статусе вывода модуля. Когда вы нажимаете кнопку **[Запустить]**, модуль переключается во вкладку *Вывод* и вы можете видеть информацию о процессе анализа. Если все закончилось успешно, в конце вы увидите сообщение `Завершено успешно`.

Справка

The *Manual* tab shows the HTML help page of the GRASS module. You can use it to check further module parameters and flags or to get a deeper knowledge about the purpose of the module. At the end of each module manual page, you see further links to the `Main Help index`, the `Thematic index` and the `Full index`. These links provide the same information as the module `g.manual`.

Совет: Показать результат сразу

Если вы хотите отобразить результаты выших вычислений сразу же в окне карты, используйте кнопку **[Показать вывод]** внизу вкладки модуля.

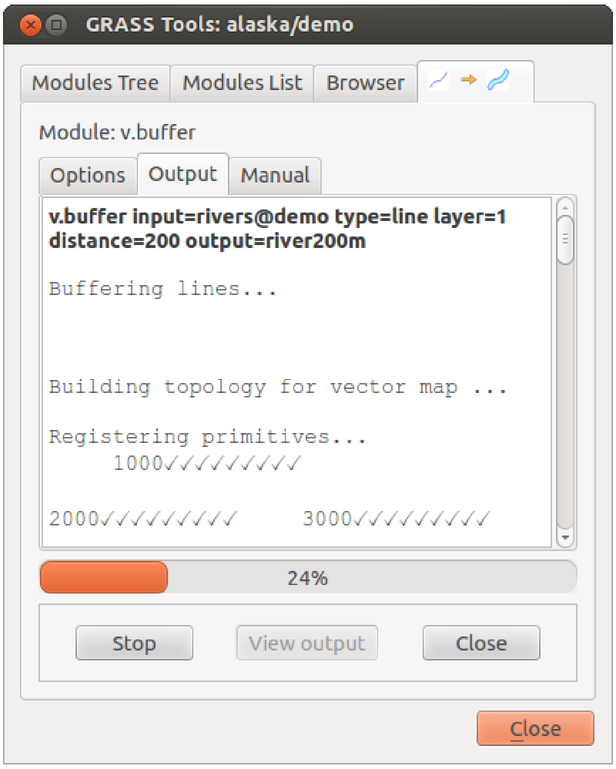

Рис. 16.10: Модули GRASS, вкладка «Вывод»

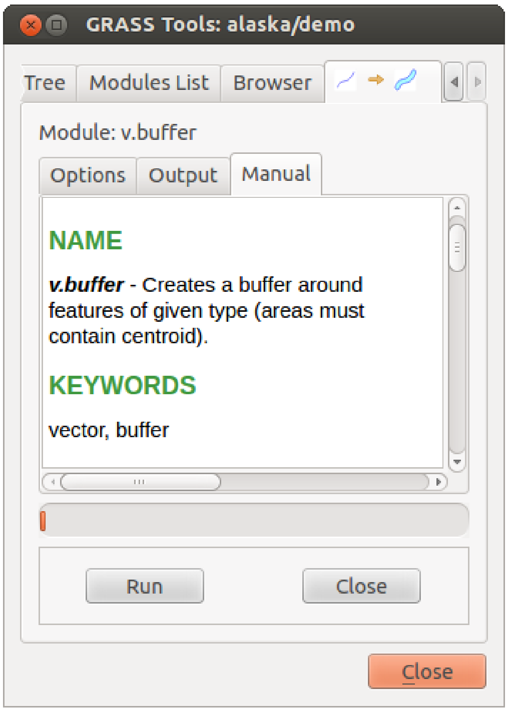

Рис. 16.11: Модули GRASS, вкладка «Справка»

16.9.2 Примеры модулей GRASS

Следующие примеры продемонстрируют применение некоторых из модулей GRASS.

Создание изолиний

The first example creates a vector contour map from an elevation raster (DEM). Here, it is assumed that you have the Alaska LOCATION set up as explained in section *Импорт данных в область GRASS*.

- First, open the location by clicking the Open mapset button and choosing the Alaska location.
- Теперь откройте карту рельефа gtopo30, нажав кнопку Добавить растровый слой GRASS и выбрав растр gtopo30 из набора demo.
- Теперь откройте панель инструментов с помощью кнопки Открыть инструменты GRASS.
- In the list of tool categories, double-click *Raster → Surface Management → Generate vector contour lines*.
- Now a single click on the tool **r.contour** will open the tool dialog as explained above (see *Работа с модулями GRASS*). The gtopo30 raster should appear as the *Name of input raster*.
- Напечатайте в *Шаг горизонталей* 1,00 значение 100 (тогда будут создаваться изолинии с интервалом в 100 метров).
- Введите в поле *Имя выходного векторного слоя* имя ctour_100.
- Нажмите кнопку **[Выполнить]** для начала процесса. Подождите некоторое время, пока в окне вывода не появится сообщение Успешное завершение. Тогда нажмите кнопку **[Открыть вывод]** и кнопку **[Закрыть]**.

Так как текущий регион довольно обширен, отображение на экране может занять какое-то время. После завершения отрисовки вы можете открыть окно свойств слоя, чтобы изменить цвет линии, так, чтобы изолинии были заметны на слое рельефа, как описано в разделе *Свойства векторного слоя*.

Next, zoom in to a small, mountainous area in the center of Alaska. Zooming in close, you will notice that the contours have sharp corners. GRASS offers the **v.generalize** tool to slightly alter vector maps while keeping their overall shape. The tool uses several different algorithms with different purposes. Some of the algorithms (i.e., Douglas Peuker and Vertex Reduction) simplify the line by removing some of the vertices. The resulting vector will load faster. This process is useful when you have a highly detailed vector, but you are creating a very small-scale map, so the detail is unnecessary.

Совет: Инструмент упрощения геометрии

Note that the QGIS fTools plugin has a *Simplify geometries →* tool that works just like the GRASS **v.generalize** Douglas-Peuker algorithm.

However, the purpose of this example is different. The contour lines created by r.contour have sharp angles that should be smoothed. Among the **v.generalize** algorithms, there is Chaiken's, which does just that (also Hermite splines). Be aware that these algorithms can **add** additional vertices to the vector, causing it to load even more slowly.

- Open the GRASS Toolbox and double-click the categories *Vector → Develop map → Generalization*, then click on the **v.generalize** module to open its options window.
- Проверьте, что в поле *Имя исходного векторного слоя* находится вектор ctour_100.
- From the list of algorithms, choose Chaiken's. Leave all other options at their default, and scroll down to the last row to enter in the field *Name for output vector map* 'ctour_100_smooth', and click **[Run]**.

- The process takes several moments. Once `Successfully finished` appears in the output windows, click **[View output]** and then **[Close]**.
- Вы можете изменить цвет векторных изолиний, чтобы четче отобразить их поверх растра и в контрасте с оригинальными изолиниями. Вы заметите, что новые изолинии имеют более гладкие края, чем оригинальные, оставаясь в целом исходной формы.

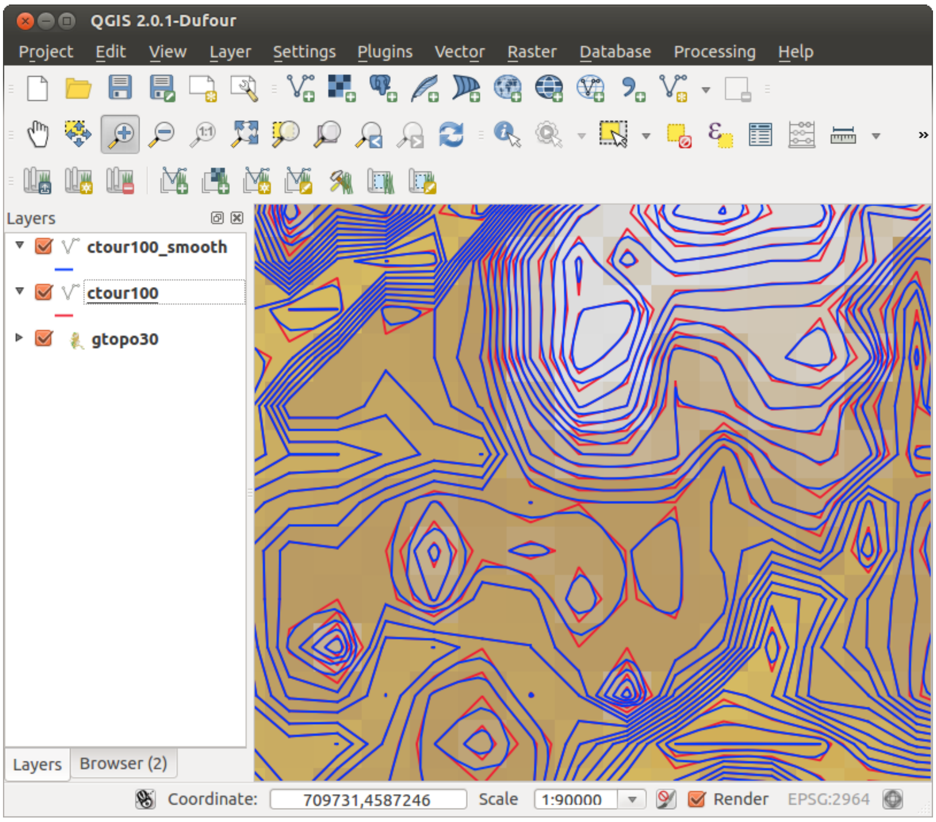

Рис. 16.12: Модуль GRASS v.generalize для сглаживания объектов векторного слоя

Совет: Другие применения модуля r.contour

The procedure described above can be used in other equivalent situations. If you have a raster map of precipitation data, for example, then the same method will be used to create a vector map of isohyetal (constant rainfall) lines.

Creating a Hillshade 3-D effect

Several methods are used to display elevation layers and give a 3-D effect to maps. The use of contour lines, as shown above, is one popular method often chosen to produce topographic maps. Another way to display a 3-D effect is by hillshading. The hillshade effect is created from a DEM (elevation) raster by first calculating the slope and aspect of each cell, then simulating the sun's position in the sky and giving a reflectance value to each cell. Thus, you get sun-facing slopes lighted; the slopes facing away from the sun (in shadow) are darkened.

- Begin this example by loading the `gtopo30` elevation raster. Start the GRASS Toolbox, and under the Raster category, double-click to open *Spatial analysis* → *Terrain analysis*.
- Затем выберите **r.shaded.relief**, чтобы открыть этот модуль.
- Измените значение поля *Азимут* 1,00 с 270 на 315.
- Введите `gtopo30_shade` в качестве имени нового растра теневой отмывки и нажмите **[Выполнить]**.

- Когда процесс закончится, добавьте растр отмывки на карту. Как вы видите, он отображается в серой цветовой шкале.
- To view both the hillshading and the colors of the `gtopo30` together, move the hillshade map below the `gtopo30` map in the table of contents, then open the *Properties* window of `gtopo30`, switch to the *Transparency* tab and set its transparency level to about 25%.

Вы должны получить слой рельефа `gtopo30` с его цветовой картой и заданной прозрачностью **поверх** слоя отмывки в серых тонах. Для того, чтобы оценить визуальный эффект теневой отмывки рельефа, отключите слой `gtopo30_shade`, затем опять верните его.

Использование оболочки GRASS

The GRASS plugin in QGIS is designed for users who are new to GRASS and not familiar with all the modules and options. As such, some modules in the Toolbox do not show all the options available, and some modules do not appear at all. The GRASS shell (or console) gives the user access to those additional GRASS modules that do not appear in the Toolbox tree, and also to some additional options to the modules that are in the Toolbox with the simplest default parameters. This example demonstrates the use of an additional option in the **r.shaded.relief** module that was shown above.

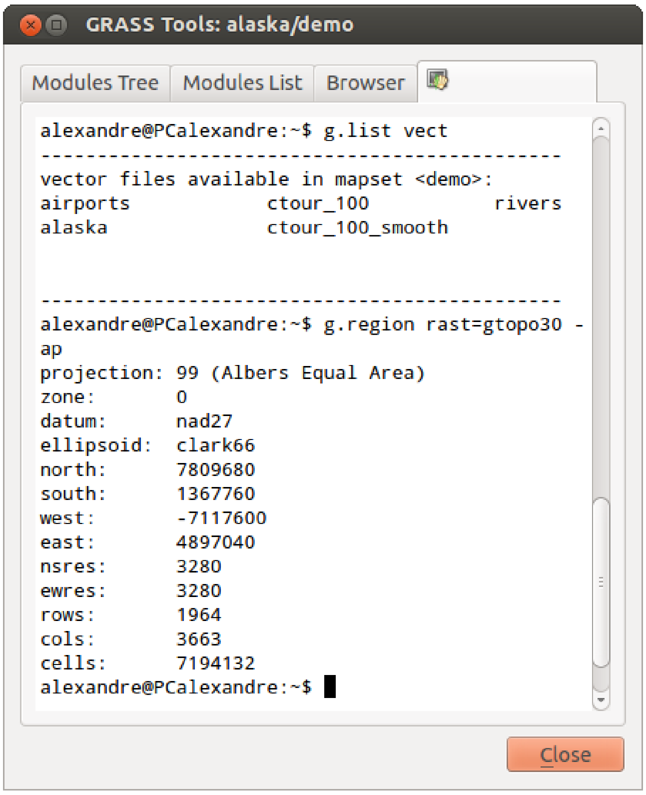

Рис. 16.13: Оболочка GRASS, модуль r.shaded.relief

The module **r.shaded.relief** can take a parameter `zmult`, which multiplies the elevation values relative to the X-Y coordinate units so that the hillshade effect is even more pronounced.

- Load the `gtopo30` elevation raster as above, then start the GRASS Toolbox and click on the GRASS shell. In the shell window, type the command `r.shaded.relief map=gtopo30 shade=gtopo30_shade2 azimuth=315 zmult=3` and press **[Enter]**.
- After the process finishes, shift to the *Browse* tab and double-click on the new `gtopo30_shade2` raster to display it in QGIS.
- As explained above, move the shaded relief raster below the `gtopo30` raster in the table of contents, then check the transparency of the colored `gtopo30` layer. You should see that the 3-D effect stands out more strongly compared with the first shaded relief map.

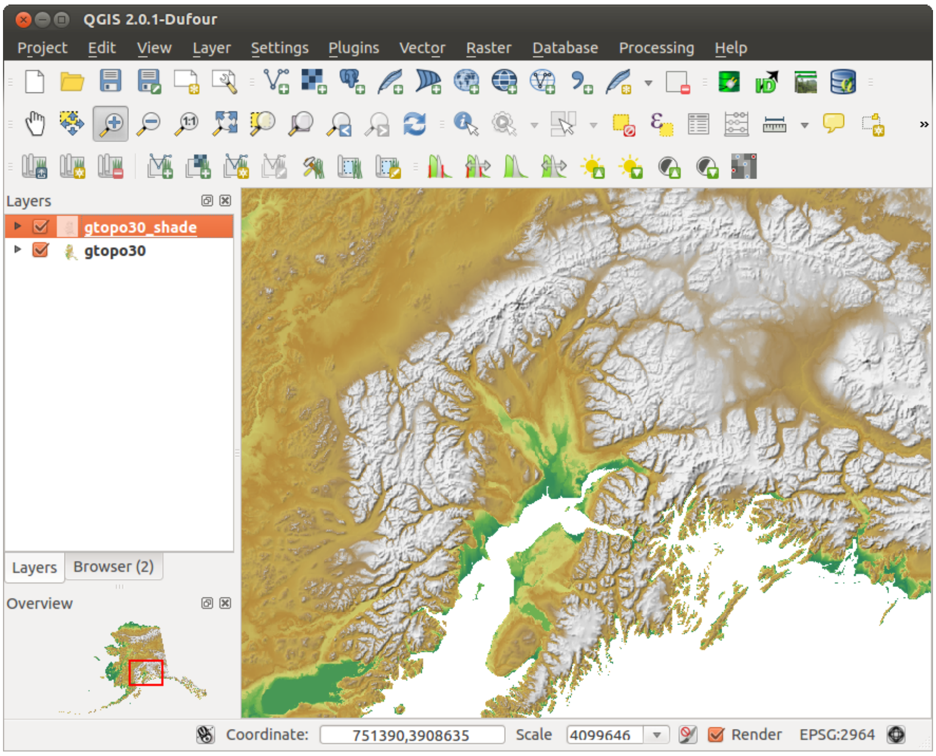

Рис. 16.14: Карта теневой отмывки рельефа, созданная с помощью модуля r.shaded.relief

Растровая статистика на векторной карте

Следующий пример показывает, как модуль GRASS может обрабатывать растровые данные и добавлять колонки статистики для каждого полигона в векторном слое.

- Снова используем данные набора данных Alaska, ссылаясь на *Импорт данных в область GRASS* для импорта shape-файла растительности из директории `shapefiles` в GRASS.
- Now an intermediate step is required: centroids must be added to the imported trees map to make it a complete GRASS area vector (including both boundaries and centroids).
- From the Toolbox, choose *Vector* → *Manage features*, and open the module **v.centroids**.
- Введите в поле *Имя выходного векторного слоя* имя `forest_areas` и запустите модуль.
- Now load the `forest_areas` vector and display the types of forests - deciduous, evergreen, mixed - in different colors: In the layer *Properties* window, *Symbology* tab, choose from *Legend type* ‘Unique value’ and set the *Classification field* to ‘VEGDESC’. (Refer to the explanation of the symbology tab in *Вкладка «Стиль»* of the vector section.)
- Next, reopen the GRASS Toolbox and open *Vector* → *Vector update* by other maps.
- Click on the **v.rast.stats** module. Enter `gtopo30` and `forest_areas`.
- Only one additional parameter is needed: Enter *column prefix* `elev`, and click **[Run]**. This is a computationally heavy operation, which will run for a long time (probably up to two hours).
- Finally, open the `forest_areas` attribute table, and verify that several new columns have been added, including `elev_min`, `elev_max`, `elev_mean`, etc., for each forest polygon.

16.9.3 Работа с браузером GRASS

Another useful feature inside the GRASS Toolbox is the GRASS `LOCATION` browser. In figure_grass_module_7, you can see the current working `LOCATION` with its `MAPSET`s.

In the left browser windows, you can browse through all `MAPSETs` inside the current `LOCATION`. The right browser window shows some meta-information for selected raster or vector layers (e.g., resolution, bounding box, data source, connected attribute table for vector data, and a command history).

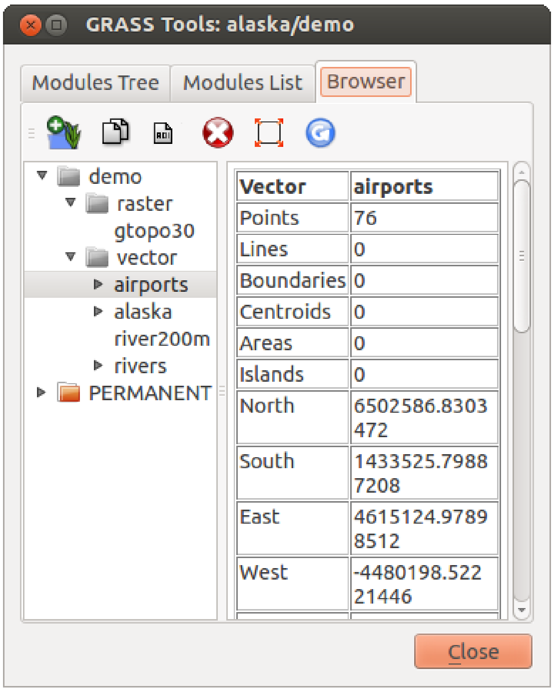

Рис. 16.15: Браузер GRASS

The toolbar inside the *Browser* tab offers the following tools to manage the selected `LOCATION`:

- *Добавить выбранную карту в область QGIS*
- *Копировать выбранную карту*
- *Переименовать выбранную карту*
- *Удалить выбранную карту*
- *Задать регион по границам выбранной карты*
- *Обновить*

Инструменты Переименовать выбранную карту и Удалить выбранную карту работают только с картами внутри текущего выбранного `набора`. Все остальные инструменты работают также с растровыми и векторными слоями в других `наборах`.

16.9.4 Настройка инструментов GRASS

Nearly all GRASS modules can be added to the GRASS Toolbox. An XML interface is provided to parse the pretty simple XML files that configure the modules' appearance and parameters inside the Toolbox.

Простой XML-файл для генерации модуля **v.buffer** (`v.buffer.qgm`) выглядит примерно так:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE qgisgrassmodule SYSTEM "http://mrcc.com/qgisgrassmodule.dtd">

<qgisgrassmodule label="Vector buffer" module="v.buffer">
        <option key="input" typeoption="type" layeroption="layer" />
```

```
        <option key="buffer"/>
        <option key="output" />
</qgisgrassmodule>
```

The parser reads this definition and creates a new tab inside the Toolbox when you select the module. A more detailed description for adding new modules, changing a module's group, etc., can be found on the QGIS wiki at http://hub.qgis.org/projects/quantum-gis/wiki/Adding_New_Tools_to_the_GRASS_Toolbox.

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Глава 17

Фреймвок геообработки QGIS

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17.1 Введение

This chapter introduces the QGIS processing framework, a geoprocessing environment that can be used to call native and third-party algorithms from QGIS, making your spatial analysis tasks more productive and easy to accomplish.

In the following sections, we will review how to use the graphical elements of this framework and make the most out of each one of them.

There are four basic elements in the framework GUI, which are used to run algorithms for different purposes. Choosing one tool or another will depend on the kind of analysis that is to be performed and the particular characteristics of each user and project. All of them (except for the batch processing interface, which is called from the toolbox, as we will see) can be accessed from the *Processing* menu item. (You will see more than four entries. The remaining ones are not used to execute algorithms and will be explained later in this chapter.)

- Панель инструментов. Является основным элементом графического интерфейса, позволяет выполнять как единичный алгоритм, так и запускать групповую обработку.

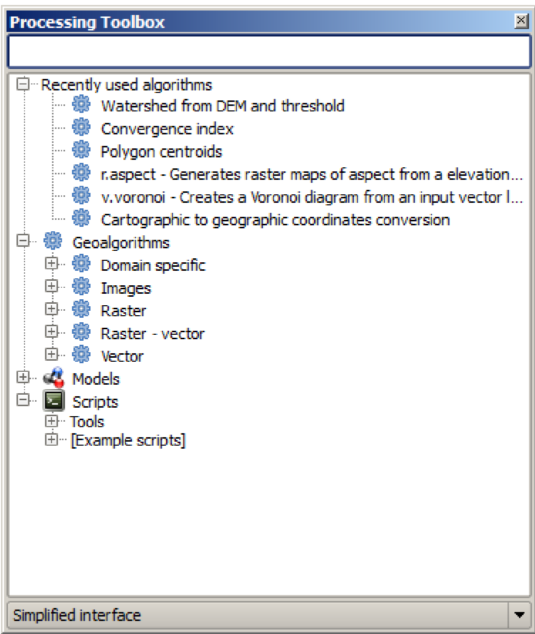

Рис. 17.1: Панель инструментов

- The graphical modeler. Several algorithms can be combined graphically using the modeler to define a workflow, creating a single process that involves several subprocesses.

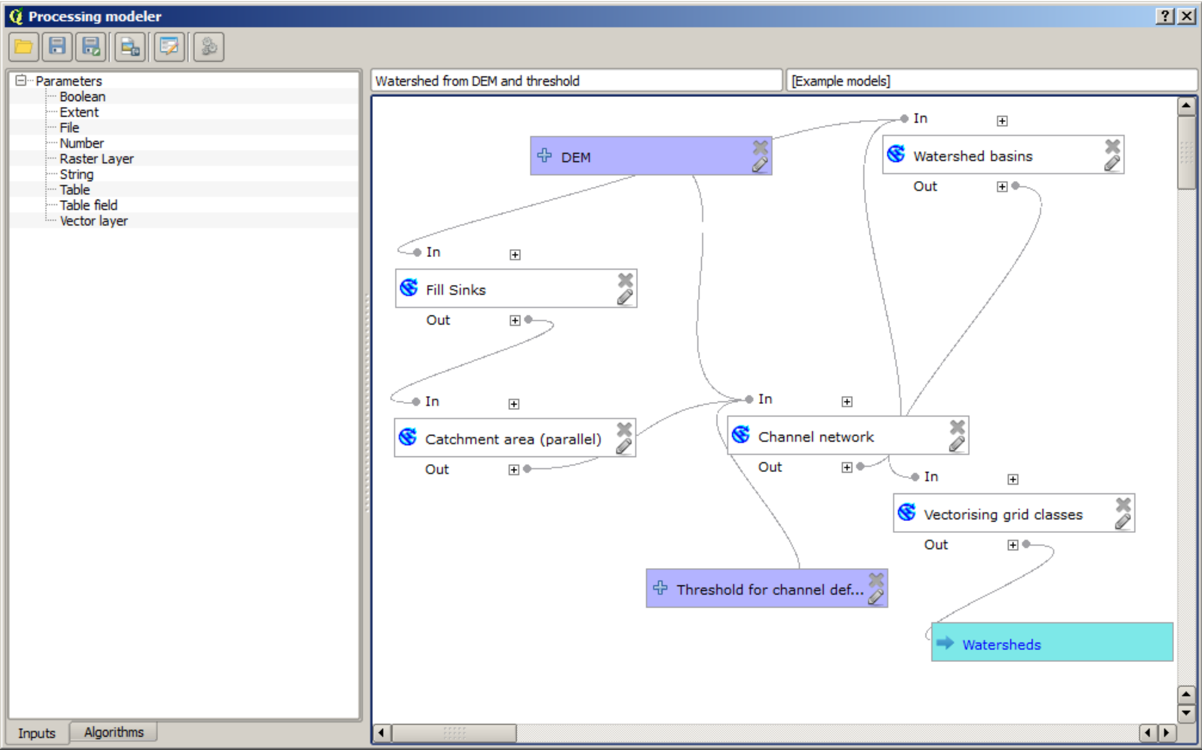

Рис. 17.2: Редактор моделей

- The history manager. All actions performed using any of the aforementioned elements are stored in a history file and can be later easily reproduced using the history manager.
- Интерфейс пакетной обработки. Позволяет применять один алгоритм к нескольким наборам данных одновременно.

In the following sections, we will review each one of these elements in detail.

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17.2 Панель инструментов

The *Toolbox* is the main element of the processing GUI, and the one that you are more likely to use in your daily work. It shows the list of all available algorithms grouped in different blocks, and it is the access point to run them, whether as a single process or as a batch process involving several executions of the same algorithm on different sets of inputs.

В панели инструментов отображаются все доступные алгоритмы, собранные в группы. Группы в свою очередь являются дочерними элементами узла *Geoalgorithms*.

Additionally, two more entries are found, namely *Models* and *Scripts*. These include user-created algorithms, and they allow you to define your own workflows and processing tasks. We will devote a full section to them a bit later.

In the upper part of the toolbox, you will find a text box. To reduce the number of algorithms shown in the toolbox and make it easier to find the one you need, you can enter any word or phrase on the text box. Notice that, as you type, the number of algorithms in the toolbox is reduced to just those that contain the text you have entered in their names.

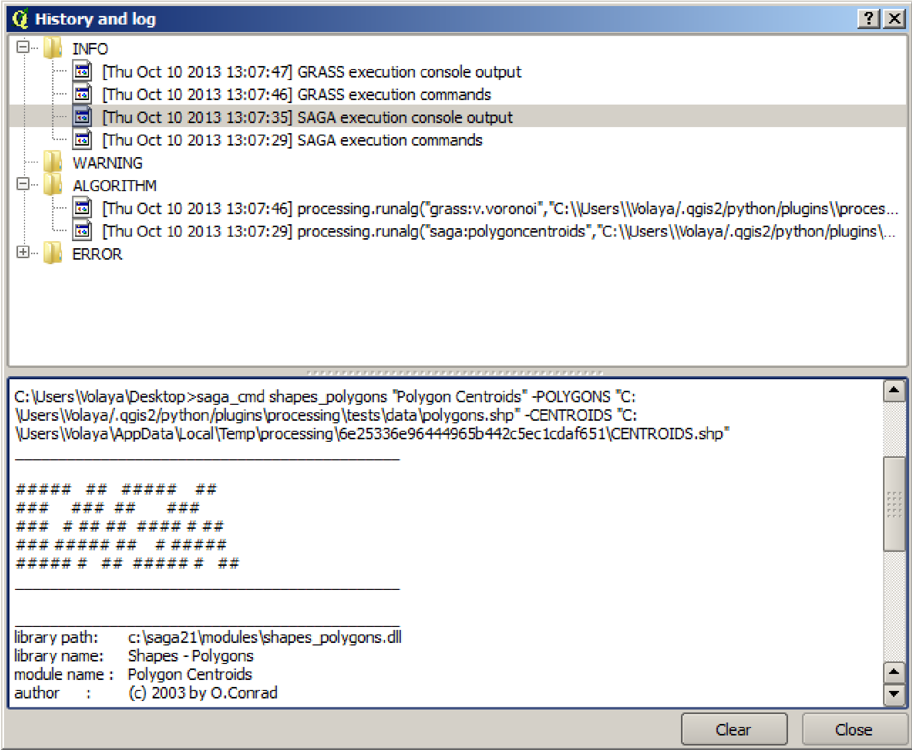

Рис. 17.3: Журнал

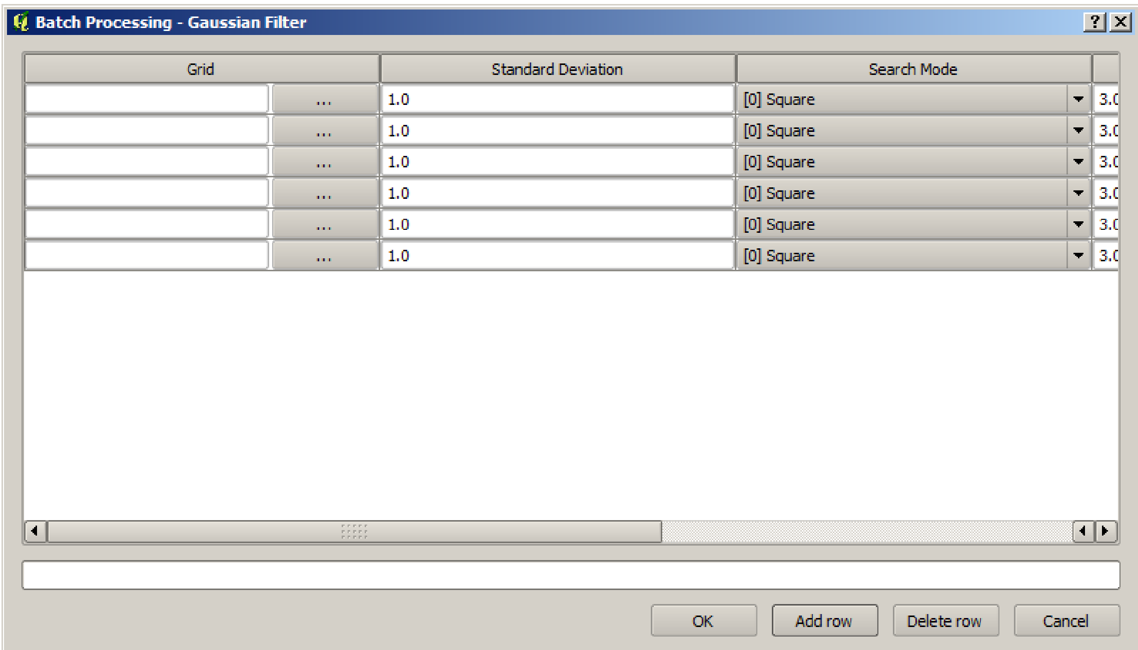

Рис. 17.4: Интерфейс групповой обработки

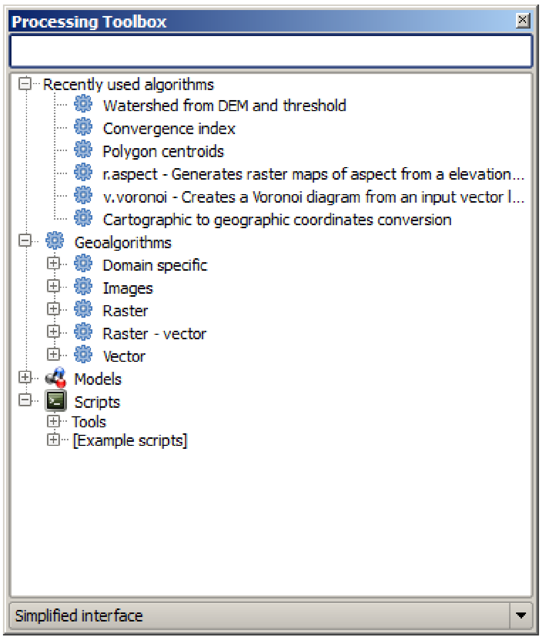

Рис. 17.5: Панель инструментов

In the lower part, you will find a box that allows you to switch between the simplified algorithm list (the one explained above) and the advanced list. If you change to the advanced mode, the toolbox will look like this:

In the advanced view, each group represents a so-called 'algorithm provider', which is a set of algorithms coming from the same source, for instance, from a third-party application with geoprocessing capabilities. Some of these groups represent algorithms from third-party applications like SAGA, GRASS or R, while others contain algorithms directly coded as part of the processing plugin, not relying on any additional software.

This view is recommended to those users who have a certain knowledge of the applications that are backing the algorithms, since they will be shown with their original names and groups.

Also, some additional algorithms are available only in the advanced view, such as LiDAR tools and scripts based on the R statistical computing software, among others. Independent QGIS plugins that add new algorithms to the toolbox will only be shown in the advanced view.

В частности, упрощённый вид содержит алгоритмы следующих провайдеров:

- GRASS
- SAGA
- OTB
- «Родные» алгоритмы QGIS

In the case of running QGIS under Windows, these algorithms are fully-functional in a fresh installation of QGIS, and they can be run without requiring any additional installation. Also, running them requires no prior knowledge of the external applications they use, making them more accesible for first-time users.

If you want to use an algorithm not provided by any of the above providers, switch to the advanced mode by selecting the corresponding option at the bottom of the toolbox.

Для запуска алгоритма необходимо выполнить двойной щелчок по его имени в панели инструментов.

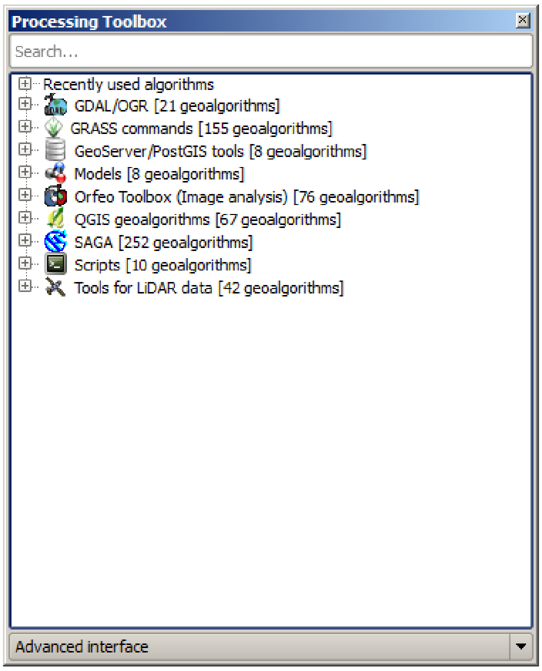

Рис. 17.6: Панель инструментов (расширенный режим)

17.2.1 Диалог алгоритма

Once you double-click on the name of the algorithm that you want to execute, a dialog similar to that in the figure below is shown (in this case, the dialog corresponds to the SAGA 'Convergence index' algorithm).

This dialog is used to set the input values that the algorithm needs to be executed. It shows a table where input values and configuration parameters are to be set. It of course has a different content, depending on the requirements of the algorithm to be executed, and is created automatically based on those requirements. On the left side, the name of the parameter is shown. On the right side, the value of the parameter can be set.

Although the number and type of parameters depend on the characteristics of the algorithm, the structure is similar for all of them. The parameters found in the table can be of one of the following types.

- A raster layer, to select from a list of all such layers available (currently opened) in QGIS. The selector contains as well a button on its right-hand side, to let you select filenames that represent layers currently not loaded in QGIS.
- A vector layer, to select from a list of all vector layers available in QGIS. Layers not loaded in QGIS can be selected as well, as in the case of raster layers, but only if the algorithm does not require a table field selected from the attributes table of the layer. In that case, only opened layers can be selected, since they need to be open so as to retrieve the list of field names available.

  Возле каждого поля выбора векторного слоя находится ещё одна кнопка, как показано на рисунке ниже.

If the algorithm contains several of them, you will be able to toggle just one of them. If the button corresponding to a vector input is toggled, the algorithm will be executed iteratively on each one of its features, instead of just once for the whole layer, producing as many outputs as times the algorithm is executed. This allows for automating the process when all features in a layer have to be processed separately.

- A table, to select from a list of all available in QGIS. Non-spatial tables are loaded into QGIS like vector layers, and in fact they are treated as such by the program. Currently, the list of available tables that you will see when executing an algorithm that needs one of them is restricted to tables coming from files in dBase (`.dbf`) or Comma-Separated Values (`.csv`) formats.

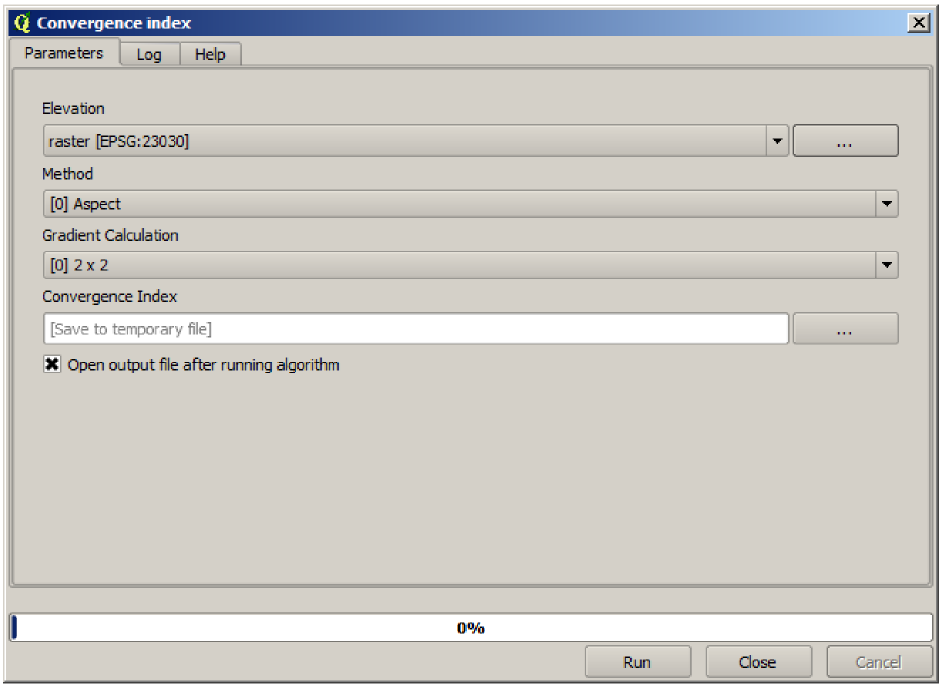

Рис. 17.7: Диалог алгоритма

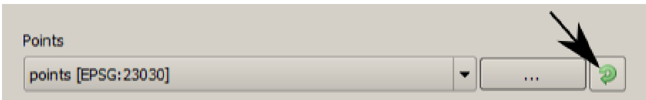

Рис. 17.8: Кнопка пообъектного выполнения

- Выбор — выпадающий список предустановленных значений, из которого необходимо выбрать одно.
- A numerical value, to be introduced in a text box. You will find a button by its side. Clicking on it, you will see a dialog that allows you to enter a mathematical expression, so you can use it as a handy calculator. Some useful variables related to data loaded into QGIS can be added to your expression, so you can select a value derived from any of these variables, such as the cell size of a layer or the northernmost coordinate of another one.
- Диапазон числовых значений — задаётся минимальным и максимальным значениями.
- Текст — строковая величина
- Имя поля атрибутивной таблицы — выбирается из списка полей таблицы или слоя, заданных другим параметром.
- A coordinate reference system. You can type the EPSG code directly in the text box, or select it from the CRS selection dialog that appears when you click on the button on the right-hand side.
- An extent, to be entered by four numbers representing its `xmin`, `xmax`, `ymin`, `ymax` limits. Clicking on the button on the right-hand side of the value selector, a pop-up menu will appear, giving you two options: to select the value from a layer or the current canvas extent, or to define it by dragging directly onto the map canvas.

  Если выбран первый вариант, появится следующий диалог.

  Если же выбран второй вариант, то диалог параметров будет скрыт, и вы сможете указать область на карте. После того, как область будет указана, диалог параметров отобразится, а поле охвата будет содержать значения, соответствующие указанной вами области.
- A list of elements (whether raster layers, vector layers or tables), to select from the list of such layers available in QGIS. To make the selection, click on the small button on the left side of the

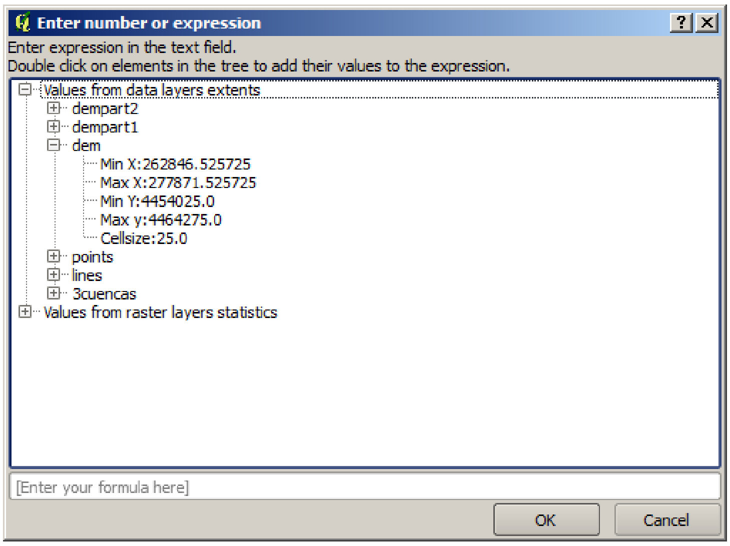

Рис. 17.9: Поле ввода чисел

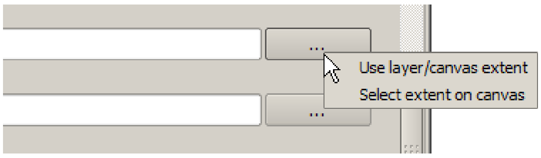

Рис. 17.10: Выбор охвата

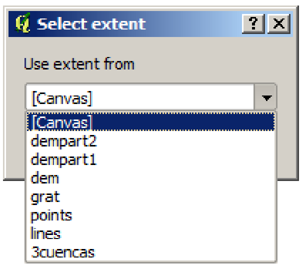

Рис. 17.11: Список охватов

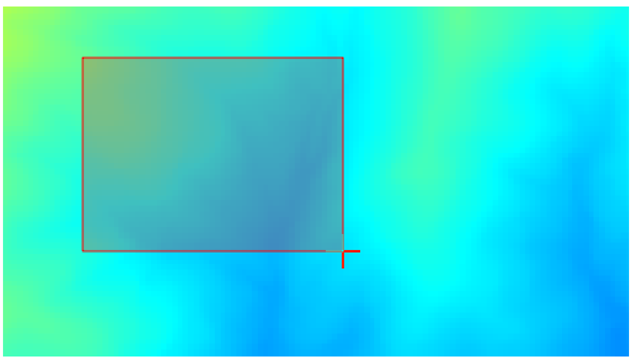

Рис. 17.12: Выделение области на карте

corresponding row to see a dialog like the following one.

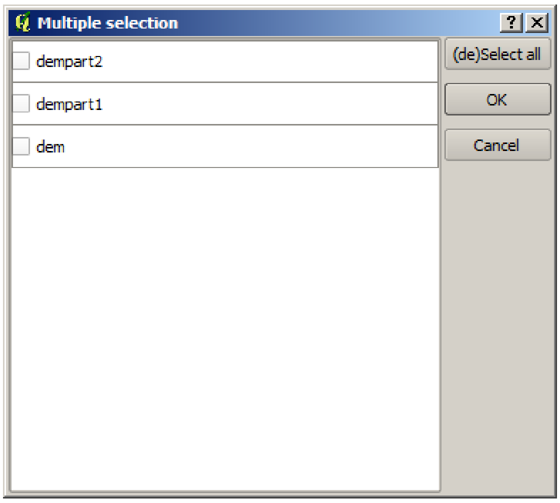

Рис. 17.13: Множественный выбор

- Пользовательская таблица — небольшая таблица, редактируемая пользователем (например, настройки скользящего окна для работы с растровыми данными).

  Для редактирования таблицы нажмите на кнопку справа от нее.

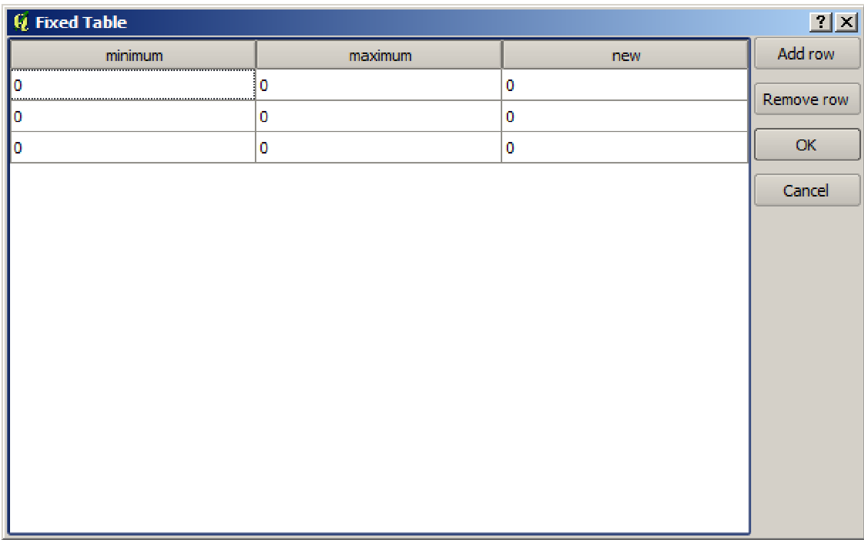

Рис. 17.14: Таблица

  Depending on the algorithm, the number of rows can be modified or not by using the buttons on the right side of the window.

You will find a **[Help]** tab in the the parameters dialog. If a help file is available, it will be shown, giving you more information about the algorithm and detailed descriptions of what each parameter does. Unfortunately, most algorithms lack good documentation, but if you feel like contributing to the project, this would be a good place to start.

Немного о проекциях

Algorithms run from the processing framework — this is also true of most of the external applications whose algorithms are exposed through it. Do not perform any reprojection on input layers and assume that all of them are already in a common coordinate system and ready to be analized. Whenever you use more than one layer as input to an algorithm, whether vector or raster, it is up to you to make sure that they are all in the same coordinate system.

Note that, due to QGIS‘s on-the-fly reprojecting capabilities, although two layers might seem to overlap and match, that might not be true if their original coordinates are used without reprojecting them onto a common coordinate system. That reprojection should be done manually, and then the resulting files should be used as input to the algorithm. Also, note that the reprojection process can be performed with the algorithms that are available in the processing framework itself.

By default, the parameters dialog will show a description of the CRS of each layer along with its name, making it easy to select layers that share the same CRS to be used as input layers. If you do not want to see this additional information, you can disable this functionality in the processing configuration dialog, unchecking the *Show CRS* option.

If you try to execute an algorithm using as input two or more layers with unmatching CRSs, a warning dialog will be shown.

Вы можете продолжить выполнение алгоритма, но необходимо понимать, что в большинстве случаев результат будет неправильным. Например, итоговые слои будут пустыми, т.к. исходные слои не пересекаются.

17.2.2 Данные, создаваёмые алгоритмами

В результате работы алгоритма могут быть созданы следующие виды данных:

- Растровый слой
- Векторный слой
- Таблица
- Файл HTML (используется для отображения текста и графики)

These are all saved to disk, and the parameters table will contain a text box corresponding to each one of these outputs, where you can type the output channel to use for saving it. An output channel contains the information needed to save the resulting object somewhere. In the most usual case, you will save it to a file, but the architecture allows for any other way of storing it. For instance, a vector layer can be stored in a database or even uploaded to a remote server using a WFS-T service. Although solutions like these are not yet implemented, the processing framework is prepared to handle them, and we expect to add new kinds of output channels in a near feature.

To select an output channel, just click on the button on the right side of the text box. That will open a save file dialog, where you can select the desired file path. Supported file extensions are shown in the file format selector of the dialog, depending on the kind of output and the algorithm.

The format of the output is defined by the filename extension. The supported formats depend on what is supported by the algorithm itself. To select a format, just select the corresponding file extension (or add it, if you are directly typing the file path instead). If the extension of the file path you entered does not match any of the supported formats, a default extension (usually `.dbf‘` for tables, `.tif` for raster layers and `.shp` for vector layers) will be appended to the file path, and the file format corresponding to that extension will be used to save the layer or table.

If you do not enter any filename, the result will be saved as a temporary file in the corresponding default file format, and it will be deleted once you exit QGIS (take care with that, in case you save your project and it contains temporary layers).

You can set a default folder for output data objects. Go to the configuration dialog (you can open it from the *Processing* menu), and in the *General* group, you will find a parameter named *Output folder*. This output folder is used as the default path in case you type just a filename with no path (i.e., `myfile.shp`) when executing an algorithm.

When running an algorithm that uses a vector layer in iterative mode, the entered file path is used as the base path for all generated files, which are named using the base name and appending a number representing the index of the iteration. The file extension (and format) is used for all such generated files.

Apart from raster layers and tables, algorithms also generate graphics and text as HTML files. These results are shown at the end of the algorithm execution in a new dialog. This dialog will keep the results produced by any algorithm during the current session, and can be shown at any time by selecting *Processing → Results viewer* from the QGIS main menu.

Some external applications might have files (with no particular extension restrictions) as output, but they do not belong to any of the categories above. Those output files will not be processed by QGIS (opened or included into the current QGIS project), since most of the time they correspond to file formats or elements not supported by QGIS. This is, for instance, the case with LAS files used for LiDAR data. The files get created, but you won't see anything new in your QGIS working session.

For all the other types of output, you will find a checkbox that you can use to tell the algorithm whether to load the file once it is generated by the algorithm or not. By default, all files are opened.

Optional outputs are not supported. That is, all outputs are created. However, you can uncheck the corresponding checkbox if you are not interested in a given output, which essentially makes it behave like an optional output (in other words, the layer is created anyway, but if you leave the text box empty, it will be saved to a temporary file and deleted once you exit QGIS).

17.2.3 Настройка платформы геообработки

As has been mentioned, the configuration menu gives access to a new dialog where you can configure how algorithms work. Configuration parameters are structured in separate blocks that you can select on the left-hand side of the dialog.

Наряду с уже упоминавшимся параметром *Output folder*, в группе *General* можно задать стили для отрисовки слоёв по умолчанию (т.е. для слоёв, созданных при помощи любого алгоритма платформы). Просто создайте необходимый стиль, сохраните его в файл, а затем укажите путь к этому файлу в настройках и алгоритмы станут использовать его. Каждый слой, добавляемый в проект алгоритмом будет отрисован с использованием указанного стиля.

Стили отрисовки могут настраиваться отдельно для каждого алгоритма и каждого выходного параметра. Вызовите контекстное меню, нажав правую кнопку мыши на алгоритме в панели инструментов и выберите *Edit rendering styles*. Откроется диалог похожий на этот.

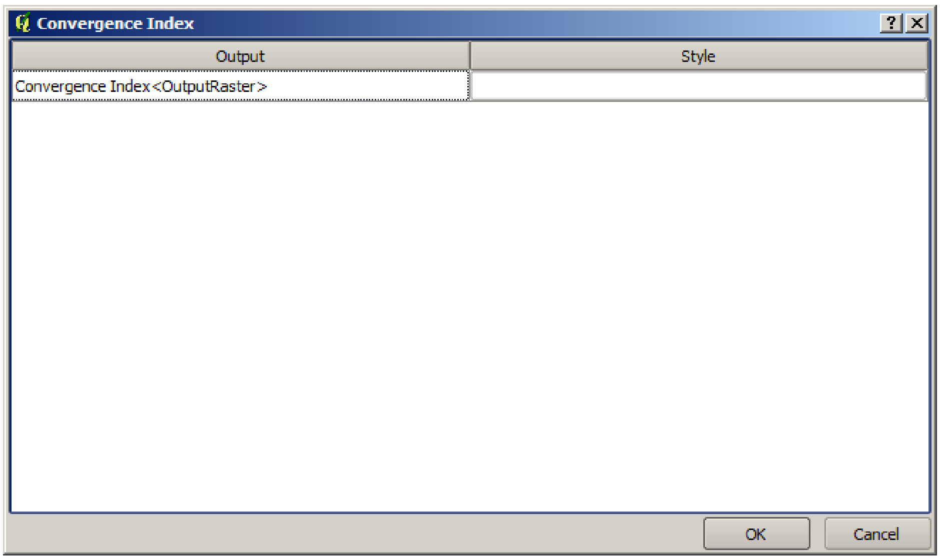

Рис. 17.15: Стили отрисовки

Укажите файл стиля `.qml` для каждого выходного файла и нажмите **[OK]**.

Other configuration parameters in the *General* group are listed below:

- *Use filename as layer name*. The name of each resulting layer created by an algorithm is defined by the algorithm itself. In some cases, a fixed name might be used, meaning that the same output name will be used, no matter which input layer is used. In other cases, the name might depend on the name of the input layer or some of the parameters used to run the algorithm. If this checkbox is checked, the name will be taken from the output filename instead. Notice that, if the output is saved to a temporary file, the filename of this temporary file is usually a long and meaningless one intended to avoid collision with other already existing filenames.
- *Use only selected features*. If this option is selected, whenever a vector layer is used as input for an algorithm, only its selected features will be used. If the layer has no selected features, all features will be used.
- *Pre-execution script file* and *Post-execution script file*. These parameters refer to scripts written using the processing scripting functionality, and are explained in the section covering scripting and the console.

Apart from the *General* block in the settings dialog, you will also find a block for algorithm providers. Each entry in this block contains an *Activate* item that you can use to make algorithms appear or not in the toolbox. Also, some algorithm providers have their own configuration items, which we will explain later when covering particular algorithm providers.

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17.3 Редактор моделей

The *graphical modeler* allows you to create complex models using a simple and easy-to-use interface. When working with a GIS, most analysis operations are not isolated, but rather part of a chain of operations instead. Using the graphical modeler, that chain of processes can be wrapped into a single process, so it is as easy and convenient to execute as a single process later on a different set of inputs. No matter how many steps and different algorithms it involves, a model is executed as a single algorithm, thus saving time and effort, especially for larger models.

Редактор моделей можно вызвать из меню *Анализ* → *Редактор моделей*

Окно построителя моделей состоит из двух частей: слева находится панель вкладок, в ней выбирают составные элементы модели (исходные данные и алгоритмы), справа — рабочая область, где и создаётся модель.

Создание модели условно можно разделить на два этапа:

1. *Definition of necessary inputs*. These inputs will be added to the parameters window, so the user can set their values when executing the model. The model itself is an algorithm, so the parameters window is generated automatically as it happens with all the algorithms available in the processing framework.
2. *Definition of the workflow*. Using the input data of the model, the workflow is defined by adding algorithms and selecting how they use those inputs or the outputs generated by other algorithms already in the model.

17.3.1 Определение исходных данных

Перед созданием модели нужно задать необходимые исходные данные. Все доступные исходные данные собраны в левой части окна построителя моделей, на вкладке *Исходные данные*:

- растровый слой (raster layer)
- векторный слой (vector layer)
- строка (string)
- поле таблицы (table field)

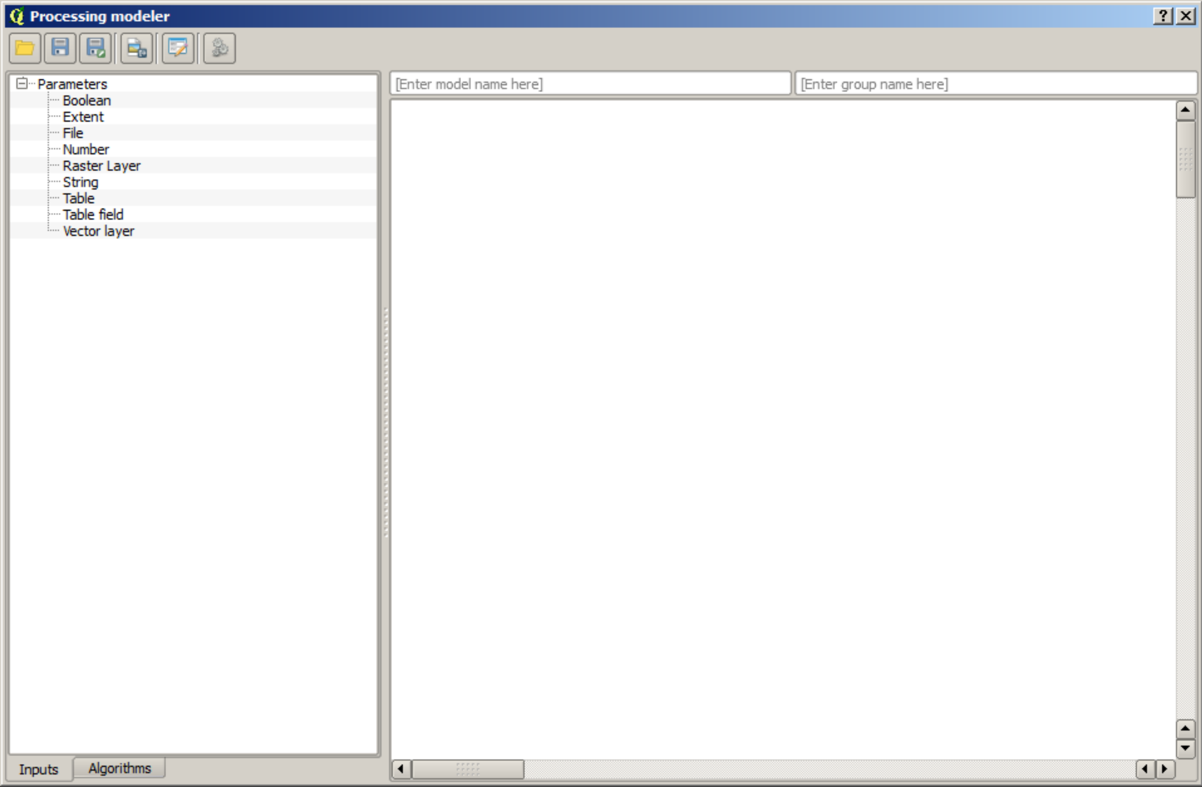

Рис. 17.16: Редактор моделей

- таблица (table)
- охват (extent)
- число (number)
- логическая величина (boolean)
- файл (file)

Double-clicking on any of these elements, a dialog is shown to define its characteristics. Depending on the parameter itself, the dialog may contain just one basic element (the description, which is what the user will see when executing the model) or more of them. For instance, when adding a numerical value, as can be seen in the next figure, apart from the description of the parameter, you have to set a default value and a range of valid values.

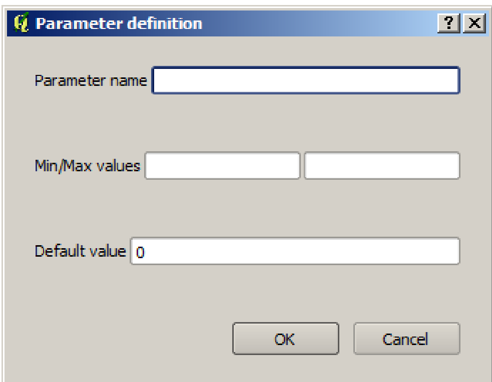

Рис. 17.17: Настройки модели

После заполнения полей, в рабочую область построения модели добавится новый блок, соответствующий новому элементу.

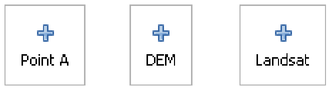

Рис. 17.18: Настройки модели

You can also add inputs by dragging the input type from the list and dropping it in the modeler canvas, in the position where you want to place it.

17.3.2 Описание процесса

После того, как заданы все исходные данные, можно приступать к описанию процесса анализа. Доступные алгоритмы находятся на вкладке *Algorithms* в левой части окна. Алгоритмы сгруппированы точно так же как и в панели инструментов.

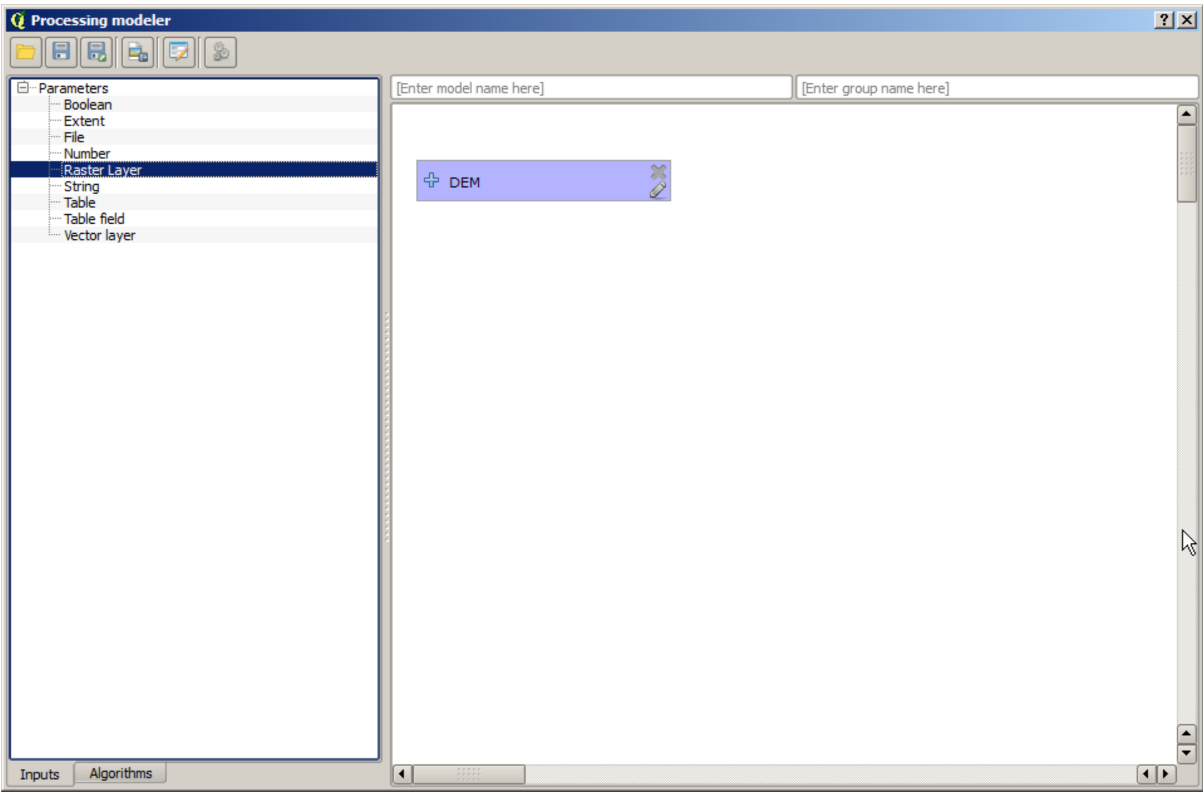

Рис. 17.19: Настройки модели

The appearance of the toolbox has two modes here as well: simplified and advanced. However, there is no element to switch between views in the modeler, so you have to do it in the toolbox. The mode that is selected in the toolbox is the one that will be used for the list of algorithms in the modeler.

To add an algorithm to a model, double-click on its name or drag and drop it, just like it was done when adding inputs. An execution dialog will appear, with a content similar to the one found in the execution panel that is shown when executing the algorithm from the toolbox. The one shown next corresponds to the SAGA 'Convergence index' algorithm, the same example we saw in the section dedicated to the toolbox.

As you can see, some differences exist. Instead of the file output box that was used to set the file path for output layers and tables, a simple text box is used here. If the layer generated by the algorithm is

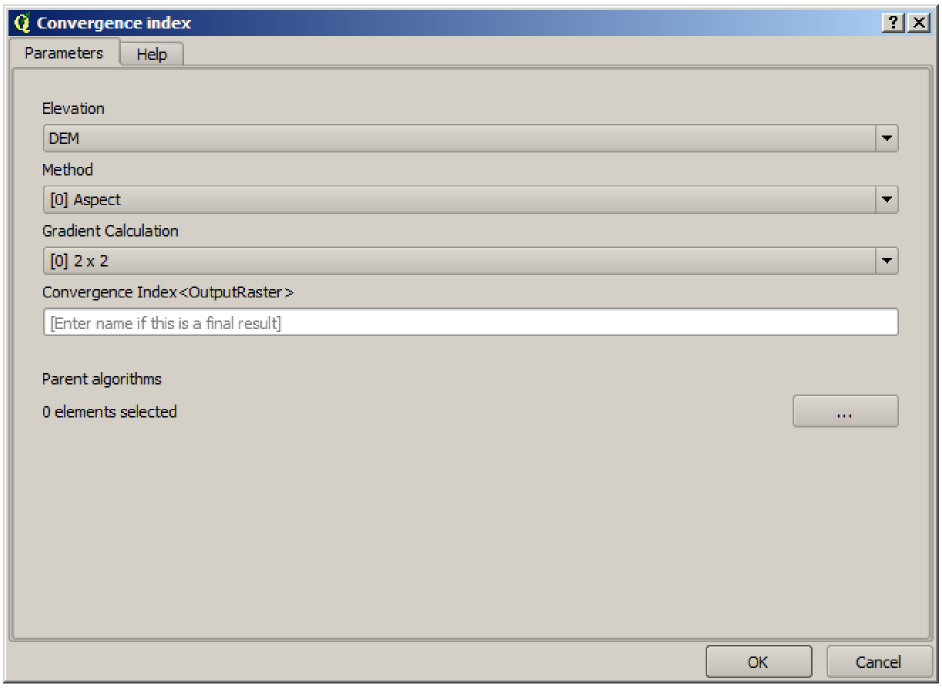

Рис. 17.20: Настройки модели

just a temporary result that will be used as the input of another algorithm and should not be kept as a final result, just do not edit that text box. Typing anything in it means that the result is final and the text that you supply will be the description for the output, which will be the output the user will see when executing the model.

Selecting the value of each parameter is also a bit different, since there are important differences between the context of the modeler and that of the toolbox. Let's see how to introduce the values for each type of parameter.

- Layers (raster and vector) and tables. These are selected from a list, but in this case, the possible values are not the layers or tables currently loaded in QGIS, but the list of model inputs of the corresponding type, or other layers or tables generated by algorithms already added to the model.
- Numerical values. Literal values can be introduced directly in the text box. But this text box is also a list that can be used to select any of the numerical value inputs of the model. In this case, the parameter will take the value introduced by the user when executing the model.
- String. As in the case of numerical values, literal strings can be typed, or an input string can be selected.
- Table field. The fields of the parent table or layer cannot be known at design time, since they depend on the selection of the user each time the model is executed. To set the value for this parameter, type the name of a field directly in the text box, or use the list to select a table field input already added to the model. The validity of the selected field will be checked at run time.

In all cases, you will find an additional parameter named *Parent algorithms* that is not available when calling the algorithm from the toolbox. This parameter allows you to define the order in which algorithms are executed by explicitly defining one algorithm as a parent of the current one, which will force the parent algorithm to be executed before the current one.

When you use the output of a previous algorithm as the input of your algorithm, that implicitly sets the previous algorithm as parent of the current one (and places the corresponding arrow in the modeler canvas). However, in some cases an algorithm might depend on another one even if it does not use any output object from it (for instance, an algorithm that executes an SQL sentence on a PostGIS database and another one that imports a layer into that same database). In that case, just select the previous algorithm in the *Parent algorithms* parameter and the two steps will be executed in the correct order.

Once all the parameters have been assigned valid values, click on **[OK]** and the algorithm will be added to the canvas. It will be linked to all the other elements in the canvas, whether algorithms or inputs, that provide objects that are used as inputs for that algorithm.

Elements can be dragged to a different position within the canvas, to change the way the module structure is displayed and make it more clear and intuitive. Links between elements are updated automatically. You can zoom in and out by using the mouse wheel.

You can run your algorithm anytime by clicking on the **[Run]** button. However, in order to use the algorithm from the toolbox, it has to be saved and the modeler dialog closed, to allow the toolbox to refresh its contents.

17.3.3 Сохранение и загрузка модели

Use the **[Save]** button to save the current model and the **[Open]** button to open any model previously saved. Models are saved with the `.model` extension. If the model has been previously saved from the modeler window, you will not be prompted for a filename. Since there is already a file associated with that model, the same file will be used for any subsequent saves.

Прежде чем сохранять модель, ей надо дать имя и указать в какой группе она будет находиться. Эти данные вносятся в два поля над рабочей областью построителя моделей.

Models saved on the `models` folder (the default folder when you are prompted for a filename to save the model) will appear in the toolbox in the corresponding branch. When the toolbox is invoked, it searches the `models` folder for files with the `.model` extension and loads the models they contain. Since a model is itself an algorithm, it can be added to the toolbox just like any other algorithm.

Расположение каталога моделей, при желании путь можно изменить в настройках в группе *Modeler*.

Модели, загруженные из каталога `models` появляются не только в панели инструментов, но и в списке алгоритмов вкладки *Алгоритмы* редактора моделей. Это значит, что модель может использоваться внутри более крупной модели, как любой другой алгоритм.

In some cases, a model might not be loaded because not all the algorithms included in its workflow are available. If you have used a given algorithm as part of your model, it should be available (that is, it should appear in the toolbox) in order to load that model. Deactivating an algorithm provider in the processing configuration window renders all the algorithms in that provider unusable by the modeler, which might cause problems when loading models. Keep that in mind when you have trouble loading or executing models.

17.3.4 Редактирование модели

Текущую модель можно редактировать, изменяя описание процесса и меняя связи между алгоритмами и исходными данными, описающими модель.

Нажатие правой клавиши мыши на блоке алгоритма вызовет следующее контекстное меню:

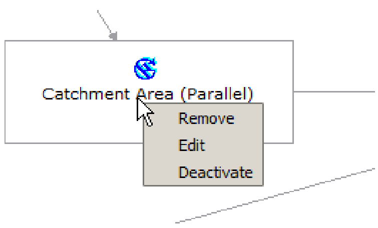

Рис. 17.21: Контекстное меню при создании модели

Выбор пункта *Remove* приведет к удалению выделенного блока алгоритма. Необходимо помнить, что алгоритм может быть удален тогда и только тогда, когда нет других, зависящих от него,

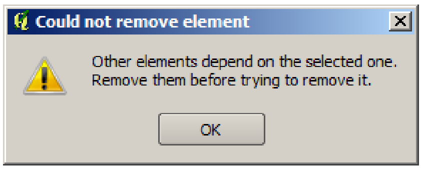

Рис. 17.22: Ошибка удаления алгоритма

алгоритмов. Т.е. результаты удаляемого алгоритма нигде не используются. Если вы попытаетесь удалить алгоритм, от которого зависят другие алгоритмы, появится предупреждение:

Пункт *Edit* или просто двойной щелчок по блоку алгоритма откроют диалог настройки параметров, где можно изменить исходные данные и значения параметров. В этом случае в качестве доступных исходных данных будут отображены не все имеющиеся в модели данные. Слои и значения, созданные на более поздних этапах процесса будут недоступны, если они приводят к циклическим зависимостям.

Выберите новые значения и нажмите кнопку **[OK]**. Связи между элементами модели будут соответствующим образом обновлены.

17.3.5 Документирование моделей

Созданные модели можно документировать. Для этого нажмите на кнопку **[Edit model help]**, откроется диалог редактирования описания модели.

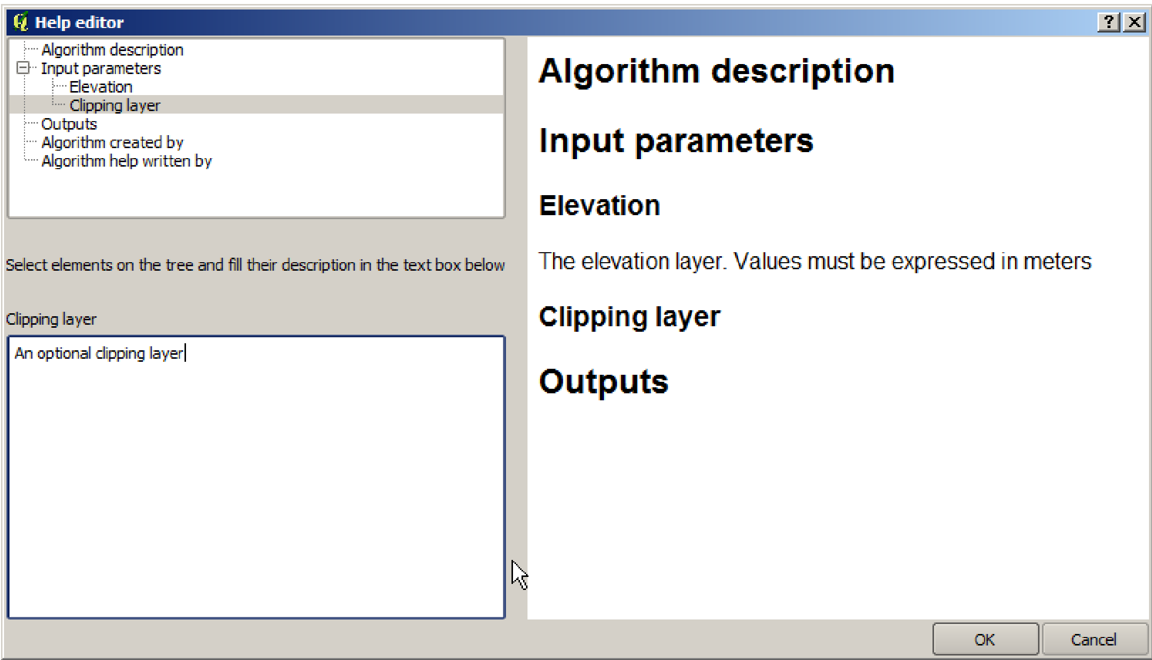

Рис. 17.23: Редактирование описания модели

On the right-hand side, you will see a simple HTML page, created using the description of the input parameters and outputs of the algorithm, along with some additional items like a general description of the model or its author. The first time you open the help editor, all these descriptions are empty, but you can edit them using the elements on the left-hand side of the dialog. Select an element on the upper part and then write its description in the text box below.

Описание модели сохраняется в тот же каталог, что и сама модель, автоматически при сохранении модели.

17.3.6 Немного о доступных алгоритмах

You might notice that some algorithms that can be be executed from the toolbox do not appear in the list of available algorithms when you are designing a model. To be included in a model, an algorithm must have a correct semantic, so as to be properly linked to others in the workflow. If an algorithm does not have such a well-defined semantic (for instance, if the number of output layers cannot be known in advance), then it is not possible to use it within a model, and thus, it does not appear in the list of algorithms that you can find in the modeler dialog.

Additionally, you will see some algorithms in the modeler that are not found in the toolbox. These algorithms are meant to be used exclusively as part of a model, and they are of no interest in a different context. The 'Calculator' algorithm is an example of that. It is just a simple arithmetic calculator that you can use to modify numerical values (entered by the user or generated by some other algorithm). This tool is really useful within a model, but outside of that context, it doesn't make too much sense.

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17.4 Интерфейс пакетной обработки

17.4.1 Введение

All algorithms (including models) can be executed as a batch process. That is, they can be executed using not just a single set of inputs, but several of them, executing the algorithm as many times as needed. This is useful when processing large amounts of data, since it is not necessary to launch the algorithm many times from the toolbox.

Чтобы запустить алгоритм в режиме пакетной обработки выделите его в панели инструментов, вызовите контекстное меню и выберите пункт *Execute as batch process*.

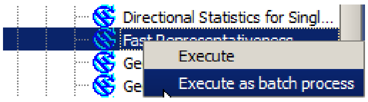

Рис. 17.24: Запуск пакетной обработки из констекстного меню

17.4.2 Таблица параметров

Запуск пакетной обработки во многом схож с выполнением единичной операции. Отличие лишь в том, что параметры теперь задаются для каждой итерации обработки. Диалог настройки в этом случае принимает вид таблицы.

Каждая строка таблицы соответствует одному запуску алгоритма, в ячейках находятся параметры. Это похоже на обычный диалог настройки алгоритмов, только используется другое расположение элементов.

По умолчанию в таблице три строки, при необходимости добавить или удалить строки можно при помощи кнопок внизу окна.

После того, как размер таблицы (число строк в ней) задан, можно приступать к её заполнению.

17.4.3 Заполнение таблицы параметров

For most parameters, setting the value is trivial. Just type the value or select it from the list of available options, depending on the parameter type.

The main differences are found for parameters representing layers or tables, and for output file paths. Regarding input layers and tables, when an algorithm is executed as part of a batch process, those input

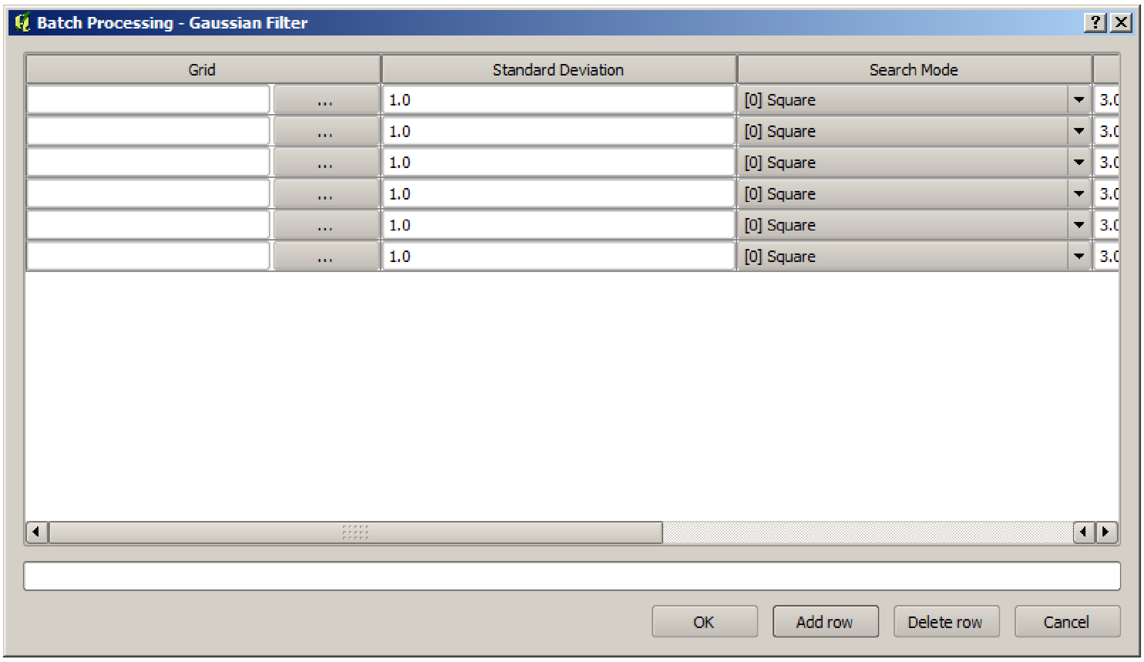

Рис. 17.25: Пакетная обработка

data objects are taken directly from files, and not from the set of them already opened in QGIS. For this reason, any algorithm can be executed as a batch process, even if no data objects at all are opened and the algorithm cannot be run from the toolbox.

Filenames for input data objects are introduced directly typing or, more conveniently, clicking on the ... button on the right hand of the cell, which shows a typical file chooser dialog. Multiple files can be selected at once. If the input parameter represents a single data object and several files are selected, each one of them will be put in a separate row, adding new ones if needed. If the parameter represents a multiple input, all the selected files will be added to a single cell, separated by semicolons (;).

Output data objects are always saved to a file and, unlike when executing an algorithm from the toolbox, saving to a temporary file is not permitted. You can type the name directly or use the file chooser dialog that appears when clicking on the accompanying button.

После выбора выходного файла появится ещё один диалог, позволяющий автоматически заполнить остальные ячейки.

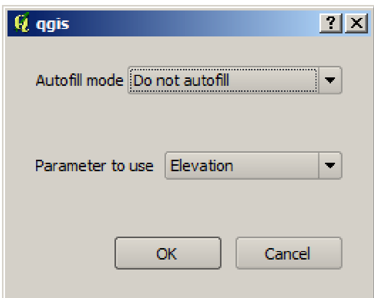

Рис. 17.26: Диалог автозаполнения

Если выбрано значение *Do not autofill* (по умолчанию), в заданную ячейку будет просто вставлено выбранное имя файла. Если же выбрано любое другое значение, будут заполнены все ячейки. При этом имена файлов будут сформированы на основе указаного критерия автозаполнения. Такой подход значительно ускоряет заполнение таблицы параметров пакетной обработки.

Automatic filling can be done by simply adding correlative numbers to the selected file path, or by appending the value of another field at the same row. This is particularly useful for naming output data objects according to input ones.

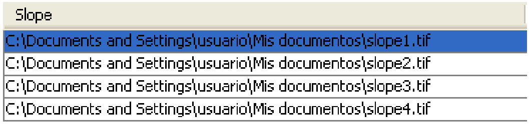

Рис. 17.27: Заполненые пути при пакетной обработке

17.4.4 Выполнение пакетной обработки

После заполнения всех необходимых полей можно запустить процесс пакетной обработки просто нажав на кнопку **[OK]**. В нижней части диалога будет отображаться общий прогресс.

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17.5 Использование алгоритмов геообработки в консоли

The console allows advanced users to increase their productivity and perform complex operations that cannot be performed using any of the other GUI elements of the processing framework. Models involving several algorithms can be defined using the command-line interface, and additional operations such as loops and conditional sentences can be added to create more flexible and powerful workflows.

There is not a proccesing console in QGIS, but all processing commands are available instead from the QGIS built-in Python console. That means that you can incorporate those commands into your console work and connect processing algorithms to all the other features (including methods from the QGIS API) available from there.

Код, выполняемый в консоли Python, даже если он не вызывает ни одного алгоритма платформы геообработки, может быть преобразован в новый алгоритм, который в дальнейшем может вызываться из панели инструментов или использоваться в редакторе моделей, как любой другой алгоритм. Более того, некоторые алгоритмы, которые вы видите в панели инструментов, на самом деле являются обычными скриптами.

In this section, we will see how to use processing algorithms from the QGIS Python console, and also how to write algorithms using Python.

17.5.1 Вызов алгоритмов из консоли Python

ервое, что нужно сделать при использовании платформы геообработки из командной строки — импортировать модуль processing:

```
>>> import processing
```

Now, there is basically just one (interesting) thing you can do with that from the console: execute an algorithm. That is done using the `runalg()` method, which takes the name of the algorithm to execute as its first parameter, and then a variable number of additional parameters depending on the requirements of the algorithm. So the first thing you need to know is the name of the algorithm to execute. That is not the name you see in the toolbox, but rather a unique command–line name. To find the right name for your algorithm, you can use the `algslist()` method. Type the following line in your console:

```
>>> processing.alglist()
```

На консоль будет выведено что-то вроде этого

```
Accumulated Cost (Anisotropic)---------------->saga:accumulatedcost(anisotropic)
Accumulated Cost (Isotropic)------------------>saga:accumulatedcost(isotropic)
Add Coordinates to points--------------------->saga:addcoordinatestopoints
Add Grid Values to Points--------------------->saga:addgridvaluestopoints
Add Grid Values to Shapes--------------------->saga:addgridvaluestoshapes
Add Polygon Attributes to Points-------------->saga:addpolygonattributestopoints
Aggregate------------------------------------->saga:aggregate
Aggregate Point Observations------------------>saga:aggregatepointobservations
Aggregation Index----------------------------->saga:aggregationindex
Analytical Hierarchy Process------------------>saga:analyticalhierarchyprocess
Analytical Hillshading------------------------>saga:analyticalhillshading
Average With Mask 1--------------------------->saga:averagewithmask1
Average With Mask 2--------------------------->saga:averagewithmask2
Average With Thereshold 1--------------------->saga:averagewiththereshold1
Average With Thereshold 2--------------------->saga:averagewiththereshold2
Average With Thereshold 3--------------------->saga:averagewiththereshold3
B-Spline Approximation------------------------>saga:b-splineapproximation
...
```

Это список всех активных алгоритмов, отсортированный в алфавитном порядке (слева название, справа — внутренее имя).

You can use a string as a parameter for this method. Instead of returning the full list of algorithms, it will only display those that include that string. If, for instance, you are looking for an algorithm to calculate slope from a DEM, type `alglist("slope")` to get the following result:

```
DTM Filter (slope-based)---------------------->saga:dtmfilter(slope-based)
Downslope Distance Gradient------------------->saga:downslopedistancegradient
Relative Heights and Slope Positions---------->saga:relativeheightsandslopepositions
Slope Length---------------------------------->saga:slopelength
Slope, Aspect, Curvature---------------------->saga:slopeaspectcurvature
Upslope Area---------------------------------->saga:upslopearea
Vegetation Index[slope based]----------------->saga:vegetationindex[slopebased]
```

Вывод может несколько отличаться, т.к. он зависит от доступных у вас алгоритмов.

Теперь намного легче найти имя необходимого алгоритма, в нашем случае `saga:slopeaspectcurvature`.

Once you know the command-line name of the algorithm, the next thing to do is to determine the right syntax to execute it. That means knowing which parameters are needed and the order in which they have to be passed when calling the `runalg()` method. There is a method to describe an algorithm in detail, which can be used to get a list of the parameters that an algorithm requires and the outputs that it will generate. To get this information, you can use the `alghelp(name_of_the_algorithm)` method. Use the command-line name of the algorithm, not the full descriptive name.

Calling the method with `saga:slopeaspectcurvature` as parameter, you get the following description:

```
>>> processing.alghelp("saga:slopeaspectcurvature")
ALGORITHM: Slope, Aspect, Curvature
   ELEVATION <ParameterRaster>
   METHOD <ParameterSelection>
   SLOPE <OutputRaster>
   ASPECT <OutputRaster>
   CURV <OutputRaster>
   HCURV <OutputRaster>
   VCURV <OutputRaster>
```

Теперь у нас есть вся необходимая для запуска алгоритма информация. Как уже было сказано, запуск алгоритма выполняется при помощи метода `runalg()`. Он имеет следующий синтаксис:

```
>>> processing.runalg(name_of_the_algorithm, param1, param2, ..., paramN,
         Output1, Output2, ..., OutputN)
```

Список параметров и результатов зависит от алгоритма, и должен указываться в том порядке, в котором их выдаёт метод `alghelp()`.

Depending on the type of parameter, values are introduced differently. The next list gives a quick review of how to introduce values for each type of input parameter:

- Raster Layer, Vector Layer or Table. Simply use a string with the name that identifies the data object to use (the name it has in the QGIS Table of Contents) or a filename (if the corresponding layer is not opened, it will be opened but not added to the map canvas). If you have an instance of a QGIS object representing the layer, you can also pass it as parameter. If the input is optional and you do not want to use any data object, use `None`.
- выбор из списка предустановленных значений. Значение указывается как целочисленный индекс, соответствующий значению. Получить список доступных значений и соответствующие им индексы можно при помощи метода `algoptions()`. Например:

  ```
  >>> processing.algoptions("saga:slopeaspectcurvature")
  METHOD(Method)
      0 - [0] Maximum Slope (Travis et al. 1975)
      1 - [1] Maximum Triangle Slope (Tarboton 1997)
      2 - [2] Least Squares Fitted Plane (Horn 1981, Costa-Cabral & Burgess 1996)
      3 - [3] Fit 2.Degree Polynom (Bauer, Rohdenburg, Bork 1985)
      4 - [4] Fit 2.Degree Polynom (Heerdegen & Beran 1982)
      5 - [5] Fit 2.Degree Polynom (Zevenbergen & Thorne 1987)
      6 - [6] Fit 3.Degree Polynom (Haralick 1983)
  ```

  In this case, the algorithm has one such parameter, with seven options. Notice that ordering is zero-based.
- Multiple input. The value is a string with input descriptors separated by semicolons (`;`). As in the case of single layers or tables, each input descriptor can be the data object name, or its file path.
- имя поля. Регистрозависимое название поля атрибутивной таблицы
- Fixed Table. Type the list of all table values separated by commas (`,`) and enclosed between quotes (`"`). Values start on the upper row and go from left to right. You can also use a 2-D array of values representing the table.
- система координат. Указывается код EPSG нужной системы координат
- охват. Значения `xmin`, `xmax`, `ymin` и `ymax`, разделенные запятыми (`,`).

Логические, строковые и числовые значения, а также пути к файлам в дополнительных пояснениях не нуждаются.

Input parameters such as strings, booleans, or numerical values have default values. To use them, specify `None` in the corresponding parameter entry.

For output data objects, type the file path to be used to save it, just as it is done from the toolbox. If you want to save the result to a temporary file, use `None`. The extension of the file determines the file format. If you enter a file extension not supported by the algorithm, the default file format for that output type will be used, and its corresponding extension appended to the given file path.

Unlike when an algorithm is executed from the toolbox, outputs are not added to the map canvas if you execute that same algorithm from the Python console. If you want to add an output to the map canvas, you have to do it yourself after running the algorithm. To do so, you can use QGIS API commands, or, even easier, use one of the handy methods provided for such tasks.

The `runalg` method returns a dictionary with the output names (the ones shown in the algorithm description) as keys and the file paths of those outputs as values. You can load those layers by passing the corresponding file paths to the `load()` method.

17.5.2 Дополнительные функции для работы с данными

Помимо функций, используемых для запуска алгоритмов, модуль processing предоставляет ряд вспомогательных функций, которые облегчают работу с данными, в частности с векторными данными. Все эти функции являются обёртками над функциями QGIS API, и, обычно, имеют более простой синтаксис. Рекомендуется использовать их при создании новых алгоритмов, т.к. они упрощают работу с исходными данными.

Below is a list of some of these commands. More information can be found in the classes under the `processing/tools` package, and also in the example scripts provided with QGIS.

- `getObject(obj)`: Returns a QGIS object (a layer or table) from the passed object, which can be a filename or the name of the object in the QGIS Table of Contents.
- `values(layer, fields)`: Returns the values in the attributes table of a vector layer, for the passed fields. Fields can be passed as field names or as zero-based field indices. Returns a dict of lists, with the passed field identifiers as keys. It considers the existing selection.
- `features(layer)`: Returns an iterator over the features of a vector layer, considering the existing selection.
- `uniqueValues(layer, field)`: Returns a list of unique values for a given attribute. Attributes can be passed as a field name or a zero-based field index. It considers the existing selection.

17.5.3 Создание скриптов и из запуск

You can create your own algorithms by writing the corresponding Python code and adding a few extra lines to supply additional information needed to define the semantics of the algorithm. You can find a *Create new script* menu under the *Tools* group in the *Script* algorithms block of the toolbox. Double-click on it to open the script editing dialog. That's where you should type your code. Saving the script from there in the `scripts` folder (the default folder when you open the save file dialog) with `.py` extension will automatically create the corresponding algorithm.

Имя файла будет использоваться в качестве имени алгоритма в панели инструментов (при этом расширение отбрасывается, а подчеркивания заменяются пробелами).

Let's have a look at the following code, which calculates the Topographic Wetness Index (TWI) directly from a DEM.

```
##dem=raster
##twi=output
ret_slope = processing.runalg("saga:slopeaspectcurvature", dem, 0, None,
                None, None, None, None)
ret_area = processing.runalg("saga:catchmentarea(mass-fluxmethod)", dem,
                0, False, False, False, False, None, None, None, None, None)
processing.runalg("saga:topographicwetnessindex(twi), ret_slope['SLOPE'],
                ret_area['AREA'], None, 1, 0, twi)
```

As you can see, the calculation involves three algorithms, all of them coming from SAGA. The last one calculates the TWI, but it needs a slope layer and a flow accumulation layer. We do not have these layers, but since we have the DEM, we can calculate them by calling the corresponding SAGA algorithms.

Если вы внимательно читали предыдущий раздел, разобраться в коде будет достаточно легко. Сейчас наибольший интерес для нас представляют первые три строчки, начинающиеся символами ##. Эти строки, необходимы для правильной работы со скриптом, именно они позволяют выполнять скрипт, а также использовать его в моделях, как и любой другой алгоритм.

These lines start with a double Python comment symbol (##) and have the following structure:

```
[parameter_name]=[parameter_type] [optional_values]
```

Here is a list of all the parameter types that are supported in processing scripts, their syntax and some examples.

- `raster`. A raster layer.
- `vector`. A vector layer.
- `table`. A table.
- `number`. A numerical value. A default value must be provided. For instance, `depth=number 2.4`.
- `string`. A text string. As in the case of numerical values, a default value must be added. For instance, `name=string Victor`.
- `boolean`. A boolean value. Add `True` or `False` after it to set the default value. For example, `verbose=boolean True`.
- `multiple raster`. Набор растровых слоёв
- `multiple vector`. Набор векторных слоёв
- `field`. Поле атрибутивной таблицы, необходимо указать слой или таблицу, из которого будет браться поле. Например, если задан параметр `mylayer=vector`, то поле атрибутивной таблицы слоя `mylayer` описывается так `myfield=field mylayer`
- `folder`. A folder.
- `file`. A filename.

Название параметра будет использоваться как в качестве подписи соответствующего поля ввода при запуске алгоритма, так и в качестве переменной внутри скрипта, которой будет присвоено введенное пользователем значение.

When showing the name of the parameter to the user, the name will be edited to improve its appearance, replacing low hyphens with spaces. So, for instance, if you want the user to see a parameter named `A numerical value`, you can use the variable name `A_numerical_value`.

Layers and table values are strings containing the file path of the corresponding object. To turn them into a QGIS object, you can use the `processing.getObjectFromUri()` function. Multiple inputs also have a string value, which contains the file paths to all selected object, separated by semicolons (`;`).

Результаты описываются точно также, с использованием следующих типов:

- `output raster`
- `output vector`
- `output table`
- `output html`
- `output file`
- `output number`
- `output string`

The value assigned to the output variables is always a string with a file path. It will correspond to a temporary file path in case the user has not entered any output filename.

When you declare an output, the algorithm will try to add it to QGIS once it is finished. That is why, although the `runalg()` method does not load the layers it produces, the final TWI layer will be loaded (using the case of our previous example), since it is saved to the file entered by the user, which is the value of the corresponding output.

Do not use the `load()` method in your script algorithms, just when working with the console line. If a layer is created as output of an algorithm, it should be declared as such. Otherwise, you will not be able to properly use the algorithm in the modeler, since its syntax (as defined by the tags explained above) will not match what the algorithm really creates.

Hidden outputs (numbers and strings) do not have a value. Instead, you have to assign a value to them. To do so, just set the value of a variable with the name you used to declare that output. For instance, if you have used this declaration,

```
##average=output number
```

следующая строка установит значение выходного параметра равным 5:

```
average = 5
```

В дополнение к тегам параметров и результатов, можно задавать группу, в которой будет отображаться новый алгоритм. Для этого служит тег `group`.

If your algorithm takes a long time to process, it is a good idea to inform the user. You have a global named `progress` available, with two possible methods: `setText(text)` and `setPercentage(percent)` to modify the progress text and the progress bar.

Several examples are provided. Please check them to see real examples of how to create algorithms using the processing framework classes. You can right-click on any script algorithm and select *Edit script* to edit its code or just to see it.

17.5.4 Документирование скриптов

As in the case of models, you can create additional documentation for your scripts, to explain what they do and how to use them. In the script editing dialog, you will find an **[Edit script help]** button. Click on it and it will take you to the help editing dialog. Check the section about the graphical modeler to know more about this dialog and how to use it.

Help files are saved in the same folder as the script itself, adding the `.help` extension to the filename. Notice that you can edit your script's help before saving the script for the first time. If you later close the script editing dialog without saving the script (i.e., you discard it), the help content you wrote will be lost. If your script was already saved and is associated to a filename, saving the help content is done automatically.

17.5.5 Хуки пред- и постобработки

Скрипты также могут использоваться для создания хуков пред- и постобработки, которые будут выполняться перед запуском алгоритма и по окончанию обработки. Эта возможность может пригодиться для автоматизации задач, выполняемых перед обработкой данных.

Синтаксис идентичек описанному выше, в дополнение доступна глобальная переменная `alg`, являющаяся алгоритмом, которы был (или будет) выполнен.

In the *General* group of the processing configuration dialog, you will find two entries named *Pre-execution script file* and *Post-execution script file* where the filename of the scripts to be run in each case can be entered.

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17.6 Журнал

17.6.1 Журнал

При каждом запуске алгоритма, информация о процессе сохраняется менеджером истории. Записываются как используемые параметры, так и дата и время выполнения алгоритма.

This way, it is easy to track and control all the work that has been developed using the processing framework, and easily reproduce it.

The history manager is a set of registry entries grouped according to their date of execution, making it easier to find information about an algorithm executed at any particular moment.

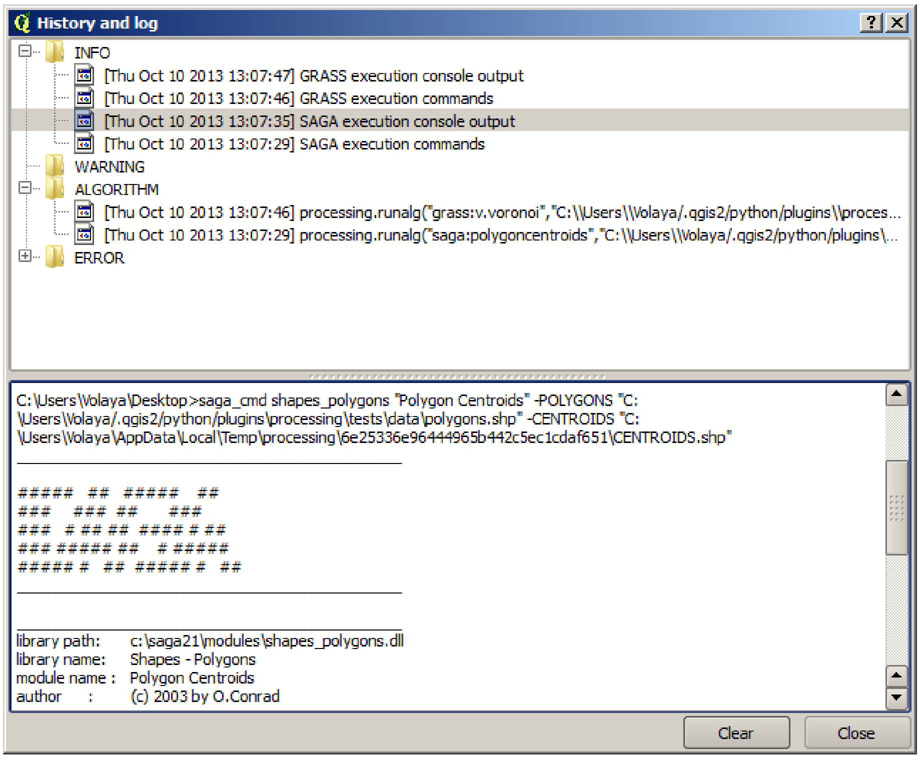


Рис. 17.28: Журнал

Информация о процессе сохраняется в виде выражения командной строки, даже если алгоритм был запущен из панели инструментов. Это делает менеджер истории полезным также при изучении возможностей командной строки SEXTANTE, т.к. можно запустить алгоритм из панели инструментов, а затем посмотреть в менеджере истории как его вызывать из командной строки.

Apart from browsing the entries in the registry, you can also re-execute processes by simply double-clicking on the corresponding entry.

Along with recording algorithm executions, the processing framework communicates with the user by means of the other groups of the registry, namely *Errors*, *Warnings* and *Information*. In case something is not working properly, having a look at the *Errors* might help you to see what is happening. If you get in contact with a developer to report a bug or error, the information in that group will be very useful for her or him to find out what is going wrong.

Third-party algorithms are usually executed by calling their command-line interfaces, which communicate with the user via the console. Although that console is not shown, a full dump of it is stored in the *Information* group each time you run one of those algorithms. If, for instance, you are having problems executing a SAGA algorithm, look for an entry named 'SAGA execution console output' to check all the messages generated by SAGA and try to find out where the problem is.

Some algorithms, even if they can produce a result with the given input data, might add comments or additional information to the *Warning* block if they detect potential problems with the data, in order to warn you. Make sure you check those messages if you are having unexpected results.

17.7 Writing new Processing algorithms as python scripts

You can create your own algorithms by writing the corresponding Python code and adding a few extra lines to supply additional information needed to define the semantics of the algorithm. You can find a *Create new script* menu under the *Tools* group in the *Script* algorithms block of the toolbox. Double-click on it to open the script edition dialog. That's where you should type your code. Saving the script from there in the `scripts` folder (the default one when you open the save file dialog), with `.py` extension, will automatically create the corresponding algorithm.

The name of the algorithm (the one you will see in the toolbox) is created from the filename, removing its extension and replacing low hyphens with blank spaces.

Let's have the following code, which calculates the Topographic Wetness Index (TWI) directly from a DEM

```
##dem=raster
##twi=output raster
ret_slope = processing.runalg("saga:slopeaspectcurvature", dem, 0, None,
                None, None, None, None)
ret_area = processing.runalg("saga:catchmentarea", dem,
                0, False, False, False, False, None, None, None, None, None)
processing.runalg("saga:topographicwetnessindextwi, ret_slope['SLOPE'],
                ret_area['AREA'], None, 1, 0, twi)
```

As you can see, it involves 3 algorithms, all of them coming from SAGA. The last one of them calculates the TWI, but it needs a slope layer and a flow accumulation layer. We do not have these ones, but since we have the DEM, we can calculate them calling the corresponding SAGA algorithms.

The part of the code where this processing takes place is not difficult to understand if you have read the previous chapter. The first lines, however, need some additional explanation. They provide the information that is needed to turn your code into an algorithm that can be run from any of the GUI components, like the toolbox or the graphical modeler.

These lines start with a double Python comment symbol (`##`) and have the following structure

```
[parameter_name]=[parameter_type] [optional_values]
```

Here is a list of all the parameter types that are supported in processign scripts, their syntax and some examples.

- `raster`. A raster layer
- `vector`. A vector layer
- `table`. A table
- `number`. A numerical value. A default value must be provided. For instance, `depth=number 2.4`
- `string`. A text string. As in the case of numerical values, a default value must be added. For instance, `name=string Victor`
- `longstring`. Same as string, but a larger text box will be shown, so it is better suited for long strings, such as for a script expecting a small code snippet.
- `boolean`. A boolean value. Add `True` or `False` after it to set the default value. For example, `verbose=boolean True`.
- `multiple raster`. A set of input raster layers.
- `multiple vector`. A set of input vector layers.
- `field`. A field in the attributes table of a vector layer. The name of the layer has to be added after the `field` tag. For instance, if you have declared a vector input with `mylayer=vector`, you could use `myfield=field mylayer` to add a field from that layer as parameter.
- `folder`. A folder
- `file`. A filename
- `crs`. A Coordinate Reference System

The parameter name is the name that will be shown to the user when executing the algorithm, and also the variable name to use in the script code. The value entered by the user for that parameter will be assigned to a variable with that name.

When showing the name of the parameter to the user, the name will be edited it to improve its appearance, replacing low hyphens with spaces. So, for instance, if you want the user to see a parameter named `A numerical value`, you can use the variable name `A_numerical_value`.

Layers and tables values are strings containing the filepath of the corresponding object. To turn them into a QGIS object, you can use the `processing.getObjectFromUri()` function. Multiple inputs also have a string value, which contains the filepaths to all selected objects, separated by semicolons (`;`).

Outputs are defined in a similar manner, using the following tags:

- `output raster`
- `output vector`
- `output table`
- `output html`
- `output file`
- `output number`
- `output string`
- `output extent`

The value assigned to the output variables is always a string with a filepath. It will correspond to a temporary filepath in case the user has not entered any output filename.

In addition to the tags for parameters and outputs, you can also define the group under which the algorithm will be shown, using the `group` tag.

The last tag that you can use in your script header is `##nomodeler`. Use that when you do not want your algorithm to be shown in the modeler window. This should be used for algorithms that do not have a clear syntax (for instance, if the number of layers to be created is not known in advance, at design time), which make them unsuitable for the graphical modeler

17.8 Handing data produced by the algorithm

When you declare an output representing a layer (raster, vector or table), the algorithm will try to add it to QGIS once it is finished. That is the reason why, although the `runalg()` method does not load the layers it produces, the final *TWI* layer will be loaded, since it is saved to the file entered by the user, which is the value of the corresponding output.

Do not use the `load()` method in your script algorithms, but just when working with the console line. If a layer is created as output of an algorithm, it should be declared as such. Otherwise, you will not be able to properly use the algorithm in the modeler, since its syntax (as defined by the tags explained above) will not match what the algorithm really creates.

Hidden outputs (numbers and strings) do not have a value. Instead, it is you who has to assign a value to them. To do so, just set the value of a variable with the name you used to declare that output. For instance, if you have used this declaration,

```
##average=output number
```

the following line will set the value of the output to 5:

```
average = 5
```

17.9 Communicating with the user

If your algorithm takes a long time to process, it is a good idea to inform the user. You have a global named `progress` available, with two available methods: `setText(text)` and `setPercentage(percent)` to modify the progress text and the progress bar.

If you have to provide some information to the user, not related to the progress of the algorithm, you can use the `setInfo(text)` method, also from the `progress` object.

If your script has some problem, the correct way of propagating it is to raise an exception of type `GeoAlgorithmExecutionException()`. You can pass a message as argument to the constructor of the exception. Processing will take care of handling it and communicating with the user, depending on where the algorithm is being executed from (toolbox, modeler, Python console...)

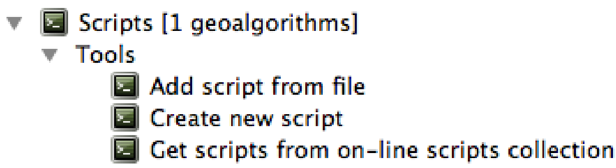
17.10 Documenting your scripts

As in the case of models, you can create additional documentation for your script, to explain what they do and how to use them. In the script editing dialog you will find a **[Edit script help]** button. Click on it and it will take you to the help editing dialog. Check the chapter about the graphical modeler to know more about this dialog and how to use it.

Help files are saved in the same folder as the script itself, adding the `.help` extension to the filename. Notice that you can edit your script's help before saving it for the first time. If you later close the script editing dialog without saving the script (i.e. you discard it), the help content you wrote will be lost. If your script was already saved and is associated to a filename, saving is done automatically.

17.11 Example scripts

Several examples are available in the on-line collection of scripts, which you can access by selecting the *Get script from on-line script collection* tool under the *Scripts/tools* entry in the toolbox.



Please, check them to see real examples of how to create algorithms using the processing framework classes. You can right-click on any script algorithm and select *Edit script* to edit its code or just to see it.

17.12 Best practices for writing script algorithms

Here's a quick summary of ideas to consider when creating your script algorithms and, epsecially, if you want to share with other QGIS users. Following these simple rules will ensure consistency across the different Processing elements such as the toolbox, the modeler or the batch processing interface.

- Do not load resulting layers. Let Processing handle your results and load your layers if needed.
- Always declare the outputs your algorithm creates. Avoid things such as decalring one output and then using the destination filename set for that output to create a collection of them. That will break the correct semantics of the algorithm and make it impossible to use it safely in the modeler. If you have to write an algorithm like that, make sure you add the `##nomodeler` tag.
- Do not show message boxes or use any GUI element from the script. If you want to communicate with the user, use the `setInfo()` method or throw an `GeoAlgorithmExecutionException`
- As a rule of thumb, do not forget that your agorithm might be executed in a context other than the Processing toolbox.

17.13 Pre- and post-execution script hooks

Scripts can also be used to set pre- and post-execution hooks that are run before and after an algorithm is run. This can be used to automate tasks that should be performed whenever an algorithm is executed.

The syntax is identical to the syntax explained above, but an additional global variable named `alg` is available, representing the algorithm that has just been (or is about to be) executed.

In the *General* group of the processing config dialog you will find two entries named *Pre-execution script file* and *Post-execution script file* where the filename of the scripts to be run in each case can be entered.

.

17.14 Настройка сторонних приложений

The processing framework can be extended using additional applications. Currently, SAGA, GRASS, OTB (Orfeo Toolbox) and R are supported, along with some other command-line applications that provide spatial data analysis functionalities. Algorithms relying on an external application are managed by their own algorithm provider.

This section will show you how to configure the processing framework to include these additional applications, and it will explain some particular features of the algorithms based on them. Once you have correctly configured the system, you will be able to execute external algorithms from any component like the toolbox or the graphical modeler, just like you do with any other geoalgorithm.

По умолчанию, все алгоритмы, зависящие от внешних приложений, которые не поставляются с QGIS, деактивированы. Вы можете активировать их в диалоге настройки платформы геообработки. Убедитесь, что соответствующее приложение уже установлено в системе. Активация провайдера алгоритмов без установки приложения, которое ему требуется, приведет к появлению алгоритмов в панели инструментов, но при попытке запуска алгоритма вы получите ошибку.

This is because the algorithm descriptions (needed to create the parameters dialog and provide the information needed about the algorithm) are not included with each application, but with QGIS instead. That is, they are part of QGIS, so you have them in your installation even if you have not installed any other software. Running the algorithm, however, needs the application binaries to be installed in your system.

17.14.1 Примечание для пользователей Windows

If you are not an advanced user and you are running QGIS on Windows, you might not be interested in reading the rest of this chapter. Make sure you install QGIS in your system using the standalone installer. That will automatically install SAGA, GRASS and OTB in your system and configure them so they can be run from QGIS. All the algorithms in the simplified view of the toolbox will be ready to be run without needing any further configuration. If installing through OSGeo4W application, make sure you select for insttallation SAGA and OTB as well.

If you want to know more about how these providers work, or if you want to use some algorithms not included in the simplified toolbox (such as R scripts), keep on reading.

17.14.2 О форматах файлов

When using an external software, opening a file in QGIS does not mean that it can be opened and processed as well in that other software. In most cases, other software can read what you have opened in QGIS, but in some cases, that might not be true. When using databases or uncommon file formats, whether for raster or vector layers, problems might arise. If that happens, try to use well-known file formats that you are sure are understood by both programs, and check the console output (in the history and log dialog) to know more about what is going wrong.

Использование растровых данных GRASS является одним из случаев, когда у вас могут возникнуть проблемы, мешающие завершить анализ, если внешний алгоритм использует такой слой в качестве исходного. Поэтому такие слои не отображаются в качестве доступных для алгоритмов.

You should, however, find no problems at all with vector layers, since QGIS automatically converts from the original file format to one accepted by the external application before passing the layer to it. This adds extra processing time, which might be significant if the layer has a large size, so do not be surprised if it takes more time to process a layer from a DB connection than it does to process one of a similar size stored in a shapefile.

Провайдеры, не использующие внешние приложения, могут обрабатывать любые слои, открытые в QGIS, так как они открыты для анализа самой QGIS.

Regarding output formats, all formats supported by QGIS as output can be used, both for raster and vector layers. Some providers do not support certain formats, but all can export to common raster layer formats that can later be transformed by QGIS automatically. As in the case of input layers, if this conversion is needed, that might increase the processing time.

If the extension of the filename specified when calling an algorithm does not match the extension of any of the formats supported by QGIS, then a suffix will be added to set a default format. In the case of raster layers, the `.tif` extension is used, while `.shp` is used for vector layers.

17.14.3 О выделении в векторных слоях

External applications may also be made aware of the selections that exist in vector layers within QGIS. However, that requires rewriting all input vector layers, just as if they were originally in a format not supported by the external application. Only when no selection exists, or the *Use only selected features* option is not enabled in the processing general configuration, can a layer be directly passed to an external application.

Во всех остальных случаях необходим экспорт выбранных объектов, что увеличивает время обработки.

SAGA

Алгоритмы SAGA могут использоваться из QGIS, если SAGA установлена в системе, а платформа геообработки правильно настроена и может найти исполнимые файлы SAGA. Для запуска алгоритмов SAGA необходимы консольные приложения SAGA.

If you are running Windows, both the stand-alone installer and the OSGeo4W installer include SAGA along with QGIS, and the path is automatically configured, so there is no need to do anything else.

If you have installed SAGA yourself (remember, you need version 2.1), the path to the SAGA executable must be configured. To do this, open the configuration dialog. In the *SAGA* block, you will find a setting named *SAGA Folder*. Enter the path to the folder where SAGA is installed. Close the configuration dialog, and now you are ready to run SAGA algorithms from QGIS.

If you are running Linux, SAGA binaries are not included with SEXTANTE, so you have to download and install the software yourself. Please check the SAGA website for more information. SAGA 2.1 is needed.

In this case, there is no need to configure the path to the SAGA executable, and you will not see those folders. Instead, you must make sure that SAGA is properly installed and its folder is added to the PATH environment variable. Just open a console and type `saga_cmd` to check that the system can find where the SAGA binaries are located.

17.14.4 Ограничения системы покрытий SAGA

Most SAGA algorithms that require several input raster layers require them to have the same grid system. That is, they must cover the same geographic area and have the same cell size, so their corresponding grids match. When calling SAGA algorithms from QGIS, you can use any layer, regardless of its cell size and extent. When multiple raster layers are used as input for a SAGA algorithm, QGIS resamples them to a common grid system and then passes them to SAGA (unless the SAGA algorithm can operate with layers from different grid systems).

The definition of that common grid system is controlled by the user, and you will find several parameters in the SAGA group of the settings window to do so. There are two ways of setting the target grid system:

- Setting it manually. You define the extent by setting the values of the following parameters:
  - *Resampling min X*
  - *Resampling max X*
  - *Resampling min Y*
  - *Resampling max Y*
  - *Resampling cellsize*

  Имейте ввиду, что QGIS выполнит пересчет исходных слоёв к этому охвату даже если они не пересекают его.
- Setting it automatically from input layers. To select this option, just check the *Use min covering grid system for resampling* option. All the other settings will be ignored and the minimum extent that covers all the input layers will be used. The cell size of the target layer is the maximum of all cell sizes of the input layers.

При вызове алгоритмов, которые не используют несколько исходных слоёв или не требуют единой системы покрытия, пересчет перед запуском SAGA не выполняется и все эти настройки ингорируются.

17.14.5 Ограничения многоканальных слоёв

Unlike QGIS, SAGA has no support for multi-band layers. If you want to use a multiband layer (such as an RGB or multispectral image), you first have to split it into single-banded images. To do so, you can use the 'SAGA/Grid - Tools/Split RGB image' algorithm (which creates three images from an RGB image) or the 'SAGA/Grid - Tools/Extract band' algorithm (to extract a single band).

17.14.6 Limitations in cell size

SAGA assumes that raster layers have the same cell size in the X and Y axis. If you are working with a layer with different values for horizontal and vertical cell size, you might get unexpected results. In this case, a warning will be added to the processing log, indicating that an input layer might not be suitable to be processed by SAGA.

17.14.7 Логгирование

When QGIS calls SAGA, it does so using its command-line interface, thus passing a set of commands to perform all the required operations. SAGA shows its progress by writing information to the console, which includes the percentage of processing already done, along with additional content. This output is filtered and used to update the progress bar while the algorithm is running.

Both the commands sent by QGIS and the additional information printed by SAGA can be logged along with other processing log messages, and you might find them useful to track in detail what is going on when QGIS runs a SAGA algorithm. You will find two settings, namely *Log console output* and *Log execution commands*, to activate that logging mechanism.

Большинство провайдеров, использующих сторонние приложения и взаимодействующие с ними через командную строку, имеют схожие параметры, так что вы можете встретить их и в других местах диалога настройки.

R. Creating R scripts

R integration in QGIS is different from that of SAGA in that there is not a predefined set of algorithms you can run (except for a few examples). Instead, you should write your scripts and call R commands, much like you would do from R, and in a very similar manner to what we saw in the section dedicated to processing scripts. This section shows you the syntax to use to call those R commands from QGIS and how to use QGIS objects (layers, tables) in them.

The first thing you have to do, as we saw in the case of SAGA, is to tell QGIS where your R binaries are located. You can do this using the *R folder* entry in the processing configuration dialog. Once you have set that parameter, you can start creating and executing your own R scripts.

И снова, в Linux всё значительно проще: достаточно убедиться, что R доступен в PATH. Если ыв можете запустить R просто введя в консоли `R`, значит всё в порядке.

Чтобы добавить новый алгоритм, вызывающий функицю R (или более сложный скрипт R, который вы написали и хотите сделать доступным из QGIS), необходимо создать файл скрипта, объясняющий платформе геообработки как выполнить операцию и содержащий соответствующие команды R.

R script files have the extension `.rsx`, and creating them is pretty easy if you just have a basic knowledge of R syntax and R scripting. They should be stored in the R scripts folder. You can set this folder in the *R* settings group (available from the processing settings dialog), just like you do with the folder for regular processing scripts.

Let's have a look at a very simple script file, which calls the R method `spsample` to create a random grid within the boundary of the polygons in a given polygon layer. This method belongs to the `maptools` package. Since almost all the algorithms that you might like to incorporate into QGIS will use or generate spatial data, knowledge of spatial packages like `maptools` and, especially, `sp`, is mandatory.

```
##polyg=vector
##numpoints=number 10
##output=output vector
##sp=group
pts=spsample(polyg,numpoints,type="random")
output=SpatialPointsDataFrame(pts, as.data.frame(pts))
```

The first lines, which start with a double Python comment sign (`##`), tell QGIS the inputs of the algorithm described in the file and the outputs that it will generate. They work with exactly the same syntax as the SEXTANTE scripts that we have already seen, so they will not be described here again.

When you declare an input parameter, QGIS uses that information for two things: creating the user interface to ask the user for the value of that parameter and creating a corresponding R variable that can later be used as input for R commands.

In the above example, we are declaring an input of type `vector` named `polyg`. When executing the algorithm, QGIS will open in R the layer selected by the user and store it in a variable also named `polyg`. So, the name of a parameter is also the name of the variable that we can use in R for accesing the value of that parameter (thus, you should avoid using reserved R words as parameter names).

Spatial elements such as vector and raster layers are read using the `readOGR()` and `brick()` commands (you do not have to worry about adding those commands to your description file – QGIS will do it), and they are stored as `Spatial*DataFrame` objects. Table fields are stored as strings containing the name of the selected field.

Tables are opened using the `read.csv()` command. If a table entered by the user is not in CSV format, it will be converted prior to importing it into R.

Additionally, raster files can be read using the `readGDAL()` command instead of `brick()` by using the `##usereadgdal`.

Если вы опытный пользователь и не хотите чтобы QGIS создавала объект, представляющий слой, используйте директиву `##passfilename`. Эта директива указывает, что необходимо вернуть строку с именем файла. В этом случае, перед выполнением любых операций с файлом, вам необходимо позаботиться о его открытии.

Теперь, используя вышеприведённые сведения, мы легко можем разобрать первую строку скрипта (первую строку без символа комментария в начале).

```
pts=spsample(polyg,numpoints,type="random")
```

Переменная `polygon` уже содержит объект `SpatialPolygonsDataFrame` и может использоваться для вызова метода `spsample`, как и переменная `numpoints`, которая содержит число точек для создания сетки.

Since we have declared an output of type vector named `out`, we have to create a variable named `out` and store a `Spatial*DataFrame` object in it (in this case, a `SpatialPointsDataFrame`). You can use any name for your intermediate variables. Just make sure that the variable storing your final result has the same name that you used to declare it, and that it contains a suitable value.

В нашем случае результат полученный от метода `spsample` необходимо явно преобразовать в объект `SpatialPointsDataFrame`, так как изначально это экземпляр класса `ppp`, который не подходит для возвращения в QGIS.

If your algorithm generates raster layers, the way they are saved will depend on whether or not you have used the `#dontuserasterpackage` option. In you have used it, layers are saved using the `writeGDAL()` method. If not, the `writeRaster()` method from the `raster` package will be used.

Если указана директива `#passfilename`, выходные растры будут созданы при помощи пакета `raster` (методом `writeRaster()`), даже если он не использовался для загрузки исходных данных.

If your algorithm does not generate any layer, but rather a text result in the console instead, you have to indicate that you want the console to be shown once the execution is finished. To do so, just start the command lines that produce the results you want to print with the > ('greater') sign. The output of all other lines will not be shown. For instance, here is the description file of an algorithm that performs a normality test on a given field (column) of the attributes of a vector layer:

```
##layer=vector
##field=field layer
##nortest=group
library(nortest)
>lillie.test(layer[[field]])
```

The output of the last line is printed, but the output of the first is not (and neither are the outputs from other command lines added automatically by QGIS).

Если алгоритм создаёт какие-либо графические объекты (используя метод `plot()`), добавьте следующую строку:

```
##showplots
```

This will cause QGIS to redirect all R graphical outputs to a temporary file, which will be opened once R execution has finished.

И консольные и графические результаты будут доступны в окне *Просмотр результатов*.

For more information, please check the script files provided with SEXTANTE. Most of them are rather simple and will greatly help you understand how to create your own scripts.

Примечание: `rgdal` and `maptools` libraries are loaded by default, so you do not have to add the corresponding `library()` commands (you just have to make sure that those two packages are installed in your R distribution). However, other additional libraries that you might need have to be explicitly loaded. Just add the necessary commands at the beginning of your script. You also have to make sure that the corresponding packages are installed in the R distribution used by QGIS. The processing framework will not take care of any package installation. If you run a script that requires a package that is not installed, the execution will fail, and SEXTANTE will try to detect which packages are missing. You must install those missing libraries manually before you can run the algorithm.

GRASS

Настройка GRASS мало чем отличается от настройки SAGA. Прежде всего необходимо указать путь к каталогу установки GRASS, но только в том случае, если вы использует Windows. Дополнительно требуется указать используемый интерпретатор командной строки (обычно это `msys.exe`, который имеется в большинстве дистрибутивов GRASS для Windows) и его расположение.

By default, the processing framework tries to configure its GRASS connector to use the GRASS distribution that ships along with QGIS. This should work without problems in most systems, but if you experience problems, you might have to configure the GRASS connector manually. Also, if you want to use a different GRASS installation, you can change that setting and point to the folder where the other version is installed. GRASS 6.4 is needed for algorithms to work correctly.

Если вы используете Linux, просто убедитесь, что GRASS корректно установлена и запускается из командной строки без ошибок.

GRASS algorithms use a region for calculations. This region can be defined manually using values similar to the ones found in the SAGA configuration, or automatically, taking the minimum extent that covers all the input layers used to execute the algorithm each time. If the latter approach is the behaviour you prefer, just check the *Use min covering region* option in the GRASS configuration parameters.

The last parameter that has to be configured is related to the mapset. A mapset is needed to run GRASS, and the processing framework creates a temporary one for each execution. You have to specify if the data you are working with uses geographical (lat/lon) coordinates or projected ones.

GDAL

No additional configuration is needed to run GDAL algorithms. Since they are already incorporated into QGIS, the algorithms can infer their configuration from it.

Orfeo Toolbox

Orfeo Toolbox (OTB) algorithms can be run from QGIS if you have OTB installed in your system and you have configured QGIS properly, so it can find all necessary files (command-line tools and libraries).

As in the case of SAGA, OTB binaries are included in the stand-alone installer for Windows, but they are not included if you are runing Linux, so you have to download and install the software yourself. Please check the OTB website for more information.

Once OTB is installed, start QGIS, open the processing configuration dialog and configure the OTB algorithm provider. In the *Orfeo Toolbox (image analysis)* block, you will find all settings related to OTB. First, ensure that algorithms are enabled.

Then, configure the path to the folder where OTB command-line tools and libraries are installed:

- Usually *OTB applications folder* points to `/usr/lib/otb/applications` and *OTB command line tools folder* is `/usr/bin`.
- If you use the OSGeo4W installer, then install `otb-bin` package and enter `C:\OSGeo4W\apps\orfeotoolbox\applications` as *OTB applications folder* and `C:\OSGeo4W\bin` as *OTB command line tools folder*. These values should be configured by default, but if you have a different OTB installation, configure them to the corresponding values in your system.

TauDEM

To use this provider, you need to install TauDEM command line tools.

17.14.8 Windows

Please visit the TauDEM homepage for installation instructions and precompiled binaries for 32-bit and 64-bit systems. **IMPORTANT**: You need TauDEM 5.0.6 executables. Version 5.2 is currently not supported.

17.14.9 Linux

There are no packages for most Linux distributions, so you should compile TauDEM by yourself. As TauDEM uses MPICH2, first install it using your favorite package manager. Alternatively, TauDEM works fine with Open MPI, so you can use it instead of MPICH2.

Download TauDEM 5.0.6 source code and extract the files in some folder.

Open the `linearpart.h` file, and after line

```
#include "mpi.h"
```

add a new line with

```
#include <stdint.h>
```

Т.е. у вас будет

```
#include "mpi.h"
#include <stdint.h>
```

Save the changes and close the file. Now open `tiffIO.h`, find line `#include "stdint.h"` and replace quotes () with <>, so you'll get

```
#include <stdint.h>
```

Save the changes and close the file. Create a build directory and cd into it

```
mkdir build
cd build
```

Configure your build with the command

```
CXX=mpicxx cmake -DCMAKE_INSTALL_PREFIX=/usr/local ..
```

и запустите компиляцию

```
make
```

Finally, to install TauDEM into `/usr/local/bin`, run

```
sudo make install
```

.

17.15 The QGIS Commander

Processing includes a practical tool that allows you to run algorithms without having to use the toolbox, but just by typing the name of the algorithm you want to run.

This tool is known as the *QGIS commander*, and it is just a simple text box with autocompletion where you type the command you want to run.

The Commander is started from the *Analysis* menu or, more practically, by pressing `Shift + Ctrl + M` (you can change that default keyboard shortcut in the QGIS configuration if you prefer a different one). Apart from executing Processing algorithms, the Commander gives you access to most of the

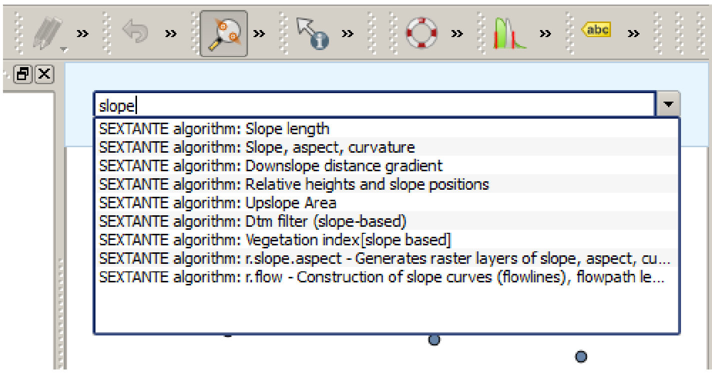


Рис. 17.29: The QGIS Commander

functionality in QGIS, which means that it gives you a practical and efficient way of running QGIS tasks and allows you to control QGIS with reduced usage of buttons and menus.

Moreover, the Commander is configurable, so you can add your custom commands and have them just a few keystrokes away, making it a powerful tool to help you become more productive in your daily work with QGIS.

17.15.1 Доступные команды

The commands available in the Commander fall in the following categories:

- Processing algorithms. These are shown as `Processing algorithm: <name of the algorithm>`.
- Menu items. These are shown as `Menu item: <menu entry text>`. All menus items available from the QGIS interface are available, even if they are included in a submenu.
- Python functions. You can create short Python functions that will be then included in the list of available commands. They are shown as `Function: <function name>`.

To run any of the above, just start typing and then select the corresponding element from the list of available commands that appears after filtering the whole list of commands with the text you have entered.

В случае функции Python можно выбрать соответствующий элемент списка, начинающийся с `Function:` (например, `Function: removeall`), или же полностью ввести имя функции (`removeall` в предыдущем примере). Добавлять скобки после имени функции не требуется.

17.15.2 Создание пользовательских функций

Пользовательские функции создаются путём добавления соответствующего кода Python в файл `commands.py`, который находится в каталоге `.qgis2/processing/commander` пользовательской директории. Это обычный файл Python, в который можно добавлять свои функции.

The file is created with a few example functions the first time you open the Commander. If you haven't launched the Commander yet, you can create the file yourself. To edit the commands file, use your favorite text editor. You can also use a built-in editor by calling the `edit` command from the Commander. It will open the editor with the commands file, and you can edit it directly and then save your changes.

Например, можно добавить такую функцию для удаления всех слоёв:

```
from qgis.gui import *

def removeall():
    mapreg = QgsMapLayerRegistry.instance()
    mapreg.removeAllMapLayers()
```

Once you have added the function, it will be available in the Commander, and you can invoke it by typing `removeall`. There is no need to do anything apart from writing the function itself.

Functions can receive parameters. Add `*args` to your function definition to receive arguments. When calling the function from the Commander, parameters have to be passed separated by spaces.

Вот пример функции, загружающей слой. В качестве параметра ей передаётся имя файла, который необходимо открыть.

```
import processing

def load(*args):
  processing.load(args[0])
```

If you want to load the layer in `/home/myuser/points.shp`, type `load /home/myuser/points.shp` in the Commander text box.

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Processing providers and algorithms

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18.1 GDAL algorithm provider

GDAL (Geospatial Data Abstraction Library) is a translator library for raster and vector geospatial data formats.

.

18.1.1 GDAL analysis

Aspect

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band number` **[number]** <put parameter description here>

Default: *1*

`Compute edges` **[boolean]** <put parameter description here>

Default: *False*

`Use Zevenbergen&Thorne formula (instead of the Horn's one)` **[boolean]** <put parameter description here>

Default: *False*

`Return trigonometric angle (instead of azimuth)` **[boolean]** <put parameter description here>

Default: *False*

`Return 0 for flat (instead of -9999)` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:aspect', input, band, compute_edges, zevenbergen, trig_angle, zero_flat, output)
```

See also

Color relief

Description

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band number` **[number]** <put parameter description here>

Default: *1*

`Compute edges` **[boolean]** <put parameter description here>

Default: *False*

`Color configuration file` **[file]** <put parameter description here>

`Matching mode` **[selection]** <put parameter description here>

Options:

- 0 — "0,0,0,0" RGBA
- 1 — Exact color
- 2 — Nearest color

Default: *0*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:colorrelief', input, band, compute_edges, color_table, match_mode, output)
```

See also

Fill nodata

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Search distance` **[number]** <put parameter description here>

Default: *100*

`Smooth iterations` **[number]** <put parameter description here>

Default: *0*

`Band to operate on` **[number]** <put parameter description here>

Default: *1*

`Validity mask` **[raster]** Optional.

<put parameter description here>

`Do not use default validity mask` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:fillnodata', input, distance, iterations, band, mask, no_default_mask, output)
```

See also

Grid (Moving average)

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: point]** <put parameter description here>

`Z field` **[tablefield: numeric]** Optional.

<put parameter description here>

`Radius 1` **[number]** <put parameter description here>

Default: *0.0*

`Radius 2` **[number]** <put parameter description here>

Default: *0.0*

`Min points` **[number]** <put parameter description here>

Default: *0.0*

`Angle` **[number]** <put parameter description here>

Default: *0.0*

`Nodata` **[number]** <put parameter description here>

Default: *0.0*

`Output raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32
- 9 — CFloat32
- 10 — CFloat64

Default: *5*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:gridaverage', input, z_field, radius_1, radius_2, min_points, angle, nodata, rtype,
```

See also

Grid (Data metrics)

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: point]** <put parameter description here>

`Z field` **[tablefield: numeric]** Optional.

<put parameter description here>

`Metrics` **[selection]** <put parameter description here>

Options:

- 0 — Minimum
- 1 — Maximum
- 2 — Range

- 3 — Count
- 4 — Average distance
- 5 — Average distance between points

Default: *0*

`Radius 1` **[number]** <put parameter description here>

Default: *0.0*

`Radius 2` **[number]** <put parameter description here>

Default: *0.0*

`Min points` **[number]** <put parameter description here>

Default: *0.0*

`Angle` **[number]** <put parameter description here>

Default: *0.0*

`Nodata` **[number]** <put parameter description here>

Default: *0.0*

`Output raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32
- 9 — CFloat32
- 10 — CFloat64

Default: *5*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:griddatametrics', input, z_field, metric, radius_1, radius_2, min_points, angle, nod
```

See also

Grid (Inverse distance to a power)

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: point]** <put parameter description here>

`Z field` **[tablefield: numeric]** Optional.

<put parameter description here>

`Power` **[number]** <put parameter description here>

Default: *2.0*

`Smothing` **[number]** <put parameter description here>

Default: *0.0*

`Radius 1` **[number]** <put parameter description here>

Default: *0.0*

`Radius 2` **[number]** <put parameter description here>

Default: *0.0*

`Max points` **[number]** <put parameter description here>

Default: *0.0*

`Min points` **[number]** <put parameter description here>

Default: *0.0*

`Angle` **[number]** <put parameter description here>

Default: *0.0*

`Nodata` **[number]** <put parameter description here>

Default: *0.0*

`Output raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32
- 9 — CFloat32

- 10 — CFloat64

Default: *5*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:gridinvdist', input, z_field, power, smothing, radius_1, radius_2, max_points, min_p
```

See also

Grid (Nearest neighbor)

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: point]** <put parameter description here>

`Z field` **[tablefield: numeric]** Optional.

<put parameter description here>

`Radius 1` **[number]** <put parameter description here>

Default: *0.0*

`Radius 2` **[number]** <put parameter description here>

Default: *0.0*

`Angle` **[number]** <put parameter description here>

Default: *0.0*

`Nodata` **[number]** <put parameter description here>

Default: *0.0*

`Output raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32

- 9 — CFloat32
- 10 — CFloat64

Default: *5*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:gridnearestneighbor', input, z_field, radius_1, radius_2, angle, nodata, rtype, outp
```

See also

Hillshade

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band number` **[number]** <put parameter description here>

Default: *1*

`Compute edges` **[boolean]** <put parameter description here>

Default: *False*

`Use Zevenbergen&Thorne formula (instead of the Horn's one)` **[boolean]** <put parameter description here>

Default: *False*

`Z factor (vertical exaggeration)` **[number]** <put parameter description here>

Default: *1.0*

`Scale (ratio of vert. units to horiz.)` **[number]** <put parameter description here>

Default: *1.0*

`Azimuth of the light` **[number]** <put parameter description here>

Default: *315.0*

`Altitude of the light` **[number]** <put parameter description here>

Default: *45.0*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:hillshade', input, band, compute_edges, zevenbergen, z_factor, scale, azimuth, altit
```

See also

Near black

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`How far from black (white)` **[number]** <put parameter description here>

Default: *15*

`Search for nearly white pixels instead of nearly black` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:nearblack', input, near, white, output)
```

See also

Proximity (raster distance)

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Values` **[string]** <put parameter description here>

Default: *(not set)*

`Dist units` **[selection]** <put parameter description here>

Options:

- 0 — GEO
- 1 — PIXEL

Default: *0*

`Max dist (negative value to ignore)` **[number]** <put parameter description here>

Default: *-1*

`No data (negative value to ignore)` **[number]** <put parameter description here>

Default: *-1*

`Fixed buf val (negative value to ignore)` **[number]** <put parameter description here>

Default: *-1*

`Output raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32
- 9 — CFloat32
- 10 — CFloat64

Default: *5*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:proximity', input, values, units, max_dist, nodata, buf_val, rtype, output)
```

See also

Roughness

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band number` **[number]** <put parameter description here>

Default: *1*

`Compute edges` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:roughness', input, band, compute_edges, output)
```

See also

Sieve

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Threshold` **[number]** <put parameter description here>

Default: *2*

`Pixel connection` **[selection]** <put parameter description here>

Options:

- 0 — 4
- 1 — 8

Default: *0*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:sieve', input, threshold, connections, output)
```

See also

Slope

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band number` **[number]** <put parameter description here>

Default: *1*

`Compute edges` **[boolean]** <put parameter description here>

Default: *False*

`Use Zevenbergen&Thorne formula (instead of the Horn's one)` **[boolean]** <put parameter description here>

Default: *False*

`Slope expressed as percent (instead of degrees)` **[boolean]** <put parameter description here>

Default: *False*

`Scale (ratio of vert. units to horiz.)` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:slope', input, band, compute_edges, zevenbergen, as_percent, scale, output)
```

See also

TPI (Topographic Position Index)

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band number` **[number]** <put parameter description here>

Default: *1*

`Compute edges` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:tpitopographicpositionindex', input, band, compute_edges, output)
```

See also

TRI (Terrain Ruggedness Index)

Description

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band number` **[number]** <put parameter description here>

Default: *1*

`Compute edges` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Output file` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:triterrainruggednessindex', input, band, compute_edges, output)
```

See also

.

18.1.2 GDAL conversion

gdal2xyz

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band number` **[number]** <put parameter description here>

Default: *1*

Outputs

`Output file` **[table]** <put output description here>

Console usage

```
processing.runalg('gdalogr:gdal2xyz', input, band, output)
```

See also

PCT to RGB

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Band to convert` **[selection]** <put parameter description here>

Options:

- 0 — 1
- 1 — 2
- 2 — 3
- 3 — 4
- 4 — 5
- 5 — 6
- 6 — 7
- 7 — 8
- 8 — 9
- 9 — 10
- 10 — 11
- 11 — 12
- 12 — 13
- 13 — 14
- 14 — 15
- 15 — 16
- 16 — 17
- 17 — 18
- 18 — 19
- 19 — 20
- 20 — 21

- 21 — 22
- 22 — 23
- 23 — 24
- 24 — 25

Default: *0*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:pcttorgb', input, nband, output)
```

See also

Polygonize (raster to vector)

Description

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Output field name` **[string]** <put parameter description here>

Default: *DN*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('gdalogr:polygonize', input, field, output)
```

See also

Rasterize (vector to raster)

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Attribute field` **[tablefield: any]** <put parameter description here>

`Write values inside an existing raster layer(*)` **[boolean]** <put parameter description here>

Default: *False*

`Set output raster size (ignored if above option is checked)` **[selection]** <put parameter description here>

Options:

- 0 — Output size in pixels
- 1 — Output resolution in map units per pixel

Default: *1*

`Horizontal` **[number]** <put parameter description here>

Default: *100.0*

`Vertical` **[number]** <put parameter description here>

Default: *100.0*

`Raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32
- 9 — CFloat32
- 10 — CFloat64

Default: *0*

Outputs

`Output layer: mandatory to choose an existing raster layer if the (*) option is selected` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:rasterize', input, field, writeover, dimensions, width, height, rtype, output)
```

See also

RGB to PCT

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Number of colors` **[number]** <put parameter description here>

Default: *2*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:rgbtopct', input, ncolors, output)
```

See also

Translate (convert format)

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Set the size of the output file (In pixels or %)` **[number]** <put parameter description here>

Default: *100*

`Output size is a percentage of input size` **[boolean]** <put parameter description here>

Default: *True*

`Nodata value, leave as none to take the nodata value from input` **[string]** <put parameter description here>

Default: *none*

`Expand` **[selection]** <put parameter description here>

Options:

- 0 — none
- 1 — gray

- 2 — rgb
- 3 — rgba

Default: *0*

`Output projection for output file [leave blank to use input projection]` **[crs]** <put parameter description here>

Default: *None*

`Subset based on georeferenced coordinates` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Copy all subdatasets of this file to individual output files` **[boolean]** <put parameter description here>

Default: *False*

`Additional creation parameters` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Output raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32
- 9 — CFloat32
- 10 — CFloat64

Default: *5*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:translate', input, outsize, outsize_perc, no_data, expand, srs, projwin, sds, extra,
```

See also

.

18.1.3 GDAL extraction

Clip raster by extent

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Nodata value, leave as none to take the nodata value from input` **[string]** <put parameter description here>

Default: *none*

`Clipping extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Additional creation parameters` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:cliprasterbyextent', input, no_data, projwin, extra, output)
```

See also

Clip raster by mask layer

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Mask layer` **[vector: polygon]** <put parameter description here>

`Nodata value, leave as none to take the nodata value from input` **[string]** <put parameter description here>

Default: *none*

`Create and output alpha band` **[boolean]** <put parameter description here>

Default: *False*

`Keep resolution of output raster` **[boolean]** <put parameter description here>

Default: *False*

`Additional creation parameters` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:cliprasterbymasklayer', input, mask, no_data, alpha_band, keep_resolution, extra, ou
```

See also

Contour

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Interval between contour lines` **[number]** <put parameter description here>

Default: *10.0*

`Attribute name (if not set, no elevation attribute is attached)` **[string]** Optional.

<put parameter description here>

Default: *ELEV*

`Additional creation parameters` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

`Output file for contour lines (vector)` **[vector]** <put output description here>

Console usage

```
processing.runalg('gdalogr:contour', input_raster, interval, field_name, extra, output_vector)
```

See also

.

18.1.4 GDAL miscellaneous

Build Virtual Raster

Описание

<put algortithm description here>

Parameters

`Input layers` **[multipleinput: rasters]** <put parameter description here>

`Resolution` **[selection]** <put parameter description here>

Options:

- 0 — average
- 1 — highest
- 2 — lowest

Default: *0*

`Layer stack` **[boolean]** <put parameter description here>

Default: *True*

`Allow projection difference` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:buildvirtualraster', input, resolution, separate, proj_difference, output)
```

See also

Merge

Описание

<put algortithm description here>

Parameters

`Input layers` **[multipleinput: rasters]** <put parameter description here>

`Grab pseudocolor table from first layer` **[boolean]** <put parameter description here>

Default: *False*

`Layer stack` **[boolean]** <put parameter description here>

Default: *False*

`Output raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32
- 9 — CFloat32
- 10 — CFloat64

Default: *5*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:merge', input, pct, separate, rtype, output)
```

See also

Build overviews (pyramids)

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Overview levels` **[string]** <put parameter description here>

Default: *2 4 8 16*

`Remove all existing overviews` **[boolean]** <put parameter description here>

Default: *False*

`Resampling method` **[selection]** <put parameter description here>

Options:

- 0 — nearest
- 1 — average
- 2 — gauss

- 3 — cubic
- 4 — average_mp
- 5 — average_magphase
- 6 — mode

Default: *0*

`Overview format` **[selection]** <put parameter description here>

Options:

- 0 — Internal (if possible)
- 1 — External (GTiff .ovr)
- 2 — External (ERDAS Imagine .aux)

Default: *0*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:overviews', input, levels, clean, resampling_method, format)
```

See also

Information

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Suppress GCP info` **[boolean]** <put parameter description here>

Default: *False*

`Suppress metadata info` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Layer information` **[html]** <put output description here>

Console usage

```
processing.runalg('gdalorg:rasterinfo', input, nogcp, nometadata, output)
```

See also

.

18.1.5 GDAL projections

Extract projection

Описание

<put algortithm description here>

Parameters

`Input file` **[raster]** <put parameter description here>

`Create also .prj file` **[boolean]** <put parameter description here>

Default: *False*

Outputs

Console usage

```
processing.runalg('gdalogr:extractprojection', input, prj_file)
```

See also

Warp (reproject)

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

`Source SRS (EPSG Code)` **[crs]** <put parameter description here>

Default: *EPSG:4326*

`Destination SRS (EPSG Code)` **[crs]** <put parameter description here>

Default: *EPSG:4326*

`Output file resolution in target georeferenced units (leave 0 for no change)` **[number]** <put parameter description here>

Default: *0.0*

`Resampling method` **[selection]** <put parameter description here>

Options:

- 0 — near
- 1 — bilinear

- 2 — cubic
- 3 — cubicspline
- 4 — lanczos

Default: *0*

`Additional creation parameters` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Output raster type` **[selection]** <put parameter description here>

Options:

- 0 — Byte
- 1 — Int16
- 2 — UInt16
- 3 — UInt32
- 4 — Int32
- 5 — Float32
- 6 — Float64
- 7 — CInt16
- 8 — CInt32
- 9 — CFloat32
- 10 — CFloat64

Default: *5*

Outputs

`Output layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('gdalogr:warpreproject', input, source_srs, dest_srs, tr, method, extra, rtype, output)
```

See also

.

18.1.6 OGR conversion

Convert format

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Destination Format` **[selection]** <put parameter description here>

Options:

- 0 — ESRI Shapefile
- 1 — GeoJSON
- 2 — GeoRSS
- 3 — SQLite
- 4 — GMT
- 5 — MapInfo File
- 6 — INTERLIS 1
- 7 — INTERLIS 2
- 8 — GML
- 9 — Geoconcept
- 10 — DXF
- 11 — DGN
- 12 — CSV
- 13 — BNA
- 14 — S57
- 15 — KML
- 16 — GPX
- 17 — PGDump
- 18 — GPSTrackMaker
- 19 — ODS
- 20 — XLSX
- 21 — PDF

Default: *0*

`Creation Options` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('gdalogr:convertformat', input_layer, format, options, output_layer)
```

See also

.

18.1.7 OGR geoprocessing

Clip vectors by extent

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Clip extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Additional creation Options` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('gdalogr:clipvectorsbyextent', input_layer, clip_extent, options, output_layer)
```

See also

Clip vectors by polygon

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Clip layer` **[vector: polygon]** <put parameter description here>

`Additional creation Options` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('gdalogr:clipvectorsbypolygon', input_layer, clip_layer, options, output_layer)
```

See also

.

18.1.8 OGR miscellaneous

Execute SQL

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`SQL` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

`SQL result` **[vector]** <put output description here>

Console usage

```
processing.runalg('gdalogr:executesql', input, sql, output)
```

See also

Import Vector into PostGIS database (available connections)

Описание

<put algortithm description here>

Parameters

`Database (connection name)` **[selection]** <put parameter description here>

Options:

- 0 — local

Default: *0*

`Input layer` **[vector: any]** <put parameter description here>

`Output geometry type` **[selection]** <put parameter description here>

Options:

- 0 —
- 1 — NONE
- 2 — GEOMETRY
- 3 — POINT
- 4 — LINESTRING
- 5 — POLYGON
- 6 — GEOMETRYCOLLECTION
- 7 — MULTIPOINT
- 8 — MULTIPOLYGON
- 9 — MULTILINESTRING

Default: *5*

`Input CRS (EPSG Code)` **[crs]** <put parameter description here>

Default: *EPSG:4326*

`Output CRS (EPSG Code)` **[crs]** <put parameter description here>

Default: *EPSG:4326*

`Schema name` **[string]** Optional.

<put parameter description here>

Default: *public*

`Table name, leave blank to use input name` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Primary Key` **[string]** Optional.

<put parameter description here>

Default: *id*

`Geometry column name` **[string]** Optional.

<put parameter description here>

Default: *geom*

`Vector dimensions` **[selection]** <put parameter description here>

Options:

- 0 — 2

- 1 — 3

Default: *0*

`Distance tolerance for simplification` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Maximum distance between 2 nodes (densification)` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Select features by extent (defined in input layer CRS)` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Clip the input layer using the above (rectangle) extent` **[boolean]** <put parameter description here>

Default: *False*

`Select features using a SQL "WHERE"statement (Ex: column="value")` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Group "n"features per transaction (Default: 20000)` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Overwrite existing table?` **[boolean]** <put parameter description here>

Default: *True*

`Append to existing table?` **[boolean]** <put parameter description here>

Default: *False*

`Append and add new fields to existing table?` **[boolean]** <put parameter description here>

Default: *False*

`Do not launder columns/table name/s?` **[boolean]** <put parameter description here>

Default: *False*

`Do not create Spatial Index?` **[boolean]** <put parameter description here>

Default: *False*

`Continue after a failure, skipping the failed feature` **[boolean]** <put parameter description here>

Default: *False*

`Additional creation options` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

Console usage

```
processing.runalg('gdalogr:importvectorintopostgisdatabaseavailableconnections', database, input_layer, gtype, s
```

See also

Import Vector into PostGIS database (new connection)

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Output geometry type` **[selection]** <put parameter description here>

Options:

- 0 —
- 1 — NONE
- 2 — GEOMETRY
- 3 — POINT
- 4 — LINESTRING
- 5 — POLYGON
- 6 — GEOMETRYCOLLECTION
- 7 — MULTIPOINT
- 8 — MULTIPOLYGON
- 9 — MULTILINESTRING

Default: *5*

`Input CRS (EPSG Code)` **[crs]** <put parameter description here>

Default: *EPSG:4326*

`Output CRS (EPSG Code)` **[crs]** <put parameter description here>

Default: *EPSG:4326*

`Host` **[string]** <put parameter description here>

Default: *localhost*

`Port` **[string]** <put parameter description here>

Default: *5432*

`Username` **[string]** <put parameter description here>

Default: *(not set)*

`Database Name` **[string]** <put parameter description here>

Default: *(not set)*

`Password` **[string]** <put parameter description here>

Default: *(not set)*

`Schema name` **[string]** Optional.

<put parameter description here>

Default: *public*

`Table name, leave blank to use input name` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Primary Key` **[string]** Optional.

<put parameter description here>

Default: *id*

`Geometry column name` **[string]** Optional.

<put parameter description here>

Default: *geom*

`Vector dimensions` **[selection]** <put parameter description here>

Options:

- 0 — 2
- 1 — 3

Default: *0*

`Distance tolerance for simplification` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Maximum distance between 2 nodes (densification)` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Select features by extent (defined in input layer CRS)` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Clip the input layer using the above (rectangle) extent` **[boolean]** <put parameter description here>

Default: *False*

`Select features using a SQL "WHERE"statement (Ex: column="value")` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Group "n"features per transaction (Default: 20000)` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Overwrite existing table?` **[boolean]** <put parameter description here>

Default: *True*

`Append to existing table?` **[boolean]** <put parameter description here>

Default: *False*

`Append and add new fields to existing table?` **[boolean]** <put parameter description here>

Default: *False*

`Do not launder columns/table name/s?` **[boolean]** <put parameter description here>

Default: *False*

`Do not create Spatial Index?` **[boolean]** <put parameter description here>

Default: *False*

`Continue after a failure, skipping the failed feature` **[boolean]** <put parameter description here>

Default: *False*

`Additional creation options` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

Console usage

```
processing.runalg('gdalogr:importvectorintopostgisdatabasenewconnection', input_layer, gtype, s_srs, t_srs, hos
```

See also

Information

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

Outputs

`Layer information` **[html]** <put output description here>

Console usage

```
processing.runalg('gdalogr:information', input, output)
```

See also

.

18.2 LAStools

LAStools is a collection of highly efficient, multicore command line tools for LiDAR data processing.

18.2.1 las2las_filter

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

`filter (by return, classification, flags)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — keep_last
- 2 — keep_first
- 3 — keep_middle
- 4 — keep_single
- 5 — drop_single
- 6 — keep_double
- 7 — keep_class 2
- 8 — keep_class 2 8
- 9 — keep_class 8
- 10 — keep_class 6
- 11 — keep_class 9
- 12 — keep_class 3 4 5
- 13 — keep_class 2 6
- 14 — drop_class 7
- 15 — drop_withheld

Default: *0*

`second filter (by return, classification, flags)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — keep_last
- 2 — keep_first
- 3 — keep_middle

- 4 — keep_single
- 5 — drop_single
- 6 — keep_double
- 7 — keep_class 2
- 8 — keep_class 2 8
- 9 — keep_class 8
- 10 — keep_class 6
- 11 — keep_class 9
- 12 — keep_class 3 4 5
- 13 — keep_class 2 6
- 14 — drop_class 7
- 15 — drop_withheld

Default: *0*

`filter (by coordinate, intensity, GPS time, ...)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — clip_x_above
- 2 — clip_x_below
- 3 — clip_y_above
- 4 — clip_y_below
- 5 — clip_z_above
- 6 — clip_z_below
- 7 — drop_intensity_above
- 8 — drop_intensity_below
- 9 — drop_gps_time_above
- 10 — drop_gps_time_below
- 11 — drop_scan_angle_above
- 12 — drop_scan_angle_below
- 13 — keep_point_source
- 14 — drop_point_source
- 15 — drop_point_source_above
- 16 — drop_point_source_below
- 17 — keep_user_data
- 18 — drop_user_data
- 19 — drop_user_data_above
- 20 — drop_user_data_below
- 21 — keep_every_nth
- 22 — keep_random_fraction

- 23 — thin_with_grid

Default: *0*

`value for filter (by coordinate, intensity, GPS time, ...)` **[string]** <put parameter description here>

Default: *(not set)*

`second filter (by coordinate, intensity, GPS time, ...)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — clip_x_above
- 2 — clip_x_below
- 3 — clip_y_above
- 4 — clip_y_below
- 5 — clip_z_above
- 6 — clip_z_below
- 7 — drop_intensity_above
- 8 — drop_intensity_below
- 9 — drop_gps_time_above
- 10 — drop_gps_time_below
- 11 — drop_scan_angle_above
- 12 — drop_scan_angle_below
- 13 — keep_point_source
- 14 — drop_point_source
- 15 — drop_point_source_above
- 16 — drop_point_source_below
- 17 — keep_user_data
- 18 — drop_user_data
- 19 — drop_user_data_above
- 20 — drop_user_data_below
- 21 — keep_every_nth
- 22 — keep_random_fraction
- 23 — thin_with_grid

Default: *0*

`value for second filter (by coordinate, intensity, GPS time, ...)` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

`output LAS/LAZ file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:las2lasfilter', verbose, input_laslaz, filter_return_class_flags1, filter_return_
```

See also

18.2.2 las2las_project

Description

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

`source projection` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — utm
- 2 — sp83
- 3 — sp27
- 4 — longlat
- 5 — latlong

Default: *0*

`source utm zone` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — 1 (north)
- 2 — 2 (north)
- 3 — 3 (north)
- 4 — 4 (north)
- 5 — 5 (north)
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- 119 — 59 (south)
- 120 — 60 (south)

Default: *0*

`source state plane code` **[selection]** <put parameter description here>

Options:

- 0 — –
- 1 — AK_10
- 2 — AK_2
- 3 — AK_3
- 4 — AK_4
- 5 — AK_5

- 6 — AK_6
- 7 — AK_7
- 8 — AK_8
- 9 — AK_9
- 10 — AL_E
- 11 — AL_W
- 12 — AR_N
- 13 — AR_S
- 14 — AZ_C
- 15 — AZ_E
- 16 — AZ_W
- 17 — CA_I
- 18 — CA_II
- 19 — CA_III
- 20 — CA_IV
- 21 — CA_V
- 22 — CA_VI
- 23 — CA_VII
- 24 — CO_C
- 25 — CO_N
- 26 — CO_S
- 27 — CT
- 28 — DE
- 29 — FL_E
- 30 — FL_N
- 31 — FL_W
- 32 — GA_E
- 33 — GA_W
- 34 — HI_1
- 35 — HI_2
- 36 — HI_3
- 37 — HI_4
- 38 — HI_5
- 39 — IA_N
- 40 — IA_S
- 41 — ID_C
- 42 — ID_E
- 43 — ID_W
- 44 — IL_E

- 45 — IL_W
- 46 — IN_E
- 47 — IN_W
- 48 — KS_N
- 49 — KS_S
- 50 — KY_N
- 51 — KY_S
- 52 — LA_N
- 53 — LA_S
- 54 — MA_I
- 55 — MA_M
- 56 — MD
- 57 — ME_E
- 58 — ME_W
- 59 — MI_C
- 60 — MI_N
- 61 — MI_S
- 62 — MN_C
- 63 — MN_N
- 64 — MN_S
- 65 — MO_C
- 66 — MO_E
- 67 — MO_W
- 68 — MS_E
- 69 — MS_W
- 70 — MT_C
- 71 — MT_N
- 72 — MT_S
- 73 — NC
- 74 — ND_N
- 75 — ND_S
- 76 — NE_N
- 77 — NE_S
- 78 — NH
- 79 — NJ
- 80 — NM_C
- 81 — NM_E
- 82 — NM_W
- 83 — NV_C

- 84 — NV_E
- 85 — NV_W
- 86 — NY_C
- 87 — NY_E
- 88 — NY_LI
- 89 — NY_W
- 90 — OH_N
- 91 — OH_S
- 92 — OK_N
- 93 — OK_S
- 94 — OR_N
- 95 — OR_S
- 96 — PA_N
- 97 — PA_S
- 98 — PR
- 99 — RI
- 100 — SC_N
- 101 — SC_S
- 102 — SD_N
- 103 — SD_S
- 104 — St.Croix
- 105 — TN
- 106 — TX_C
- 107 — TX_N
- 108 — TX_NC
- 109 — TX_S
- 110 — TX_SC
- 111 — UT_C
- 112 — UT_N
- 113 — UT_S
- 114 — VA_N
- 115 — VA_S
- 116 — VT
- 117 — WA_N
- 118 — WA_S
- 119 — WI_C
- 120 — WI_N
- 121 — WI_S
- 122 — WV_N

- 123 — WV_S
- 124 — WY_E
- 125 — WY_EC
- 126 — WY_W
- 127 — WY_WC

Default: *0*

`target projection` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — utm
- 2 — sp83
- 3 — sp27
- 4 — longlat
- 5 — latlong

Default: *0*

`target utm zone` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — 1 (north)
- 2 — 2 (north)
- 3 — 3 (north)
- 4 — 4 (north)
- 5 — 5 (north)
- 6 — 6 (north)
- 7 — 7 (north)
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- 118 — 58 (south)
- 119 — 59 (south)
- 120 — 60 (south)

Default: *0*

`target state plane code` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — AK_10
- 2 — AK_2
- 3 — AK_3
- 4 — AK_4
- 5 — AK_5
- 6 — AK_6
- 7 — AK_7
- 8 — AK_8
- 9 — AK_9
- 10 — AL_E
- 11 — AL_W
- 12 — AR_N
- 13 — AR_S
- 14 — AZ_C

- 15 — AZ_E
- 16 — AZ_W
- 17 — CA_I
- 18 — CA_II
- 19 — CA_III
- 20 — CA_IV
- 21 — CA_V
- 22 — CA_VI
- 23 — CA_VII
- 24 — CO_C
- 25 — CO_N
- 26 — CO_S
- 27 — CT
- 28 — DE
- 29 — FL_E
- 30 — FL_N
- 31 — FL_W
- 32 — GA_E
- 33 — GA_W
- 34 — HI_1
- 35 — HI_2
- 36 — HI_3
- 37 — HI_4
- 38 — HI_5
- 39 — IA_N
- 40 — IA_S
- 41 — ID_C
- 42 — ID_E
- 43 — ID_W
- 44 — IL_E
- 45 — IL_W
- 46 — IN_E
- 47 — IN_W
- 48 — KS_N
- 49 — KS_S
- 50 — KY_N
- 51 — KY_S
- 52 — LA_N
- 53 — LA_S

- 54 — MA_I
- 55 — MA_M
- 56 — MD
- 57 — ME_E
- 58 — ME_W
- 59 — MI_C
- 60 — MI_N
- 61 — MI_S
- 62 — MN_C
- 63 — MN_N
- 64 — MN_S
- 65 — MO_C
- 66 — MO_E
- 67 — MO_W
- 68 — MS_E
- 69 — MS_W
- 70 — MT_C
- 71 — MT_N
- 72 — MT_S
- 73 — NC
- 74 — ND_N
- 75 — ND_S
- 76 — NE_N
- 77 — NE_S
- 78 — NH
- 79 — NJ
- 80 — NM_C
- 81 — NM_E
- 82 — NM_W
- 83 — NV_C
- 84 — NV_E
- 85 — NV_W
- 86 — NY_C
- 87 — NY_E
- 88 — NY_LI
- 89 — NY_W
- 90 — OH_N
- 91 — OH_S
- 92 — OK_N

- 93 — OK_S
- 94 — OR_N
- 95 — OR_S
- 96 — PA_N
- 97 — PA_S
- 98 — PR
- 99 — RI
- 100 — SC_N
- 101 — SC_S
- 102 — SD_N
- 103 — SD_S
- 104 — St.Croix
- 105 — TN
- 106 — TX_C
- 107 — TX_N
- 108 — TX_NC
- 109 — TX_S
- 110 — TX_SC
- 111 — UT_C
- 112 — UT_N
- 113 — UT_S
- 114 — VA_N
- 115 — VA_S
- 116 — VT
- 117 — WA_N
- 118 — WA_S
- 119 — WI_C
- 120 — WI_N
- 121 — WI_S
- 122 — WV_N
- 123 — WV_S
- 124 — WY_E
- 125 — WY_EC
- 126 — WY_W
- 127 — WY_WC

Default: *0*

Outputs

`output LAS/LAZ file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:las2lasproject', verbose, input_laslaz, source_projection, source_utm, source_sp,
```

See also

18.2.3 las2las_transform

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

`transform (coordinates)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — translate_x
- 2 — translate_y
- 3 — translate_z
- 4 — scale_x
- 5 — scale_y
- 6 — scale_z
- 7 — clamp_z_above
- 8 — clamp_z_below

Default: *0*

`value for transform (coordinates)` **[string]** <put parameter description here>

Default: *(not set)*

`second transform (coordinates)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — translate_x
- 2 — translate_y
- 3 — translate_z
- 4 — scale_x
- 5 — scale_y
- 6 — scale_z
- 7 — clamp_z_above

- 8 — clamp_z_below

Default: *0*

`value for second transform (coordinates)` **[string]** <put parameter description here>

Default: *(not set)*

`transform (intensities, scan angles, GPS times, ...)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — scale_intensity
- 2 — translate_intensity
- 3 — clamp_intensity_above
- 4 — clamp_intensity_below
- 5 — scale_scan_angle
- 6 — translate_scan_angle
- 7 — translate_gps_time
- 8 — set_classification
- 9 — set_user_data
- 10 — set_point_source
- 11 — scale_rgb_up
- 12 — scale_rgb_down
- 13 — repair_zero_returns

Default: *0*

`value for transform (intensities, scan angles, GPS times, ...)` **[string]** <put parameter description here>

Default: *(not set)*

`second transform (intensities, scan angles, GPS times, ...)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — scale_intensity
- 2 — translate_intensity
- 3 — clamp_intensity_above
- 4 — clamp_intensity_below
- 5 — scale_scan_angle
- 6 — translate_scan_angle
- 7 — translate_gps_time
- 8 — set_classification
- 9 — set_user_data
- 10 — set_point_source
- 11 — scale_rgb_up

- 12 — scale_rgb_down
- 13 — repair_zero_returns

Default: *0*

`value for second transform (intensities, scan angles, GPS times, ...)` **[string]** <put parameter description here>

Default: *(not set)*

`operations (first 7 need an argument)` **[selection]** <put parameter description here>

Options:

- 0 — —
- 1 — set_point_type
- 2 — set_point_size
- 3 — set_version_minor
- 4 — set_version_major
- 5 — start_at_point
- 6 — stop_at_point
- 7 — remove_vlr
- 8 — auto_reoffset
- 9 — week_to_adjusted
- 10 — adjusted_to_week
- 11 — scale_rgb_up
- 12 — scale_rgb_down
- 13 — remove_all_vlrs
- 14 — remove_extra
- 15 — clip_to_bounding_box

Default: *0*

`argument for operation` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

`output LAS/LAZ file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:las2lastransform', verbose, input_laslaz, transform_coordinate1, transform_coordi
```

See also

18.2.4 las2txt

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

`parse_string` **[string]** <put parameter description here>

Default: *xyz*

Outputs

`Output ASCII file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:las2txt', verbose, input_laslaz, parse_string, output)
```

See also

18.2.5 lasindex

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

`is mobile or terrestrial LiDAR (not airborne)` **[boolean]** <put parameter description here>

Default: *False*

Outputs

Console usage

```
processing.runalg('lidartools:lasindex', verbose, input_laslaz, mobile_or_terrestrial)
```

See also

18.2.6 lasinfo

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

Outputs

`Output ASCII file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:lasinfo', verbose, input_laslaz, output)
```

See also

18.2.7 lasmerge

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`files are flightlines` **[boolean]** <put parameter description here>

Default: *True*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

`2nd file` **[file]** Optional.

<put parameter description here>

`3rd file` **[file]** Optional.

<put parameter description here>

`4th file` **[file]** Optional.

<put parameter description here>

`5th file` **[file]** Optional.

<put parameter description here>

`6th file` **[file]** Optional.

<put parameter description here>

`7th file` **[file]** Optional.

<put parameter description here>

Outputs

`output LAS/LAZ file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:lasmerge', verbose, files_are_flightlines, input_laslaz, file2, file3, file4, fil
```

See also

18.2.8 lasprecision

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

Outputs

`Output ASCII file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:lasprecision', verbose, input_laslaz, output)
```

See also

18.2.9 lasquery

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`area of interest` **[extent]** <put parameter description here>

Default: *0,1,0,1*

Outputs

Console usage

```
processing.runalg('lidartools:lasquery', verbose, aoi)
```

See also

18.2.10 lasvalidate

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

Outputs

`Output XML file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:lasvalidate', verbose, input_laslaz, output)
```

See also

18.2.11 laszip

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`input LAS/LAZ file` **[file]** Optional.

<put parameter description here>

`only report size` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`output LAS/LAZ file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:laszip', verbose, input_laslaz, report_size, output_laslaz)
```

See also

18.2.12 txt2las

Описание

<put algortithm description here>

Parameters

`verbose` **[boolean]** <put parameter description here>

Default: *False*

`Input ASCII file` **[file]** Optional.

<put parameter description here>

`parse lines as` **[string]** <put parameter description here>

Default: *xyz*

`skip the first n lines` **[number]** <put parameter description here>

Default: *0*

`resolution of x and y coordinate` **[number]** <put parameter description here>

Default: *0.01*

`resolution of z coordinate` **[number]** <put parameter description here>

Default: *0.01*

Outputs

`output LAS/LAZ file` **[file]** <put output description here>

Console usage

```
processing.runalg('lidartools:txt2las', verbose, input, parse_string, skip, scale_factor_xy, scale_factor_z, ou
```

See also

.

18.3 Modeler Tools

18.3.1 Calculator

Описание

<put algortithm description here>

Parameters

`Formula` **[string]** <put parameter description here>

Default: *(not set)*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

`dummy` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Result` **[number]** <put output description here>

Console usage

```
processing.runalg('modelertools:calculator', formula, number0, number1, number2, number3, number4, number5, num
```

See also

18.3.2 Raster layer bounds

Описание

<put algortithm description here>

Parameters

Layer **[raster]** <put parameter description here>

Outputs

min X **[number]** <put output description here>

max X **[number]** <put output description here>

min Y **[number]** <put output description here>

max Y **[number]** <put output description here>

Extent **[extent]** <put output description here>

Console usage

```
processing.runalg('modelertools:rasterlayerbounds', layer)
```

See also

18.3.3 Vector layer bounds

Описание

<put algortithm description here>

Parameters

Layer **[vector: any]** <put parameter description here>

Outputs

min X **[number]** <put output description here>

max X **[number]** <put output description here>

min Y **[number]** <put output description here>

max Y **[number]** <put output description here>

Extent **[extent]** <put output description here>

Console usage

```
processing.runalg('modelertools:vectorlayerbounds', layer)
```

See also

.

18.4 OrfeoToolbox algorithm provider

Orfeo ToolBox (OTB) is an open source library of image processing algorithms. OTB is based on the medical image processing library ITK and offers particular functionalities for remote sensing image processing in general and for high spatial resolution images in particular. Targeted algorithms for high resolution optical images (Pleiades, SPOT, QuickBird, WorldView, Landsat, Ikonos), hyperspectral sensors (Hyperion) or SAR (TerraSarX, ERS, Palsar) are available.

Примечание: Please remember that Processing contains only the interface description, so you need to install OTB by yourself and configure Processing properly.

.

18.4.1 Calibration

Optical calibration

Описание

<put algortithm description here>

Parameters

`Input` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Calibration Level` **[selection]** <put parameter description here>

Options:

- 0 — toa

Default: *0*

`Convert to milli reflectance` **[boolean]** <put parameter description here>

Default: *True*

`Clamp of reflectivity values between [0, 100]` **[boolean]** <put parameter description here>

Default: *True*

`Relative Spectral Response File` **[file]** Optional.

<put parameter description here>

Outputs

`Output` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:opticalcalibration', -in, -ram, -level, -milli, -clamp, -rsr, -out)
```

See also

.

18.4.2 Feature extrcation

BinaryMorphologicalOperation (closing)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Structuring Element Type` **[selection]** <put parameter description here>

Options:

- 0 — ball

Default: *0*

`The Structuring Element Radius` **[number]** <put parameter description here>

Default: *5*

`Morphological Operation` **[selection]** <put parameter description here>

Options:

- 0 — closing

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:binarymorphologicaloperationclosing', -in, -channel, -ram, -structype, -structype.ball.x
```

See also

BinaryMorphologicalOperation (dilate)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Structuring Element Type` **[selection]** <put parameter description here>

Options:

- 0 — ball

Default: *0*

`The Structuring Element Radius` **[number]** <put parameter description here>

Default: *5*

`Morphological Operation` **[selection]** <put parameter description here>

Options:

- 0 — dilate

Default: *0*

`Foreground Value` **[number]** <put parameter description here>

Default: *1*

`Background Value` **[number]** <put parameter description here>

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:binarymorphologicaloperationdilate', -in, -channel, -ram, -structype, -structype.ball.xr
```

See also

BinaryMorphologicalOperation (erode)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

  Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

  Default: *128*

`Structuring Element Type` **[selection]** <put parameter description here>

  Options:

  - 0 — ball

  Default: *0*

`The Structuring Element Radius` **[number]** <put parameter description here>

  Default: *5*

`Morphological Operation` **[selection]** <put parameter description here>

  Options:

  - 0 — erode

  Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:binarymorphologicaloperationerode', -in, -channel, -ram, -structype, -structype.ball.xra
```

See also

BinaryMorphologicalOperation (opening)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Structuring Element Type` **[selection]** <put parameter description here>

Options:

- 0 — ball

Default: *0*

`The Structuring Element Radius` **[number]** <put parameter description here>

Default: *5*

`Morphological Operation` **[selection]** <put parameter description here>

Options:

- 0 — opening

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:binarymorphologicaloperationopening', -in, -channel, -ram, -structype, -structype.ball.x
```

See also

EdgeExtraction (gradient)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Edge feature` **[selection]** <put parameter description here>

Options:

- 0 — gradient

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:edgeextractiongradient', -in, -channel, -ram, -filter, -out)
```

See also

EdgeExtraction (sobel)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Edge feature` **[selection]** <put parameter description here>

Options:

- 0 — sobel

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:edgeextractionsobel', -in, -channel, -ram, -filter, -out)
```

See also

EdgeExtraction (touzi)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Edge feature` **[selection]** <put parameter description here>

Options:

- 0 — touzi

Default: *0*

`The Radius` **[number]** <put parameter description here>

Default: *1*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:edgeextractiontouzi', -in, -channel, -ram, -filter, -filter.touzi.xradius, -out)
```

See also

GrayScaleMorphologicalOperation (closing)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Structuring Element Type` **[selection]** <put parameter description here>

Options:

- 0 — ball

Default: *0*

`The Structuring Element Radius` **[number]** <put parameter description here>

Default: *5*

`Morphological Operation` **[selection]** <put parameter description here>

Options:

- 0 — closing

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:grayscalemorphologicaloperationclosing', -in, -channel, -ram, -structype, -structype.bal
```

See also

GrayScaleMorphologicalOperation (dilate)

Description

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Structuring Element Type` **[selection]** <put parameter description here>

Options:

- 0 — ball

Default: *0*

`The Structuring Element Radius` **[number]** <put parameter description here>

Default: *5*

`Morphological Operation` **[selection]** <put parameter description here>

Options:

- 0 — dilate

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:grayscalemorphologicaloperationdilate', -in, -channel, -ram, -structype, -structype.ball
```

See also

GrayScaleMorphologicalOperation (erode)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Structuring Element Type` **[selection]** <put parameter description here>

Options:

- 0 — ball

Default: *0*

`The Structuring Element Radius` **[number]** <put parameter description here>

Default: *5*

`Morphological Operation` **[selection]** <put parameter description here>

Options:

- 0 — erode

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:grayscalemorphologicaloperationerode', -in, -channel, -ram, -structype, -structype.ball.
```

See also

GrayScaleMorphologicalOperation (opening)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Structuring Element Type` **[selection]** <put parameter description here>

Options:

- 0 — ball

Default: *0*

`The Structuring Element Radius` **[number]** <put parameter description here>

Default: *5*

`Morphological Operation` **[selection]** <put parameter description here>

Options:

- 0 — opening

Default: *0*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:grayscalemorphologicaloperationopening', -in, -channel, -ram, -structype, -structype.bal
```

See also

Haralick Texture Extraction

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`X Radius` **[number]** <put parameter description here>

Default: *2*

`Y Radius` **[number]** <put parameter description here>

Default: *2*

`X Offset` **[number]** <put parameter description here>

Default: *1*

`Y Offset` **[number]** <put parameter description here>

Default: *1*

`Image Minimum` **[number]** <put parameter description here>

Default: *0*

`Image Maximum` **[number]** <put parameter description here>

Default: *255*

`Histogram number of bin` **[number]** <put parameter description here>

Default: *8*

`Texture Set Selection` **[selection]** <put parameter description here>

Options:

- 0 — simple
- 1 — advanced
- 2 — higher

Default: *0*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:haralicktextureextraction', -in, -channel, -ram, -parameters.xrad, -parameters.yrad, -pa
```

See also

Line segment detection

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`No rescaling in [0, 255]` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Output Detected lines` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:linesegmentdetection', -in, -norescale, -out)
```

See also

Local Statistic Extraction

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Selected Channel` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Neighborhood radius` **[number]** <put parameter description here>

Default: *3*

Outputs

`Feature Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:localstatisticextraction', -in, -channel, -ram, -radius, -out)
```

See also

Multivariate alteration detector

Описание

<put algortithm description here>

Parameters

`Input Image 1` **[raster]** <put parameter description here>

`Input Image 2` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Change Map` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:multivariatealterationdetector', -in1, -in2, -ram, -out)
```

See also

Radiometric Indices

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Blue Channel` **[number]** <put parameter description here>

Default: *1*

`Green Channel` **[number]** <put parameter description here>

Default: *1*

`Red Channel` **[number]** <put parameter description here>

Default: *1*

`NIR Channel` **[number]** <put parameter description here>

Default: *1*

`Mir Channel` **[number]** <put parameter description here>

Default: *1*

`Available Radiometric Indices` **[selection]** <put parameter description here>

Options:

- 0 — ndvi
- 1 — tndvi
- 2 — rvi

- 3 — savi
- 4 — tsavi
- 5 — msavi
- 6 — msavi2
- 7 — gemi
- 8 — ipvi
- 9 — ndwi
- 10 — ndwi2
- 11 — mndwi
- 12 — ndpi
- 13 — ndti
- 14 — ri
- 15 — ci
- 16 — bi
- 17 — bi2

Default: *0*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:radiometricindices', -in, -ram, -channels.blue, -channels.green, -channels.red, -channel
```

See also

.

18.4.3 Geometry

Image Envelope

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Sampling Rate` **[number]** <put parameter description here>

Default: *0*

`Projection` **[string]** Optional.

<put parameter description here>

Default: *None*

Outputs

`Output Vector Data` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:imageenvelope', -in, -sr, -proj, -out)
```

See also

OrthoRectification (epsg)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Output Cartographic Map Projection` **[selection]** <put parameter description here>

Options:

- 0 — epsg

Default: *0*

`EPSG Code` **[number]** <put parameter description here>

Default: *4326*

`Parameters estimation modes` **[selection]** <put parameter description here>

Options:

- 0 — autosize
- 1 — autospacing

Default: *0*

`Default pixel value` **[number]** <put parameter description here>

Default: *0*

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — bco
- 1 — nn
- 2 — linear

Default: *0*

`Radius for bicubic interpolation` **[number]** <put parameter description here>

Default: *2*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Resampling grid spacing` **[number]** <put parameter description here>

Default: *4*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:orthorectificationepsg', -io.in, -map, -map.epsg.code, -outputs.mode, -outputs.default,
```

See also

OrthoRectification (fit-to-ortho)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Parameters estimation modes` **[selection]** <put parameter description here>

Options:

- 0 — orthofit

Default: *0*

`Model ortho-image` **[raster]** Optional.

<put parameter description here>

`Default pixel value` **[number]** <put parameter description here>

Default: *0*

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — bco
- 1 — nn
- 2 — linear

Default: *0*

`Radius for bicubic interpolation` **[number]** <put parameter description here>

Default: *2*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Resampling grid spacing` **[number]** <put parameter description here>

Default: *4*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:orthorectificationfittoortho', -io.in, -outputs.mode, -outputs.ortho, -outputs.default,
```

See also

OrthoRectification (lambert-WGS84)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Output Cartographic Map Projection` **[selection]** <put parameter description here>

Options:

- 0 — lambert2
- 1 — lambert93
- 2 — wgs

Default: *0*

`Parameters estimation modes` **[selection]** <put parameter description here>

Options:

- 0 — autosize
- 1 — autospacing

Default: *0*

`Default pixel value` **[number]** <put parameter description here>

Default: *0*

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — bco
- 1 — nn
- 2 — linear

Default: *0*

`Radius for bicubic interpolation` **[number]** <put parameter description here>

Default: *2*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Resampling grid spacing` **[number]** <put parameter description here>

Default: *4*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:orthorectificationlambertwgs84', -io.in, -map, -outputs.mode, -outputs.default, -elev.de
```

See also

OrthoRectification (utm)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Output Cartographic Map Projection` **[selection]** <put parameter description here>

Options:

- 0 — utm

Default: *0*

`Zone number` **[number]** <put parameter description here>

Default: *31*

`Northern Hemisphere` **[boolean]** <put parameter description here>

Default: *True*

`Parameters estimation modes` **[selection]** <put parameter description here>

Options:

- 0 — autosize
- 1 — autospacing

Default: *0*

`Default pixel value` **[number]** <put parameter description here>

Default: *0*

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — bco
- 1 — nn
- 2 — linear

Default: *0*

`Radius for bicubic interpolation` **[number]** <put parameter description here>

Default: *2*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Resampling grid spacing` **[number]** <put parameter description here>

Default: *4*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:orthorectificationutm', -io.in, -map, -map.utm.zone, -map.utm.northhem, -outputs.mode, -
```

See also

Pansharpening (bayes)

Описание

<put algortithm description here>

Parameters

`Input PAN Image` **[raster]** <put parameter description here>

`Input XS Image` **[raster]** <put parameter description here>

`Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — bayes

Default: *0*

`Weight` **[number]** <put parameter description here>

Default: *0.9999*

`S coefficient` **[number]** <put parameter description here>

Default: *1*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:pansharpeningbayes', -inp, -inxs, -method, -method.bayes.lambda, -method.bayes.s, -ram,
```

See also

Pansharpening (lmvm)

Описание

<put algortithm description here>

Parameters

`Input PAN Image` **[raster]** <put parameter description here>

`Input XS Image` **[raster]** <put parameter description here>

`Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — lmvm

Default: *0*

`X radius` **[number]** <put parameter description here>

Default: *3*

`Y radius` **[number]** <put parameter description here>

Default: *3*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:pansharpeninglmvm', -inp, -inxs, -method, -method.lmvm.radiusx, -method.lmvm.radiusy, -r
```

See also

Pansharpening (rcs)

Описание

<put algortithm description here>

Parameters

`Input PAN Image` **[raster]** <put parameter description here>

`Input XS Image` **[raster]** <put parameter description here>

`Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — rcs

Default: *0*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:pansharpeningrcs', -inp, -inxs, -method, -ram, -out)
```

See also

RigidTransformResample (id)

Описание

<put algortithm description here>

Parameters

`Input image` **[raster]** <put parameter description here>

`Type of transformation` **[selection]** <put parameter description here>

Options:

- 0 — id

Default: *0*

`X scaling` **[number]** <put parameter description here>

Default: *1*

`Y scaling` **[number]** <put parameter description here>

Default: *1*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — nn
- 1 — linear
- 2 — bco

Default: *2*

`Radius for bicubic interpolation` **[number]** <put parameter description here>

Default: *2*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:rigidtransformresampleid', -in, -transform.type, -transform.type.id.scalex, -transform.t
```

See also

RigidTransformResample (rotation)

Описание

<put algortithm description here>

Parameters

`Input image` **[raster]** <put parameter description here>

`Type of transformation` **[selection]** <put parameter description here>

Options:

- 0 — rotation

Default: *0*

`Rotation angle` **[number]** <put parameter description here>

Default: *0*

`X scaling` **[number]** <put parameter description here>

Default: *1*

`Y scaling` **[number]** <put parameter description here>

Default: *1*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — nn
- 1 — linear
- 2 — bco

Default: *2*

`Radius for bicubic interpolation` **[number]** <put parameter description here>

Default: *2*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:rigidtransformresamplerotation', -in, -transform.type, -transform.type.rotation.angle, -
```

See also

RigidTransformResample (translation)

Описание

<put algortithm description here>

Parameters

`Input image` **[raster]** <put parameter description here>

`Type of transformation` **[selection]** <put parameter description here>

Options:

- 0 — translation

Default: *0*

`The X translation (in physical units)` **[number]** <put parameter description here>

Default: *0*

`The Y translation (in physical units)` **[number]** <put parameter description here>

Default: *0*

`X scaling` **[number]** <put parameter description here>

Default: *1*

`Y scaling` **[number]** <put parameter description here>

Default: *1*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — nn
- 1 — linear
- 2 — bco

Default: *2*

`Radius for bicubic interpolation` **[number]** <put parameter description here>

Default: *2*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:rigidtransformresampletranslation', -in, -transform.type, -transform.type.translation.tx
```

See also

Superimpose sensor

Описание

<put algortithm description here>

Parameters

`Reference input` **[raster]** <put parameter description here>

`The image to reproject` **[raster]** <put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Spacing of the deformation field` **[number]** <put parameter description here>

Default: *4*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — bco
- 1 — nn
- 2 — linear

Default: *0*

`Radius for bicubic interpolation` **[number]** <put parameter description here>

Default: *2*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:superimposesensor', -inr, -inm, -elev.default, -lms, -interpolator, -interpolator.bco.ra
```

See also

.

18.4.4 Image filtering

DimensionalityReduction (ica)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — ica

Default: *0*

`number of iterations` **[number]** <put parameter description here>

Default: *20*

`Give the increment weight of W in [0, 1]` **[number]** <put parameter description here>

Default: *1*

`Number of Components` **[number]** <put parameter description here>

Default: *0*

`Normalize` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Output Image` **[raster]** <put output description here>

“ Inverse Output Image“ [raster] <put output description here>

`Transformation matrix output` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:dimensionalityreductionica', -in, -method, -method.ica.iter, -method.ica.mu, -nbcomp, -n
```

See also

DimensionalityReduction (maf)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — maf

Default: *0*

`Number of Components.` **[number]** <put parameter description here>

Default: *0*

`Normalize.` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Output Image` **[raster]** <put output description here>

`Transformation matrix output` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:dimensionalityreductionmaf', -in, -method, -nbcomp, -normalize, -out, -outmatrix)
```

See also

DimensionalityReduction (napca)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — napca

Default: *0*

`Set the x radius of the sliding window.` **[number]** <put parameter description here>

Default: *1*

`Set the y radius of the sliding window.` **[number]** <put parameter description here>

Default: *1*

`Number of Components.` **[number]** <put parameter description here>

Default: *0*

`Normalize.` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Output Image` **[raster]** <put output description here>

“ Inverse Output Image“ [raster] <put output description here>

`Transformation matrix output` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:dimensionalityreductionnapca', -in, -method, -method.napca.radiusx, -method.napca.radius
```

See also

DimensionalityReduction (pca)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — pca

Default: *0*

`Number of Components.` **[number]** <put parameter description here>

Default: *0*

`Normalize.` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Output Image` **[raster]** <put output description here>

“ Inverse Output Image“ [raster] <put output description here>

`Transformation matrix output` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:dimensionalityreductionpca', -in, -method, -nbcomp, -normalize, -out, -outinv, -outmatri
```

See also

Mean Shift filtering (can be used as Exact Large-Scale Mean-Shift segmentation, step 1)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Spatial radius` **[number]** <put parameter description here>

Default: *5*

`Range radius` **[number]** <put parameter description here>

Default: *15*

`Mode convergence threshold` **[number]** <put parameter description here>

Default: *0.1*

`Maximum number of iterations` **[number]** <put parameter description here>

Default: *100*

`Range radius coefficient` **[number]** <put parameter description here>

Default: *0*

`Mode search.` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Filtered output` **[raster]** <put output description here>

`Spatial image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:meanshiftfilteringcanbeusedasexactlargescalemeanshiftsegmentationstep1', -in, -spatialr,
```

See also

Smoothing (anidif)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

  Default: *128*

`Smoothing Type` **[selection]** <put parameter description here>

  Options:

  - 0 — anidif

  Default: *2*

`Time Step` **[number]** <put parameter description here>

  Default: *0.125*

`Nb Iterations` **[number]** <put parameter description here>

  Default: *10*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:smoothinganidif', -in, -ram, -type, -type.anidif.timestep, -type.anidif.nbiter, -out)
```

See also

Smoothing (gaussian)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Smoothing Type` **[selection]** <put parameter description here>

Options:

- 0 — gaussian

Default: *2*

`Radius` **[number]** <put parameter description here>

Default: *2*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:smoothinggaussian', -in, -ram, -type, -type.gaussian.radius, -out)
```

See also

Smoothing (mean)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Smoothing Type` **[selection]** <put parameter description here>

Options:

- 0 — mean

Default: *2*

`Radius` **[number]** <put parameter description here>

Default: *2*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:smoothingmean', -in, -ram, -type, -type.mean.radius, -out)
```

See also

.

18.4.5 Image manipulation

ColorMapping (continuous)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Operation` **[selection]** <put parameter description here>

Options:

- 0 — labeltocolor

Default: *0*

`Color mapping method` **[selection]** <put parameter description here>

Options:

- 0 — continuous

Default: *0*

`Look-up tables` **[selection]** <put parameter description here>

Options:

- 0 — red
- 1 — green
- 2 — blue
- 3 — grey
- 4 — hot
- 5 — cool
- 6 — spring
- 7 — summer
- 8 — autumn
- 9 — winter
- 10 — copper

- 11 — jet
- 12 — hsv
- 13 — overunder
- 14 — relief

Default: *0*

`Mapping range lower value` **[number]** <put parameter description here>

Default: *0*

`Mapping range higher value` **[number]** <put parameter description here>

Default: *255*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:colormappingcontinuous', -in, -ram, -op, -method, -method.continuous.lut, -method.contin
```

See also

ColorMapping (custom)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Operation` **[selection]** <put parameter description here>

Options:

- 0 — labeltocolor

Default: *0*

`Color mapping method` **[selection]** <put parameter description here>

Options:

- 0 — custom

Default: *0*

`Look-up table file` **[file]** <put parameter description here>

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:colormappingcustom', -in, -ram, -op, -method, -method.custom.lut, -out)
```

See also

ColorMapping (image)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Operation` **[selection]** <put parameter description here>

Options:

- 0 — labeltocolor

Default: *0*

`Color mapping method` **[selection]** <put parameter description here>

Options:

- 0 — image

Default: *0*

`Support Image` **[raster]** <put parameter description here>

`NoData value` **[number]** <put parameter description here>

Default: *0*

`lower quantile` **[number]** <put parameter description here>

Default: *2*

`upper quantile` **[number]** <put parameter description here>

Default: *2*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:colormappingimage', -in, -ram, -op, -method, -method.image.in, -method.image.nodatavalue
```

See also

ColorMapping (optimal)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Operation` **[selection]** <put parameter description here>

Options:

- 0 — labeltocolor

Default: *0*

`Color mapping method` **[selection]** <put parameter description here>

Options:

- 0 — optimal

Default: *0*

`Background label` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:colormappingoptimal', -in, -ram, -op, -method, -method.optimal.background, -out)
```

See also

ExtractROI (fit)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Extraction mode` **[selection]** <put parameter description here>

Options:

- 0 — fit

Default: *0*

`Reference image` **[raster]** <put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:extractroifit', -in, -ram, -mode, -mode.fit.ref, -mode.fit.elev.default, -out)
```

See also

ExtractROI (standard)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Extraction mode` **[selection]** <put parameter description here>

Options:

- 0 — standard

Default: *0*

`Start X` **[number]** <put parameter description here>

Default: *0*

`Start Y` **[number]** <put parameter description here>

Default: *0*

`Size X` **[number]** <put parameter description here>

Default: *0*

`Size Y` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:extractroistandard', -in, -ram, -mode, -startx, -starty, -sizex, -sizey, -out)
```

See also

Images Concatenation

Описание

<put algortithm description here>

Parameters

`Input images list` **[multipleinput: rasters]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:imagesconcatenation', -il, -ram, -out)
```

See also

Image Tile Fusion

Описание

<put algortithm description here>

Parameters

`Input Tile Images` **[multipleinput: rasters]** <put parameter description here>

`Number of tile columns` **[number]** <put parameter description here>

Default: *0*

`Number of tile rows` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:imagetilefusion', -il, -cols, -rows, -out)
```

See also

Read image information

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Display the OSSIM keywordlist` **[boolean]** <put parameter description here>

Default: *True*

`GCPs Id` **[string]** <put parameter description here>

Default: *None*

`GCPs Info` **[string]** <put parameter description here>

Default: *None*

`GCPs Image Coordinates` **[string]** <put parameter description here>

Default: *None*

`GCPs Geographic Coordinates` **[string]** <put parameter description here>

Default: *None*

Outputs

Console usage

```
processing.runalg('otb:readimageinformation', -in, -keywordlist, -gcp.ids, -gcp.info, -gcp.imcoord, -gcp.geocoo
```

See also

Rescale Image

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Output min value` **[number]** <put parameter description here>

Default: *0*

`Output max value` **[number]** <put parameter description here>

Default: *255*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:rescaleimage', -in, -ram, -outmin, -outmax, -out)
```

See also

Split Image

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output Image` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:splitimage', -in, -ram, -out)
```

See also

.

18.4.6 Learning

Classification Map Regularization

Описание

<put algortithm description here>

Parameters

`Input classification image` **[raster]** <put parameter description here>

`Structuring element radius (in pixels)` **[number]** <put parameter description here>

Default: *1*

`Multiple majority: Undecided(X)/Original` **[boolean]** <put parameter description here>

Default: *True*

`Label for the NoData class` **[number]** <put parameter description here>

Default: *0*

`Label for the Undecided class` **[number]** <put parameter description here>

Default: *0*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output regularized image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:classificationmapregularization', -io.in, -ip.radius, -ip.suvbool, -ip.nodatalabel, -ip.
```

See also

ComputeConfusionMatrix (raster)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Ground truth` **[selection]** <put parameter description here>

Options:

- 0 — raster

Default: *0*

`Input reference image` **[raster]** <put parameter description here>

`Value for nodata pixels` **[number]** <put parameter description here>

Default: *0*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Matrix output` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:computeconfusionmatrixraster', -in, -ref, -ref.raster.in, -nodatalabel, -ram, -out)
```

See also

ComputeConfusionMatrix (vector)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Ground truth` **[selection]** <put parameter description here>

Options:

- 0 — vector

Default: *0*

`Input reference vector data` **[file]** <put parameter description here>

`Field name` **[string]** Optional.

<put parameter description here>

Default: *Class*

`Value for nodata pixels` **[number]** <put parameter description here>

Default: *0*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Matrix output` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:computeconfusionmatrixvector', -in, -ref, -ref.vector.in, -ref.vector.field, -nodatalabe
```

See also

Compute Images second order statistics

Описание

<put algortithm description here>

Parameters

`Input images` **[multipleinput: rasters]** <put parameter description here>

`Background Value` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Output XML file` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:computeimagessecondorderstatistics', -il, -bv, -out)
```

See also

FusionOfClassifications (dempstershafer)

Описание

<put algortithm description here>

Parameters

`Input classifications` **[multipleinput: rasters]** <put parameter description here>

`Fusion method` **[selection]** <put parameter description here>

Options:

- 0 — dempstershafer

Default: *0*

`Confusion Matrices` **[multipleinput: files]** <put parameter description here>

`Mass of belief measurement` **[selection]** <put parameter description here>

Options:

- 0 — precision
- 1 — recall
- 2 — accuracy
- 3 — kappa

Default: *0*

`Label for the NoData class` **[number]** <put parameter description here>

Default: *0*

`Label for the Undecided class` **[number]** <put parameter description here>

Default: *0*

Outputs

`The output classification image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:fusionofclassificationsdempstershafer', -il, -method, -method.dempstershafer.cmfl, -meth
```

See also

FusionOfClassifications (majorityvoting)

Описание

<put algortithm description here>

Parameters

`Input classifications` **[multipleinput: rasters]** <put parameter description here>

`Fusion method` **[selection]** <put parameter description here>

Options:

- 0 — majorityvoting

Default: *0*

`Label for the NoData class` **[number]** <put parameter description here>

Default: *0*

`Label for the Undecided class` **[number]** <put parameter description here>

Default: *0*

Outputs

`The output classification image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:fusionofclassificationsmajorityvoting', -il, -method, -nodatalabel, -undecidedlabel, -ou
```

See also

Image Classification

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Input Mask` **[raster]** Optional.

<put parameter description here>

`Model file` **[file]** <put parameter description here>

`Statistics file` **[file]** Optional.

<put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:imageclassification', -in, -mask, -model, -imstat, -ram, -out)
```

See also

SOM Classification

Описание

<put algortithm description here>

Parameters

`InputImage` **[raster]** <put parameter description here>

`ValidityMask` **[raster]** Optional.

<put parameter description here>

`TrainingProbability` **[number]** <put parameter description here>

Default: *1*

`TrainingSetSize` **[number]** <put parameter description here>

Default: *0*

`StreamingLines` **[number]** <put parameter description here>

Default: *0*

`SizeX` **[number]** <put parameter description here>

Default: *32*

`SizeY` **[number]** <put parameter description here>

Default: *32*

`NeighborhoodX` **[number]** <put parameter description here>

Default: *10*

`NeighborhoodY` **[number]** <put parameter description here>

Default: *10*

`NumberIteration` **[number]** <put parameter description here>

Default: *5*

`BetaInit` **[number]** <put parameter description here>

Default: *1*

`BetaFinal` **[number]** <put parameter description here>

Default: *0.1*

`InitialValue` **[number]** <put parameter description here>

Default: *0*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`OutputImage` **[raster]** <put output description here>

`SOM Map` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:somclassification', -in, -vm, -tp, -ts, -sl, -sx, -sy, -nx, -ny, -ni, -bi, -bf, -iv, -ra
```

See also

TrainImagesClassifier (ann)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — ann

Default: *0*

`Train Method Type` **[selection]** <put parameter description here>

Options:

- 0 — reg
- 1 — back

Default: *0*

`Number of neurons in each intermediate layer` **[string]** <put parameter description here>

Default: *None*

`Neuron activation function type` **[selection]** <put parameter description here>

Options:

- 0 — ident
- 1 — sig

- 2 — gau

Default: *1*

`Alpha parameter of the activation function` **[number]** <put parameter description here>

Default: *1*

`Beta parameter of the activation function` **[number]** <put parameter description here>

Default: *1*

`Strength of the weight gradient term in the BACKPROP method` **[number]** <put parameter description here>

Default: *0.1*

`Strength of the momentum term (the difference between weights on the 2 previous iterations)` **[number]** <put parameter description here>

Default: *0.1*

`Initial value Delta_0 of update-values Delta_{ij} in RPROP method` **[number]** <put parameter description here>

Default: *0.1*

`Update-values lower limit Delta_{min} in RPROP method` **[number]** <put parameter description here>

Default: *1e-07*

`Termination criteria` **[selection]** <put parameter description here>

Options:

- 0 — iter
- 1 — eps
- 2 — all

Default: *2*

`Epsilon value used in the Termination criteria` **[number]** <put parameter description here>

Default: *0.01*

`Maximum number of iterations used in the Termination criteria` **[number]** <put parameter description here>

Default: *1000*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifierann', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sampl
```

See also

TrainImagesClassifier (bayes)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — bayes

Default: *0*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifierbayes', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sam
```

See also

TrainImagesClassifier (boost)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — boost

Default: *0*

`Boost Type` **[selection]** <put parameter description here>

Options:

- 0 — discrete
- 1 — real
- 2 — logit
- 3 — gentle

Default: *1*

`Weak count` **[number]** <put parameter description here>

Default: *100*

`Weight Trim Rate` **[number]** <put parameter description here>

Default: *0.95*

`Maximum depth of the tree` **[number]** <put parameter description here>

Default: *1*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifierboost', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sam
```

See also

TrainImagesClassifier (dt)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — dt

Default: *0*

`Maximum depth of the tree` **[number]** <put parameter description here>

Default: *65535*

`Minimum number of samples in each node` **[number]** <put parameter description here>

Default: *10*

`Termination criteria for regression tree` **[number]** <put parameter description here>

Default: *0.01*

`Cluster possible values of a categorical variable into K <= cat clusters to find a suboptimal split` **[**
<put parameter description here>

Default: *10*

`K-fold cross-validations` **[number]** <put parameter description here>

Default: *10*

`Set Use1seRule flag to false` **[boolean]** <put parameter description here>

Default: *True*

`Set TruncatePrunedTree flag to false` **[boolean]** <put parameter description here>

Default: *True*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifierdt', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sample
```

See also

TrainImagesClassifier (gbt)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — gbt

Default: *0*

`Number of boosting algorithm iterations` **[number]** <put parameter description here>

Default: *200*

`Regularization parameter` **[number]** <put parameter description here>

Default: *0.01*

`Portion of the whole training set used for each algorithm iteration` **[number]** <put parameter description here>

Default: *0.8*

`Maximum depth of the tree` **[number]** <put parameter description here>

Default: *3*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifiergbt', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sampl
```

See also

TrainImagesClassifier (knn)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — knn

Default: *0*

`Number of Neighbors` **[number]** <put parameter description here>

Default: *32*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifierknn', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sampl
```

See also

TrainImagesClassifier (libsvm)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — libsvm

Default: *0*

`SVM Kernel Type` **[selection]** <put parameter description here>

Options:

- 0 — linear
- 1 — rbf
- 2 — poly
- 3 — sigmoid

Default: *0*

`Cost parameter C` **[number]** <put parameter description here>

Default: *1*

`Parameters optimization` **[boolean]** <put parameter description here>

Default: *True*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifierlibsvm', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sa
```

See also

TrainImagesClassifier (rf)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — rf

Default: *0*

`Maximum depth of the tree` **[number]** <put parameter description here>

Default: *5*

`Minimum number of samples in each node` **[number]** <put parameter description here>

Default: *10*

`Termination Criteria for regression tree` **[number]** <put parameter description here>

Default: *0*

`Cluster possible values of a categorical variable into K <= cat clusters to find a suboptimal split` **[**
<put parameter description here>

Default: *10*

`Size of the randomly selected subset of features at each tree node` **[number]** <put parameter description here>

Default: *0*

`Maximum number of trees in the forest` **[number]** <put parameter description here>

Default: *100*

`Sufficient accuracy (OOB error)` **[number]** <put parameter description here>

Default: *0.01*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifierrf', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sample
```

See also

TrainImagesClassifier (svm)

Описание

<put algortithm description here>

Parameters

`Input Image List` **[multipleinput: rasters]** <put parameter description here>

`Input Vector Data List` **[multipleinput: any vectors]** <put parameter description here>

`Input XML image statistics file` **[file]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Maximum training sample size per class` **[number]** <put parameter description here>

Default: *1000*

`Maximum validation sample size per class` **[number]** <put parameter description here>

Default: *1000*

`On edge pixel inclusion` **[boolean]** <put parameter description here>

Default: *True*

`Training and validation sample ratio` **[number]** <put parameter description here>

Default: *0.5*

`Name of the discrimination field` **[string]** <put parameter description here>

Default: *Class*

`Classifier to use for the training` **[selection]** <put parameter description here>

Options:

- 0 — svm

Default: *0*

`SVM Model Type` **[selection]** <put parameter description here>

Options:

- 0 — csvc
- 1 — nusvc
- 2 — oneclass

Default: *0*

`SVM Kernel Type` **[selection]** <put parameter description here>

Options:

- 0 — linear
- 1 — rbf
- 2 — poly
- 3 — sigmoid

Default: *0*

`Cost parameter C` **[number]** <put parameter description here>

Default: *1*

`Parameter nu of a SVM optimization problem (NU_SVC / ONE_CLASS)` **[number]** <put parameter description here>

Default: *0*

`Parameter coef0 of a kernel function (POLY / SIGMOID)` **[number]** <put parameter description here>

Default: *0*

`Parameter gamma of a kernel function (POLY / RBF / SIGMOID)` **[number]** <put parameter description here>

Default: *1*

`Parameter degree of a kernel function (POLY)` **[number]** <put parameter description here>

Default: *1*

`Parameters optimization` **[boolean]** <put parameter description here>

Default: *True*

`set user defined seed` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output confusion matrix` **[file]** <put output description here>

`Output model` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:trainimagesclassifiersvm', -io.il, -io.vd, -io.imstat, -elev.default, -sample.mt, -sampl
```

See also

Unsupervised KMeans image classification

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Validity Mask` **[raster]** Optional.

<put parameter description here>

`Training set size` **[number]** <put parameter description here>

Default: *100*

`Number of classes` **[number]** <put parameter description here>

Default: *5*

`Maximum number of iterations` **[number]** <put parameter description here>

Default: *1000*

`Convergence threshold` **[number]** <put parameter description here>

Default: *0.0001*

Outputs

`Output Image` **[raster]** <put output description here>

`Centroid filename` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:unsupervisedkmeansimageclassification', -in, -ram, -vm, -ts, -nc, -maxit, -ct, -out, -ou
```

See also

.

18.4.7 Miscellaneous

Band Math

Описание

<put algortithm description here>

Parameters

`Input image list` **[multipleinput: rasters]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

`Expression` **[string]** <put parameter description here>

Default: *None*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:bandmath', -il, -ram, -exp, -out)
```

See also

ComputeModulusAndPhase-one (OneEntry)

Описание

<put algortithm description here>

Parameters

`Number Of inputs` **[selection]** <put parameter description here>

Options:

- 0 — one

Default: *0*

`Input image` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Modulus` **[raster]** <put output description here>

`Phase` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:computemodulusandphaseoneoneentry', -nbinput, -nbinput.one.in, -ram, -mod, -pha)
```

See also

ComputeModulusAndPhase-two (TwoEntries)

Описание

<put algortithm description here>

Parameters

`Number Of inputs` **[selection]** <put parameter description here>

Options:

- 0 — two

Default: *0*

`Real part input` **[raster]** <put parameter description here>

`Imaginary part input` **[raster]** <put parameter description here>

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Modulus` **[raster]** <put output description here>

`Phase` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:computemodulusandphasetwotwoentries', -nbinput, -nbinput.two.re, -nbinput.two.im, -ram,
```

See also

Images comparaison

Описание

<put algortithm description here>

Parameters

`Reference image` **[raster]** <put parameter description here>

`Reference image channel` **[number]** <put parameter description here>

Default: *1*

`Measured image` **[raster]** <put parameter description here>

`Measured image channel` **[number]** <put parameter description here>

Default: *1*

`Start X` **[number]** <put parameter description here>

Default: *0*

`Start Y` **[number]** <put parameter description here>

Default: *0*

`Size X` **[number]** <put parameter description here>

Default: *0*

`Size Y` **[number]** <put parameter description here>

Default: *0*

Outputs

Console usage

```
processing.runalg('otb:imagescomparaison', -ref.in, -ref.channel, -meas.in, -meas.channel, -roi.startx, -roi.st
```

See also

Image to KMZ Export

Описание

<put algortithm description here>

Parameters

`Input image` **[raster]** <put parameter description here>

`Tile Size` **[number]** <put parameter description here>

Default: *512*

`Image logo` **[raster]** Optional.

<put parameter description here>

`Image legend` **[raster]** Optional.

<put parameter description here>

`Default elevation` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output .kmz product` **[file]** <put output description here>

Console usage

```
processing.runalg('otb:imagetokmzexport', -in, -tilesize, -logo, -legend, -elev.default, -out)
```

See also

.

18.4.8 Сегментация

Connected Component Segmentation

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Mask expression` **[string]** Optional.

<put parameter description here>

Default: *None*

`Connected Component Expression` **[string]** <put parameter description here>

Default: *None*

`Minimum Object Size` **[number]** <put parameter description here>

Default: *2*

`OBIA Expression` **[string]** Optional.

<put parameter description here>

Default: *None*

`Default elevation` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output Shape` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:connectedcomponentsegmentation', -in, -mask, -expr, -minsize, -obia, -elev.default, -out
```

See also

Exact Large-Scale Mean-Shift segmentation, step 2

Описание

<put algortithm description here>

Parameters

`Filtered image` **[raster]** <put parameter description here>

`Spatial image` **[raster]** Optional.

<put parameter description here>

`Range radius` **[number]** <put parameter description here>

Default: *15*

`Spatial radius` **[number]** <put parameter description here>

Default: *5*

`Minimum Region Size` **[number]** <put parameter description here>

Default: *0*

`Size of tiles in pixel (X-axis)` **[number]** <put parameter description here>

Default: *500*

`Size of tiles in pixel (Y-axis)` **[number]** <put parameter description here>

Default: *500*

`Directory where to write temporary files` **[file]** Optional.

<put parameter description here>

`Temporary files cleaning` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:exactlargescalemeanshiftsegmentationstep2', -in, -inpos, -ranger, -spatialr, -minsize, -
```

See also

Exact Large-Scale Mean-Shift segmentation, step 3 (optional)

Описание

<put algortithm description here>

Parameters

`Input image` **[raster]** <put parameter description here>

`Segmented image` **[raster]** <put parameter description here>

`Minimum Region Size` **[number]** <put parameter description here>

Default: *50*

`Size of tiles in pixel (X-axis)` **[number]** <put parameter description here>

Default: *500*

`Size of tiles in pixel (Y-axis)` **[number]** <put parameter description here>

Default: *500*

Outputs

`Output Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:exactlargescalemeanshiftsegmentationstep3optional', -in, -inseg, -minsize, -tilesizex, -
```

See also

Exact Large-Scale Mean-Shift segmentation, step 4

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Segmented image` **[raster]** <put parameter description here>

`Size of tiles in pixel (X-axis)` **[number]** <put parameter description here>

Default: *500*

`Size of tiles in pixel (Y-axis)` **[number]** <put parameter description here>

Default: *500*

Outputs

`Output GIS vector file` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:exactlargescalemeanshiftsegmentationstep4', -in, -inseg, -tilesizex, -tilesizey, -out)
```

See also

Hoover compare segmentation

Описание

<put algortithm description here>

Parameters

`Input ground truth` **[raster]** <put parameter description here>

`Input machine segmentation` **[raster]** <put parameter description here>

`Background label` **[number]** <put parameter description here>

Default: *0*

`Overlapping threshold` **[number]** <put parameter description here>

Default: *0.75*

`Correct detection score` **[number]** <put parameter description here>

Default: *0.0*

`Over-segmentation score` **[number]** <put parameter description here>

Default: *0.0*

`Under-segmentation score` **[number]** <put parameter description here>

Default: *0.0*

`Missed detection score` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Colored ground truth output` **[raster]** <put output description here>

`Colored machine segmentation output` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:hoovercomparesegmentation', -ingt, -inms, -bg, -th, -rc, -rf, -ra, -rm, -outgt, -outms)
```

See also

Segmentation (cc)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Segmentation algorithm` **[selection]** <put parameter description here>

Options:

- 0 — cc

Default: *0*

`Condition` **[string]** <put parameter description here>

Default: *None*

`Processing mode` **[selection]** <put parameter description here>

Options:

- 0 — vector

Default: *0*

`Writing mode for the output vector file` **[selection]** <put parameter description here>

Options:

- 0 — ulco
- 1 — ovw
- 2 — ulovw
- 3 — ulu

Default: *0*

`Mask Image` **[raster]** Optional.

<put parameter description here>

`8-neighbor connectivity` **[boolean]** <put parameter description here>

Default: *True*

`Stitch polygons` **[boolean]** <put parameter description here>

Default: *True*

`Minimum object size` **[number]** <put parameter description here>

Default: *1*

`Simplify polygons` **[number]** <put parameter description here>

Default: *0.1*

`Layer name` **[string]** <put parameter description here>

Default: *layer*

`Geometry index field name` **[string]** <put parameter description here>

Default: *DN*

`Tiles size` **[number]** <put parameter description here>

Default: *1024*

`Starting geometry index` **[number]** <put parameter description here>

Default: *1*

`OGR options for layer creation` **[string]** Optional.

<put parameter description here>

Default: *None*

Outputs

`Output vector file` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:segmentationcc', -in, -filter, -filter.cc.expr, -mode, -mode.vector.outmode, -mode.vecto
```

See also

Segmentation (edison)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Segmentation algorithm` **[selection]** <put parameter description here>

Options:

- 0 — edison

Default: *0*

`Spatial radius` **[number]** <put parameter description here>

Default: *5*

`Range radius` **[number]** <put parameter description here>

Default: *15*

`Minimum region size` **[number]** <put parameter description here>

Default: *100*

`Scale factor` **[number]** <put parameter description here>

Default: *1*

`Processing mode` **[selection]** <put parameter description here>

Options:

- 0 — vector

Default: *0*

`Writing mode for the output vector file` **[selection]** <put parameter description here>

Options:

- 0 — ulco
- 1 — ovw
- 2 — ulovw
- 3 — ulu

Default: *0*

`Mask Image` **[raster]** Optional.

<put parameter description here>

`8-neighbor connectivity` **[boolean]** <put parameter description here>

Default: *True*

`Stitch polygons` **[boolean]** <put parameter description here>

Default: *True*

`Minimum object size` **[number]** <put parameter description here>

Default: *1*

`Simplify polygons` **[number]** <put parameter description here>

Default: *0.1*

`Layer name` **[string]** <put parameter description here>

Default: *layer*

`Geometry index field name` **[string]** <put parameter description here>

Default: *DN*

`Tiles size` **[number]** <put parameter description here>

Default: *1024*

`Starting geometry index` **[number]** <put parameter description here>

Default: *1*

`OGR options for layer creation` **[string]** Optional.

<put parameter description here>

Default: *None*

Outputs

`Output vector file` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:segmentationedison', -in, -filter, -filter.edison.spatialr, -filter.edison.ranger, -filt
```

See also

Segmentation (meanshift)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Segmentation algorithm` **[selection]** <put parameter description here>

Options:

- 0 — meanshift

Default: *0*

`Spatial radius` **[number]** <put parameter description here>

Default: *5*

`Range radius` **[number]** <put parameter description here>

Default: *15*

`Mode convergence threshold` **[number]** <put parameter description here>

Default: *0.1*

`Maximum number of iterations` **[number]** <put parameter description here>

Default: *100*

`Minimum region size` **[number]** <put parameter description here>

Default: *100*

`Processing mode` **[selection]** <put parameter description here>

Options:

- 0 — vector

Default: *0*

`Writing mode for the output vector file` **[selection]** <put parameter description here>

Options:

- 0 — ulco
- 1 — ovw
- 2 — ulovw

- 3 — ulu

  Default: *0*

`Mask Image` **[raster]** Optional.

  <put parameter description here>

`8-neighbor connectivity` **[boolean]** <put parameter description here>

  Default: *True*

`Stitch polygons` **[boolean]** <put parameter description here>

  Default: *True*

`Minimum object size` **[number]** <put parameter description here>

  Default: *1*

`Simplify polygons` **[number]** <put parameter description here>

  Default: *0.1*

`Layer name` **[string]** <put parameter description here>

  Default: *layer*

`Geometry index field name` **[string]** <put parameter description here>

  Default: *DN*

`Tiles size` **[number]** <put parameter description here>

  Default: *1024*

`Starting geometry index` **[number]** <put parameter description here>

  Default: *1*

`OGR options for layer creation` **[string]** Optional.

  <put parameter description here>

  Default: *None*

Outputs

`Output vector file` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:segmentationmeanshift', -in, -filter, -filter.meanshift.spatialr, -filter.meanshift.range
```

See also

Segmentation (mprofiles)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Segmentation algorithm` **[selection]** <put parameter description here>

Options:

- 0 — mprofiles

Default: *0*

`Profile Size` **[number]** <put parameter description here>

Default: *5*

`Initial radius` **[number]** <put parameter description here>

Default: *1*

`Radius step.` **[number]** <put parameter description here>

Default: *1*

`Threshold of the final decision rule` **[number]** <put parameter description here>

Default: *1*

`Processing mode` **[selection]** <put parameter description here>

Options:

- 0 — vector

Default: *0*

`Writing mode for the output vector file` **[selection]** <put parameter description here>

Options:

- 0 — ulco
- 1 — ovw
- 2 — ulovw
- 3 — ulu

Default: *0*

`Mask Image` **[raster]** Optional.

<put parameter description here>

`8-neighbor connectivity` **[boolean]** <put parameter description here>

Default: *True*

`Stitch polygons` **[boolean]** <put parameter description here>

Default: *True*

`Minimum object size` **[number]** <put parameter description here>

Default: *1*

`Simplify polygons` **[number]** <put parameter description here>

Default: *0.1*

`Layer name` **[string]** <put parameter description here>

Default: *layer*

`Geometry index field name` **[string]** <put parameter description here>

Default: *DN*

`Tiles size` **[number]** <put parameter description here>

Default: *1024*

`Starting geometry index` **[number]** <put parameter description here>

Default: *1*

`OGR options for layer creation` **[string]** Optional.

<put parameter description here>

Default: *None*

Outputs

`Output vector file` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:segmentationmprofiles', -in, -filter, -filter.mprofiles.size, -filter.mprofiles.start, -
```

See also

Segmentation (watershed)

Описание

<put algortithm description here>

Parameters

`Input Image` **[raster]** <put parameter description here>

`Segmentation algorithm` **[selection]** <put parameter description here>

Options:

- 0 — watershed

Default: *0*

`Depth Threshold` **[number]** <put parameter description here>

Default: *0.01*

`Flood Level` **[number]** <put parameter description here>

Default: *0.1*

`Processing mode` **[selection]** <put parameter description here>

Options:

- 0 — vector

Default: *0*

`Writing mode for the output vector file` **[selection]** <put parameter description here>

Options:

- 0 — ulco
- 1 — ovw
- 2 — ulovw
- 3 — ulu

Default: *0*

`Mask Image` **[raster]** Optional.

<put parameter description here>

`8-neighbor connectivity` **[boolean]** <put parameter description here>

Default: *True*

`Stitch polygons` **[boolean]** <put parameter description here>

Default: *True*

`Minimum object size` **[number]** <put parameter description here>

Default: *1*

`Simplify polygons` **[number]** <put parameter description here>

Default: *0.1*

`Layer name` **[string]** <put parameter description here>

Default: *layer*

`Geometry index field name` **[string]** <put parameter description here>

Default: *DN*

`Tiles size` **[number]** <put parameter description here>

Default: *1024*

`Starting geometry index` **[number]** <put parameter description here>

Default: *1*

`OGR options for layer creation` **[string]** Optional.

<put parameter description here>

Default: *None*

Outputs

`Output vector file` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:segmentationwatershed', -in, -filter, -filter.watershed.threshold, -filter.watershed.lev
```

See also

.

18.4.9 Stereo

Stereo Framework

Описание

<put algortithm description here>

Parameters

`Input images list` **[multipleinput: rasters]** <put parameter description here>

`Couples list` **[string]** Optional.

<put parameter description here>

Default: *None*

`Image channel used for the block matching` **[number]** <put parameter description here>

Default: *1*

`Default elevation` **[number]** <put parameter description here>

Default: *0*

`Output resolution` **[number]** <put parameter description here>

Default: *1*

`NoData value` **[number]** <put parameter description here>

Default: *-32768*

`Method to fuse measures in each DSM cell` **[selection]** <put parameter description here>

Options:

- 0 — max
- 1 — min
- 2 — mean
- 3 — acc

Default: *0*

`Parameters estimation modes` **[selection]** <put parameter description here>

Options:

- 0 — fit
- 1 — user

Default: *0*

`Upper Left X` **[number]** <put parameter description here>

Default: *0.0*

`Upper Left Y` **[number]** <put parameter description here>

Default: *0.0*

`Size X` **[number]** <put parameter description here>

Default: *0*

`Size Y` **[number]** <put parameter description here>

Default: *0*

`Pixel Size X` **[number]** <put parameter description here>

Default: *0.0*

`Pixel Size Y` **[number]** <put parameter description here>

Default: *0.0*

`Output Cartographic Map Projection` **[selection]** <put parameter description here>

Options:

- 0 — utm
- 1 — lambert2
- 2 — lambert93
- 3 — wgs
- 4 — epsg

Default: *3*

`Zone number` **[number]** <put parameter description here>

Default: *31*

`Northern Hemisphere` **[boolean]** <put parameter description here>

Default: *True*

`EPSG Code` **[number]** <put parameter description here>

Default: *4326*

`Step of the deformation grid (in pixels)` **[number]** <put parameter description here>

Default: *16*

`Sub-sampling rate for epipolar grid inversion` **[number]** <put parameter description here>

Default: *10*

`Block-matching metric` **[selection]** <put parameter description here>

Options:

- 0 — ssdmean
- 1 — ssd
- 2 — ncc
- 3 — lp

Default: *0*

`p value` **[number]** <put parameter description here>

Default: *1*

`Radius of blocks for matching filter (in pixels)` **[number]** <put parameter description here>

Default: *2*

`Minimum altitude offset (in meters)` **[number]** <put parameter description here>

Default: *-20*

`Maximum altitude offset (in meters)` **[number]** <put parameter description here>

Default: *20*

`Use bijection consistency in block matching strategy` **[boolean]** <put parameter description here>

Default: *True*

`Use median disparities filtering` **[boolean]** <put parameter description here>

Default: *True*

`Correlation metric threshold` **[number]** <put parameter description here>

Default: *0.6*

`Input left mask` **[raster]** Optional.

<put parameter description here>

`Input right mask` **[raster]** Optional.

<put parameter description here>

`Discard pixels with low local variance` **[number]** <put parameter description here>

Default: *50*

`Available RAM (Mb)` **[number]** <put parameter description here>

Default: *128*

Outputs

`Output DSM` **[raster]** <put output description here>

Console usage

```
processing.runalg('otb:stereoframework', -input.il, -input.co, -input.channel, -elev.default, -output.res, -out
```

See also

.

18.4.10 Vector

Concatenate

Описание

<put algortithm description here>

Parameters

`Input VectorDatas to concatenate` **[multipleinput: any vectors]** <put parameter description here>

Outputs

`Concatenated VectorData` **[vector]** <put output description here>

Console usage

```
processing.runalg('otb:concatenate', -vd, -out)
```

See also

.

18.5 QGIS algorithm provider

QGIS algortihm provider implements various analysis and geoprocessing operations using mostly only QGIS API. So almost all algorthms from this provider will work "out of the box" without any additional configuration.

This provider incorporates fTools functionality, some algorithms from mmQGIS plugin and also adds its own algorithms.

.

18.5.1 Database

Import into PostGIS

Описание

<put algortithm description here>

Parameters

`Layer to import` **[vector: any]** <put parameter description here>

`Database (connection name)` **[selection]** <put parameter description here>

Options:

- 0 — local

Default: *0*

`Schema (schema name)` **[string]** <put parameter description here>

Default: *public*

`Table to import to (leave blank to use layer name)` **[string]** <put parameter description here>

Default: *(not set)*

`Primary key field` **[tablefield: any]** Optional.

<put parameter description here>

`Geometry column` **[string]** <put parameter description here>

Default: *geom*

`Overwrite` **[boolean]** <put parameter description here>

Default: *True*

`Create spatial index` **[boolean]** <put parameter description here>

Default: *True*

`Convert field names to lowercase` **[boolean]** <put parameter description here>

Default: *True*

`Drop length constraints on character fields` **[boolean]** <put parameter description here>

Default: *False*

Outputs

Console usage

```
processing.runalg('qgis:importintopostgis', input, database, schema, tablename, primary_key, geometry_column, o
```

See also

PostGIS execute SQL

Описание

<put algortithm description here>

Parameters

`Database` **[string]** <put parameter description here>

Default: *(not set)*

`SQL query` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

Console usage

```
processing.runalg('qgis:postgisexecutesql', database, sql)
```

See also

.

18.5.2 Raster general

Set style for raster layer

Описание

<put algortithm description here>

Parameters

`Raster layer` **[raster]** <put parameter description here>

`Style file` **[file]** <put parameter description here>

Outputs

`Styled layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('qgis:setstyleforrasterlayer', input, style)
```

See also

.

18.5.3 Raster

Hypsometric curves

Описание

Calculate hypsometric curves for features of polygon layer and save them as CSV file for further processing.

Parameters

`DEM to analyze` **[raster]** DEM to use for calculating altitudes.

`Boundary layer` **[vector: polygon]** Polygonal vector layer with boundaries of areas used to calculate hypsometric curves.

`Step` **[number]** Distanse between curves.

Default: *100.0*

`Use % of area instead of absolute value` **[boolean]** Write area percentage to "Area" field of the CSV file instead of absolute area value.

Default: *False*

Outputs

`Output directory` **[directory]** Directory where output will be saved. For each feature from input vector layer CSV file with area and altitude values will be created.

File name consists of prefix `hystogram_` followed by layer name and feature ID.

Console usage

```
processing.runalg('qgis:hypsometriccurves', input_dem, boundary_layer, step, use_percentage, output_directory)
```

See also

Raster layer statistics

Описание

Calculates basic statistics of the raster layer.

Parameters

`Input layer` **[raster]** Raster to analyze.

Outputs

`Statistics` **[html]** Analysis results in HTML format.

`Minimum value` **[number]** Minimum cell value.

`Maximum value` **[number]** Maximum cell value.

`Sum` **[number]** Sum of all cells values.

`Mean value` **[number]** Mean cell value.

`valid cells count` **[number]** Number of cell with data.

`No-data cells count` **[number]** Number of NODATA cells.

`Standard deviation` **[number]** Standard deviation of cells values.

Console usage

```
processing.runalg('qgis:rasterlayerstatistics', input, output_html_file)
```

See also

Zonal Statistics

Описание

Calculates some statistics values for pixels of input raster inside certain zones, defined as polygon layer.

Following values calculated for each zone:

- minimum

- maximum
- sum
- count
- mean
- standard deviation
- number of unique values
- range
- variance

Parameters

`Raster layer` **[raster]** Raster to analyze.

`Raster band` **[number]** Number of raster band to analyze.

Default: *1*

`Vector layer containing zones` **[vector: polygon]** Layer with zones boundaries.

`Output column prefix` **[string]** Prefix for output fields.

Default: _

`Load whole raster in memory` **[boolean]** Determines if raster band will be loaded in memory (`True`) or readed by chunks (`False`). Useful only when disk IO or raster scanning inefficiencies are your limiting factor.

Default: *True*

Outputs

`Output layer` **[vector]** The resulting layer. Basically this is same layer as zones layer with new columns containing statistics added.

Console usage

```
processing.runalg('qgis:zonalstatistics', input_raster, raster_band, input_vector, column_prefix, global_extent
```

See also

.

18.5.4 Table

Frequency analysis

Описание

<put algortithm description here>

Parameters

`input` **[vector: any]** <put parameter description here>

`fields` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

`output` **[table]** <put output description here>

Console usage

```
processing.runalg('qgis:frequencyanalysis', input, fields, output)
```

See also

.

18.5.5 Vector analysis

Count points in polygon

Описание

Counts the number of points present in each feature of a polygon layer.

Parameters

`Polygons` **[vector: polygon]** Polygons layer.

`Points` **[vector: point]** Points layer.

`Count field name` **[string]** The name of the attribute table column containing the points number.

Default: *NUMPOINTS*

Outputs

`Result` **[vector]** Resulting layer with the attribute table containing the new column of the points count.

Console usage

```
processing.runalg('qgis:countpointsinpolygon', polygons, points, field, output)
```

See also

Count points in polygon (weighted)

Описание

Counts the number of points in each feature of a polygon layer and calculates the mean of the selected field for each feature of the polygon layer. These values will be added to the attribute table of the resulting polygon layer.

Parameters

`Polygons` **[vector: polygon]** Polygons layer.

`Points` **[vector: point]** Points layer.

`Weight field` **[tablefield: any]** Weight field of the points attribute table.

`Count field name` **[string]** Name of the column for the new weighted field.

Default: *NUMPOINTS*

Outputs

`Result` **[vector]** The resulting polygons layer.

Console usage

```
processing.runalg('qgis:countpointsinpolygonweighted', polygons, points, weight, field, output)
```

See also

Count unique points in polygon

Описание

Counts the number of unique values of a points in a polygons layer. Creates a new polygons layer with an extra column in the attribute table containing the count of unique values for each feature.

Parameters

`Polygons` **[vector: polygon]** Polygons layer.

`Points` **[vector: point]** Points layer.

`Class field` **[tablefield: any]** Points layer column name of the unique value chosen.

`Count field name` **[string]** Column name containing the count of unique values in the resulting polygons layer.

Default: *NUMPOINTS*

Outputs

`Result` **[vector]** The resulting polygons layer.

Console usage

```
processing.runalg('qgis:countuniquepointsinpolygon', polygons, points, classfield, field, output)
```

See also

Distance matrix

Описание

<put algortithm description here>

Parameters

`Input point layer` **[vector: point]** <put parameter description here>

`Input unique ID field` **[tablefield: any]** <put parameter description here>

`Target point layer` **[vector: point]** <put parameter description here>

`Target unique ID field` **[tablefield: any]** <put parameter description here>

`Output matrix type` **[selection]** <put parameter description here>

Options:

- 0 — Linear (N*k x 3) distance matrix
- 1 — Standard (N x T) distance matrix
- 2 — Summary distance matrix (mean, std. dev., min, max)

Default: *0*

`Use only the nearest (k) target points` **[number]** <put parameter description here>

Default: *0*

Outputs

`Distance matrix` **[table]** <put output description here>

Console usage

```
processing.runalg('qgis:distancematrix', input_layer, input_field, target_layer, target_field, matrix_type, nea
```

See also

Distance to nearest hub

Описание

<put algortithm description here>

Parameters

`Source points layer` **[vector: any]** <put parameter description here>

`Destination hubs layer` **[vector: any]** <put parameter description here>

`Hub layer name attribute` **[tablefield: any]** <put parameter description here>

`Output shape type` **[selection]** <put parameter description here>

Options:

- 0 — Point
- 1 — Line to hub

Default: *0*

`Measurement unit` **[selection]** <put parameter description here>

Options:

- 0 — Meters
- 1 — Feet
- 2 — Miles
- 3 — Kilometers
- 4 — Layer units

Default: *0*

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:distancetonearesthub', points, hubs, field, geometry, unit, output)
```

See also

Generate points (pixel centroids) along line

Описание

<put algortithm description here>

Parameters

`Raster layer` **[raster]** <put parameter description here>

`Vector layer` **[vector: line]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:generatepointspixelcentroidsalongline', input_raster, input_vector, output_layer)
```

See also

Generate points (pixel centroids) inside polygons

Описание

<put algortithm description here>

Parameters

`Raster layer` **[raster]** <put parameter description here>

`Vector layer` **[vector: polygon]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:generatepointspixelcentroidsinsidepolygons', input_raster, input_vector, output_layer)
```

See also

Hub lines

Описание

Creates hub and spoke diagrams with lines drawn from points on the `Spoke Point` layer to matching points in the `Hub Point` layer. Determination of which hub goes with each point is based on a match between the `Hub ID field` on the hub points and the `Spoke ID field` on the spoke points.

Parameters

`Hub point layer` **[vector: any]** <put parameter description here>

`Hub ID field` **[tablefield: any]** <put parameter description here>

`Spoke point layer` **[vector: any]** <put parameter description here>

`Spoke ID field` **[tablefield: any]** <put parameter description here>

Outputs

`Output` **[vector]** The resulting layer.

Console usage

```
processing.runalg('qgis:hublines', hubs, hub_field, spokes, spoke_field, output)
```

See also

Mean coordinate(s)

Описание

Calculates the mean of the coordinates of a layer starting from a field of the attribute table.

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Weight field` **[tablefield: numeric]** Optional.

Field to use if you want to perform a weighted mean.

`Unique ID field` **[tablefield: numeric]** Optional.

Unique field on which the calculation of the mean will be made.

Outputs

`Result` **[vector]** The resulting points layer.

Console usage

```
processing.runalg('qgis:meancoordinates', points, weight, uid, output)
```

See also

Nearest neighbour analysis

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

Outputs

`Result` **[html]** <put output description here>

`Observed mean distance` **[number]** <put output description here>

`Expected mean distance` **[number]** <put output description here>

`Nearest neighbour index` **[number]** <put output description here>

`Number of points` **[number]** <put output description here>

`Z-Score` **[number]** <put output description here>

Console usage

```
processing.runalg('qgis:nearestneighbouranalysis', points, output)
```

See also

Sum line lengths

Описание

<put algortithm description here>

Parameters

`Lines` **[vector: line]** <put parameter description here>

`Polygons` **[vector: polygon]** <put parameter description here>

`Lines length field name` **[string]** <put parameter description here>

Default: *LENGTH*

`Lines count field name` **[string]** <put parameter description here>

Default: *COUNT*

Outputs

`Result` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:sumlinelengths', lines, polygons, len_field, count_field, output)
```

See also

.

18.5.6 Vector creation

Create grid

Описание

Creates a grid.

Parameters

`Grid type` **[selection]** Grid type.

Options:

- 0 — Rectangle (line)
- 1 — Rectangle (polygon)
- 2 — Diamond (polygon)
- 3 — Hexagon (polygon)

Default: *0*

`Width` **[number]** Horizontal extent of the grid.

Default: *360.0*

`Height` **[number]** Vertical extent of the grid.

Default: *180.0*

`Horizontal spacing` **[number]** X-axes spacing between the lines.

Default: *10.0*

`Vertical spacing` **[number]** Y-axes spacing between the lines.

Default: *10.0*

`Center X` **[number]** X-coordinate of the grid center.

Default: *0.0*

`Center Y` **[number]** Y-coordinate of the grid center.

Default: *0.0*

`Output CRS` **[crs]** Coordinate reference system for grid.

Default: *EPSG:4326*

Outputs

`Output` **[vector]** The resulting grid layer (lines or polygons).

Console usage

```
processing.runalg('qgis:creategrid', type, width, height, hspacing, vspacing, centerx, centery, crs, output)
```

See also

Points layer from table

Описание

Creates points layer from geometryless table with columns that contain point coordinates.

Parameters

`Input layer` **[table]** Input table

`X field` **[tablefield: any]** Table column containing the X coordinate.

`Y field` **[tablefield: any]** Table column containing the Y coordinate.

`Target CRS` **[crs]** Coordinate reference system to use for layer.

Default: *EPSG:4326*

Outputs

`Output layer` **[vector]** The resulting layer.

Console usage

```
processing.runalg('qgis:pointslayerfromtable', input, xfield, yfield, target_crs, output)
```

See also

Points to path

Описание

<put algortithm description here>

Parameters

`Input point layer` **[vector: point]** <put parameter description here>

`Group field` **[tablefield: any]** <put parameter description here>

`Order field` **[tablefield: any]** <put parameter description here>

`Date format (if order field is DateTime)` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

Outputs

`Paths` **[vector]** <put output description here>

`Directory` **[directory]** <put output description here>

Console usage

```
processing.runalg('qgis:pointstopath', vector, group_field, order_field, date_format, output_lines, output_text
```

See also

Random points along line

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: line]** <put parameter description here>

`Number of points` **[number]** <put parameter description here>

Default: *1*

`Minimum distance` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Random points` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randompointsalongline', vector, point_number, min_distance, output)
```

See also

Random points in extent

Описание

<put algortithm description here>

Parameters

`Input extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Points number` **[number]** <put parameter description here>

Default: *1*

`Minimum distance` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Random points` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randompointsinextent', extent, point_number, min_distance, output)
```

See also

Random points in layer bounds

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon]** <put parameter description here>

`Points number` **[number]** <put parameter description here>

Default: *1*

`Minimum distance` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Random points` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randompointsinlayerbounds', vector, point_number, min_distance, output)
```

See also

Random points inside polygons (fixed)

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon]** <put parameter description here>

`Sampling strategy` **[selection]** <put parameter description here>

Options:

- 0 — Points count
- 1 — Points density

Default: *0*

`Number or density of points` **[number]** <put parameter description here>

Default: *1.0*

`Minimum distance` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Random points` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randompointsinsidepolygonsfixed', vector, strategy, value, min_distance, output)
```

See also

Random points inside polygons (variable)

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon]** <put parameter description here>

`Sampling strategy` **[selection]** <put parameter description here>

Options:

- 0 — Points count
- 1 — Points density

Default: *0*

`Number field` **[tablefield: numeric]** <put parameter description here>

`Minimum distance` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Random points` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randompointsinsidepolygonsvariable', vector, strategy, field, min_distance, output)
```

See also

Regular points

Описание

<put algortithm description here>

Parameters

`Input extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Point spacing/count` **[number]** <put parameter description here>

Default: *0.0001*

`Initial inset from corner (LH side)` **[number]** <put parameter description here>

Default: *0.0*

`Apply random offset to point spacing` **[boolean]** <put parameter description here>

Default: *False*

`Use point spacing` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Regular points` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:regularpoints', extent, spacing, inset, randomize, is_spacing, output)
```

See also

Vector grid

Описание

<put algortithm description here>

Parameters

`Grid extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`X spacing` **[number]** <put parameter description here>

Default: *0.0001*

`Y spacing` **[number]** <put parameter description here>

Default: *0.0001*

`Grid type` **[selection]** <put parameter description here>

Options:

- 0 — Output grid as polygons
- 1 — Output grid as lines

Default: *0*

Outputs

`Grid` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:vectorgrid', extent, step_x, step_y, type, output)
```

See also

.

18.5.7 Vector general

Delete duplicate geometries

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:deleteduplicategeometries', input, output)
```

See also

Join atributes by location

Описание

<put algortithm description here>

Parameters

`Target vector layer` **[vector: any]** <put parameter description here>

`Join vector layer` **[vector: any]** <put parameter description here>

`Attribute summary` **[selection]** <put parameter description here>

Options:

- 0 — Take attributes of the first located feature
- 1 — Take summary of intersecting features

Default: *0*

`Statistics for summary (comma separated)` **[string]** <put parameter description here>

Default: *sum,mean,min,max,median*

`Output table` **[selection]** <put parameter description here>

Options:

- 0 — Only keep matching records
- 1 — Keep all records (including non-matching target records)

Default: *0*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:joinatributesbylocation', target, join, summary, stats, keep, output)
```

See also

Join attributes table

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Input layer 2` **[table]** <put parameter description here>

`Table field` **[tablefield: any]** <put parameter description here>

`Table field 2` **[tablefield: any]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:joinattributestable', input_layer, input_layer_2, table_field, table_field_2, output_la
```

See also

Merge vector layers

Описание

<put algortithm description here>

Parameters

`Input layer 1` **[vector: any]** <put parameter description here>

`Input layer 2` **[vector: any]** <put parameter description here>

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:mergevectorlayers', layer1, layer2, output)
```

See also

Polygon from layer extent

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Calculate extent for each feature separately` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:polygonfromlayerextent', input_layer, by_feature, output)
```

See also

Reproject layer

Описание

Reprojects a vector layer in a different CRS.

Parameters

`Input layer` **[vector: any]** Layer to reproject.

`Target CRS` **[crs]** Destination coordinate reference system.

Default: *EPSG:4326*

Outputs

`Reprojected layer` **[vector]** The resulting layer.

Console usage

```
processing.runalg('qgis:reprojectlayer', input, target_crs, output)
```

See also

Save selected features

Описание

Saves the selected features as a new layer.

Parameters

`Input layer` **[vector: any]** Layer to process.

Outputs

`Output layer with selected features` **[vector]** The resulting layer.

Console usage

```
processing.runalg('qgis:saveselectedfeatures', input_layer, output_layer)
```

See also

Set style for vector layer

Описание

<put algortithm description here>

Parameters

`Vector layer` **[vector: any]** <put parameter description here>

`Style file` **[file]** <put parameter description here>

Outputs

`Styled layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:setstyleforvectorlayer', input, style)
```

See also

Snap points to grid

Описание

<put algortithm description here>

Parameters

`Input Layer` **[vector: any]** <put parameter description here>

`Horizontal spacing` **[number]** <put parameter description here>

Default: *0.1*

`Vertical spacing` **[number]** <put parameter description here>

Default: *0.1*

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:snappointstogrid', input, hspacing, vspacing, output)
```

See also

Split vector layer

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Unique ID field` **[tablefield: any]** <put parameter description here>

Outputs

`Output directory` **[directory]** <put output description here>

Console usage

```
processing.runalg('qgis:splitvectorlayer', input, field, output)
```

See also

.

18.5.8 Vector geometry

Concave hull

Описание

<put algortithm description here>

Parameters

`Input point layer` **[vector: point]** <put parameter description here>

`Threshold (0-1, where 1 is equivalent with Convex Hull)` **[number]** <put parameter description here>

Default: *0.3*

`Allow holes` **[boolean]** <put parameter description here>

Default: *True*

`Split multipart geometry into singleparts geometries` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Concave hull` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:concavehull', input, alpha, holes, no_multigeometry, output)
```

See also

Convert geometry type

Описание

Converts a geometry type to another one.

Parameters

`Input layer` **[vector: any]** Layer in input.

`New geometry type` **[selection]** Type of conversion to perform.

Options:

- 0 — Centroids
- 1 — Nodes
- 2 — Linestrings
- 3 — Multilinestrings
- 4 — Polygons

Default: *0*

Outputs

`Output` **[vector]** The resulting layer.

Console usage

```
processing.runalg('qgis:convertgeometrytype', input, type, output)
```

See also

Convex hull

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Field (optional, only used if creating convex hulls by classes)` **[tablefield: any]**
Optional.

<put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — Create single minimum convex hull
- 1 — Create convex hulls based on field

Default: *0*

Outputs

`Convex hull` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:convexhull', input, field, method, output)
```

See also

Create points along lines

Описание

<put algortithm description here>

Parameters

`lines` **[vector: any]** <put parameter description here>

`distance` **[number]** <put parameter description here>

Default: *1*

`startpoint` **[number]** <put parameter description here>

Default: *0*

`endpoint` **[number]** <put parameter description here>

Default: *0*

Outputs

`output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:createpointsalonglines', lines, distance, startpoint, endpoint, output)
```

See also

Delaunay triangulation

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: point]** <put parameter description here>

Outputs

`Delaunay triangulation` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:delaunaytriangulation', input, output)
```

See also

Densify geometries given an interval

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon, line]** <put parameter description here>

`Interval between Vertices to add` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Densified layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:densifygeometriesgivenaninterval', input, interval, output)
```

See also

Densify geometries

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon, line]** <put parameter description here>

`Vertices to add` **[number]** <put parameter description here>

Default: *1*

Outputs

`Densified layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:densifygeometries', input, vertices, output)
```

See also

Dissolve

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon, line]** <put parameter description here>

`Dissolve all (do not use field)` **[boolean]** <put parameter description here>

Default: *True*

`Unique ID field` **[tablefield: any]** Optional.

<put parameter description here>

Outputs

`Dissolved` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:dissolve', input, dissolve_all, field, output)
```

See also

Eliminate sliver polygons

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon]** <put parameter description here>

`Use current selection in input layer (works only if called from toolbox)` **[boolean]**
<put parameter description here>

Default: *False*

`Selection attribute` **[tablefield: any]** <put parameter description here>

`Comparison` **[selection]** <put parameter description here>

Options:

- 0 — ==
- 1 — !=
- 2 — >
- 3 — >=
- 4 — <
- 5 — <=
- 6 — begins with
- 7 — contains

Default: *0*

`Value` **[string]** <put parameter description here>

Default: *0*

`Merge selection with the neighbouring polygon with the` **[selection]** <put parameter description here>

Options:

- 0 — Largest area
- 1 — Smallest Area
- 2 — Largest common boundary

Default: *0*

Outputs

`Cleaned layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:eliminatesliverpolygons', input, keepselection, attribute, comparison, comparisonvalue,
```

See also

Explode lines

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: line]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:explodelines', input, output)
```

See also

Extract nodes

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon, line]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:extractnodes', input, output)
```

See also

Fill holes

Описание

<put algortithm description here>

Parameters

`Polygons` **[vector: any]** <put parameter description here>

`Max area` **[number]** <put parameter description here>

Default: *100000*

Outputs

`Results` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:fillholes', polygons, max_area, results)
```

See also

Fixed distance buffer

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Distance` **[number]** <put parameter description here>

Default: *10.0*

`Segments` **[number]** <put parameter description here>

Default: *5*

`Dissolve result` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Buffer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:fixeddistancebuffer', input, distance, segments, dissolve, output)
```

See also

Keep n biggest parts

Описание

<put algortithm description here>

Parameters

`Polygons` **[vector: polygon]** <put parameter description here>

`To keep` **[number]** <put parameter description here>

Default: *1*

Outputs

`Results` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:keepnbiggestparts', polygons, to_keep, results)
```

See also

Lines to polygons

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: line]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:linestopolygons', input, output)
```

See also

Multipart to singleparts

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:multiparttosingleparts', input, output)
```

See also

Points displacement

Описание

Moves overlapped points at small distance, that they all become visible. The result is very similar to the output of the "Point displacement" renderer but it is permanent.

Parameters

`Input layer` **[vector: point]** Layer with overlapped points.

`Displacement distance` **[number]** Desired displacement distance **NOTE**: displacement distance should be in same units as layer.

Default: *0.00015*

`Horizontal distribution for two point case` **[boolean]** Controls distrobution direction in case of two overlapped points. If *True* points wwill be distributed horizontally, otherwise they will be distributed vertically.

Default: *True*

Outputs

`Output layer` **[vector]** The resulting layer with shifted overlapped points.

Console usage

```
processing.runalg('qgis:pointsdisplacement', input_layer, distance, horizontal, output_layer)
```

See also

Polygon centroids

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:polygoncentroids', input_layer, output_layer)
```

See also

Polygonize

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: line]** <put parameter description here>

`Keep table structure of line layer` **[boolean]** <put parameter description here>

Default: *False*

`Create geometry columns` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:polygonize', input, fields, geometry, output)
```

See also

Polygons to lines

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:polygonstolines', input, output)
```

See also

Simplify geometries

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: polygon, line]** <put parameter description here>

`Tolerance` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Simplified layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:simplifygeometries', input, tolerance, output)
```

See also

Singleparts to multipart

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Unique ID field` **[tablefield: any]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:singlepartstomultipart', input, field, output)
```

See also

Variable distance buffer

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Distance field` **[tablefield: any]** <put parameter description here>

`Segments` **[number]** <put parameter description here>

Default: *5*

`Dissolve result` **[boolean]** <put parameter description here>

Default: *False*

Outputs

`Buffer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:variabledistancebuffer', input, field, segments, dissolve, output)
```

See also

Voronoi polygons

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: point]** <put parameter description here>

`Buffer region` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Voronoi polygons` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:voronoipolygons', input, buffer, output)
```

See also

.

18.5.9 Vector overlay

Clip

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Clip layer` **[vector: any]** <put parameter description here>

Outputs

`Clipped` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:clip', input, overlay, output)
```

See also

Difference

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Difference layer` **[vector: any]** <put parameter description here>

Outputs

`Difference` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:difference', input, overlay, output)
```

See also

Intersection

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Intersect layer` **[vector: any]** <put parameter description here>

Outputs

`Intersection` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:intersection', input, input2, output)
```

See also

Line intersections

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: line]** <put parameter description here>

`Intersect layer` **[vector: line]** <put parameter description here>

`Input unique ID field` **[tablefield: any]** <put parameter description here>

`Intersect unique ID field` **[tablefield: any]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:lineintersections', input_a, input_b, field_a, field_b, output)
```

See also

Symetrical difference

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Difference layer` **[vector: any]** <put parameter description here>

Outputs

`Symetrical difference` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:symetricaldifference', input, overlay, output)
```

See also

Union

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Input layer 2` **[vector: any]** <put parameter description here>

Outputs

`Union` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:union', input, input2, output)
```

See also

.

18.5.10 Vector selection

Extract by attribute

Описание

<put algortithm description here>

Parameters

`Input Layer` **[vector: any]** <put parameter description here>

`Selection attribute` **[tablefield: any]** <put parameter description here>

`Operator` **[selection]** <put parameter description here>

Options:

- 0 — =
- 1 — !=
- 2 — >
- 3 — >=
- 4 — <
- 5 — <=

- 6 — begins with
- 7 — contains

  Default: *0*

`Value` **[string]** <put parameter description here>

  Default: *(not set)*

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:extractbyattribute', input, field, operator, value, output)
```

See also

Extract by location

Описание

<put algortithm description here>

Parameters

`Layer to select from` **[vector: any]** <put parameter description here>

`Additional layer (intersection layer)` **[vector: any]** <put parameter description here>

`Include input features that touch the selection features` **[boolean]** <put parameter description here>

  Default: *False*

`Include input features that overlap/cross the selection features` **[boolean]** <put parameter description here>

  Default: *False*

`Include input features completely within the selection features` **[boolean]** <put parameter description here>

  Default: *False*

Outputs

`Selection` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:extractbylocation', input, intersect, touches, overlaps, within, output)
```

See also

Random extract

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — Number of selected features
- 1 — Percentage of selected features

Default: *0*

`Number/percentage of selected features` **[number]** <put parameter description here>

Default: *10*

Outputs

`Selection` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randomextract', input, method, number, output)
```

See also

Random extract within subsets

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`ID Field` **[tablefield: any]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — Number of selected features
- 1 — Percentage of selected features

Default: *0*

`Number/percentage of selected features` **[number]** <put parameter description here>

Default: *10*

Outputs

`Selection` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randomextractwithinsubsets', input, field, method, number, output)
```

See also

Random selection

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — Number of selected features
- 1 — Percentage of selected features

Default: *0*

`Number/percentage of selected features` **[number]** <put parameter description here>

Default: *10*

Outputs

`Selection` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randomselection', input, method, number)
```

See also

Random selection within subsets

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`ID Field` **[tablefield: any]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — Number of selected features
- 1 — Percentage of selected features

Default: *0*

`Number/percentage of selected features` **[number]** <put parameter description here>

Default: *10*

Outputs

`Selection` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:randomselectionwithinsubsets', input, field, method, number)
```

See also

Select by attribute

Описание

Selects and saves as new layer all features from input layer that satisfy condition.

NOTE: algorithm is case-sensitive ("qgis" is different from "Qgis" and "QGIS")

Parameters

`Input Layer` **[vector: any]** Layer to process.

`Selection attribute` **[tablefield: any]** Field on which perform the selection.

`Operator` **[selection]** Comparison operator.

Options:

- 0 — =
- 1 — !=
- 2 — >
- 3 — >=
- 4 — <
- 5 — <=
- 6 — begins with
- 7 — contains

Default: *0*

`Value` **[string]** Value to compare.

Default: *(not set)*

Outputs

`Output` **[vector]** The resulting layer.

Console usage

```
processing.runalg('qgis:selectbyattribute', input, field, operator, value, output)
```

See also

Select by expression

Описание

<put algortithm description here>

Parameters

`Input Layer` **[vector: any]** <put parameter description here>

`Expression` **[string]** <put parameter description here>

Default: *(not set)*

`Modify current selection by` **[selection]** <put parameter description here>

Options:

- 0 — creating new selection
- 1 — adding to current selection
- 2 — removing from current selection

Default: *0*

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:selectbyexpression', layername, expression, method)
```

See also

Select by location

Описание

<put algortithm description here>

Parameters

`Layer to select from` **[vector: any]** <put parameter description here>

`Additional layer (intersection layer)` **[vector: any]** <put parameter description here>

`Include input features that touch the selection features` **[boolean]** <put parameter description here>

Default: *False*

`Include input features that overlap/cross the selection features` **[boolean]** <put parameter description here>

Default: *False*

`Include input features completely within the selection features` **[boolean]** <put parameter description here>

Default: *False*

`Modify current selection by` **[selection]** <put parameter description here>

Options:

- 0 — creating new selection
- 1 — adding to current selection
- 2 — removing from current selection

Default: *0*

Outputs

`Selection` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:selectbylocation', input, intersect, touches, overlaps, within, method)
```

See also

.

18.5.11 Vector table

Add autoincremental field

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:addautoincrementalfield', input, output)
```

See also

Add field to attributes table

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Field name` **[string]** <put parameter description here>

Default: *(not set)*

`Field type` **[selection]** <put parameter description here>

Options:

- 0 — Integer
- 1 — Float
- 2 — String

Default: *0*

`Field length` **[number]** <put parameter description here>

Default: *10*

`Field precision` **[number]** <put parameter description here>

Default: *0*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:addfieldtoattributestable', input_layer, field_name, field_type, field_length, field_pr
```

See also

Advanced Python field calculator

Описание

<put algorithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Result field name` **[string]** <put parameter description here>

Default: *NewField*

`Field type` **[selection]** <put parameter description here>

Options:

- 0 — Integer
- 1 — Float
- 2 — String

Default: *0*

`Field length` **[number]** <put parameter description here>

Default: *10*

`Field precision` **[number]** <put parameter description here>

Default: *0*

`Global expression` **[string]** Optional.

<put parameter description here>

Default: *(not set)*

`Formula` **[string]** <put parameter description here>

Default: *value =*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:advancedpythonfieldcalculator', input_layer, field_name, field_type, field_length, fiel
```

See also

Basic statistics for numeric fields

Описание

<put algortithm description here>

Parameters

`Input vector layer` **[vector: any]** <put parameter description here>

`Field to calculate statistics on` **[tablefield: numeric]** <put parameter description here>

Outputs

`Statistics for numeric field` **[html]** <put output description here>

`Coefficient of Variation` **[number]** <put output description here>

`Minimum value` **[number]** <put output description here>

`Maximum value` **[number]** <put output description here>

`Sum` **[number]** <put output description here>

`Mean value` **[number]** <put output description here>

`Count` **[number]** <put output description here>

`Range` **[number]** <put output description here>

`Median` **[number]** <put output description here>

`Number of unique values` **[number]** <put output description here>

`Standard deviation` **[number]** <put output description here>

Console usage

```
processing.runalg('qgis:basicstatisticsfornumericfields', input_layer, field_name, output_html_file)
```

See also

Basic statistics for text fields

Описание

<put algortithm description here>

Parameters

`Input vector layer` **[vector: any]** <put parameter description here>

`Field to calculate statistics on` **[tablefield: string]** <put parameter description here>

Outputs

`Statistics for text field` **[html]** <put output description here>

`Minimum length` **[number]** <put output description here>

`Maximum length` **[number]** <put output description here>

`Mean length` **[number]** <put output description here>

`Count` **[number]** <put output description here>

`Number of empty values` **[number]** <put output description here>

`Number of non-empty values` **[number]** <put output description here>

`Number of unique values` **[number]** <put output description here>

Console usage

```
processing.runalg('qgis:basicstatisticsfortextfields', input_layer, field_name, output_html_file)
```

See also

Create equivalent numerical field

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Class field` **[tablefield: any]** <put parameter description here>

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:createequivalentnumericalfield', input, field, output)
```

See also

Delete column

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Field to delete` **[tablefield: any]** <put parameter description here>

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:deletecolumn', input, column, output)
```

See also

Export/Add geometry columns

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Calculate using` **[selection]** <put parameter description here>

Options:

- 0 — Layer CRS
- 1 — Project CRS
- 2 — Ellipsoidal

Default: *0*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:exportaddgeometrycolumns', input, calc_method, output)
```

See also

Field calculator

Описание

<put algortithm description here>

Parameters

`Input layer` **[vector: any]** <put parameter description here>

`Result field name` **[string]** <put parameter description here>

Default: *(not set)*

`Field type` **[selection]** <put parameter description here>

Options:

- 0 — Float
- 1 — Integer
- 2 — String
- 3 — Date

Default: *0*

`Field length` **[number]** <put parameter description here>

Default: *10*

`Field precision` **[number]** <put parameter description here>

Default: *3*

`Create new field` **[boolean]** <put parameter description here>

Default: *True*

`Formula` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

`Output layer` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:fieldcalculator', input_layer, field_name, field_type, field_length, field_precision, n
```

See also

List unique values

Описание

Lists unique values of an attribute table field and counts their number.

Parameters

`Input layer` **[vector: any]** Layer to analyze.

`Target field` **[tablefield: any]** Field to analyze.

Outputs

`Unique values` **[html]** Analysis results in HTML format.

`Total unique values` **[number]** Total number of unique values in given field.

`Unique values` **[string]** List of all unique values in given field.

Console usage

```
processing.runalg('qgis:listuniquevalues', input_layer, field_name, output)
```

See also

Number of unique values in classes

Описание

<put algortithm description here>

Parameters

`input` **[vector: any]** <put parameter description here>

`class field` **[tablefield: any]** <put parameter description here>

`value field` **[tablefield: any]** <put parameter description here>

Outputs

`output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:numberofuniquevaluesinclasses', input, class_field, value_field, output)
```

See also

Statistics by categories

Описание

<put algortithm description here>

Parameters

`Input vector layer` **[vector: any]** <put parameter description here>

`Field to calculate statistics on` **[tablefield: numeric]** <put parameter description here>

`Field with categories` **[tablefield: any]** <put parameter description here>

Outputs

`Statistics` **[table]** <put output description here>

Console usage

```
processing.runalg('qgis:statisticsbycategories', input_layer, values_field_name, categories_field_name, output)
```

See also

Text to float

Описание

<put algortithm description here>

Parameters

`Input Layer` **[vector: any]** <put parameter description here>

`Text attribute to convert to float` **[tablefield: string]** <put parameter description here>

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('qgis:texttofloat', input, field, output)
```

See also

.

18.6 R algorithm provider

R also called GNU S, is a strongly functional language and environment to statistically explore data sets, make many graphical displays of data from custom data sets

Примечание: Please remember that Processing contains only R scripts, so you need to install R by yourself and configure Processing properly.

.

18.6.1 Basic statistics

Frequency table

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Field` **[tablefield: any]** <put parameter description here>

Outputs

`R Console Output` **[html]** <put output description here>

Console usage

```
processing.runalg('r:frequencytable', layer, field, r_console_output)
```

See also

Kolmogrov-Smirnov test

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Field` **[tablefield: any]** <put parameter description here>

Outputs

`R Console Output` **[html]** <put output description here>

Console usage

```
processing.runalg('r:kolmogrovsmirnovtest', layer, field, r_console_output)
```

See also

Summary statistics

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Field` **[tablefield: any]** <put parameter description here>

Outputs

`R Console Output` **[html]** <put output description here>

Console usage

```
processing.runalg('r:summarystatistics', layer, field, r_console_output)
```

See also

.

18.6.2 Home range

Characteristic hull method

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Field` **[tablefield: any]** <put parameter description here>

Outputs

`Home_ranges` **[vector]** <put output description here>

Console usage

```
processing.runalg('r:characteristichullmethod', layer, field, home_ranges)
```

See also

Kernel h ref

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Field` **[tablefield: any]** <put parameter description here>

`Grid` **[number]** <put parameter description here>

Default: *10.0*

`Percentage` **[number]** <put parameter description here>

Default: *10.0*

`Folder` **[directory]** Optional.

<put parameter description here>

Outputs

`Home_ranges` **[vector]** <put output description here>

Console usage

```
processing.runalg('r:kernelhref', layer, field, grid, percentage, folder, home_ranges)
```

See also

Minimum convex polygon

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Percentage` **[number]** <put parameter description here>

Default: *10.0*

`Field` **[tablefield: any]** <put parameter description here>

Outputs

`Home_ranges` **[vector]** <put output description here>

Console usage

```
processing.runalg('r:minimumconvexpolygon', layer, percentage, field, home_ranges)
```

See also

Single-linkage cluster analysis

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Field` **[tablefield: any]** <put parameter description here>

`Percentage` **[number]** <put parameter description here>

Default: *10.0*

Outputs

`R Plots` **[html]** <put output description here>

`Home_ranges` **[vector]** <put output description here>

Console usage

```
processing.runalg('r:singlelinkageclusteranalysis', layer, field, percentage, rplots, home_ranges)
```

See also

.

18.6.3 Point pattern

F function

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Nsim` **[number]** <put parameter description here>

Default: *10.0*

Outputs

`R Plots` **[html]** <put output description here>

Console usage

```
processing.runalg('r:ffunction', layer, nsim, rplots)
```

See also

G function

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Nsim` **[number]** <put parameter description here>

Default: *10.0*

Outputs

`R Plots` **[html]** <put output description here>

Console usage

```
processing.runalg('r:gfunction', layer, nsim, rplots)
```

See also

Monte-Carlo spatial randomness

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Simulations` **[number]** <put parameter description here>

Default: *100.0*

`Optional plot name` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

`R Plots` **[html]** <put output description here>

`R Console Output` **[html]** <put output description here>

Console usage

```
processing.runalg('r:montecarlospatialrandomness', layer, simulations, optional_plot_name, rplots, r_console_ou
```

See also

Quadrat analysis

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

Outputs

`R Plots` **[html]** <put output description here>

`R Console Output` **[html]** <put output description here>

Console usage

```
processing.runalg('r:quadratanalysis', layer, rplots, r_console_output)
```

See also

Random sampling grid

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Size` **[number]** <put parameter description here>

Default: *10.0*

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('r:randomsamplinggrid', layer, size, output)
```

See also

Regular sampling grid

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Size` **[number]** <put parameter description here>

Default: *10.0*

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('r:regularsamplinggrid', layer, size, output)
```

See also

Relative distribution (distance covariate)

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Covariate` **[vector: any]** <put parameter description here>

`Covariate name` **[string]** <put parameter description here>

Default: *mandatory_covariate_name_(no_spaces)*

`x label` **[string]** <put parameter description here>

Default: *(not set)*

`Plot name` **[string]** <put parameter description here>

Default: *(not set)*

`Legend position` **[string]** <put parameter description here>

Default: *float*

Outputs

`R Plots` **[html]** <put output description here>

Console usage

```
processing.runalg('r:relativedistributiondistancecovariate', layer, covariate, covariate_name, x_label, plot_na
```

See also

Relative distribution (raster covariate)

Описание

<put algortithm description here>

Parameters

`points` **[vector: any]** <put parameter description here>

`covariate` **[raster]** <put parameter description here>

`covariate name` **[string]** <put parameter description here>

Default: *mandatory_covariate_name_(no_spaces)*

`x label` **[string]** <put parameter description here>

Default: *(not set)*

`plot name` **[string]** <put parameter description here>

Default: *(not set)*

`legend position` **[string]** <put parameter description here>

Default: *float*

Outputs

`R Plots` **[html]** <put output description here>

Console usage

```
processing.runalg('r:relativedistributionrastercovariate', points, covariate, covariate_name, x_label, plot_nam
```

See also

Ripley - Rasson spatial domain

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('r:ripleyrassonspatialdomain', layer, output)
```

See also

.

18.6.4 Raster processing

Advanced raster histogram

Описание

<put algortithm description here>

Parameters

`Layer` **[raster]** <put parameter description here>

`Dens or Hist` **[string]** <put parameter description here>

Default: *Hist*

Outputs

`R Plots` **[html]** <put output description here>

Console usage

```
processing.runalg('r:advancedrasterhistogram', layer, dens_or_hist, rplots)
```

See also

Raster histogram

Описание

<put algortithm description here>

Parameters

`Layer` **[raster]** <put parameter description here>

Outputs

`R Plots` **[html]** <put output description here>

Console usage

```
processing.runalg('r:rasterhistogram', layer, rplots)
```

See also

.

18.6.5 Vector processing

Histogram

Описание

<put algortithm description here>

Parameters

`Layer` **[vector: any]** <put parameter description here>

`Field` **[tablefield: any]** <put parameter description here>

Outputs

`R Plots` **[html]** <put output description here>

Console usage

```
processing.runalg('r:histogram', layer, field, rplots)
```

See also

.

18.7 SAGA algorithm provider

SAGA (System for Automated Geoscientific Analyses) is a free, hybrid, cross-platform GIS software. SAGA provides many geoscientific methods which are bundled in so-called module libraries.

Примечание: Please remember that Processing contains only the interface description, so you need to install SAGA by yourself and configure Processing properly.

.

18.7.1 Geostatistics

Directional statistics for single grid

Описание

<put algortithm description here>

Параметры

`Grid` **[raster]** <put parameter description here>

`Points` **[vector: any]** Optional.

<put parameter description here>

`Direction [Degree]` **[number]** <put parameter description here>

Default: *0.0*

`Tolerance [Degree]` **[number]** <put parameter description here>

Default: *0.0*

`Maximum Distance [Cells]` **[number]** <put parameter description here>

Default: *0*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power

- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Arithmetic Mean` **[raster]** <put output description here>

`Difference from Arithmetic Mean` **[raster]** <put output description here>

`Minimum` **[raster]** <put output description here>

`Maximum` **[raster]** <put output description here>

`Range` **[raster]** <put output description here>

`Variance` **[raster]** <put output description here>

`Standard Deviation` **[raster]** <put output description here>

`Mean less Standard Deviation` **[raster]** <put output description here>

`Mean plus Standard Deviation` **[raster]** <put output description here>

`Deviation from Arithmetic Mean` **[raster]** <put output description here>

`Percentile` **[raster]** <put output description here>

`Directional Statistics for Points` **[vector]** <put output description here>

Использование консоли

```
processing.runalg('saga:directionalstatisticsforsinglegrid', grid, points, direction, tolerance, maxdistance, d
```

См. также

Fast representativeness

Описание

<put algortithm description here>

Parameters

`Input` **[raster]** <put parameter description here>

`Level of Generalisation` **[number]** <put parameter description here>

Default: *16*

Outputs

`Output` **[raster]** <put output description here>

`Output Lod` **[raster]** <put output description here>

`Output Seeds` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fastrepresentativeness', input, lod, result, result_lod, seeds)
```

See also

Geographically weighted multiple regression (points/grids)

Описание

<put algortithm description here>

Parameters

`Predictors` **[multipleinput: rasters]** <put parameter description here>

`Output of Regression Parameters` **[boolean]** <put parameter description here>

Default: *True*

`Points` **[vector: point]** <put parameter description here>

`Dependent Variable` **[tablefield: any]** <put parameter description here>

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1.0*

`Search Range` **[selection]** <put parameter description here>

Options:

- 0 — [0] search radius (local)
- 1 — [1] no search radius (global)

Default: *0*

`Search Radius` **[number]** <put parameter description here>

Default: *100*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] all directions
- 1 — [1] quadrants

Default: *0*

`Number of Points` **[selection]** <put parameter description here>

Options:

- 0 — [0] maximum number of observations
- 1 — [1] all points

Default: *0*

`Maximum Number of Observations` **[number]** <put parameter description here>

Default: *10*

`Minimum Number of Observations` **[number]** <put parameter description here>

Default: *4*

Outputs

`Regression` **[raster]** <put output description here>

`Coefficient of Determination` **[raster]** <put output description here>

`Regression Parameters` **[raster]** <put output description here>

`Residuals` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:geographicallyweightedmultipleregressionpointsgrids', predictors, parameters, points, d
```

See also

Geographically weighted multiple regression (points)

Описание

<put algortithm description here>

Parameters

`Points` **[vector: any]** <put parameter description here>

`Dependent Variable` **[tablefield: any]** <put parameter description here>

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1.0*

`Search Range` **[selection]** <put parameter description here>

Options:

- 0 — [0] search radius (local)
- 1 — [1] no search radius (global)

Default: *0*

`Search Radius` **[number]** <put parameter description here>

Default: *100*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] all directions
- 1 — [1] quadrants

Default: *0*

`Number of Points` **[selection]** <put parameter description here>

Options:

- 0 — [0] maximum number of observations
- 1 — [1] all points

Default: *0*

`Maximum Number of Observations` **[number]** <put parameter description here>

Default: *10*

`Minimum Number of Observations` **[number]** <put parameter description here>

Default: *4*

Outputs

`Regression` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:geographicallyweightedmultipleregressionpoints', points, dependent, distance_weighting_
```

See also

Geographically weighted multiple regression

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Dependent Variable` **[tablefield: any]** <put parameter description here>

`Target Grids` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1*

`Search Range` **[selection]** <put parameter description here>

Options:

- 0 — [0] search radius (local)
- 1 — [1] no search radius (global)

Default: *0*

`Search Radius` **[number]** <put parameter description here>

Default: *100*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] all directions
- 1 — [1] quadrants

Default: *0*

`Number of Points` **[selection]** <put parameter description here>

Options:

- 0 — [0] maximum number of observations
- 1 — [1] all points

Default: *0*

`Maximum Number of Observations` **[number]** <put parameter description here>

Default: *10*

`Minimum Number of Observations` **[number]** <put parameter description here>

Default: *4*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Quality` **[raster]** <put output description here>

`Intercept` **[raster]** <put output description here>

`Quality` **[raster]** <put output description here>

`Intercept` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:geographicallyweightedmultipleregression', points, dependent, target, distance_weightin
```

See also

Geographically weighted regression (points/grid)

Описание

<put algortithm description here>

Parameters

`Predictor` **[raster]** <put parameter description here>

`Points` **[vector: point]** <put parameter description here>

`Dependent Variable` **[tablefield: any]** <put parameter description here>

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1.0*

`Search Range` **[selection]** <put parameter description here>

Options:

- 0 — [0] search radius (local)
- 1 — [1] no search radius (global)

Default: *0*

`Search Radius` **[number]** <put parameter description here>

Default: *0*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] all directions
- 1 — [1] quadrants

Default: *0*

`Number of Points` **[selection]** <put parameter description here>

Options:

- 0 — [0] maximum number of observations
- 1 — [1] all points

Default: *0*

`Maximum Number of Observations` **[number]** <put parameter description here>

Default: *10*

`Minimum Number of Observations` **[number]** <put parameter description here>

Default: *4*

Outputs

`Regression` **[raster]** <put output description here>

`Coefficient of Determination` **[raster]** <put output description here>

`Intercept` **[raster]** <put output description here>

`Slope` **[raster]** <put output description here>

`Residuals` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:geographicallyweightedregressionpointsgrid', predictor, points, dependent, distance_wei
```

See also

Geographically weighted regression

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Dependent Variable` **[tablefield: any]** <put parameter description here>

`Predictor` **[tablefield: any]** <put parameter description here>

`Target Grids` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *0*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *0.0*

`Search Range` **[selection]** <put parameter description here>

Options:

- 0 — [0] search radius (local)
- 1 — [1] no search radius (global)

Default: *0*

`Search Radius` **[number]** <put parameter description here>

Default: *100*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] all directions
- 1 — [1] quadrants

Default: *0*

`Number of Points` **[selection]** <put parameter description here>

Options:

- 0 — [0] maximum number of observations
- 1 — [1] all points

Default: *0*

`Maximum Number of Observations` **[number]** <put parameter description here>

Default: *10*

`Minimum Number of Observations` **[number]** <put parameter description here>

Default: *4*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

`Quality` **[raster]** <put output description here>

`Intercept` **[raster]** <put output description here>

`Slope` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:geographicallyweightedregression', points, dependent, predictor, target, distance_weigh
```

See also

Global moran's i for grids

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Case of contiguity` **[selection]** <put parameter description here>

Options:

- 0 — [0] Rook
- 1 — [1] Queen

Default: *0*

Outputs

`Result` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:globalmoransiforgrids', grid, contiguity, result)
```

See also

Minimum distance analysis

Описание

Performs a complete distance analysis of a point layer:

- minimum distance of points
- maximum distance of points
- average distance of all the points
- standard deviation of the distance
- duplicated points

Parameters

`Points` **[vector: point]** Layer to analyze.

Outputs

`Minimum Distance Analysis` **[table]** The resulting table.

Console usage

```
processing.runalg('saga:minimumdistanceanalysis', points, table)
```

See also

Multi-band variation

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Radius [Cells]` **[number]** <put parameter description here>

Default: *1*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Mean Distance` **[raster]** <put output description here>

`Standard Deviation` **[raster]** <put output description here>

`Distance` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:multibandvariation', bands, radius, distance_weighting_weighting, distance_weighting_id
```

See also

Multiple regression analysis (grid/grids)

Описание

<put algortithm description here>

Parameters

`Dependent` **[raster]** <put parameter description here>

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Grid Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

`Include X Coordinate` **[boolean]** <put parameter description here>

Default: *True*

`Include Y Coordinate` **[boolean]** <put parameter description here>

Default: *True*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] include all
- 1 — [1] forward
- 2 — [2] backward
- 3 — [3] stepwise

Default: *0*

`P in` **[number]** <put parameter description here>

Default: *5*

`P out` **[number]** <put parameter description here>

Default: *5*

Outputs

`Regression` **[raster]** <put output description here>

`Residuals` **[raster]** <put output description here>

`Details: Coefficients` **[table]** <put output description here>

`Details: Model` **[table]** <put output description here>

`Details: Steps` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:multipleregressionanalysisgridgrids', dependent, grids, interpol, coord_x, coord_y, met
```

See also

Multiple regression analysis (points/grids)

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Shapes` **[vector: any]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Grid Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

`Include X Coordinate` **[boolean]** <put parameter description here>

Default: *True*

`Include Y Coordinate` **[boolean]** <put parameter description here>

Default: *True*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] include all
- 1 — [1] forward
- 2 — [2] backward
- 3 — [3] stepwise

Default: *0*

`P in` **[number]** <put parameter description here>

Default: *5*

`P out` **[number]** <put parameter description here>

Default: *5*

Outputs

`Details: Coefficients` **[table]** <put output description here>

`Details: Model` **[table]** <put output description here>

`Details: Steps` **[table]** <put output description here>

`Residuals` **[vector]** <put output description here>

`Regression` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:multipleregressionanalysispointsgrids', grids, shapes, attribute, interpol, coord_x, co
```

See also

Polynomial regression

Описание

<put algortithm description here>

Parameters

`Points` **[vector: any]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Polynom` **[selection]** <put parameter description here>

Options:

- 0 — [0] simple planar surface
- 1 — [1] bi-linear saddle
- 2 — [2] quadratic surface
- 3 — [3] cubic surface
- 4 — [4] user defined

Default: *0*

`Maximum X Order` **[number]** <put parameter description here>

Default: *4*

`Maximum Y Order` **[number]** <put parameter description here>

Default: *4*

`Maximum Total Order` **[number]** <put parameter description here>

Default: *4*

`Trend Surface` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Residuals` **[vector]** <put output description here>

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:polynomialregression', points, attribute, polynom, xorder, yorder, torder, target, outp
```

See also

Radius of variance (grid)

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Standard Deviation` **[number]** <put parameter description here>

Default: *1.0*

`Maximum Search Radius (cells)` **[number]** <put parameter description here>

Default: *20*

`Type of Output` **[selection]** <put parameter description here>

Options:

- 0 — [0] Cells
- 1 — [1] Map Units

Default: *0*

Outputs

`Variance Radius` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:radiusofvariancegrid', input, variance, radius, output, result)
```

See also

Regression analysis

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Shapes` **[vector: any]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Grid Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

`Regression Function` **[selection]** <put parameter description here>

Options:

- 0 — [0] Y = a + b * X (linear)
- 1 — [1] Y = a + b / X
- 2 — [2] Y = a / (b - X)
- 3 — [3] Y = a * X^b (power)
- 4 — [4] Y = a e^(b * X) (exponential)
- 5 — [5] Y = a + b * ln(X) (logarithmic)

Default: *0*

Outputs

`Regression` **[raster]** <put output description here>

`Residuals` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:regressionanalysis', grid, shapes, attribute, interpol, method, regression, residual)
```

See also

Representativeness

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Radius (Cells)` **[number]** <put parameter description here>

Default: *10*

`Exponent` **[number]** <put parameter description here>

Default: *1*

Outputs

`Representativeness` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:representativeness', input, radius, exponent, result)
```

See also

Residual analysis

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Radius (Cells)` **[number]** <put parameter description here>

Default: *7*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Mean Value` **[raster]** <put output description here>

`Difference from Mean Value` **[raster]** <put output description here>

`Standard Deviation` **[raster]** <put output description here>

`Value Range` **[raster]** <put output description here>

`Minimum Value` **[raster]** <put output description here>

`Maximum Value` **[raster]** <put output description here>

`Deviation from Mean Value` **[raster]** <put output description here>

`Percentile` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:residualanalysis', grid, radius, distance_weighting_weighting, distance_weighting_idw_p
```

See also

Spatial point pattern analysis

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Vertex Distance [Degree]` **[number]** <put parameter description here>

Default: *5*

Outputs

`Mean Centre` **[vector]** <put output description here>

`Standard Distance` **[vector]** <put output description here>

`Bounding Box` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:spatialpointpatternanalysis', points, step, centre, stddist, bbox)
```

See also

Statistics for grids

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

Outputs

`Arithmetic Mean` **[raster]** <put output description here>

`Minimum` **[raster]** <put output description here>

`Maximum` **[raster]** <put output description here>

`Variance` **[raster]** <put output description here>

`Standard Deviation` **[raster]** <put output description here>

`Mean less Standard Deviation` **[raster]** <put output description here>

`Mean plus Standard Deviation` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:statisticsforgrids', grids, mean, min, max, var, stddev, stddevlo, stddevhi)
```

See also

Variogram cloud

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Maximum Distance` **[number]** <put parameter description here>

Default: *0.0*

`Skip Number` **[number]** <put parameter description here>

Default: *1*

Outputs

`Variogram Cloud` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:variogramcloud', points, field, distmax, nskip, result)
```

See also

Variogram surface

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Number of Distance Classes` **[number]** <put parameter description here>

Default: *10*

`Skip Number` **[number]** <put parameter description here>

Default: *1*

Outputs

`Number of Pairs` **[raster]** <put output description here>

`Variogram Surface` **[raster]** <put output description here>

`Covariance Surface` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:variogramsurface', points, field, distcount, nskip, count, variance, covariance)
```

See also

Zonal grid statistics

Описание

<put algortithm description here>

Parameters

`Zone Grid` **[raster]** <put parameter description here>

`Categorial Grids` **[multipleinput: rasters]** Optional.

<put parameter description here>

`Grids to analyse` **[multipleinput: rasters]** Optional.

<put parameter description here>

`Aspect` **[raster]** Optional.

<put parameter description here>

`Short Field Names` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Zonal Statistics` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:zonalgridstatistics', zones, catlist, statlist, aspect, shortnames, outtab)
```

See also

.

18.7.2 Grid analysis

Accumulated cost (anisotropic)

Описание

<put algortithm description here>

Parameters

`Cost Grid` **[raster]** <put parameter description here>

`Direction of max cost` **[raster]** <put parameter description here>

`Destination Points` **[raster]** <put parameter description here>

`k factor` **[number]** <put parameter description here>

Default: *1*

`Threshold for different route` **[number]** <put parameter description here>

Default: *0*

Outputs

`Accumulated Cost` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:accumulatedcostanisotropic', cost, direction, points, k, threshold, acccost)
```

See also

Accumulated cost (isotropic)

Описание

<put algortithm description here>

Parameters

`Cost Grid` **[raster]** <put parameter description here>

`Destination Points` **[raster]** <put parameter description here>

`Threshold for different route` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Accumulated Cost` **[raster]** <put output description here>

`Closest Point` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:accumulatedcostisotropic', cost, points, threshold, acccost, closestpt)
```

See also

Aggregation index

Описание

<put algortithm description here>

Parameters

`Input Grid` **[raster]** <put parameter description here>

`Max. Number of Classes` **[number]** <put parameter description here>

Default: *5*

Outputs

`Result` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:aggregationindex', input, maxnumclass, result)
```

See also

Analytical hierarchy process

Описание

<put algortithm description here>

Parameters

`Input Grids` **[multipleinput: rasters]** <put parameter description here>

`Pairwise Comparisons Table` **[table]** <put parameter description here>

Outputs

`Output Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:analyticalhierarchyprocess', grids, table, output)
```

See also

Cross-classification and tabulation

Описание

<put algortithm description here>

Parameters

`Input Grid 1` **[raster]** <put parameter description here>

`Input Grid 2` **[raster]** <put parameter description here>

`Max. Number of Classes` **[number]** <put parameter description here>

Default: *5*

Outputs

`Cross-Classification Grid` **[raster]** <put output description here>

`Cross-Tabulation Table` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:crossclassificationandtabulation', input, input2, maxnumclass, resultgrid, resulttable)
```

See also

Fragmentation (alternative)

Описание

<put algortithm description here>

Parameters

`Classification` **[raster]** <put parameter description here>

`Class Identifier` **[number]** <put parameter description here>

Default: *1*

`Neighborhood Min` **[number]** <put parameter description here>

Default: *1*

`Neighborhood Max` **[number]** <put parameter description here>

Default: *1*

`Level Aggregation` **[selection]** <put parameter description here>

Options:

- 0 — [0] average
- 1 — [1] multiplicative

Default: *0*

`Add Border` **[boolean]** <put parameter description here>

Default: *True*

`Connectivity Weighting` **[number]** <put parameter description here>

Default: *1.1*

`Minimum Density [Percent]` **[number]** <put parameter description here>

Default: *10*

`Minimum Density for Interior Forest [Percent]` **[number]** <put parameter description here>

Default: *99*

`Search Distance Increment` **[number]** <put parameter description here>

Default: *0.0*

`Density from Neighbourhood` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Density [Percent]` **[raster]** <put output description here>

`Connectivity [Percent]` **[raster]** <put output description here>

`Fragmentation` **[raster]** <put output description here>

`Summary` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:fragmentationalternative', classes, class, neighborhood_min, neighborhood_max, aggregat
```

See also

Fragmentation classes from density and connectivity

Описание

<put algortithm description here>

Parameters

`Density [Percent]` **[raster]** <put parameter description here>

`Connectivity [Percent]` **[raster]** <put parameter description here>

`Add Border` **[boolean]** <put parameter description here>

Default: *True*

`Connectivity Weighting` **[number]** <put parameter description here>

Default: *0*

`Minimum Density [Percent]` **[number]** <put parameter description here>

Default: *10*

`Minimum Density for Interior Forest [Percent]` **[number]** <put parameter description here>

Default: *99*

Outputs

`Fragmentation` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fragmentationclassesfromdensityandconnectivity', density, connectivity, border, weight,
```

See also

Fragmentation (standard)

Описание

<put algortithm description here>

Parameters

`Classification` **[raster]** <put parameter description here>

`Class Identifier` **[number]** <put parameter description here>

Default: *1*

`Neighborhood Min` **[number]** <put parameter description here>

Default: *1*

`Neighborhood Max` **[number]** <put parameter description here>

Default: *3*

`Level Aggregation` **[selection]** <put parameter description here>

Options:

- 0 — [0] average
- 1 — [1] multiplicative

Default: *0*

`Add Border` **[boolean]** <put parameter description here>

Default: *True*

`Connectivity Weighting` **[number]** <put parameter description here>

Default: *1.1*

`Minimum Density [Percent]` **[number]** <put parameter description here>

Default: *10*

`Minimum Density for Interior Forest [Percent]` **[number]** <put parameter description here>

Default: *99*

`Neighborhood Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] square
- 1 — [1] circle

Default: *0*

`Include diagonal neighbour relations` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Density [Percent]` **[raster]** <put output description here>

`Connectivity [Percent]` **[raster]** <put output description here>

`Fragmentation` **[raster]** <put output description here>

`Summary` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:fragmentationstandard', classes, class, neighborhood_min, neighborhood_max, aggregation
```

See also

Layer of extreme value

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Maximum
- 1 — [1] Minimum

Default: *0*

Outputs

`Result` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:layerofextremevalue', grids, criteria, result)
```

See also

Least cost paths

Описание

<put algortithm description here>

Parameters

`Source Point(s)` **[vector: point]** <put parameter description here>

`Accumulated cost` **[raster]** <put parameter description here>

`Values` **[multipleinput: rasters]** Optional.

<put parameter description here>

Outputs

`Profile (points)` **[vector]** <put output description here>

`Profile (lines)` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:leastcostpaths', source, dem, values, points, line)
```

See also

Ordered Weighted Averaging

Описание

<put algortithm description here>

Parameters

`Input Grids` **[multipleinput: rasters]** <put parameter description here>

`Weights` **[fixedtable]** <put parameter description here>

Outputs

`Output Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:orderedweightedaveraging', grids, weights, output)
```

See also

Pattern analysis

Описание

<put algortithm description here>

Parameters

`Input Grid` **[raster]** <put parameter description here>

`Size of Analysis Window` **[selection]** <put parameter description here>

Options:

- 0 — [0] 3 X 3
- 1 — [1] 5 X 5
- 2 — [2] 7 X 7

Default: *0*

`Max. Number of Classes` **[number]** <put parameter description here>

Default: *0*

Outputs

`Relative Richness` **[raster]** <put output description here>

`Diversity` **[raster]** <put output description here>

`Dominance` **[raster]** <put output description here>

`Fragmentation` **[raster]** <put output description here>

`Number of Different Classes` **[raster]** <put output description here>

`Center Versus Neighbours` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:patternanalysis', input, winsize, maxnumclass, relative, diversity, dominance, fragment
```

See also

Soil texture classification

Описание

<put algortithm description here>

Parameters

`Sand` **[raster]** Optional.

<put parameter description here>

`Silt` **[raster]** Optional.

<put parameter description here>

`Clay` **[raster]** Optional.

<put parameter description here>

Outputs

`Soil Texture` **[raster]** <put output description here>

`Sum` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:soiltextureclassification', sand, silt, clay, texture, sum)
```

See also

.

18.7.3 Grid calculus

Function

Описание

<put algortithm description here>

Parameters

`xmin` **[number]** <put parameter description here>

Default: *0.0*

`xmax` **[number]** <put parameter description here>

Default: *0.0*

`ymin` **[number]** <put parameter description here>

Default: *0.0*

`ymax` **[number]** <put parameter description here>

Default: *0.0*

`Formula` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

`Function` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:function', xmin, xmax, ymin, ymax, formul, result)
```

See also

Fuzzify

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`A` **[number]** <put parameter description here>

Default: *0.0*

`B` **[number]** <put parameter description here>

Default: *0.0*

`C` **[number]** <put parameter description here>

Default: *0.0*

`D` **[number]** <put parameter description here>

Default: *0.0*

`Membership Function Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] linear
- 1 — [1] sigmoidal
- 2 — [2] j-shaped

Default: *0*

`Adjust to Grid` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Fuzzified Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fuzzify', input, a, b, c, d, type, autofit, output)
```

See also

Fuzzy intersection (and)

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Operator Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] min(a, b) (non-interactive)
- 1 — [1] a * b
- 2 — [2] max(0, a + b - 1)

Default: *0*

Outputs

`Intersection` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fuzzyintersectionand', grids, type, and)
```

See also

Fuzzy union (or)

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Operator Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] max(a, b) (non-interactive)
- 1 — [1] a + b - a * b
- 2 — [2] min(1, a + b)

Default: *0*

Outputs

`Union` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fuzzyunionor', grids, type, or)
```

See also

Geometric figures

Описание

Draws simple geometric figures.

Parameters

`Cell Count` **[number]** Number of cells to use.

Default: *0*

`Cell Size` **[number]** Size of the single cell.

Default: *0*

`Figure` **[selection]** Type of the figure.

Options:

- 0 — [0] Cone (up)
- 1 — [1] Cone (down)
- 2 — [2] Plane

Default: *0*

`Direction of Plane [Degree]` **[number]** Rotation factor in degrees.

Default: *0*

Outputs

`Result` **[raster]** The resulting layer.

Console usage

```
processing.runalg('saga:geometricfigures', cell_count, cell_size, figure, plane, result)
```

See also

Gradient vector from cartesian to polar coordinates

Описание

<put algortithm description here>

Parameters

`X Component` **[raster]** <put parameter description here>

`Y Component` **[raster]** <put parameter description here>

`Polar Angle Units` **[selection]** <put parameter description here>

Options:

- 0 — [0] radians
- 1 — [1] degree

Default: *0*

`Polar Coordinate System` **[selection]** <put parameter description here>

Options:

- 0 — [0] mathematical
- 1 — [1] geographical
- 2 — [2] user defined

Default: *0*

`User defined Zero Direction` **[number]** <put parameter description here>

Default: *0.0*

`User defined Orientation` **[selection]** <put parameter description here>

Options:

- 0 — [0] clockwise
- 1 — [1] counterclockwise

Default: *0*

Outputs

`Direction` **[raster]** <put output description here>

`Length` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gradientvectorfromcartesiantopolarcoordinates', dx, dy, units, system, system_zero, sys
```

See also

Gradient vector from polar to cartesian coordinates

Описание

<put algortithm description here>

Parameters

`Direction` **[raster]** <put parameter description here>

`Length` **[raster]** <put parameter description here>

`Polar Angle Units` **[selection]** <put parameter description here>

Options:

- 0 — [0] radians
- 1 — [1] degree

Default: *0*

`Polar Coordinate System` **[selection]** <put parameter description here>

Options:

- 0 — [0] mathematical
- 1 — [1] geographical
- 2 — [2] user defined

Default: *0*

`User defined Zero Direction` **[number]** <put parameter description here>

Default: *0.0*

`User defined Orientation` **[selection]** <put parameter description here>

Options:

- 0 — [0] clockwise

- 1 — [1] counterclockwise

Default: *0*

Outputs

`X Component` **[raster]** <put output description here>

`Y Component` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gradientvectorfrompolartocartesiancoordinates', dir, len, units, system, system_zero, s
```

See also

Grid difference

Описание

Creates a new grid layer as the result of the difference between two other grid layers.

Parameters

`A` **[raster]** First layer.

`B` **[raster]** Second layer.

Outputs

`Difference (A - B)` **[raster]** The resulting layer.

Console usage

```
processing.runalg('saga:griddifference', a, b, c)
```

See also

Grid division

Описание

Creates a new grid layer as the result of the division between two other grid layers.

Parameters

`Dividend` **[raster]** First layer.

`Divisor` **[raster]** Second layer.

Outputs

`Quotient` **[raster]** The resulting layer.

Console usage

```
processing.runalg('saga:griddivision', a, b, c)
```

See also

Grid normalisation

Описание

Normalises the grid values according to minimum and maximum values chosen.

Parameters

`Grid` **[raster]** Grid to normalize.

`Target Range (min)` **[number]** Minimum value.

Default: *0*

`Target Range (max)` **[number]** Maximum value.

Default: *1*

Outputs

`Normalised Grid` **[raster]** The resulting layer.

Console usage

```
processing.runalg('saga:gridnormalisation', input, range_min, range_max, output)
```

See also

Grids product

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

Outputs

`Product` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gridsproduct', grids, result)
```

See also

Grids sum

Описание

Creates a new grid layer as the result of the sum of two or more grid layers.

Parameters

`Grids` **[multipleinput: rasters]** Grid layers to sum

Outputs

`Sum` **[raster]** The resulting layer.

Console usage

```
processing.runalg('saga:gridssum', grids, result)
```

See also

Grid standardisation

Описание

Standardises the grid layer values.

Parameters

`Grid` **[raster]** Grid to process.

`Stretch Factor` **[number]** stretching factor.

Default: *1.0*

Outputs

`Standardised Grid` **[raster]** The resulting layer.

Console usage

```
processing.runalg('saga:gridstandardisation', input, stretch, output)
```

See also

Grid volume

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Count Only Above Base Level
- 1 — [1] Count Only Below Base Level
- 2 — [2] Subtract Volumes Below Base Level
- 3 — [3] Add Volumes Below Base Level

Default: *0*

`Base Level` **[number]** <put parameter description here>

Default: *0.0*

Outputs

Console usage

```
processing.runalg('saga:gridvolume', grid, method, level)
```

See also

Metric conversions

Описание

Performs numerical conversions of the grid values.

Parameters

`Grid` **[raster]** Grid to process.

`Conversion` **[selection]** Conversion type.

Options:

- 0 — [0] radians to degree
- 1 — [1] degree to radians
- 2 — [2] Celsius to Fahrenheit
- 3 — [3] Fahrenheit to Celsius

Default: *0*

Outputs

`Converted Grid` **[raster]** The resulting layer.

Console usage

```
processing.runalg('saga:metricconversions', grid, conversion, conv)
```

See also

Polynomial trend from grids

Описание

<put algortithm description here>

Parameters

`Dependent Variables` **[multipleinput: rasters]** <put parameter description here>

`Independent Variable (per Grid and Cell)` **[multipleinput: rasters]** Optional.
<put parameter description here>

`Independent Variable (per Grid)` **[fixedtable]** <put parameter description here>

`Type of Approximated Function` **[selection]** <put parameter description here>

Options:

- 0 — [0] first order polynom (linear regression)
- 1 — [1] second order polynom
- 2 — [2] third order polynom
- 3 — [3] fourth order polynom
- 4 — [4] fifth order polynom

Default: *0*

Outputs

`Polynomial Coefficients` **[raster]** <put output description here>

`Coefficient of Determination` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:polynomialtrendfromgrids', grids, y_grids, y_table, polynom, parms, quality)
```

See also

Random field

Описание

Generates a random grid layer.

Parameters

`Width (Cells)` **[number]** Width of the layer in cells.

Default: *100*

`Height (Cells)` **[number]** Height of the layer in cells.

Default: *100*

`Cellsize` **[number]** Cell size to use.

Default: *100.0*

`West` **[number]** West coordinate of the bottom-left corner of the grid.

Default: *0.0*

`South` **[number]** South coordinate of the bottom-left corner of the grid.

Default: *0.0*

`Method` **[selection]** Statistical method used for the calculation.

Options:

- 0 — [0] Uniform
- 1 — [1] Gaussian

Default: *0*

`Range Min` **[number]** Minimum cell value to use.

Default: *0.0*

`Range Max` **[number]** Maximum cell value to use.

Default: *1.0*

`Arithmetic Mean` **[number]** Mean of all the cell values to use.

Default: *0.0*

`Standard Deviation` **[number]** Standard deviation of all the cell values to use.

Default: *1.0*

Outputs

`Random Field` **[raster]** The resulting layer.

Console usage

```
processing.runalg('saga:randomfield', nx, ny, cellsize, xmin, ymin, method, range_min, range_max, mean, stddev,
```

See also

Random terrain generation

Описание

<put algortithm description here>

Parameters

`Radius (cells)` **[number]** <put parameter description here>

Default: *10*

`Iterations` **[number]** <put parameter description here>

Default: *10*

`Target Dimensions` **[selection]** <put parameter description here>

Options:

- 0 — [0] User defined

Default: *0*

`Grid Size` **[number]** <put parameter description here>

Default: *1.0*

`Cols` **[number]** <put parameter description here>

Default: *100*

`Rows` **[number]** <put parameter description here>

Default: *100*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:randomterraingeneration', radius, iterations, target_type, user_cell_size, user_cols, u
```

See also

Raster calculator

Описание

<put algortithm description here>

Parameters

`Main input layer` **[raster]** <put parameter description here>

`Additional layers` **[multipleinput: rasters]** Optional.

<put parameter description here>

`Formula` **[string]** <put parameter description here>

Default: *(not set)*

Outputs

`Result` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:rastercalculator', grids, xgrids, formula, result)
```

See also

.

18.7.4 Grid filter

Dtm filter (slope-based)

Описание

<put algortithm description here>

Parameters

`Grid to filter` **[raster]** <put parameter description here>

`Search Radius` **[number]** <put parameter description here>

Default: *2*

`Approx. Terrain Slope` **[number]** <put parameter description here>

Default: *30.0*

`Use Confidence Interval` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Bare Earth` **[raster]** <put output description here>

`Removed Objects` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:dtmfilterslopebased', input, radius, terrainslope, stddev, ground, nonground)
```

See also

Filter clumps

Описание

<put algortithm description here>

Parameters

`Input Grid` **[raster]** <put parameter description here>

`Min. Size` **[number]** <put parameter description here>

Default: *10*

Outputs

`Filtered Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:filterclumps', grid, threshold, output)
```

See also

Gaussian filter

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Standard Deviation` **[number]** <put parameter description here>

Default: *1*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] Square
- 1 — [1] Circle

Default: *0*

`Search Radius` **[number]** <put parameter description here>

Default: *3*

Outputs

`Filtered Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gaussianfilter', input, sigma, mode, radius, result)
```

See also

Laplacian filter

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] standard kernel 1
- 1 — [1] standard kernel 2
- 2 — [2] Standard kernel 3
- 3 — [3] user defined kernel

Default: *0*

`Standard Deviation (Percent of Radius)` **[number]** <put parameter description here>

Default: *0*

`Radius` **[number]** <put parameter description here>

Default: *1*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] square
- 1 — [1] circle

Default: *0*

Outputs

`Filtered Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:laplacianfilter', input, method, sigma, radius, mode, result)
```

See also

Majority filter

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] Square
- 1 — [1] Circle

Default: *0*

`Radius` **[number]** <put parameter description here>

Default: *1*

`Threshold [Percent]` **[number]** <put parameter description here>

Default: *0*

Outputs

`Filtered Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:majorityfilter', input, mode, radius, threshold, result)
```

See also

Morphological filter

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] Square
- 1 — [1] Circle

Default: *0*

`Radius` **[number]** <put parameter description here>

Default: *1*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Dilation
- 1 — [1] Erosion
- 2 — [2] Opening
- 3 — [3] Closing

Default: *0*

Outputs

`Filtered Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:morphologicalfilter', input, mode, radius, method, result)
```

See also

Multi direction lee filter

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Estimated Noise (absolute)` **[number]** <put parameter description here>

Default: *1.0*

`Estimated Noise (relative)` **[number]** <put parameter description here>

Default: *1.0*

`Weighted` **[boolean]** <put parameter description here>

Default: *True*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] noise variance given as absolute value
- 1 — [1] noise variance given relative to mean standard deviation
- 2 — [2] original calculation (Ringeler)

Default: *0*

Outputs

`Filtered Grid` **[raster]** <put output description here>

`Minimum Standard Deviation` **[raster]** <put output description here>

`Direction of Minimum Standard Deviation` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:multidirectionleefilter', input, noise_abs, noise_rel, weighted, method, result, stddev
```

See also

Rank filter

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] Square
- 1 — [1] Circle

Default: *0*

`Radius` **[number]** <put parameter description here>

Default: *1*

`Rank [Percent]` **[number]** <put parameter description here>

Default: *50*

Outputs

`Filtered Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:rankfilter', input, mode, radius, rank, result)
```

See also

Simple filter

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] Square
- 1 — [1] Circle

Default: *0*

`Filter` **[selection]** <put parameter description here>

Options:

- 0 — [0] Smooth
- 1 — [1] Sharpen
- 2 — [2] Edge

Default: *0*

`Radius` **[number]** <put parameter description here>

Default: *2*

Outputs

`Filtered Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:simplefilter', input, mode, method, radius, result)
```

See also

User defined filter

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Filter Matrix` **[table]** Optional.

<put parameter description here>

`Default Filter Matrix (3x3)` **[fixedtable]** <put parameter description here>

Outputs

`Filtered Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:userdefinedfilter', input, filter, filter_3x3, result)
```

See also

.

18.7.5 Grid gridding

Inverse distance weighted

Описание

Inverse distance grid interpolation from irregular distributed points.

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] inverse distance to a power
- 1 — [1] linearly decreasing within search radius
- 2 — [2] exponential weighting scheme
- 3 — [3] gaussian weighting scheme

Default: *0*

`Inverse Distance Power` **[number]** <put parameter description here>

Default: *2*

`Exponential and Gaussian Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1*

`Search Range` **[selection]** <put parameter description here>

Options:

- 0 — [0] search radius (local)
- 1 — [1] no search radius (global)

Default: *0*

`Search Radius` **[number]** <put parameter description here>

Default: *100.0*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] all directions
- 1 — [1] quadrants

Default: *0*

`Number of Points` **[selection]** <put parameter description here>

Options:

- 0 — [0] maximum number of points
- 1 — [1] all points

Default: *0*

`Maximum Number of Points` **[number]** <put parameter description here>

Default: *10*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:inversedistanceweighted', shapes, field, target, weighting, power, bandwidth, range, ra
```

See also

Kernel density estimation

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Weight` **[tablefield: any]** <put parameter description here>

`Radius` **[number]** <put parameter description here>

Default: *10*

`Kernel` **[selection]** <put parameter description here>

Options:

- 0 — [0] quartic kernel
- 1 — [1] gaussian kernel

Default: *0*

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:kerneldensityestimation', points, population, radius, kernel, target, output_extent, us
```

See also

Modifed quadratic shepard

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Quadratic Neighbors` **[number]** <put parameter description here>

Default: *13*

`Weighting Neighbors` **[number]** <put parameter description here>

Default: *19*

`Left` **[number]** <put parameter description here>

Default: *0.0*

`Right` **[number]** <put parameter description here>

Default: *0.0*

`Bottom` **[number]** <put parameter description here>

Default: *0.0*

`Top` **[number]** <put parameter description here>

Default: *0.0*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:modifedquadraticshepard', shapes, field, target, quadratic_neighbors, weighting_neighbo
```

See also

Natural neighbour

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Sibson` **[boolean]** <put parameter description here>

Default: *True*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:naturalneighbour', shapes, field, target, sibson, output_extent, user_size, user_grid)
```

See also

Nearest neighbour

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:nearestneighbour', shapes, field, target, output_extent, user_size, user_grid)
```

See also

Shapes to grid

Описание

<put algortithm description here>

Parameters

`Shapes` **[vector: any]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Method for Multiple Values` **[selection]** <put parameter description here>

Options:

- 0 — [0] first
- 1 — [1] last
- 2 — [2] minimum
- 3 — [3] maximum
- 4 — [4] mean

Default: *0*

`Method for Lines` **[selection]** <put parameter description here>

Options:

- 0 — [0] thin
- 1 — [1] thick

Default: *0*

`Preferred Target Grid Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] Integer (1 byte)
- 1 — [1] Integer (2 byte)
- 2 — [2] Integer (4 byte)
- 3 — [3] Floating Point (4 byte)
- 4 — [4] Floating Point (8 byte)

Default: *0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:shapestogrid', input, field, multiple, line_type, grid_type, output_extent, user_size,
```

See also

Triangulation

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:triangulation', shapes, field, target, output_extent, user_size, user_grid)
```

See also

.

18.7.6 Grid spline

B-spline approximation

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Resolution` **[number]** <put parameter description here>

Default: *1.0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:bsplineapproximation', shapes, field, target, level, output_extent, user_size, user_gri
```

See also

Cubic spline approximation

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Minimal Number of Points` **[number]** <put parameter description here>

Default: *3*

`Maximal Number of Points` **[number]** <put parameter description here>

Default: *20*

`Points per Square` **[number]** <put parameter description here>

Default: *5*

`Tolerance` **[number]** <put parameter description here>

Default: *140.0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:cubicsplineapproximation', shapes, field, target, npmin, npmax, nppc, k, output_extent,
```

See also

Multilevel b-spline interpolation (from grid)

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] without B-spline refinement
- 1 — [1] with B-spline refinement

Default: *0*

`Threshold Error` **[number]** <put parameter description here>

Default: *0.0001*

`Maximum Level` **[number]** <put parameter description here>

Default: *11.0*

`Data Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] same as input grid
- 1 — [1] floating point

Default: *0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:multilevelbsplineinterpolationfromgrid', gridpoints, target, method, epsilon, level_max
```

See also

Multilevel b-spline interpolation

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] without B-spline refinement
- 1 — [1] with B-spline refinement

Default: *0*

`Threshold Error` **[number]** <put parameter description here>

Default: *0.0001*

`Maximum Level` **[number]** <put parameter description here>

Default: *11.0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:multilevelbsplineinterpolation', shapes, field, target, method, epsilon, level_max, out
```

See also

Thin plate spline (global)

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Regularisation` **[number]** <put parameter description here>

Default: *0.0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:thinplatesplineglobal', shapes, field, target, regul, output_extent, user_size, user_gr
```

See also

Thin plate spline (local)

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Regularisation` **[number]** <put parameter description here>

Default: *0.0001*

`Search Radius` **[number]** <put parameter description here>

Default: *100.0*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] all directions
- 1 — [1] quadrants

Default: *0*

`Points Selection` **[selection]** <put parameter description here>

Options:

- 0 — [0] all points in search radius
- 1 — [1] maximum number of points

Default: *0*

`Maximum Number of Points` **[number]** <put parameter description here>

Default: *10*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:thinplatesplinelocal', shapes, field, target, regul, radius, mode, select, maxpoints, o
```

See also

Thin plate spline (tin)

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Regularisation` **[number]** <put parameter description here>

Default: *0.0*

`Neighbourhood` **[selection]** <put parameter description here>

Options:

- 0 — [0] immediate
- 1 — [1] level 1
- 2 — [2] level 2

Default: *0*

`Add Frame` **[boolean]** <put parameter description here>

Default: *True*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:thinplatesplinetin', shapes, field, target, regul, level, frame, output_extent, user_si
```

See also

.

18.7.7 Grid tools

Aggregate

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Aggregation Size` **[number]** <put parameter description here>

Default: *3*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Sum
- 1 — [1] Min
- 2 — [2] Max

Default: *0*

Outputs

Console usage

```
processing.runalg('saga:aggregate', input, size, method)
```

See also

Change grid values

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Replace Condition` **[selection]** <put parameter description here>

Options:

- 0 — [0] Grid value equals low value
- 1 — [1] Low value < grid value < high value

- 2 — [2] Low value <= grid value < high value

  Default: *0*

`Lookup Table` **[fixedtable]** <put parameter description here>

Outputs

`Changed Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:changegridvalues', grid_in, method, lookup, grid_out)
```

See also

Close gaps

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Mask` **[raster]** Optional.

  <put parameter description here>

`Tension Threshold` **[number]** <put parameter description here>

  Default: *0.1*

Outputs

`Changed Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:closegaps', input, mask, threshold, result)
```

See also

Close gaps with spline

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Mask` **[raster]** Optional.

<put parameter description here>

`Only Process Gaps with Less Cells` **[number]** <put parameter description here>

Default: *0*

`Maximum Points` **[number]** <put parameter description here>

Default: *1000*

`Number of Points for Local Interpolation` **[number]** <put parameter description here>

Default: *10*

`Extended Neighourhood` **[boolean]** <put parameter description here>

Default: *True*

`Neighbourhood` **[selection]** <put parameter description here>

Options:

- 0 — [0] Neumann
- 1 — [1] Moore

Default: *0*

`Radius (Cells)` **[number]** <put parameter description here>

Default: *0*

`Relaxation` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Closed Gaps Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:closegapswithspline', grid, mask, maxgapcells, maxpoints, localpoints, extended, neighb
```

See also

Close one cell gaps

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

Outputs

`Changed Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:closeonecellgaps', input, result)
```

See also

Convert data storage type

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Data storage type` **[selection]** <put parameter description here>

Options:

- 0 — [0] bit
- 1 — [1] unsigned 1 byte integer
- 2 — [2] signed 1 byte integer
- 3 — [3] unsigned 2 byte integer
- 4 — [4] signed 2 byte integer
- 5 — [5] unsigned 4 byte integer
- 6 — [6] signed 4 byte integer
- 7 — [7] 4 byte floating point number
- 8 — [8] 8 byte floating point number

Default: *0*

Outputs

`Converted Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:convertdatastoragetype', input, type, output)
```

See also

Crop to data

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

Outputs

`Cropped layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:croptodata', input, output)
```

See also

Grid buffer

Описание

<put algortithm description here>

Parameters

`Features Grid` **[raster]** <put parameter description here>

`Distance` **[number]** <put parameter description here>

Default: *1000*

`Buffer Distance` **[selection]** <put parameter description here>

Options:

- 0 — [0] Fixed
- 1 — [1] Cell value

Default: *0*

Outputs

`Buffer Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gridbuffer', features, dist, buffertype, buffer)
```

See also

Grid masking

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Mask` **[raster]** <put parameter description here>

Outputs

`Masked Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gridmasking', grid, mask, masked)
```

See also

Grid orientation

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Copy
- 1 — [1] Flip
- 2 — [2] Mirror
- 3 — [3] Invert

Default: *0*

Outputs

`Changed Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gridorientation', input, method, result)
```

See also

Grid proximity buffer

Описание

<put algortithm description here>

Parameters

`Source Grid` **[raster]** <put parameter description here>

`Buffer distance` **[number]** <put parameter description here>

Default: *500.0*

`Equidistance` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Distance Grid` **[raster]** <put output description here>

`Allocation Grid` **[raster]** <put output description here>

`Buffer Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gridproximitybuffer', source, dist, ival, distance, alloc, buffer)
```

See also

Grid shrink/expand

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Operation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Shrink
- 1 — [1] Expand

Default: *0*

`Search Mode` **[selection]** <put parameter description here>

Options:

- 0 — [0] Square
- 1 — [1] Circle

Default: *0*

`Radius` **[number]** <put parameter description here>

Default: *1*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] min
- 1 — [1] max
- 2 — [2] mean
- 3 — [3] majority

Default: *0*

Outputs

`Result Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:gridshrinkexpand', input, operation, mode, radius, method_expand, result)
```

See also

Invert data/no-data

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

Outputs

`Result` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:invertdatanodata', input, output)
```

See also

Merge raster layers

Описание

<put algortithm description here>

Parameters

`Grids to Merge` **[multipleinput: rasters]** <put parameter description here>

`Preferred data storage type` **[selection]** <put parameter description here>

Options:

- 0 — [0] 1 bit
- 1 — [1] 1 byte unsigned integer
- 2 — [2] 1 byte signed integer
- 3 — [3] 2 byte unsigned integer
- 4 — [4] 2 byte signed integer
- 5 — [5] 4 byte unsigned integer
- 6 — [6] 4 byte signed integer
- 7 — [7] 4 byte floating point
- 8 — [8] 8 byte floating point

Default: *0*

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

`Overlapping Cells` **[selection]** <put parameter description here>

Options:

- 0 — [0] mean value
- 1 — [1] first value in order of grid list

Default: *0*

Outputs

`Merged Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:mergerasterlayers', grids, type, interpol, overlap, merged)
```

See also

Patching

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Patch Grid` **[raster]** <put parameter description here>

`Interpolation Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

Outputs

`Completed Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:patching', original, additional, interpolation, completed)
```

See also

Proximity grid

Описание

<put algortithm description here>

Parameters

`Features` **[raster]** <put parameter description here>

Outputs

`Distance` **[raster]** <put output description here>

`Direction` **[raster]** <put output description here>

`Allocation` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:proximitygrid', features, distance, direction, allocation)
```

See also

Reclassify grid values

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] single
- 1 — [1] range
- 2 — [2] simple table

Default: *0*

`old value (for single value change)` **[number]** <put parameter description here>

Default: *0.0*

`new value (for single value change)` **[number]** <put parameter description here>

Default: *1.0*

`operator (for single value change)` **[selection]** <put parameter description here>

Options:

- 0 — [0] =
- 1 — [1] <
- 2 — [2] <=
- 3 — [3] >=
- 4 — [4] >

Default: *0*

`minimum value (for range)` **[number]** <put parameter description here>

Default: *0.0*

`maximum value (for range)` **[number]** <put parameter description here>

Default: *1.0*

`new value(for range)` **[number]** <put parameter description here>

Default: *2.0*

`operator (for range)` **[selection]** <put parameter description here>

Options:

- 0 — [0] <=
- 1 — [1] <

Default: *0*

`Lookup Table` **[fixedtable]** <put parameter description here>

`operator (for table)` **[selection]** <put parameter description here>

Options:

- 0 — [0] min <= value < max
- 1 — [1] min <= value <= max
- 2 — [2] min < value <= max
- 3 — [3] min < value < max

Default: *0*

`replace no data values` **[boolean]** <put parameter description here>

Default: *True*

`new value for no data values` **[number]** <put parameter description here>

Default: *0.0*

`replace other values` **[boolean]** <put parameter description here>

Default: *True*

`new value for other values` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Reclassified Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:reclassifygridvalues', input, method, old, new, soperator, min, max, rnew, roperator, r
```

See also

Resampling

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Preserve Data Type` **[boolean]** <put parameter description here>

Default: *True*

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Interpolation Method (Scale Up)` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation
- 5 — [5] Mean Value
- 6 — [6] Mean Value (cell area weighted)
- 7 — [7] Minimum Value
- 8 — [8] Maximum Value
- 9 — [9] Majority

Default: *0*

`Interpolation Method (Scale Down)` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

`Cellsize` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:resampling', input, keep_type, target, scale_up_method, scale_down_method, output_exten
```

See also

Sort grid

Описание

<put algortithm description here>

Parameters

`Input Grid` **[raster]** <put parameter description here>

`Down sort` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Sorted Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:sortgrid', grid, down, output)
```

See also

Split RGB bands

Описание

<put algortithm description here>

Parameters

`Input layer` **[raster]** <put parameter description here>

Outputs

`Output R band layer` **[raster]** <put output description here>

`Output G band layer` **[raster]** <put output description here>

`Output B band layer` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:splitrgbbands', input, r, g, b)
```

See also

Threshold buffer

Описание

<put algortithm description here>

Parameters

`Features Grid` **[raster]** <put parameter description here>

`Value Grid` **[raster]** <put parameter description here>

`Threshold Grid` **[raster]** Optional.

<put parameter description here>

`Threshold` **[number]** <put parameter description here>

Default: *0.0*

`Threshold Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] Absolute
- 1 — [1] Relative from cell value

Default: *0*

Outputs

`Buffer Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:thresholdbuffer', features, value, thresholdgrid, threshold, thresholdtype, buffer)
```

See also

.

18.7.8 Grid visualization

Histogram surface

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] rows
- 1 — [1] columns
- 2 — [2] circle

Default: *0*

Outputs

`Histogram` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:histogramsurface', grid, method, hist)
```

See also

Rgb composite

Описание

<put algortithm description here>

Parameters

`R` **[raster]** <put parameter description here>

`G` **[raster]** <put parameter description here>

`B` **[raster]** <put parameter description here>

`Method for R value` **[selection]** <put parameter description here>

Options:

- 0 — 0 - 255
- 1 — Rescale to 0 - 255
- 2 — User defined rescale
- 3 — Percentiles
- 4 — Percentage of standard deviation

Default: *0*

`Method for G value` **[selection]** <put parameter description here>

Options:

- 0 — 0 - 255
- 1 — Rescale to 0 - 255

- 2 — User defined rescale
- 3 — Percentiles
- 4 — Percentage of standard deviation

Default: *0*

`Method for B value` **[selection]** <put parameter description here>

Options:

- 0 — 0 - 255
- 1 — Rescale to 0 - 255
- 2 — User defined rescale
- 3 — Percentiles
- 4 — Percentage of standard deviation

Default: *0*

`Rescale Range for RED min` **[number]** <put parameter description here>

Default: *0*

`Rescale Range for RED max` **[number]** <put parameter description here>

Default: *255*

`Percentiles Range for RED max` **[number]** <put parameter description here>

Default: *1*

`Percentiles Range for RED max` **[number]** <put parameter description here>

Default: *99*

`Percentage of standard deviation for RED` **[number]** <put parameter description here>

Default: *150.0*

`Rescale Range for GREEN min` **[number]** <put parameter description here>

Default: *0*

`Rescale Range for GREEN max` **[number]** <put parameter description here>

Default: *255*

`Percentiles Range for GREEN max` **[number]** <put parameter description here>

Default: *1*

`Percentiles Range for GREEN max` **[number]** <put parameter description here>

Default: *99*

`Percentage of standard deviation for GREEN` **[number]** <put parameter description here>

Default: *150.0*

`Rescale Range for BLUE min` **[number]** <put parameter description here>

Default: *0*

`Rescale Range for BLUE max` **[number]** <put parameter description here>

Default: *255*

`Percentiles Range for BLUE max` **[number]** <put parameter description here>

Default: *1*

`Percentiles Range for BLUE max` **[number]** <put parameter description here>

Default: *99*

`Percentage of standard deviation for BLUE` **[number]** <put parameter description here>

Default: *150.0*

Outputs

`Output RGB` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:rgbcomposite', grid_r, grid_g, grid_b, r_method, g_method, b_method, r_range_min, r_rang
```

See also

.

18.7.9 Imagery classification

Change detection

Описание

<put algortithm description here>

Parameters

`Initial State` **[raster]** <put parameter description here>

`Look-up Table` **[table]** Optional.

<put parameter description here>

`Value` **[tablefield: any]** <put parameter description here>

`Value (Maximum)` **[tablefield: any]** <put parameter description here>

`Name` **[tablefield: any]** <put parameter description here>

`Final State` **[raster]** <put parameter description here>

`Look-up Table` **[table]** Optional.

<put parameter description here>

`Value` **[tablefield: any]** <put parameter description here>

`Value (Maximum)` **[tablefield: any]** <put parameter description here>

`Name` **[tablefield: any]** <put parameter description here>

`Report Unchanged Classes` **[boolean]** <put parameter description here>

Default: *True*

`Output as...` **[selection]** <put parameter description here>

Options:

- 0 — [0] cells
- 1 — [1] percent
- 2 — [2] area

Default: *0*

Outputs

`Changes` **[raster]** <put output description here>

`Changes` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:changedetection', initial, ini_lut, ini_lut_min, ini_lut_max, ini_lut_nam, final, fin_l
```

See also

Cluster analysis for grids

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Iterative Minimum Distance (Forgy 1965)
- 1 — [1] Hill-Climbing (Rubin 1967)
- 2 — [2] Combined Minimum Distance / Hillclimbing

Default: *0*

`Clusters` **[number]** <put parameter description here>

Default: *5*

`Normalise` **[boolean]** <put parameter description here>

Default: *True*

`Old Version` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Clusters` **[raster]** <put output description here>

`Statistics` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:clusteranalysisforgrids', grids, method, ncluster, normalise, oldversion, cluster, stat
```

See also

Supervised classification

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Training Areas` **[vector: polygon]** <put parameter description here>

`Class Identifier` **[tablefield: any]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Binary Encoding
- 1 — [1] Parallelepiped
- 2 — [2] Minimum Distance
- 3 — [3] Mahalanobis Distance
- 4 — [4] Maximum Likelihood
- 5 — [5] Spectral Angle Mapping
- 6 — [6] Winner Takes All

Default: *0*

`Normalise` **[boolean]** <put parameter description here>

Default: *True*

`Distance Threshold` **[number]** <put parameter description here>

Default: *0.0*

`Probability Threshold (Percent)` **[number]** <put parameter description here>

Default: *0.0*

`Probability Reference` **[selection]** <put parameter description here>

Options:

- 0 — [0] absolute
- 1 — [1] relative

Default: *0*

`Spectral Angle Threshold (Degree)` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Class Information` **[table]** <put output description here>

`Classification` **[raster]** <put output description here>

`Quality` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:supervisedclassification', grids, roi, roi_id, method, normalise, threshold_dist, thres
```

See also

.

18.7.10 Imagery RGA

Fast region growing algorithm

Описание

<put algortithm description here>

Parameters

`Input Grids` **[multipleinput: rasters]** <put parameter description here>

`Seeds Grid` **[raster]** <put parameter description here>

`Smooth Rep` **[raster]** Optional.

<put parameter description here>

Outputs

`Segmente` **[raster]** <put output description here>

`Mean` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fastregiongrowingalgorithm', input, start, rep, result, mean)
```

See also

.

18.7.11 Imagery segmentation

Grid skeletonization

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Standard
- 1 — [1] Hilditch's Algorithm
- 2 — [2] Channel Skeleton

Default: *0*

`Initialisation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Less than
- 1 — [1] Greater than

Default: *0*

`Threshold (Init.)` **[number]** <put parameter description here>

Default: *0.0*

`Convergence` **[number]** <put parameter description here>

Default: *3.0*

Outputs

`Skeleton` **[raster]** <put output description here>

`Skeleton` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:gridskeletonization', input, method, init_method, init_threshold, convergence, result, v
```

See also

Seed generation

Описание

<put algortithm description here>

Parameters

`Features` **[multipleinput: rasters]** <put parameter description here>

`Bandwidth (Cells)` **[number]** <put parameter description here>

Default: *2*

`Type of Surface` **[selection]** <put parameter description here>

Options:

- 0 — [0] smoothed surface
- 1 — [1] variance (a)
- 2 — [2] variance (b)

Default: *0*

`Extraction of...` **[selection]** <put parameter description here>

Options:

- 0 — [0] minima
- 1 — [1] maxima
- 2 — [2] minima and maxima

Default: *0*

`Feature Aggregation` **[selection]** <put parameter description here>

Options:

- 0 — [0] additive
- 1 — [1] multiplicative

Default: *0*

`Normalized` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Surface` **[raster]** <put output description here>

`Seeds Grid` **[raster]** <put output description here>

`Seeds` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:seedgeneration', grids, factor, type_surface, type_seeds, type_merge, normalize, surfac
```

See also

Simple region growing

Описание

<put algortithm description here>

Parameters

`Seeds` **[raster]** <put parameter description here>

`Features` **[multipleinput: rasters]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] feature space and position
- 1 — [1] feature space

Default: *0*

`Neighbourhood` **[selection]** <put parameter description here>

Options:

- 0 — [0] 4 (von Neumann)
- 1 — [1] 8 (Moore)

Default: *0*

`Variance in Feature Space` **[number]** <put parameter description here>

Default: *1.0*

`Variance in Position Space` **[number]** <put parameter description here>

Default: *1.0*

`Threshold - Similarity` **[number]** <put parameter description here>

Default: *0.0*

`Refresh` **[boolean]** <put parameter description here>

Default: *True*

`Leaf Size (for Speed Optimisation)` **[number]** <put parameter description here>

Default: *256*

Outputs

`Segments` **[raster]** <put output description here>

`Similarity` **[raster]** <put output description here>

`Seeds` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:simpleregiongrowing', seeds, features, method, neighbour, sig_1, sig_2, threshold, refr
```

See also

Watershed segmentation

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Output` **[selection]** <put parameter description here>

Options:

- 0 — [0] Seed Value
- 1 — [1] Segment ID

Default: *0*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Minima
- 1 — [1] Maxima

Default: *0*

`Join Segments based on Threshold Value` **[selection]** <put parameter description here>

Options:

- 0 — [0] do not join
- 1 — [1] seed to saddle difference
- 2 — [2] seeds difference

Default: *0*

`Threshold` **[number]** <put parameter description here>

Default: *0*

`Allow Edge Pixels to be Seeds` **[boolean]** <put parameter description here>

Default: *True*

`Borders` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Segments` **[raster]** <put output description here>

`Seed Points` **[vector]** <put output description here>

`Borders` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:watershedsegmentation', grid, output, down, join, threshold, edge, bborders, segments, s
```

See also

.

18.7.12 Imagery tools

Vegetation index[distance based]

Описание

<put algortithm description here>

Parameters

`Near Infrared Band` **[raster]** <put parameter description here>

`Red Band` **[raster]** <put parameter description here>

`Slope of the soil line` **[number]** <put parameter description here>

Default: *0.0*

`Intercept of the soil line` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`PVI (Richardson and Wiegand)` **[raster]** <put output description here>

`PVI (Perry & Lautenschlager)` **[raster]** <put output description here>

`PVI (Walther & Shabaani)` **[raster]** <put output description here>

`PVI (Qi, et al)` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:vegetationindexdistancebased', nir, red, slope, intercept, pvi, pvi1, pvi2, pvi3)
```

See also

Vegetation index[slope based]

Описание

<put algortithm description here>

Parameters

`Near Infrared Band` **[raster]** <put parameter description here>

`Red Band` **[raster]** <put parameter description here>

Outputs

`Normalized Difference Vegetation Index` **[raster]** <put output description here>

`Ratio Vegetation Index` **[raster]** <put output description here>

`Transformed Vegetation Index` **[raster]** <put output description here>

`Corrected Transformed Vegetation Index` **[raster]** <put output description here>

`Thiam's Transformed Vegetation Index` **[raster]** <put output description here>

`Normalized Ratio Vegetation Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:vegetationindexslopebased', nir, red, ndvi, ratio, tvi, ctvi, ttvi, nratio)
```

See also

.

18.7.13 Kriging

Ordinary kriging (global)

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Create Variance Grid` **[boolean]** <put parameter description here>

Default: *True*

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Variogram Model` **[selection]** <put parameter description here>

Options:

- 0 — [0] Spherical Model
- 1 — [1] Exponential Model
- 2 — [2] Gaussian Model
- 3 — [3] Linear Regression
- 4 — [4] Exponential Regression
- 5 — [5] Power Function Regression

Default: *0*

`Block Kriging` **[boolean]** <put parameter description here>

Default: *True*

`Block Size` **[number]** <put parameter description here>

Default: *100*

`Logarithmic Transformation` **[boolean]** <put parameter description here>

Default: *True*

`Nugget` **[number]** <put parameter description here>

Default: *0.0*

`Sill` **[number]** <put parameter description here>

Default: *0.0*

`Range` **[number]** <put parameter description here>

Default: *0.0*

`Linear Regression` **[number]** <put parameter description here>

Default: *1.0*

`Exponential Regression` **[number]** <put parameter description here>

Default: *0.1*

`Power Function - A` **[number]** <put parameter description here>

Default: *1.0*

`Power Function - B` **[number]** <put parameter description here>

Default: *0.5*

`Grid Size` **[number]** <put parameter description here>

Default: *1.0*

`Fit Extent` **[boolean]** <put parameter description here>

Default: *True*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

Outputs

`Grid` **[raster]** <put output description here>

`Variance` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:ordinarykrigingglobal', shapes, field, bvariance, target, model, block, dblock, blog, n
```

See also

Ordinary kriging

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Create Variance Grid` **[boolean]** <put parameter description here>

Default: *True*

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Variogram Model` **[selection]** <put parameter description here>

Options:

- 0 — [0] Spherical Model
- 1 — [1] Exponential Model
- 2 — [2] Gaussian Model
- 3 — [3] Linear Regression
- 4 — [4] Exponential Regression
- 5 — [5] Power Function Regression

Default: *0*

`Block Kriging` **[boolean]** <put parameter description here>

Default: *True*

`Block Size` **[number]** <put parameter description here>

Default: *100*

`Logarithmic Transformation` **[boolean]** <put parameter description here>

Default: *True*

`Nugget` **[number]** <put parameter description here>

Default: *0.0*

`Sill` **[number]** <put parameter description here>

Default: *10.0*

`Range` **[number]** <put parameter description here>

Default: *100.0*

`Linear Regression` **[number]** <put parameter description here>

Default: *1.0*

`Exponential Regression` **[number]** <put parameter description here>

Default: *0.1*

`Power Function - A` **[number]** <put parameter description here>

Default: *1*

`Power Function - B` **[number]** <put parameter description here>

Default: *0.5*

`Maximum Search Radius (map units)` **[number]** <put parameter description here>

Default: *1000.0*

`Min.Number of m_Points` **[number]** <put parameter description here>

Default: *4*

`Max. Number of m_Points` **[number]** <put parameter description here>

Default: *20*

`Grid Size` **[number]** <put parameter description here>

Default: *1.0*

`Fit Extent` **[boolean]** <put parameter description here>

Default: *True*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

Outputs

`Grid` **[raster]** <put output description here>

`Variance` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:ordinarykriging', shapes, field, bvariance, target, model, block, dblock, blog, nugget,
```

See also

Universal kriging (global)

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Create Variance Grid` **[boolean]** <put parameter description here>

Default: *True*

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Variogram Model` **[selection]** <put parameter description here>

Options:

- 0 — [0] Spherical Model
- 1 — [1] Exponential Model
- 2 — [2] Gaussian Model
- 3 — [3] Linear Regression
- 4 — [4] Exponential Regression
- 5 — [5] Power Function Regression

Default: *0*

`Block Kriging` **[boolean]** <put parameter description here>

Default: *True*

`Block Size` **[number]** <put parameter description here>

Default: *100*

`Logarithmic Transformation` **[boolean]** <put parameter description here>

Default: *True*

`Nugget` **[number]** <put parameter description here>

Default: *0.0*

`Sill` **[number]** <put parameter description here>

Default: *0.0*

`Range` **[number]** <put parameter description here>

Default: *0.0*

`Linear Regression` **[number]** <put parameter description here>

Default: *1*

`Exponential Regression` **[number]** <put parameter description here>

Default: *0.5*

`Power Function - A` **[number]** <put parameter description here>

Default: *1.0*

`Power Function - B` **[number]** <put parameter description here>

Default: *0.1*

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Grid Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation

- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

`Grid Size` **[number]** <put parameter description here>

Default: *1.0*

`Fit Extent` **[boolean]** <put parameter description here>

Default: *True*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

Outputs

`Grid` **[raster]** <put output description here>

`Variance` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:universalkrigingglobal', shapes, field, bvariance, target, model, block, dblock, blog, :
```

See also

Universal kriging

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Create Variance Grid` **[boolean]** <put parameter description here>

Default: *True*

`Target Grid` **[selection]** <put parameter description here>

Options:

- 0 — [0] user defined

Default: *0*

`Variogram Model` **[selection]** <put parameter description here>

Options:

- 0 — [0] Spherical Model
- 1 — [1] Exponential Model
- 2 — [2] Gaussian Model
- 3 — [3] Linear Regression

- 4 — [4] Exponential Regression
- 5 — [5] Power Function Regression

Default: *0*

`Block Kriging` **[boolean]** <put parameter description here>

Default: *True*

`Block Size` **[number]** <put parameter description here>

Default: *100*

`Logarithmic Transformation` **[boolean]** <put parameter description here>

Default: *True*

`Nugget` **[number]** <put parameter description here>

Default: *0.0*

`Sill` **[number]** <put parameter description here>

Default: *0.0*

`Range` **[number]** <put parameter description here>

Default: *0.0*

`Linear Regression` **[number]** <put parameter description here>

Default: *1.0*

`Exponential Regression` **[number]** <put parameter description here>

Default: *0.1*

`Power Function - A` **[number]** <put parameter description here>

Default: *1*

`Power Function - B` **[number]** <put parameter description here>

Default: *0.5*

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Grid Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

`Min.Number of m_Points` **[number]** <put parameter description here>

Default: *4*

`Max. Number of m_Points` **[number]** <put parameter description here>

Default: *20*

`Maximum Search Radius (map units)` **[number]** <put parameter description here>

Default: *1000.0*

`Grid Size` **[number]** <put parameter description here>

Default: *1.0*

`Fit Extent` **[boolean]** <put parameter description here>

Default: *True*

`Output extent` **[extent]** <put parameter description here>

Default: *0,1,0,1*

Outputs

`Grid` **[raster]** <put output description here>

`Variance` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:universalkriging', shapes, field, bvariance, target, model, block, dblock, blog, nugget
```

See also

.

18.7.14 Shapes grid

Add grid values to points

Описание

Creates a new vector layer as a result of the union of a points layer with the interpolated value of one or more base background grid layer(s). This way, the new layer created will have a new column in the attribute table that reflects the interpolated value of the background grid.

Parameters

`Points` **[vector: point]** Input layer.

`Grids` **[multipleinput: rasters]** Background grid layer(s)

`Interpolation` **[selection]** interpolation method to use.

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

Outputs

`Result` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:addgridvaluestopoints', shapes, grids, interpol, result)
```

See also

Add grid values to shapes

Описание

<put algortithm description here>

Parameters

`Shapes` **[vector: any]** <put parameter description here>

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbor
- 1 — [1] Bilinear Interpolation
- 2 — [2] Inverse Distance Interpolation
- 3 — [3] Bicubic Spline Interpolation
- 4 — [4] B-Spline Interpolation

Default: *0*

Outputs

`Result` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:addgridvaluestoshapes', shapes, grids, interpol, result)
```

See also

Clip grid with polygon

Описание

<put algortithm description here>

Parameters

`Input` **[raster]** <put parameter description here>

`Polygons` **[vector: polygon]** <put parameter description here>

Outputs

`Output` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:clipgridwithpolygon', input, polygons, output)
```

See also

Contour lines from grid

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Minimum Contour Value` **[number]** <put parameter description here>

Default: *0.0*

`Maximum Contour Value` **[number]** <put parameter description here>

Default: *10000.0*

`Equidistance` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Contour Lines` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:contourlinesfromgrid', input, zmin, zmax, zstep, contour)
```

See also

Gradient vectors from directional components

Описание

<put algortithm description here>

Parameters

`X Component` **[raster]** <put parameter description here>

`Y Component` **[raster]** <put parameter description here>

`Step` **[number]** <put parameter description here>

Default: *1*

`Size Range Min` **[number]** <put parameter description here>

Default: *25.0*

`Size Range Max` **[number]** <put parameter description here>

Default: *100.0*

`Aggregation` **[selection]** <put parameter description here>

Options:

- 0 — [0] nearest neighbour
- 1 — [1] mean value

Default: *0*

`Style` **[selection]** <put parameter description here>

Options:

- 0 — [0] simple line
- 1 — [1] arrow
- 2 — [2] arrow (centered to cell)

Default: *0*

Outputs

`Gradient Vectors` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:gradientvectorsfromdirectionalcomponents', x, y, step, size_min, size_max, aggr, style,
```

See also

Gradient vectors from direction and length

Описание

<put algortithm description here>

Parameters

`Direction` **[raster]** <put parameter description here>

`Length` **[raster]** <put parameter description here>

`Step` **[number]** <put parameter description here>

Default: *1*

`Size Range Min` **[number]** <put parameter description here>

Default: *25.0*

`Size Range Max` **[number]** <put parameter description here>

Default: *100.0*

`Aggregation` **[selection]** <put parameter description here>

Options:

- 0 — [0] nearest neighbour
- 1 — [1] mean value

Default: *0*

`Style` **[selection]** <put parameter description here>

Options:

- 0 — [0] simple line
- 1 — [1] arrow
- 2 — [2] arrow (centered to cell)

Default: *0*

Outputs

`Gradient Vectors` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:gradientvectorsfromdirectionandlength', dir, len, step, size_min, size_max, aggr, style
```

See also

Gradient vectors from surface

Описание

<put algortithm description here>

Parameters

`Surface` **[raster]** <put parameter description here>

`Step` **[number]** <put parameter description here>

Default: *1*

`Size Range Min` **[number]** <put parameter description here>

Default: *25.0*

`Size Range Max` **[number]** <put parameter description here>

Default: *100.0*

`Aggregation` **[selection]** <put parameter description here>

Options:

- 0 — [0] nearest neighbour
- 1 — [1] mean value

Default: *0*

`Style` **[selection]** <put parameter description here>

Options:

- 0 — [0] simple line
- 1 — [1] arrow
- 2 — [2] arrow (centered to cell)

Default: *0*

Outputs

`Gradient Vectors` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:gradientvectorsfromsurface', surface, step, size_min, size_max, aggr, style, vectors)
```

See also

Grid statistics for polygons

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Polygons` **[vector: polygon]** <put parameter description here>

`Number of Cells` **[boolean]** <put parameter description here>

Default: *True*

`Minimum` **[boolean]** <put parameter description here>

Default: *True*

`Maximum` **[boolean]** <put parameter description here>

Default: *True*

`Range` **[boolean]** <put parameter description here>

Default: *True*

`Sum` **[boolean]** <put parameter description here>

Default: *True*

`Mean` **[boolean]** <put parameter description here>

Default: *True*

`Variance` **[boolean]** <put parameter description here>

Default: *True*

`Standard Deviation` **[boolean]** <put parameter description here>

Default: *True*

`Quantiles` **[number]** <put parameter description here>

Default: *0*

Outputs

`Statistics` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:gridstatisticsforpolygons', grids, polygons, count, min, max, range, sum, mean, var, st
```

See also

Grid values to points (randomly)

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Frequency` **[number]** <put parameter description here>

Default: *100*

Outputs

`Points` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:gridvaluestopointsrandomly', grid, freq, points)
```

See also

Grid values to points

Описание

<put algortithm description here>

Parameters

`Grids` **[multipleinput: rasters]** <put parameter description here>

`Polygons` **[vector: any]** Optional.

<put parameter description here>

`Exclude NoData Cells` **[boolean]** <put parameter description here>

Default: *True*

`Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] nodes
- 1 — [1] cells

Default: *0*

Outputs

`Shapes` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:gridvaluestopoints', grids, polygons, nodata, type, shapes)
```

See also

Local minima and maxima

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

Outputs

`Minima` **[vector]** <put output description here>

`Maxima` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:localminimaandmaxima', grid, minima, maxima)
```

See also

Vectorising grid classes

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Class Selection` **[selection]** <put parameter description here>

Options:

- 0 — [0] one single class specified by class identifier
- 1 — [1] all classes

Default: *0*

`Class Identifier` **[number]** <put parameter description here>

Default: *0*

`Vectorised class as...` **[selection]** <put parameter description here>

Options:

- 0 — [0] one single (multi-)polygon object
- 1 — [1] each island as separated polygon

Default: *0*

Outputs

`Polygons` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:vectorisinggridclasses', grid, class_all, class_id, split, polygons)
```

See also

.

18.7.15 Shapes lines

Convert points to line(s)

Описание

Converts points to lines.

Parameters

`Points` **[vector: point]** Points to convert.

`Order by...` **[tablefield: any]** Lines will be ordered following this field.

`Separate by...` **[tablefield: any]** Lines will be grouped according to this field.

Outputs

`Lines` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:convertpointstolines', points, order, separate, lines)
```

See also

Convert polygons to lines

Описание

Creates lines from polygons.

Parameters

`Polygons` **[vector: polygon]** Layer to process.

Outputs

`Lines` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:convertpolygonstolines', polygons, lines)
```

See also

Line dissolve

Описание

<put algortithm description here>

Parameters

`Lines` **[vector: any]** <put parameter description here>

`1. Attribute` **[tablefield: any]** <put parameter description here>

`2. Attribute` **[tablefield: any]** <put parameter description here>

`3. Attribute` **[tablefield: any]** <put parameter description here>

`Dissolve...` **[selection]** <put parameter description here>

Options:

- 0 — [0] lines with same attribute value(s)
- 1 — [1] all lines

Default: *0*

Outputs

`Dissolved Lines` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:linedissolve', lines, field_1, field_2, field_3, all, dissolved)
```

See also

Line-polygon intersection

Описание

<put algortithm description here>

Parameters

`Lines` **[vector: line]** <put parameter description here>

`Polygons` **[vector: polygon]** <put parameter description here>

`Output` **[selection]** <put parameter description here>

Options:

- 0 — [0] one multi-line per polygon
- 1 — [1] keep original line attributes

Default: *0*

Outputs

`Intersection` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:linepolygonintersection', lines, polygons, method, intersect)
```

See also

Line properties

Описание

Calculates some information on each line of the layer.

Parameters

`Lines` **[vector: line]** Layer to analyze.

`Number of Parts` **[boolean]** Determites whether to calculate number of segments in line.

Default: *True*

`Number of Vertices` **[boolean]** Determites whether to calculate number of vertices in line.

Default: *True*

`Length` **[boolean]** Determites whether to calculate total line lenght.

Default: *True*

Outputs

`Lines with Property Attributes` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:lineproperties', lines, bparts, bpoints, blength, output)
```

See also

Line simplification

Описание

Simplyfies the geometry of a lines layer.

Parameters

`Lines` **[vector: line]** Layer to process.

`Tolerance` **[number]** Simplification tolerance.

Default: *1.0*

Outputs

`Simplified Lines` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:linesimplification', lines, tolerance, output)
```

See also

.

18.7.16 Shapes points

Add coordinates to points

Описание

Adds the X and Y coordinates of feature in the attribute table of input layer.

Parameters

`Points` **[vector: point]** Input layer.

Outputs

`Output` **[vector]** Resulting layer with the updated attribute table.

Console usage

```
processing.runalg('saga:addcoordinatestopoints', input, output)
```

See also

Add polygon attributes to points

Описание

Adds the specified field of the polygons layer to the attribute table of the points layer. The new attributes added for each point depend on the value of the background polygon layer.

Parameters

`Points` **[vector: point]** Points layer.

`Polygons` **[vector: polygon]** Background polygons layer.

`Attribute` **[tablefield: any]** Attribute of the polygons layer that will be added to the points layer.

Outputs

`Result` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:addpolygonattributestopoints', input, polygons, field, output)
```

See also

Aggregate point observations

Описание

<put algortithm description here>

Parameters

`Reference Points` **[vector: any]** <put parameter description here>

`ID` **[tablefield: any]** <put parameter description here>

`Observations` **[table]** <put parameter description here>

`X` **[tablefield: any]** <put parameter description here>

`Y` **[tablefield: any]** <put parameter description here>

`Track` **[tablefield: any]** <put parameter description here>

`Date` **[tablefield: any]** <put parameter description here>

`Time` **[tablefield: any]** <put parameter description here>

`Parameter` **[tablefield: any]** <put parameter description here>

`Maximum Time Span (Seconds)` **[number]** <put parameter description here>

Default: *60.0*

`Maximum Distance` **[number]** <put parameter description here>

Default: *0.002*

Outputs

`Aggregated` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:aggregatepointobservations', reference, reference_id, observations, x, y, track, date,
```

See also

Clip points with polygons

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Polygons` **[vector: polygon]** <put parameter description here>

`Add Attribute to Clipped Points` **[tablefield: any]** <put parameter description here>

`Clipping Options` **[selection]** <put parameter description here>

Options:

- 0 — [0] one layer for all points
- 1 — [1] separate layer for each polygon

Default: *0*

Outputs

`Clipped Points` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:clippointswithpolygons', points, polygons, field, method, clips)
```

See also

Convert lines to points

Описание

Converts lines layer into a points.

Parameters

`Lines` **[vector: line]** Lines layer to convert.

`Insert Additional Points` **[boolean]** Determines whether to add additional nodes or not.

Default: *True*

`Insert Distance` **[number]** Distance between the additional points.

Default: *1.0*

Outputs

`Points` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:convertlinestopoints', lines, add, dist, points)
```

See also

Convert multipoints to points

Описание

<put algortithm description here>

Parameters

`Multipoints` **[vector: point]** <put parameter description here>

Outputs

`Points` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:convertmultipointstopoints', multipoints, points)
```

See also

Convex hull

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Hull Construction` **[selection]** <put parameter description here>

Options:

- 0 — [0] one hull for all shapes
- 1 — [1] one hull per shape
- 2 — [2] one hull per shape part

Default: *0*

Outputs

`Convex Hull` **[vector]** <put output description here>

`Minimum Bounding Box` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:convexhull', shapes, polypoints, hulls, boxes)
```

See also

Distance matrix

Описание

Generates a distance matrix between each point of the input layer. A unique ID will be created in the first row of the resulting matrix (symmetric matrix), while every other cell reflects the distance between the points.

Parameters

`Points` **[vector: point]** Input layer.

Outputs

`Distance Matrix Table` **[table]** The resulting table.

Console usage

```
processing.runalg('saga:distancematrix', points, table)
```

See also

Fit n points to shape

Описание

<put algortithm description here>

Parameters

`Shapes` **[vector: polygon]** <put parameter description here>

`Number of points` **[number]** <put parameter description here>

Default: *10*

Outputs

`Points` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:fitnpointstoshape', shapes, numpoints, points)
```

See also

Points filter

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Radius` **[number]** <put parameter description here>

Default: *1*

`Minimum Number of Points` **[number]** <put parameter description here>

Default: *0*

`Maximum Number of Points` **[number]** <put parameter description here>

Default: *0*

`Quadrants` **[boolean]** <put parameter description here>

Default: *True*

`Filter Criterion` **[selection]** <put parameter description here>

Options:

- 0 — [0] keep maxima (with tolerance)
- 1 — [1] keep minima (with tolerance)
- 2 — [2] remove maxima (with tolerance)
- 3 — [3] remove minima (with tolerance)
- 4 — [4] remove below percentile
- 5 — [5] remove above percentile

Default: *0*

`Tolerance` **[number]** <put parameter description here>

Default: *0.0*

`Percentile` **[number]** <put parameter description here>

Default: *50*

Outputs

`Filtered Points` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:pointsfilter', points, field, radius, minnum, maxnum, quadrants, method, tolerance, per
```

See also

Points thinning

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Resolution` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Thinned Points` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:pointsthinning', points, field, resolution, thinned)
```

See also

Remove duplicate points

Описание

<put algortithm description here>

Parameters

`Points` **[vector: any]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Point to Keep` **[selection]** <put parameter description here>

Options:

- 0 — [0] first point
- 1 — [1] last point
- 2 — [2] point with minimum attribute value
- 3 — [3] point with maximum attribute value

Default: *0*

`Numeric Attribute Values` **[selection]** <put parameter description here>

Options:

- 0 — [0] take value from the point to be kept
- 1 — [1] minimum value of all duplicates
- 2 — [2] maximum value of all duplicates
- 3 — [3] mean value of all duplicates

Default: *0*

Outputs

`Result` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:removeduplicatepoints', points, field, method, numeric, result)
```

See also

Separate points by direction

Описание

<put algortithm description here>

Parameters

`Points` **[vector: point]** <put parameter description here>

`Number of Directions` **[number]** <put parameter description here>

Default: *4*

`Tolerance (Degree)` **[number]** <put parameter description here>

Default: *5*

Outputs

`Ouput` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:separatepointsbydirection', points, directions, tolerance, output)
```

See also

.

18.7.17 Shapes polygons

Convert lines to polygons

Описание

Converts lines to polygons.

Parameters

`Lines` **[vector: line]** Lines to convert.

Outputs

`Polygons` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:convertlinestopolygons', lines, polygons)
```

See also

Convert polygon/line vertices to points

Описание

Converts the line or polygon vertices into points.

Parameters

`Shapes` **[vector: any]** Layer to process.

Outputs

`Points` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:convertpolygonlineverticestopoints', shapes, points)
```

See also

Polygon centroids

Описание

Calculates the centroids of polygons.

Parameters

`Polygons` **[vector: polygon]** Input layer.

`Centroids for each part` **[boolean]** Determites whether centroids should be calculated for each part of multipart polygon or not.

Default: *True*

Outputs

`Centroids` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:polygoncentroids', polygons, method, centroids)
```

See also

Polygon dissolve

Описание

<put algortithm description here>

Parameters

`Polygons` **[vector: polygon]** <put parameter description here>

`1. Attribute` **[tablefield: any]** Optional.

<put parameter description here>

`2. Attribute` **[tablefield: any]** Optional.

<put parameter description here>

`3. Attribute` **[tablefield: any]** Optional.

<put parameter description here>

`Dissolve...` **[selection]** <put parameter description here>

Options:

- 0 — [0] polygons with same attribute value
- 1 — [1] all polygons
- 2 — [2] polygons with same attribute value (keep inner boundaries)
- 3 — [3] all polygons (keep inner boundaries)

Default: *0*

Outputs

`Dissolved Polygons` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:polygondissolve', polygons, field_1, field_2, field_3, dissolve, dissolved)
```

See also

Polygon-line intersection

Описание

<put algortithm description here>

Parameters

`Polygons` **[vector: polygon]** <put parameter description here>

`Lines` **[vector: line]** <put parameter description here>

Outputs

`Intersection` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:polygonlineintersection', polygons, lines, intersect)
```

See also

Polygon parts to separate polygons

Описание

<put algortithm description here>

Parameters

`Polygons` **[vector: polygon]** <put parameter description here>

`Ignore Lakes` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Polygon Parts` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:polygonpartstoseparatepolygons', polygons, lakes, parts)
```

See also

Polygon properties

Описание

<put algortithm description here>

Parameters

`Polygons` **[vector: polygon]** <put parameter description here>

`Number of Parts` **[boolean]** <put parameter description here>

Default: *True*

`Number of Vertices` **[boolean]** <put parameter description here>

Default: *True*

`Perimeter` **[boolean]** <put parameter description here>

Default: *True*

`Area` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Polygons with Property Attributes` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:polygonproperties', polygons, bparts, bpoints, blength, barea, output)
```

See also

Polygon shape indices

Описание

Calculates spatial statistics for polygons. This includes:

- area
- perimeter
- perimeter / area
- perimeter / square root of the area
- maximum distance
- maximum distance / area
- maximum distance / square root of the area
- shape index

Parameters

`Shapes` **[vector: polygon]** Layer to analyze.

Outputs

`Shape Index` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:polygonshapeindices', shapes, index)
```

See also

Polygons to edges and nodes

Описание

Extracts boundaries and nodes of polygons in separate files.

Parameters

`Polygons` **[vector: polygon]** Input layer.

Outputs

`Edges` **[vector]** Resulting line layer with polygons boundaries.

`Nodes` **[vector]** Resulting line layer with polygons nodes.

Console usage

```
processing.runalg('saga:polygonstoedgesandnodes', polygons, edges, nodes)
```

See also

.

18.7.18 Shapes tools

Create graticule

Описание

Creates a grid.

Parameters

`Extent` **[vector: any]** Optional.

Grid will be created according to the selected layer.

`Output extent` **[extent]** Extent of the grid.

Default: *0,1,0,1*

`Division Width` **[number]** X-axes spacing between the lines.

Default: *1.0*

`Division Height` **[number]** Y-axes spacing between the lines.

Default: *1.0*

`Type` **[selection]** Geometry type of the resulting grid.

Options:

- 0 — [0] Lines
- 1 — [1] Rectangles

Default: *0*

Outputs

`Graticule` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:creategraticule', extent, output_extent, distx, disty, type, graticule)
```

See also

Cut shapes layer

Описание

<put algortithm description here>

Parameters

`Vector layer to cut` **[vector: any]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] completely contained
- 1 — [1] intersects
- 2 — [2] center

Default: *0*

`Cutting polygons` **[vector: any]** <put parameter description here>

Outputs

`Result` **[vector]** <put output description here>

`Extent` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:cutshapeslayer', shapes, method, polygons_polygons, cut, extent)
```

See also

Get shapes extents

Описание

Creates polygons according to the extent of the input layer features.

Parameters

`Shapes` **[vector: any]** Input layer.

`Parts` **[boolean]** Determines whether create polygon for each feature (`True`) or just create single polygon for whole layer (`False`).

Default: *True*

Outputs

`Extents` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:getshapesextents', shapes, parts, extents)
```

See also

Merge shapes layers

Описание

Merges two or more input layer into a unique resulting layer. You can merge together only layer of the same type (polygons with polygons, lines with lines, points with points).

The attribute table of the resulting layer will include only the attributes of the first input layer. Two additional columns will be added: one corresponding to the ID of every merged layer and the other one corresponding to the original name of the merged layer.

Parameters

`Main Layer` **[vector: any]** Initial layer.

`Additional Layers` **[multipleinput: any vectors]** Optional.

Layer(s) to merge with.

Outputs

`Merged Layer` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:mergeshapeslayers', main, layers, out)
```

See also

Polar to cartesian coordinates

Описание

<put algortithm description here>

Parameters

`Polar Coordinates` **[vector: any]** <put parameter description here>

`Exaggeration` **[tablefield: any]** <put parameter description here>

`Exaggeration Factor` **[number]** <put parameter description here>

Default: *1*

`Radius` **[number]** <put parameter description here>

Default: *6371000.0*

`Degree` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Cartesian Coordinates` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:polartocartesiancoordinates', polar, f_exagg, d_exagg, radius, degree, cartes)
```

See also

Quadtree structure to shapes

Описание

<put algortithm description here>

Parameters

`Shapes` **[vector: any]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

Outputs

`Polygons` **[vector]** <put output description here>

`Lines` **[vector]** <put output description here>

`Duplicated Points` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:quadtreestructuretoshapes', shapes, attribute, polygons, lines, points)
```

See also

Shapes buffer

Описание

Creates buffer around features based on fixed distance or distance field.

Parameters

`Shapes` **[vector: any]** Input layer.

`Buffer Distance` **[selection]** Buffering method.

Options:

- 0 — [0] fixed value
- 1 — [1] attribute field

Default: *0*

`Buffer Distance (Fixed)` **[number]** Buffer distance for "fixed value" method.

Default: *100.0*

`Buffer Distance (Attribute)` **[tablefield: any]** Name of the distance field for "attribute field" method.

`Scaling Factor for Attribute Value` **[number]** <put parameter description here>

Default: *1.0*

`Number of Buffer Zones` **[number]** Number of buffer(s) to generate.

Default: *1.0*

`Circle Point Distance [Degree]` **[number]** Smoothness of the buffer borders: great numbers means rough borders.

Default: *5.0*

`Dissolve Buffers` **[boolean]** Determines whether to dissolve results or not.

Default: *True*

Outputs

`Buffer` **[vector]** The resulting layer.

Console usage

```
processing.runalg('saga:shapesbuffer', shapes, buf_type, buf_dist, buf_field, buf_scale, buf_zones, dcircle, di
```

See also

Split shapes layer randomly

Описание

Splits the input layer randomly in two parts.

Parameters

`Shapes` **[vector: any]** Layer to split.

`Split ratio (%)` **[number]** Split ratio between the resulting layers.

Default: *50*

Outputs

`Group A` **[vector]** First resulting layer.

`Group B` **[vector]** Second resulting layer.

Console usage

```
processing.runalg('saga:splitshapeslayerrandomly', shapes, percent, a, b)
```

See also

Transform shapes

Описание

<put algortithm description here>

Parameters

`Shapes` **[vector: any]** <put parameter description here>

`dX` **[number]** <put parameter description here>

    Default: *0.0*

`dY` **[number]** <put parameter description here>

    Default: *0.0*

`Angle` **[number]** <put parameter description here>

    Default: *0.0*

`Scale Factor X` **[number]** <put parameter description here>

    Default: *1.0*

`Scale Factor Y` **[number]** <put parameter description here>

    Default: *1.0*

`X` **[number]** <put parameter description here>

    Default: *0.0*

`Y` **[number]** <put parameter description here>

    Default: *0.0*

Outputs

`Output` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:transformshapes', in, dx, dy, angle, scalex, scaley, anchorx, anchory, out)
```

See also

.

18.7.19 Shapes transect

Transect through polygon shapefile

Описание

<put algortithm description here>

Parameters

`Line Transect(s)` **[vector: line]** <put parameter description here>

`Theme` **[vector: any]** <put parameter description here>

`Theme Field` **[tablefield: any]** <put parameter description here>

Outputs

`Result table` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:transectthroughpolygonshapefile', transect, theme, theme_field, transect_result)
```

See also

.

18.7.20 Simulation fire

Fire risk analysis

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Fuel Model` **[raster]** <put parameter description here>

`Wind Speed` **[raster]** <put parameter description here>

`Wind Direction` **[raster]** <put parameter description here>

`Dead Fuel Moisture 1H` **[raster]** <put parameter description here>

`Dead Fuel Moisture 10H` **[raster]** <put parameter description here>

`Dead Fuel Moisture 100H` **[raster]** <put parameter description here>

`Herbaceous Fuel Moisture` **[raster]** <put parameter description here>

`Wood Fuel Moisture` **[raster]** <put parameter description here>

`Value` **[raster]** Optional.

<put parameter description here>

`Base Probability` **[raster]** Optional.

<put parameter description here>

`Number of Events` **[number]** <put parameter description here>

Default: *1000*

`Fire Length` **[number]** <put parameter description here>

Default: *100*

Outputs

`Danger` **[raster]** <put output description here>

`Compound Probability` **[raster]** <put output description here>

`Priority Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fireriskanalysis', dem, fuel, windspd, winddir, m1h, m10h, m100h, mherb, mwood, value, 
```

See also

Simulation

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Fuel Model` **[raster]** <put parameter description here>

`Wind Speed` **[raster]** <put parameter description here>

`Wind Direction` **[raster]** <put parameter description here>

`Dead Fuel Moisture 1H` **[raster]** <put parameter description here>

`Dead Fuel Moisture 10H` **[raster]** <put parameter description here>

`Dead Fuel Moisture 100H` **[raster]** <put parameter description here>

`Herbaceous Fuel Moisture` **[raster]** <put parameter description here>

`Wood Fuel Moisture` **[raster]** <put parameter description here>

`Ignition Points` **[raster]** <put parameter description here>

`Update View` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Time` **[raster]** <put output description here>

`Flame Length` **[raster]** <put output description here>

`Intensity` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:simulation', dem, fuel, windspd, winddir, m1h, m10h, m100h, mherb, mwood, ignition, upd
```

See also

.

18.7.21 Simulation hydrology

Overland flow - kinematic wave d8

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Gauges` **[vector: any]** Optional.

<put parameter description here>

`Simulation Time [h]` **[number]** <put parameter description here>

Default: *24*

`Simulation Time Step [h]` **[number]** <put parameter description here>

Default: *0.1*

`Manning's Roughness` **[number]** <put parameter description here>

Default: *0.03*

`Max. Iterations` **[number]** <put parameter description here>

Default: *100*

`Epsilon` **[number]** <put parameter description here>

Default: *0.0001*

`Precipitation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Homogenous
- 1 — [1] Above Elevation
- 2 — [2] Left Half

Default: *0*

`Threshold Elevation` **[number]** <put parameter description here>

Default: *0.0*

Outputs

`Runoff` **[raster]** <put output description here>

`Flow at Gauges` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:overlandflowkinematicwaved8', dem, gauges, time_span, time_step, roughness, newton_maxi
```

See also

Water retention capacity

Описание

<put algortithm description here>

Parameters

`Plot Holes` **[vector: any]** <put parameter description here>

`DEM` **[raster]** <put parameter description here>

Outputs

`Final Parameters` **[vector]** <put output description here>

`Water Retention Capacity` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:waterretentioncapacity', shapes, dem, output, retention)
```

See also

.

18.7.22 Table calculus

Fill gaps in records

Описание

<put algortithm description here>

Parameters

`Table` **[table]** <put parameter description here>

`Order` **[tablefield: any]** <put parameter description here>

`Interpolation` **[selection]** <put parameter description here>

Options:

- 0 — [0] Nearest Neighbour
- 1 — [1] Linear

- 2 — [2] Spline

Default: *0*

Outputs

`Table without Gaps` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:fillgapsinrecords', table, order, method, nogaps)
```

See also

Principle components analysis

Описание

<put algortithm description here>

Parameters

`Table` **[table]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] correlation matrix
- 1 — [1] variance-covariance matrix
- 2 — [2] sums-of-squares-and-cross-products matrix

Default: *0*

`Number of Components` **[number]** <put parameter description here>

Default: *3*

Outputs

`Principle Components` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:principlecomponentsanalysis', table, method, nfirst, pca)
```

See also

Running average

Описание

<put algortithm description here>

Parameters

`Input` **[table]** <put parameter description here>

`Attribute` **[tablefield: any]** <put parameter description here>

`Number of Records` **[number]** <put parameter description here>

Default: *10*

Outputs

`Output` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:runningaverage', input, field, count, output)
```

See also

.

18.7.23 Table tools

Change date format

Описание

Converts the date format of the input layer.

Parameters

`Table` **[table]** Input table.

`Date Field` **[tablefield: any]** Attribute the date.

`Input Format` **[selection]** Input date format.

Options:

- 0 — [0] dd.mm.yy
- 1 — [1] yy.mm.dd
- 2 — [2] dd:mm:yy
- 3 — [3] yy:mm:dd
- 4 — [4] ddmmyyyy, fix size
- 5 — [5] yyyymmdd, fix size
- 6 — [6] ddmmyy, fix size
- 7 — [7] yymmdd, fix size
- 8 — [8] Julian Day

Default: *0*

`Output Format` **[selection]** Output date format.

Options:

- 0 — [0] dd.mm.yy
- 1 — [1] yy.mm.dd
- 2 — [2] dd:mm:yy
- 3 — [3] yy:mm:dd
- 4 — [4] ddmmyyyy, fix size
- 5 — [5] yyyymmdd, fix size
- 6 — [6] ddmmyy, fix size
- 7 — [7] yymmdd, fix size
- 8 — [8] Julian Day

Default: *0*

Outputs

`Output` **[table]** The resulting table.

Console usage

```
processing.runalg('saga:changedateformat', table, field, fmt_in, fmt_out, output)
```

See also

Change time format

Описание

Converts the time format of the input layer.

Parameters

`Table` **[table]** Input table.

`Time Field` **[tablefield: any]** Attribute with time.

`Input Format` **[selection]** Input time format.

Options:

- 0 — [0] hh.mm.ss
- 1 — [1] hh:mm:ss
- 2 — [2] hhmmss, fix size
- 3 — [3] hours
- 4 — [4] minutes
- 5 — [5] seconds

Default: *0*

`Output Format` **[selection]** Output time format.

Options:

- 0 — [0] hh.mm.ss
- 1 — [1] hh:mm:ss
- 2 — [2] hhmmss, fix size
- 3 — [3] hours
- 4 — [4] minutes
- 5 — [5] seconds

Default: *0*

Outputs

`Output` **[table]** The resulting table.

Console usage

```
processing.runalg('saga:changetimeformat', table, field, fmt_in, fmt_out, output)
```

See also

.

18.7.24 Terrain channels

Channel network and drainage basins

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Threshold` **[number]** <put parameter description here>

Default: *5.0*

Outputs

`Flow Direction` **[raster]** <put output description here>

`Flow Connectivity` **[raster]** <put output description here>

`Strahler Order` **[raster]** <put output description here>

`Drainage Basins` **[raster]** <put output description here>

`Channels` **[vector]** <put output description here>

`Drainage Basins` **[vector]** <put output description here>

`Junctions` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:channelnetworkanddrainagebasins', dem, threshold, direction, connection, order, basin, s
```

See also

Channel network

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Flow Direction` **[raster]** Optional.

<put parameter description here>

`Initiation Grid` **[raster]** <put parameter description here>

`Initiation Type` **[selection]** <put parameter description here>

Options:

- 0 — [0] Less than
- 1 — [1] Equals
- 2 — [2] Greater than

Default: *0*

`Initiation Threshold` **[number]** <put parameter description here>

Default: *0.0*

`Divergence` **[raster]** Optional.

<put parameter description here>

`Tracing: Max. Divergence` **[number]** <put parameter description here>

Default: *10*

`Tracing: Weight` **[raster]** Optional.

<put parameter description here>

`Min. Segment Length` **[number]** <put parameter description here>

Default: *10*

Outputs

`Channel Network` **[raster]** <put output description here>

`Channel Direction` **[raster]** <put output description here>

`Channel Network` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:channelnetwork', elevation, sinkroute, init_grid, init_method, init_value, div_grid, di
```

See also

Overland flow distance to channel network

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Channel Network` **[raster]** <put parameter description here>

`Flow Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — [0] D8
- 1 — [1] MFD

Default: *0*

Outputs

`Overland Flow Distance` **[raster]** <put output description here>

`Vertical Overland Flow Distance` **[raster]** <put output description here>

`Horizontal Overland Flow Distance` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:overlandflowdistancetochannelnetwork', elevation, channels, method, distance, distvert,
```

See also

Strahler order

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

Outputs

`Strahler Order` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:strahlerorder', dem, strahler)
```

See also

Vertical distance to channel network

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Channel Network` **[raster]** <put parameter description here>

`Tension Threshold [Percentage of Cell Size]` **[number]** <put parameter description here>

Default: *1*

`Keep Base Level below Surface` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Vertical Distance to Channel Network` **[raster]** <put output description here>

`Channel Network Base Level` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:verticaldistancetochannelnetwork', elevation, channels, threshold, nounderground, dista
```

See also

Watershed basins

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Channel Network` **[raster]** <put parameter description here>

`Sink Route` **[raster]** Optional.

<put parameter description here>

`Min. Size` **[number]** <put parameter description here>

Default: *0*

Outputs

`Watershed Basins` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:watershedbasins', elevation, channels, sinkroute, minsize, basins)
```

See also

.

18.7.25 Terrain hydrology

Burn stream network into dem

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Streams` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] simply decrease cell's value by epsilon
- 1 — [1] lower cell's value to neighbours minimum value minus epsilon

Default: *0*

`Epsilon` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Processed DEM` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:burnstreamnetworkintodem', dem, stream, method, epsilon, burn)
```

See also

Catchment area (flow tracing)

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Sink Routes` **[raster]** Optional.

<put parameter description here>

`Weight` **[raster]** Optional.

<put parameter description here>

`Material` **[raster]** Optional.

<put parameter description here>

`Target` **[raster]** Optional.

<put parameter description here>

`Step` **[number]** <put parameter description here>

Default: *1*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Rho 8
- 1 — [1] Kinematic Routing Algorithm
- 2 — [2] DEMON

Default: *0*

`DEMON - Min. DQV` **[number]** <put parameter description here>

Default: *0.0*

`Flow Correction` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Catchment Area` **[raster]** <put output description here>

`Catchment Height` **[raster]** <put output description here>

`Catchment Slope` **[raster]** <put output description here>

`Total accumulated Material` **[raster]** <put output description here>

`Accumulated Material from _left_ side` **[raster]** <put output description here>

`Accumulated Material from _right_ side` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:catchmentareaflowtracing', elevation, sinkroute, weight, material, target, step, method
```

See also

Catchment area (recursive)

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Sink Routes` **[raster]** Optional.

<put parameter description here>

`Weight` **[raster]** Optional.

<put parameter description here>

`Material` **[raster]** Optional.

<put parameter description here>

`Target` **[raster]** Optional.

<put parameter description here>

`Step` **[number]** <put parameter description here>

Default: *1*

`Target Areas` **[raster]** Optional.

<put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Deterministic 8
- 1 — [1] Rho 8
- 2 — [2] Deterministic Infinity
- 3 — [3] Multiple Flow Direction

Default: *0*

`Convergence` **[number]** <put parameter description here>

Default: *1.1*

Outputs

`Catchment Area` **[raster]** <put output description here>

`Catchment Height` **[raster]** <put output description here>

`Catchment Slope` **[raster]** <put output description here>

`Total accumulated Material` **[raster]** <put output description here>

`Accumulated Material from _left_ side` **[raster]** <put output description here>

`Accumulated Material from _right_ side` **[raster]** <put output description here>

`Flow Path Length` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:catchmentarearecursive', elevation, sinkroute, weight, material, target, step, targets,
```

See also

Catchment Area

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Deterministic 8
- 1 — [1] Rho 8
- 2 — [2] Braunschweiger Reliefmodell
- 3 — [3] Deterministic Infinity
- 4 — [4] Multiple Flow Direction
- 5 — [5] Multiple Triangular Flow Directon

Default: *0*

Outputs

`Catchment Area` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:catchmentarea', elevation, method, carea)
```

See also

Cell balance

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Parameter` **[raster]** Optional.

<put parameter description here>

`Default Weight` **[number]** <put parameter description here>

Default: *1.0*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Deterministic 8
- 1 — [1] Multiple Flow Direction

Default: *0*

Outputs

`Cell Balance` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:cellbalance', dem, weights, weight, method, balance)
```

See also

Edge contamination

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

Outputs

`Edge Contamination` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:edgecontamination', dem, contamination)
```

See also

Fill Sinks

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Minimum Slope [Degree]` **[number]** <put parameter description here>

Default: *0.01*

Outputs

`Filled DEM` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fillsinks', dem, minslope, result)
```

See also

Fill sinks (wang & liu)

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Minimum Slope [Degree]` **[number]** <put parameter description here>

Default: *0.01*

Outputs

`Filled DEM` **[raster]** <put output description here>

`Flow Directions` **[raster]** <put output description here>

`Watershed Basins` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fillsinkswangliu', elev, minslope, filled, fdir, wshed)
```

See also

Fill sinks xxl (wang & liu)

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Minimum Slope [Degree]` **[number]** <put parameter description here>

Default: *0.01*

Outputs

`Filled DEM` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:fillsinksxxlwangliu', elev, minslope, filled)
```

See also

Flat detection

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Flat Area Values` **[selection]** <put parameter description here>

Options:

- 0 — [0] elevation
- 1 — [1] enumeration

Default: *0*

Outputs

`No Flats` **[raster]** <put output description here>

`Flat Areas` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:flatdetection', dem, flat_output, noflats, flats)
```

See also

Flow path length

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Seeds` **[raster]** Optional.

<put parameter description here>

`Seeds Only` **[boolean]** <put parameter description here>

Default: *True*

`Flow Routing Algorithm` **[selection]** <put parameter description here>

Options:

- 0 — [0] Deterministic 8 (D8)
- 1 — [1] Multiple Flow Direction (FD8)

Default: *0*

`Convergence (FD8)` **[number]** <put parameter description here>

Default: *1.1*

Outputs

`Flow Path Length` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:flowpathlength', elevation, seed, seeds_only, method, convergence, length)
```

See also

Flow width and specific catchment area

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Total Catchment Area (TCA)` **[raster]** Optional.

<put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Deterministic 8
- 1 — [1] Multiple Flow Direction (Quinn et al. 1991)
- 2 — [2] Aspect

Default: *0*

Outputs

`Flow Width` **[raster]** <put output description here>

`Specific Catchment Area (SCA)` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:flowwidthandspecificcatchmentarea', dem, tca, method, width, sca)
```

See also

Lake flood

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Seeds` **[raster]** <put parameter description here>

`Absolute Water Levels` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Lake` **[raster]** <put output description here>

`Surface` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:lakeflood', elev, seeds, level, outdepth, outlevel)
```

See also

Ls factor

Описание

<put algortithm description here>

Parameters

`Slope` **[raster]** <put parameter description here>

`Catchment Area` **[raster]** <put parameter description here>

`Area to Length Conversion` **[selection]** <put parameter description here>

Options:

- 0 — [0] no conversion (areas already given as specific catchment area)
- 1 — [1] 1 / cell size (specific catchment area)
- 2 — [2] square root (catchment length)

Default: *0*

`Method (LS)` **[selection]** <put parameter description here>

Options:

- 0 — [0] Moore et al. 1991
- 1 — [1] Desmet & Govers 1996
- 2 — [2] Boehner & Selige 2006

Default: *0*

`Rill/Interrill Erosivity` **[number]** <put parameter description here>

Default: *0.0*

`Stability` **[selection]** <put parameter description here>

Options:

- 0 — [0] stable
- 1 — [1] instable (thawing)

Default: *0*

Outputs

`LS Factor` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:lsfactor', slope, area, conv, method, erosivity, stability, ls)
```

See also

Saga wetness index

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`t` **[number]** <put parameter description here>

Default: *10*

Outputs

`Catchment area` **[raster]** <put output description here>

`Catchment slope` **[raster]** <put output description here>

`Modified catchment area` **[raster]** <put output description here>

`Wetness index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:sagawetnessindex', dem, t, c, gn, cs, sb)
```

See also

Sink drainage route detection

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Threshold` **[boolean]** <put parameter description here>

Default: *True*

`Threshold Height` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Sink Route` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:sinkdrainageroutedetection', elevation, threshold, thrsheight, sinkroute)
```

See also

Sink removal

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Sink Route` **[raster]** Optional.

<put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Deepen Drainage Routes
- 1 — [1] Fill Sinks

Default: *0*

`Threshold` **[boolean]** <put parameter description here>

Default: *True*

`Threshold Height` **[number]** <put parameter description here>

Default: *100.0*

Outputs

`Preprocessed DEM` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:sinkremoval', dem, sinkroute, method, threshold, thrsheight, dem_preproc)
```

See also

Slope length

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

Outputs

`Slope Length` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:slopelength', dem, length)
```

See also

Stream power index

Описание

<put algortithm description here>

Parameters

`Slope` **[raster]** <put parameter description here>

`Catchment Area` **[raster]** <put parameter description here>

`Area Conversion` **[selection]** <put parameter description here>

Options:

- 0 — [0] no conversion (areas already given as specific catchment area)
- 1 — [1] 1 / cell size (pseudo specific catchment area)

Default: *0*

Outputs

`Stream Power Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:streampowerindex', slope, area, conv, spi)
```

See also

Topographic wetness index (twi)

Описание

<put algortithm description here>

Parameters

`Slope` **[raster]** <put parameter description here>

`Catchment Area` **[raster]** <put parameter description here>

`Transmissivity` **[raster]** Optional.

<put parameter description here>

`Area Conversion` **[selection]** <put parameter description here>

Options:

- 0 — [0] no conversion (areas already given as specific catchment area)
- 1 — [1] 1 / cell size (pseudo specific catchment area)

Default: *0*

`Method (TWI)` **[selection]** <put parameter description here>

Options:

- 0 — [0] Standard
- 1 — [1] TOPMODEL

Default: *0*

Outputs

`Topographic Wetness Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:topographicwetnessindextwi', slope, area, trans, conv, method, twi)
```

See also

Upslope Area

Описание

<put algortithm description here>

Parameters

`Target Area` **[raster]** Optional.

<put parameter description here>

`Target X coordinate` **[number]** <put parameter description here>

Default: *0.0*

`Target Y coordinate` **[number]** <put parameter description here>

Default: *0.0*

`Elevation` **[raster]** <put parameter description here>

`Sink Routes` **[raster]** Optional.

<put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Deterministic 8
- 1 — [1] Deterministic Infinity
- 2 — [2] Multiple Flow Direction

Default: *0*

`Convergence` **[number]** <put parameter description here>

Default: *1.1*

Outputs

`Upslope Area` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:upslopearea', target, target_pt_x, target_pt_y, elevation, sinkroute, method, converge,
```

See also

.

18.7.26 Terrain lighting

Analytical hillshading

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Shading Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Standard
- 1 — [1] Standard (max. 90Degree)
- 2 — [2] Combined Shading
- 3 — [3] Ray Tracing

Default: *0*

`Azimuth [Degree]` **[number]** <put parameter description here>

Default: *315.0*

`Declination [Degree]` **[number]** <put parameter description here>

Default: *45.0*

`Exaggeration` **[number]** <put parameter description here>

Default: *4.0*

Outputs

`Analytical Hillshading` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:analyticalhillshading', elevation, method, azimuth, declination, exaggeration, shade)
```

See also

Sky view factor

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Maximum Search Radius` **[number]** <put parameter description here>

Default: *10000*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] multi scale
- 1 — [1] sectors

Default: *0*

`Multi Scale Factor` **[number]** <put parameter description here>

Default: *3*

`Number of Sectors` **[number]** <put parameter description here>

Default: *8*

Outputs

`Visible Sky` **[raster]** <put output description here>

`Sky View Factor` **[raster]** <put output description here>

`Sky View Factor (Simplified)` **[raster]** <put output description here>

`Terrain View Factor` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:skyviewfactor', dem, maxradius, method, level_inc, ndirs, visible, svf, simple, terrain
```

See also

Topographic correction

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Original Image` **[raster]** <put parameter description here>

`Azimuth` **[number]** <put parameter description here>

Default: *180.0*

`Height` **[number]** <put parameter description here>

Default: *45.0*

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Cosine Correction (Teillet et al. 1982)
- 1 — [1] Cosine Correction (Civco 1989)
- 2 — [2] Minnaert Correction
- 3 — [3] Minnaert Correction with Slope (Riano et al. 2003)
- 4 — [4] Minnaert Correction with Slope (Law & Nichol 2004)
- 5 — [5] C Correction
- 6 — [6] Normalization (after Civco, modified by Law & Nichol)

Default: *0*

`Minnaert Correction` **[number]** <put parameter description here>

Default: *0.5*

`Maximum Cells (C Correction Analysis)` **[number]** <put parameter description here>

Default: *1000*

`Value Range` **[selection]** <put parameter description here>

Options:

- 0 — [0] 1 byte (0-255)
- 1 — [1] 2 byte (0-65535)

Default: *0*

Outputs

`Corrected Image` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:topographiccorrection', dem, original, azi, hgt, method, minnaert, maxcells, maxvalue,
```

See also

.

18.7.27 Terrain morphometry

Convergence index

Описание

Calculates an index of convergence/divergence regarding to overland flow. By its meaning it is similar to plan or horizontal curvature, but gives much smoother results. The calculation uses the aspects of surrounding cells, i.e. it looks to which degree surrounding cells point to the center cell. The result is given as percentages, negative values correspond to convergent, positive to divergent flow conditions. Minus 100 would be like a peak of a cone, plus 100 a pit, and 0 an even slope.

Parameters

`Elevation` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Aspect
- 1 — [1] Gradient

Default: *0*

`Gradient Calculation` **[selection]** <put parameter description here>

Options:

- 0 — [0] 2 x 2

- 1 — [1] 3 x 3

Default: *0*

Outputs

`Convergence Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:convergenceindex', elevation, method, neighbours, result)
```

See also

- Koethe, R. / Lehmeier, F. (1996): 'SARA, System zur Automatischen Relief-Analyse', Benutzerhandbuch, 2. Auflage [Geogr. Inst. Univ. Goettingen, unpublished]

Convergence index (search radius)

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Radius [Cells]` **[number]** <put parameter description here>

Default: *10*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1*

`Gradient` **[boolean]** <put parameter description here>

Default: *True*

`Difference` **[selection]** <put parameter description here>

Options:

- 0 — [0] direction to the center cell
- 1 — [1] center cell's aspect direction

Default: *0*

Outputs

`Convergence Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:convergenceindexsearchradius', elevation, radius, distance_weighting_weighting, distanc
```

See also

Curvature classification

Описание

<put algortithm description here>

Parameters

`Plan Curvature` **[raster]** <put parameter description here>

`Profile Curvature` **[raster]** <put parameter description here>

`Threshold for plane` **[number]** <put parameter description here>

Default: *0.001*

Outputs

`Curvature Classification` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:curvatureclassification', cplan, cprof, threshold, class)
```

See also

Diurnal anisotropic heating

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Alpha Max (Degree)` **[number]** <put parameter description here>

Default: *202.5*

Outputs

`Diurnal Anisotropic Heating` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:diurnalanisotropicheating', dem, alpha_max, dah)
```

See also

Downslope distance gradient

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Vertical Distance` **[number]** <put parameter description here>

Default: *10*

`Output` **[selection]** <put parameter description here>

Options:

- 0 — [0] distance
- 1 — [1] gradient (tangens)
- 2 — [2] gradient (degree)

Default: *0*

Outputs

`Gradient` **[raster]** <put output description here>

`Gradient Difference` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:downslopedistancegradient', dem, distance, output, gradient, difference)
```

See also

Effective air flow heights

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Wind Direction` **[raster]** Optional.

<put parameter description here>

`Wind Speed` **[raster]** Optional.

<put parameter description here>

`Constant Wind Direction [Degree]` **[number]** <put parameter description here>

Default: *135*

`Old Version` **[boolean]** <put parameter description here>

Default: *True*

`Search Distance [km]` **[number]** <put parameter description here>

Default: *300*

`Acceleration` **[number]** <put parameter description here>

Default: *1.5*

`Use Pyramids with New Version` **[boolean]** <put parameter description here>

Default: *True*

`Lee Factor` **[number]** <put parameter description here>

Default: *0.5*

`Luv Factor` **[number]** <put parameter description here>

Default: *1.0*

`Wind Direction Units` **[selection]** <put parameter description here>

Options:

- 0 — [0] radians
- 1 — [1] degree

Default: *0*

`Wind Speed Scale Factor` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Effective Air Flow Heights` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:effectiveairflowheights', dem, dir, len, dir_const, oldver, maxdist, accel, pyramids, l
```

See also

Hypsometry

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Number of Classes` **[number]** <put parameter description here>

Default: *100.0*

`Sort` **[selection]** <put parameter description here>

Options:

- 0 — [0] up
- 1 — [1] down

Default: *0*

`Classification Constant` **[selection]** <put parameter description here>

Options:

- 0 — [0] height
- 1 — [1] area

Default: *0*

`Use Z-Range` **[boolean]** <put parameter description here>

Default: *True*

`Z-Range Min` **[number]** <put parameter description here>

Default: *0.0*

`Z-Range Max` **[number]** <put parameter description here>

Default: *1000.0*

Outputs

`Hypsometry` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:hypsometry', elevation, count, sorting, method, bzrange, zrange_min, zrange_max, table)
```

See also

Land surface temperature

Описание

<put algortithm description here>

Parameters

`Elevation [m]` **[raster]** <put parameter description here>

`Short Wave Radiation [kW/m2]` **[raster]** <put parameter description here>

`Leaf Area Index` **[raster]** <put parameter description here>

`Elevation at Reference Station [m]` **[number]** <put parameter description here>

Default: *0.0*

`Temperature at Reference Station [Deg.Celsius]` **[number]** <put parameter description here>

Default: *0.0*

`Temperature Gradient [Deg.Celsius/km]` **[number]** <put parameter description here>

Default: *6.5*

`C Factor` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Land Surface Temperature [Deg.Celsius]` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:landsurfacetemperature', dem, swr, lai, z_reference, t_reference, t_gradient, c_factor,
```

See also

Mass balance index

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Vertical Distance to Channel Network` **[raster]** Optional.

<put parameter description here>

`T Slope` **[number]** <put parameter description here>

Default: *15.0*

`T Curvature` **[number]** <put parameter description here>

Default: *0.01*

`T Vertical Distance to Channel Network` **[number]** <put parameter description here>

Default: *15.0*

Outputs

`Mass Balance Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:massbalanceindex', dem, hrel, tslope, tcurve, threl, mbi)
```

See also

Morphometric protection index

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Radius` **[number]** <put parameter description here>

Default: *2000.0*

Outputs

`Protection Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:morphometricprotectionindex', dem, radius, protection)
```

See also

Multiresolution index of valley bottom flatness (mrvbf)

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Initial Threshold for Slope` **[number]** <put parameter description here>

  Default: *16*

`Threshold for Elevation Percentile (Lowness)` **[number]** <put parameter description here>

  Default: *0.4*

`Threshold for Elevation Percentile (Upness)` **[number]** <put parameter description here>

  Default: *0.35*

`Shape Parameter for Slope` **[number]** <put parameter description here>

  Default: *4.0*

`Shape Parameter for Elevation Percentile` **[number]** <put parameter description here>

  Default: *3.0*

`Update Views` **[boolean]** <put parameter description here>

  Default: *True*

`Classify` **[boolean]** <put parameter description here>

  Default: *True*

`Maximum Resolution (Percentage)` **[number]** <put parameter description here>

  Default: *100*

Outputs

`MRVBF` **[raster]** <put output description here>

`MRRTF` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:multiresolutionindexofvalleybottomflatnessmrvbf', dem, t_slope, t_pctl_v, t_pctl_r, p_s
```

See also

Real area calculation

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

Outputs

`Real Area Grid` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:realareacalculation', dem, area)
```

See also

Relative heights and slope positions

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`w` **[number]** <put parameter description here>

Default: *0.5*

`t` **[number]** <put parameter description here>

Default: *10.0*

`e` **[number]** <put parameter description here>

Default: *2.0*

Outputs

`Slope Height` **[raster]** <put output description here>

`Valley Depth` **[raster]** <put output description here>

`Normalized Height` **[raster]** <put output description here>

`Standardized Height` **[raster]** <put output description here>

`Mid-Slope Positon` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:relativeheightsandslopepositions', dem, w, t, e, ho, hu, nh, sh, ms)
```

See also

Slope, aspect, curvature

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Maximum Slope (Travis et al. 1975)
- 1 — [1] Maximum Triangle Slope (Tarboton 1997)
- 2 — [2] Least Squares Fitted Plane (Horn 1981, Costa-Cabral & Burgess 1996)
- 3 — [3] Fit 2.Degree Polynom (Bauer, Rohdenburg, Bork 1985)
- 4 — [4] Fit 2.Degree Polynom (Heerdegen & Beran 1982)
- 5 — [5] Fit 2.Degree Polynom (Zevenbergen & Thorne 1987)
- 6 — [6] Fit 3.Degree Polynom (Haralick 1983)

Default: *5*

Outputs

`Slope` **[raster]** <put output description here>

`Aspect` **[raster]** <put output description here>

`Curvature` **[raster]** <put output description here>

`Plan Curvature` **[raster]** <put output description here>

`Profile Curvature` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:slopeaspectcurvature', elevation, method, slope, aspect, curv, hcurv, vcurv)
```

See also

Surface specific points

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Method` **[selection]** <put parameter description here>

Options:

- 0 — [0] Mark Highest Neighbour
- 1 — [1] Opposite Neighbours
- 2 — [2] Flow Direction
- 3 — [3] Flow Direction (up and down)

- 4 — [4] Peucker & Douglas

Default: *0*

`Threshold` **[number]** <put parameter description here>

Default: *2.0*

Outputs

`Result` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:surfacespecificpoints', elevation, method, threshold, result)
```

See also

Terrain ruggedness index (tri)

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Radius (Cells)` **[number]** <put parameter description here>

Default: *1*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Terrain Ruggedness Index (TRI)` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:terrainruggednessindextri', dem, radius, distance_weighting_weighting, distance_weighti
```

See also

Topographic position index (tpi)

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Standardize` **[boolean]** <put parameter description here>

Default: *True*

`Min Radius` **[number]** <put parameter description here>

Default: *0.0*

`Max Radius` **[number]** <put parameter description here>

Default: *100.0*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *75.0*

Outputs

`Topographic Position Index` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:topographicpositionindextpi', dem, standard, radius_min, radius_max, distance_weighting
```

See also

Tpi based landform classification

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Min Radius A` **[number]** <put parameter description here>

Default: *0*

`Max Radius A` **[number]** <put parameter description here>

Default: *100*

`Min Radius B` **[number]** <put parameter description here>

Default: *0*

`Max Radius B` **[number]** <put parameter description here>

Default: *1000*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *75.0*

Outputs

`Landforms` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:tpibasedlandformclassification', dem, radius_a_min, radius_a_max, radius_b_min, radius_
```

See also

Vector ruggedness measure (vrm)

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Radius (Cells)` **[number]** <put parameter description here>

Default: *1*

`Distance Weighting` **[selection]** <put parameter description here>

Options:

- 0 — [0] no distance weighting
- 1 — [1] inverse distance to a power
- 2 — [2] exponential
- 3 — [3] gaussian weighting

Default: *0*

`Inverse Distance Weighting Power` **[number]** <put parameter description here>

Default: *1*

`Inverse Distance Offset` **[boolean]** <put parameter description here>

Default: *True*

`Gaussian and Exponential Weighting Bandwidth` **[number]** <put parameter description here>

Default: *1*

Outputs

`Vector Terrain Ruggedness (VRM)` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:vectorruggednessmeasurevrm', dem, radius, distance_weighting_weighting, distance_weight
```

See also

Wind effect

Описание

<put algortithm description here>

Parameters

`Elevation` **[raster]** <put parameter description here>

`Wind Direction` **[raster]** Optional.

<put parameter description here>

`Wind Speed` **[raster]** Optional.

<put parameter description here>

`Constant Wind Direction [Degree]` **[number]** <put parameter description here>

Default: *135*

`Old Version` **[boolean]** <put parameter description here>

Default: *True*

`Search Distance [km]` **[number]** <put parameter description here>

Default: *300.0*

`Acceleration` **[number]** <put parameter description here>

Default: *1.5*

`Use Pyramids` **[boolean]** <put parameter description here>

Default: *True*

`Wind Direction Units` **[selection]** <put parameter description here>

Options:

- 0 — [0] radians
- 1 — [1] degree

Default: *0*

`Wind Speed Scale Factor` **[number]** <put parameter description here>

Default: *1.0*

Outputs

`Wind Effect` **[raster]** <put output description here>

`Windward Effect` **[raster]** <put output description here>

`Leeward Effect` **[raster]** <put output description here>

Console usage

```
processing.runalg('saga:windeffect', dem, dir, len, dir_const, oldver, maxdist, accel, pyramids, dir_units, len
```

See also

.

18.7.28 Terrain profiles

Cross profiles

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Lines` **[vector: line]** <put parameter description here>

`Profile Distance` **[number]** <put parameter description here>

Default: *10.0*

`Profile Length` **[number]** <put parameter description here>

Default: *10.0*

`Profile Samples` **[number]** <put parameter description here>

Default: *10.0*

Outputs

`Cross Profiles` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:crossprofiles', dem, lines, dist_line, dist_profile, num_profile, profiles)
```

See also

Profile from points table

Описание

<put algortithm description here>

Parameters

`Grid` **[raster]** <put parameter description here>

`Input` **[table]** <put parameter description here>

`X` **[tablefield: any]** <put parameter description here>

`Y` **[tablefield: any]** <put parameter description here>

Outputs

`Result` **[table]** <put output description here>

Console usage

```
processing.runalg('saga:profilefrompointstable', grid, table, x, y, result)
```

See also

Profiles from lines

Описание

<put algortithm description here>

Parameters

`DEM` **[raster]** <put parameter description here>

`Values` **[multipleinput: rasters]** Optional.

<put parameter description here>

`Lines` **[vector: line]** <put parameter description here>

`Name` **[tablefield: any]** <put parameter description here>

`Each Line as new Profile` **[boolean]** <put parameter description here>

Default: *True*

Outputs

`Profiles` **[vector]** <put output description here>

`Profiles` **[vector]** <put output description here>

Console usage

```
processing.runalg('saga:profilesfromlines', dem, values, lines, name, split, profile, profiles)
```

See also

.

18.8 TauDEM algorithm provider

TauDEM (Terrain Analysis Using Digital Elevation Models) is a set of Digital Elevation Model (DEM) tools for the extraction and analysis of hydrologic information from topography as represented by a DEM. This is software developed at Utah State University (USU) for hydrologic digital elevation model analysis and watershed delineation.

TauDEM is distributed as a set of standalone command line executable programs for a Windows and source code for compiling and use on other systems.

Примечание: Please remember that Processing contains only the interface description, so you need to install TauDEM 5.0.6 by yourself and configure Processing properly.

Documentation for TauDEM algorithms derived from official TauDEM documentation

.

18.8.1 Basic Grid Analysis

D8 Contributing Area

Описание

Calculates a grid of contributing areas using the single direction D8 flow model. The contribution of each grid cell is taken as one (or when the optional weight grid is used, the value from the weight grid). The contributing area for each grid cell is taken as its own contribution plus the contribution from upslope neighbors that drain in to it according to the D8 flow model.

If the optional outlet point shapefile is used, only the outlet cells and the cells upslope (by the D8 flow model) of them are in the domain to be evaluated.

By default, the tool checks for edge contamination. This is defined as the possibility that a contributing area value may be underestimated due to grid cells outside of the domain not being counted. This occurs when drainage is inwards from the boundaries or areas with "no data" values for elevation. The algorithm recognizes this and reports "no data" for the contributing area. It is common to see streaks of "no data" values extending inwards from boundaries along flow paths that enter the domain at a boundary. This is the desired effect and indicates that contributing area for these grid cells is unknown due to it being dependent on terrain outside of the domain of data available. Edge contamination checking may be turned off in cases where you know this is not an issue or want to ignore these problems, if for example, the DEM has been clipped along a watershed outline.

Parameters

`D8 Flow Direction Grid` **[raster]** A grid of D8 flow directions which are defined, for each cell, as the direction of the one of its eight adjacent or diagonal neighbors with the steepest downward slope. This grid can be obtained as the output of the **"D8 Flow Directions"** tool.

`Outlets Shapefile` **[vector: point]** Optional.

A point shapefile defining the outlets of interest. If this input file is used, only the cells upslope of these outlet cells are considered to be within the domain being evaluated.

`Weight Grid` **[raster]** Optional.

A grid giving contribution to flow for each cell. These contributions (also sometimes referred to as weights or loadings) are used in the contributing area accumulation. If this input file is not used, the contribution to flow will assumed to be one for each grid cell.

`Check for edge contamination` **[boolean]** A flag that indicates whether the tool should check for edge contamination. Edge contamination is defined as the possibility that a contributing area value may be underestimated due to the fact that grid cells outside of the domain have not been evaluated. This occurs when drainage is inwards from the boundaries or areas with NODATA values for elevation. The algorithm recognizes this and reports NODATA for the impated cells. It is common to see streaks of NODATA values extending inwards from boundaries along flow paths that enter the domain at a boundary. This is the desired effect and indicates that contributing area for these grid cells is unknown due to it being dependent on terrain outside of the domain of available data. Edge contamination checking may be turned off in cases where you know this is not an issue, or want to ignore these problems, if for example, the DEM has been clipped along a watershed outline.

Default: *True*

Outputs

`D8 Contributing Area Grid` **[raster]** A grid of contributing area values calculated as the cells own contribution plus the contribution from upslope neighbors that drain in to it according to the D8 flow model.

Console usage

```
processing.runalg('taudem:d8contributingarea', -p, -o, -wg, -nc, -ad8)
```

See also

D8 Flow Directions

Описание

Creates 2 grids. The first contains the flow direction from each grid cell to one of its adjacent or diagonal neighbors, calculated using the direction of steepest descent. The second contain the slope, as evaluated in the direction of steepest descent, and is reported as drop/distance, i.e. tan of the angle. Flow direction is reported as NODATA for any grid cell adjacent to the edge of the DEM domain, or adjacent to a NODATA value in the DEM. In flat areas, flow directions are assigned away from higher ground and towards lower ground using the method of Garbrecht and Martz (1997). The D8 flow direction algorithm may be applied to a DEM that has not had its pits filled, but it will then result in NODATA values for flow direction and slope at the lowest point of each pit.

D8 Flow Direction Coding:

- 1 — East
- 2 — Northeast
- 3 — North
- 4 — Northwest
- 5 — West
- 6 — Southwest
- 7 — South
- 8 — Southeast

The flow direction routing across flat areas is performed according to the method described by Garbrecht, J. and L. W. Martz, (1997), "The Assignment of Drainage Direction Over Flat Surfaces in Raster Digital Elevation Models", Journal of Hydrology, 193: 204-213.

Parameters

`Pit Filled Elevation Grid` **[raster]** A grid of elevation values. This is usually the output of the **"Pit Remove"** tool, in which case it is elevations with pits removed. Pits are low elevation areas in digital elevation models (DEMs) that are completely surrounded by higher terrain. They are generally taken to be artifacts of the digitation process that interfere with the processing of flow across DEMs. So they are removed by raising their elevation to the point where they just drain off the domain. This step is not essential if you have reason to believe that the pits in your DEM are real. If a few pits actually exist and so should not be removed, while at the same time others are believed to be artifacts that need to be removed, the actual pits should have NODATA elevation values inserted at their lowest point. NODATA values serve to define edges of the domain in the flow field, and elevations are only raised to where flow is off an edge, so an internal NODATA value will stop a pit from being removed, if necessary.

Outputs

`D8 Flow Direction Grid` **[raster]** A grid of D8 flow directions which are defined, for each cell, as the direction of the one of its eight adjacent or diagonal neighbors with the steepest downward slope.

`D8 Slope Grid` **[raster]** A grid giving slope in the D8 flow direction. This is measured as drop/distance.

Console usage

```
processing.runalg('taudem:d8flowdirections', -fel, -p, -sd8)
```

See also

D-Infinity Contributing Area

Описание

Calculates a grid of specific catchment area which is the contributing area per unit contour length using the multiple flow direction D-infinity approach. D-infinity flow direction is defined as steepest downward slope on planar triangular facets on a block centered grid. The contribution at each grid cell is taken as the grid cell length (or when the optional weight grid input is used, from the weight grid). The contributing area of each grid cell is then taken as its own contribution plus the contribution from upslope neighbors that have some fraction draining to it according to the D-infinity flow model. The flow from each cell either all drains to one neighbor, if the angle falls along a cardinal (0, $\pi/2$, π, $3\pi/2$) or ordinal ($\pi/4$, $3\pi/4$, $5\pi/4$, $7\pi/4$) direction, or is on an angle falling between the direct angle to two adjacent neighbors. In the latter case the flow is proportioned between these two neighbor cells according to how close the flow direction angle is to the direct angle to those cells. The contour length used here is the grid cell size. The resulting units of the specific catchment area are length units the same as those of the grid cell size.

When the optional weight grid is not used, the result is reported in terms of specific catchment area, the upslope area per unit contour length, taken here as the number of cells times grid cell length (cell area divided by cell length). This assumes that grid cell length is the effective contour length, in the definition of specific catchment area and does not distinguish any difference in contour length dependent upon the flow direction. When the optional weight grid is used, the result is reported directly as a summation of weights, without any scaling.

If the optional outlet point shapefile is used, only the outlet cells and the cells upslope (by the D-infinity flow model) of them are in the domain to be evaluated.

By default, the tool checks for edge contamination. This is defined as the possibility that a contributing area value may be underestimated due to grid cells outside of the domain not being counted. This occurs when drainage is inwards from the boundaries or areas with "no data" values for elevation. The algorithm recognizes this and reports "no data" for the contributing area. It is common to see streaks of "no data" values extending inwards from boundaries along flow paths that enter the domain at a boundary. This is the desired effect and indicates that contributing area for these grid cells is unknown due to it being dependent on terrain outside of the domain of data available. Edge contamination checking may be turned off in cases where you know it is not an issue or want to ignore these problems, if for example, the DEM has been clipped along a watershed outline.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid of flow directions based on the D-infinity flow method using the steepest slope of a triangular facet. Flow direction is determined as the direction of the steepest downward slope on the 8 triangular facets of a 3x3 block centered grid. Flow direction is encoded as an angle in radians, counter-clockwise from east as a continuous (floating point) quantity between 0 and 2π. The resulting flow in a grid is then usually interpreted as being proportioned between the two neighboring cells that define the triangular facet with the steepest downward slope.

`Outlets Shapefile` **[vector: point]** Optional.

A point shapefile defining the outlets of interest. If this input file is used, only the cells upslope of these outlet cells are considered to be within the domain being evaluated.

`Weight Grid` **[raster]** Optional.

A grid giving contribution to flow for each cell. These contributions (also sometimes referred to as weights or loadings) are used in the contributing area accumulation. If this input file is not used, the result is reported in terms of specific catchment area (the upslope area per unit contour length) taken as the number of cells times grid cell length (cell area divided by cell length).

`Check for edge contamination` **[boolean]** A flag that indicates whether the tool should check for edge contamination. Edge contamination is defined as the possibility that a contributing area value may be underestimated due to the fact that grid cells outside of the domain have not been evaluated. This occurs when drainage is inwards from the boundaries or areas with NODATA values for elevation. The algorithm recognizes this and reports NODATA for the impated cells. It is common to see streaks of NODATA values extending inwards from boundaries along flow paths that enter the domain at a boundary. This is the desired effect and indicates that contributing area for these grid cells is unknown due to it being dependent on terrain outside of the domain of available data. Edge contamination checking may be turned off in cases where you know this is not an issue, or want to ignore these problems, if for example, the DEM has been clipped along a watershed outline.

Default: *True*

Outputs

`D-Infinity Specific Catchment Area Grid` **[raster]** A grid of specific catchment area which is the contributing area per unit contour length using the multiple flow direction D-infinity approach. The contributing area of each grid cell is then taken as its own contribution plus the contribution from upslope neighbors that have some fraction draining to it according to the D-infinity flow model.

Console usage

```
processing.runalg('taudem:dinfinitycontributingarea', -ang, -o, -wg, -nc, -sca)
```

See also

D-Infinity Flow Directions

Описание

Assigns a flow direction based on the D-infinity flow method using the steepest slope of a triangular facet (Tarboton, 1997, "A New Method for the Determination of Flow Directions and Contributing Areas in Grid Digital Elevation Models", Water Resources Research, 33(2): 309-319). Flow direction is defined as steepest downward slope on planar triangular facets on a block centered grid. Flow direction is encoded as an angle in radians counter-clockwise from east as a continuous (floating point) quantity between

0 and 2π. The flow direction angle is determined as the direction of the steepest downward slope on the eight triangular facets formed in a 3 x 3 grid cell window centered on the grid cell of interest. The resulting flow in a grid is then usually interpreted as being proportioned between the two neighboring cells that define the triangular facet with the steepest downward slope.

A block-centered representation is used with each elevation value taken to represent the elevation of the center of the corresponding grid cell. Eight planar triangular facets are formed between each grid cell and its eight neighbors. Each of these has a downslope vector which when drawn outwards from the center may be at an angle that lies within or outside the 45 degree ($\pi/4$ radian) angle range of the facet at the center point. If the slope vector angle is within the facet angle, it represents the steepest flow direction on that facet. If the slope vector angle is outside a facet, the steepest flow direction associated with that facet is taken along the steepest edge. The slope and flow direction associated with the grid cell is taken as the magnitude and direction of the steepest downslope vector from all eight facets. Slope is measured as drop/distance, i.e. tan of the slope angle.

In the case where no slope vectors are positive (downslope), the flow direction is set using the method of Garbrecht and Martz (1997) for the determination of flow across flat areas. This makes flat areas drain away from high ground and towards low ground. The flow path grid to enforce drainage along existing streams is an optional input, and if used, takes precedence over elevations for the setting of flow directions.

The D-infinity flow direction algorithm may be applied to a DEM that has not had its pits filled, but it will then result in "no data" values for the D-infinity flow direction and slope associated with the lowest point of the pit.

Parameters

`Pit Filled Elevation Grid` **[raster]** A grid of elevation values. This is usually the output of the **"Pit Remove"** tool, in which case it is elevations with pits removed.

Outputs

`D-Infinity Flow Directions Grid` **[raster]** A grid of flow directions based on the D-infinity flow method using the steepest slope of a triangular facet. Flow direction is determined as the direction of the steepest downward slope on the 8 triangular facets of a 3x3 block centered grid. Flow direction is encoded as an angle in radians, counter-clockwise from east as a continuous (floating point) quantity between 0 and 2π. The resulting flow in a grid is then usually interpreted as being proportioned between the two neighboring cells that define the triangular facet with the steepest downward slope.

`D-Infinity Slope Grid` **[raster]** A grid of slope evaluated using the D-infinity method described in Tarboton, D. G., (1997), "A New Method for the Determination of Flow Directions and Contributing Areas in Grid Digital Elevation Models", Water Resources Research, 33(2): 309-319. This is the steepest outwards slope on one of eight triangular facets centered at each grid cell, measured as drop/distance, i.e. tan of the slope angle.

Console usage

```
processing.runalg('taudem:dinfinityflowdirections', -fel, -ang, -slp)
```

See also

Grid Network

Описание

Creates 3 grids that contain for each grid cell: 1) the longest path, 2) the total path, and 3) the Strahler order number. These values are derived from the network defined by the D8 flow model.

The longest upslope length is the length of the flow path from the furthest cell that drains to each cell. The total upslope path length is the length of the entire grid network upslope of each grid cell. Lengths are measured between cell centers taking into account cell size and whether the direction is adjacent or diagonal.

Strahler order is defined as follows: A network of flow paths is defined by the D8 Flow Direction grid. Source flow paths have a Strahler order number of one. When two flow paths of different order join the order of the downstream flow path is the order of the highest incoming flow path. When two flow paths of equal order join the downstream flow path order is increased by 1. When more than two flow paths join the downstream flow path order is calculated as the maximum of the highest incoming flow path order or the second highest incoming flow path order + 1. This generalizes the common definition to cases where more than two flow paths join at a point.

Where the optional mask grid and threshold value are input, the function is evaluated only considering grid cells that lie in the domain with mask grid value greater than or equal to the threshold value. Source (first order) grid cells are taken as those that do not have any other grid cells from inside the domain draining in to them, and only when two of these flow paths join is order propagated according to the ordering rules. Lengths are also only evaluated counting paths within the domain greater than or equal to the threshold.

If the optional outlet point shapefile is used, only the outlet cells and the cells upslope (by the D8 flow model) of them are in the domain to be evaluated.

Parameters

`D8 Flow Direction Grid` **[raster]** A grid of D8 flow directions which are defined, for each cell, as the direction of the one of its eight adjacent or diagonal neighbors with the steepest downward slope. This grid can be obtained as the output of the **"D8 Flow Directions"** tool.

`Outlets Shapefile` **[vector: point]** Optional.

A point shapefile defining the outlets of interest. If this input file is used, only the cells upslope of these outlet cells are considered to be within the domain being evaluated.

`Mask Grid` **[raster]** Optional.

A grid that is used to determine the domain do be analyzed. If the mask grid value >= mask threshold (see below), then the cell will be included in the domain. While this tool does not have an edge contamination flag, if edge contamination analysis is needed, then a mask grid from a function like **"D8 Contributing Area"** that does support edge contamination can be used to achieve the same result.

`Mask Threshold` **[number]** This input parameter is used in the calculation mask grid value >= mask threshold to determine if the grid cell is in the domain to be analyzed.

Default: *100*

Outputs

`Longest Upslope Length Grid` **[raster]** A grid that gives the length of the longest upslope D8 flow path terminating at each grid cell. Lengths are measured between cell centers taking into account cell size and whether the direction is adjacent or diagonal.

`Total Upslope Length Grid` **[raster]** The total upslope path length is the length of the entire D8 flow grid network upslope of each grid cell. Lengths are measured between cell centers taking into account cell size and whether the direction is adjacent or diagonal.

`Strahler Network Order Grid` **[raster]** A grid giving the Strahler order number for each cell. A network of flow paths is defined by the D8 Flow Direction grid. Source flow paths have a Strahler order number of one. When two flow paths of different order join the order of the downstream flow path is the order of the highest incoming flow path. When two flow paths of equal order join the downstream flow path order is increased by 1. When more than two flow paths join the downstream flow path order is calculated as the maximum of the highest incoming flow path order or the second highest incoming flow path order + 1. This generalizes the common definition to cases where more than two flow paths join at a point.

Console usage

```
processing.runalg('taudem:gridnetwork', d8_flow_dir_grid, outlets_shape, mask_grid, threshold, longest_len_grid
```

See also

Pit Remove

Описание

Identifies all pits in the DEM and raises their elevation to the level of the lowest pour point around their edge. Pits are low elevation areas in digital elevation models (DEMs) that are completely surrounded by higher terrain. They are generally taken to be artifacts that interfere with the routing of flow across DEMs, so are removed by raising their elevation to the point where they drain off the edge of the domain. The pour point is the lowest point on the boundary of the "watershed" draining to the pit. This step is not essential if you have reason to believe that the pits in your DEM are real. If a few pits actually exist and so should not be removed, while at the same time others are believed to be artifacts that need to be removed, the actual pits should have NODATA elevation values inserted at their lowest point. NODATA values serve to define edges in the domain, and elevations are only raised to where flow is off an edge, so an internal NODATA value will stop a pit from being removed, if necessary.

Parameters

`Elevation Grid` **[raster]** A digital elevation model (DEM) grid to serve as the base input for the terrain analysis and stream delineation.

Outputs

`Pit Removed Elevation Grid` **[raster]** A grid of elevation values with pits removed so that flow is routed off of the domain.

Console usage

```
processing.runalg('taudem:pitremove', -z, -fel)
```

See also

.

18.8.2 Specialized Grid Analysis

D8 Distance To Streams

Описание

Computes the horizontal distance to stream for each grid cell, moving downslope according to the D8 flow model, until a stream grid cell is encountered.

Parameters

`D8 Flow Direction Grid` **[raster]** This input is a grid of flow directions that are encoded using the D8 method where all flow from a cells goes to a single neighboring cell in the direction of steepest descent. This grid can be obtained as the output of the **"D8 Flow Directions"** tool.

`Stream Raster Grid` **[raster]** A grid indicating streams. Such a grid can be created by several of the tools in the **"Stream Network Analysis"** toolset. However, the tools in the **"Stream Network Analysis"** toolset only create grids with a value of 0 for no stream, or 1 for stream cells. This tool can also accept grids with values greater than 1, which can be used in conjunction with the `Threshold` parameter to determine the location of streams. This allows Contributing Area grids to be used to define streams as well as the normal Stream Raster grids. This grid expects integer (long integer) values and any non-integer values will be truncated to an integer before being evaluated.

`Threshold` **[number]** This value acts as threshold on the `Stream Raster Grid` to determine the location of streams. Cells with a `Stream Raster Grid` value greater than or equal to the `Threshold` value are interpreted as streams.

Default: *50*

Outputs

`Output Distance to Streams` **[raster]** A grid giving the horizontal distance along the flow path as defined by the D8 Flow Directions Grid to the streams in the Stream Raster Grid.

Console usage

```
processing.runalg('taudem:d8distancetostreams', -p, -src, -thresh, -dist)
```

See also

D-Infinity Avalanche Runout

Описание

Identifies an avalanche's affected area and the flow path length to each cell in that affacted area. All cells downslope from each source area cell, up to the point where the slope from the source to the affected area is less than a threshold angle called the Alpha Angle can be in the affected area. This tool uses the D-infinity multiple flow direction method for determining flow direction. This will likely cause very small amounts of flow to be dispersed to some downslope cells that might overstate the affected area, so a threshold proportion can be set to avoid this excess dispersion. The flow path length is the distance from the cell in question to the source cell that has the highest angle.

All points downslope from the source area are potentially in the affected area, but not beyond a point where the slope from the source to the affected area is less than a threshold angle called the Alpha Angle.

Slope is to be measured using the straight line distance from source point to evaluation point.

It makes more physical sense to me for the angle to be measured along the flow path. Nevertheless it is equally easy to code straight line angles as angles along the flow path, so an option that allows switching will be provided. The most practical way to evaluate avalanche runout is to keep track of the source point with the greatest angle to each point. Then the recursive upslope flow algebra approach will look at a grid cell and all its upslope neighbors that flow to it. Information from the upslope neighbors will be used to calculate the angle to the grid cell in question and retain it in the runout zone if the angle exceeds the alpha angle. This procedure makes the assumption that the maximum angle at a grid cell will be from the set of cells that have maximum angles to the inflowing neighbors. This will always be true of angle is calculated along a flow path, but I can conceive of cases where flow paths bend back on themselves where this would not be the case for straight line angles.

The D-infinity multiple flow direction field assigns flow from each grid cell to multiple downslope neighbors using proportions (`Pik`) that vary between 0 and 1 and sum to 1 for all flows out of a grid cell. It may be desirable to specify a threshold `T` that this proportion has to exceed before a grid cell is counted as flowing to a downslope grid cell, e.g. `Pik > T` (=0.2 say) to avoid dispersion to grid cells that get very little flow. `T` will be specified as a user input. If all upslope grid cells are to be used `T` may be input as 0.

Avalanche source sites are to be input as a short integer grid (name suffix `*ass`, e.g. `demass`) comprised of positive values where avalanches may be triggered and 0 values elsewhere.

The following grids are output:

- rz — A runout zone indicator with value 0 to indicate that this grid cell is not in the runout zone and value > 0 to indicate that this grid cell is in the runout zone. Since there may be information in the angle to the associated source site, this variable will be assigned the angle to the source site (in degrees)
- dm — Along flow distance from the source site that has the highest angle to the point in question

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-infinity method. Flow direction is measured in radians, counter clockwise from east. This can be created by the tool **"D-Infinity Flow Directions"**.

`Pit Filled Elevation Grid` **[raster]** This input is a grid of elevation values. As a general rule, it is recommended that you use a grid of elevation values that have had the pits removed for this input. Pits are generally taken to be artifacts that interfere with the analysis of flow across them. This grid can be obtained as the output of the **"Pit Remove"** tool, in which case it contains elevation values where the pits have been filled to the point where they just drain.

`Avalanche Source Site Grid` **[raster]** This is a grid of source areas for snow avalanches that are commonly identified manually using a mix of experience and visual interpretation of maps. Avalanche source sites are to be input as a short integer grid (name suffix `*ass`, e.g. `demass`) comprised of positive values where avalanches may be triggered and 0 values elsewhere.

`Proportion Threshold` **[number]** This value is a threshold proportion that is used to limit the disperson of flow caused by using the D-infinity multiple flow direction method for determining flow direction. The D-infinity multiple flow direction method often causes very small amounts of flow to be dispersed to some downslope cells that might overstate the affected area, so a threshold proportion can be set to avoid this excess dispersion.

Default: *0.2*

`Alpha Angle Threshold` **[number]** This value is the threshold angle, called the Alpha Angle, that is used to determine which of the cells downslope from the source cells are in the affected area. Only the cells downslope from each source area cell, up to the point where the slope from the source to the affected area is less than a threshold angle are in the affected area.

Default: *18*

`Measure distance along flow path` **[boolean]** This option selects the method used to measure the distance used to calculate the slope angle. If option is *True* then measure it along the flow path, where the *False* option causes the slope to be measure along the straight line distance from the source cell to the evaluation cell.

Default: *True*

Outputs

`Runout Zone Grid` **[raster]** This grid Identifies the avalanche's runout zone (affected area) using a runout zone indicator with value 0 to indicate that this grid cell is not in the runout zone and value $>$ 0 to indicate that this grid cell is in the runout zone. Since there may be information in the angle to the associated source site, this variable will be assigned the angle to the source site (in degrees).

`Path Distance Grid` **[raster]** This is a grid of the flow distance from the source site that has the highest angle to each cell.

Console usage

```
processing.runalg('taudem:dinfinityavalancherunout', -ang, -fel, -ass, -thresh, -alpha, -direct, -rz, -dfs)
```

See also

D-Infinity Concentration Limited Accumulation

Описание

This function applies to the situation where an unlimited supply of a substance is loaded into flow at a concentration or solubility threshold Csol over a region indicated by an indicator grid (dg). It a grid of the concentration of a substance at each location in the domain, where the supply of substance from a supply area is loaded into the flow at a concentration or solubility threshold. The flow is first calculated as a D-infinity weighted contributing area of an input Effective Runoff Weight Grid (notionally excess precipitation). The concentation of substance over the supply area (indicator grid) is at the concentration threshold. As the substance moves downslope with the D-infinity flow field, it is subject to first order decay in moving from cell to cell as well as dilution due to changes in flow. The decay multiplier grid gives the fractional (first order) reduction in quantity in moving from grid cell `x` to the next downslope cell. If the outlets shapefile is used, the tool only evaluates the part of the domain that contributes flow to the locations given by the shapefile. This is useful for a tracking a contaminant or compound from an area with unlimited supply of that compound that is loaded into a flow at a concentration or solubility threshold over a zone and flow from the zone may be subject to decay or attenuation.

The indicator grid (dg) is used to delineate the area of the substance supply using the (0, 1) indicator function `i(x)`. `A[]` denotes the weighted accumulation operator evaluated using the D-Infinity Contributing Area function. The Effective Runoff Weight Grid gives the supply to the flow (e.g. the excess rainfall if this is overland flow) denoted as `w(x)`. The specific discharge is then given by:

```
Q(x)=A[w(x)]
```

This weighted accumulation `Q(x)` is output as the Overland Flow Specific Discharge Grid. Over the substance supply area concentration is at the threshold (the threshold is a saturation or solubility limit). If `i(x) = 1`, then

```
C(x) = Csol, and L(x) = Csol Q(x),
```

where `L(x)` denotes the load being carried by the flow. At remaining locations, the load is determined by load accumulation and the concentration by dilution:

Here `d(x) = d(i, j)` is a decay multiplier giving the fractional (first order) reduction in mass in moving from grid cell `x` to the next downslope cell. If travel (or residence) times `t(x)` associated with flow between cells are available `d(x)` may be evaluated as `exp(-k t(x))` where `k` is a first order decay parameter. The Concentration grid output is `C(x)`. If the outlets shapefile is used, the tool only evaluates the part of the domain that contributes flow to the locations given by the shapefile.

Useful for a tracking a contaminant released or partitioned to flow at a fixed threshold concentration.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-infinity method. Flow direction is measured in radians, counter clockwise from east. This grid can be created by the function **"D-Infinity Flow Directions"**.

`Disturbance Indicator Grid` **[raster]** A grid that indicates the source zone of the area of substance supply and must be 1 inside the zone and 0 or NODATA over the rest of the domain.

`Decay Multiplier Grid` **[raster]** A grid giving the factor by which flow leaving each grid cell is multiplied before accumulation on downslope grid cells. This may be used to simulate the movement of an attenuating or decaying substance. If travel (or residence) times `t(x)` associated with flow between cells are available `d(x)` may be evaluated as `exp(-k t(x))` where `k` is a first order decay parameter.

`Effective Runoff Weight Grid` **[raster]** A grid giving the input quantity (notionally effective runoff or excess precipitation) to be used in the D-infinity weighted contributing area evaluation of Overland Flow Specific Discharge.

`Outlets shapefile` **[vector: point]** Optional.

This optional input is a point shapefile defining outlets of interest. If this file is used, the tool will only evaluate the area upslope of these outlets.

`Concentration Threshold` **[number]** The concentration or solubility threshold. Over the substance supply area, concentration is at this threshold.

Default: *1.0*

`Check for edge contamination` **[boolean]** This option determines whether the tool should check for edge contamination. Edge contamination is defined as the possibility that a value may be underestimated due to grid cells outside of the domain not being considered when determining contributing area.

Default: *True*

Outputs

`Concentration Grid` **[raster]** A grid giving the resulting concentration of the compound of interest in the flow.

Console usage

```
processing.runalg('taudem:dinfinityconcentrationlimitedaccumulation', -ang, -dg, -dm, -q, -o, -csol, -nc, -ctpt
```

See also

D-Infinity Decaying Accumulation

Описание

The D-Infinity Decaying Accumulation tool creates a grid of the accumulated quantity at each location in the domain where the quantity accumulates with the D-infinity flow field, but is subject to first order decay in moving from cell to cell. By default, the quantity contribution of each grid cell is the cell length to give a per unit width accumulation, but can optionally be expressed with a weight grid. The decay multiplier grid gives the fractional (first order) reduction in quantity in accumulating from grid cell `x` to the next downslope cell.

A decayed accumulation operator `DA[.]` takes as input a mass loading field `m(x)` expressed at each grid location as `m(i, j)` that is assumed to move with the flow field but is subject to first order decay in moving from cell to cell. The output is the accumulated mass at each location `DA(x)`. The accumulation of `m` at each grid cell can be numerically evaluated.

Here `d(x) = d(i ,j)` is a decay multiplier giving the fractional (first order) reduction in mass in moving from grid cell `x` to the next downslope cell. If travel (or residence) times `t(x)` associated with flow between cells are available `d(x)` may be evaluated as `exp(-k t(x))` where `k` is a first order decay parameter. The weight grid is used to represent the mass loading `m(x)`. If not specified this is taken as 1. If the outlets shapefile is used the function is only evaluated on that part of the domain that contributes flow to the locations given by the shapefile.

Useful for a tracking contaminant or compound subject to decay or attenuation.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-infinity method. Flow direction is measured in radians, counter clockwise from east. This grid can be created by the function **"D-Infinity Flow Directions"**.

`Decay Multiplier Grid` **[raster]** A grid giving the factor by which flow leaving each grid cell is multiplied before accumulation on downslope grid cells. This may be used to simulate the movement of an attenuating substance.

`Weight Grid` **[raster]** Optional.

A grid giving weights (loadings) to be used in the accumulation. If this optional grid is not specified, weights are taken as the linear grid cell size to give a per unit width accumulation.

`Outlets Shapefile` **[vector: point]** Optional.

This optional input is a point shapefile defining outlets of interest. If this file is used, the tool will only evaluate ther area upslope of these outlets.

`Check for edge contamination` **[boolean]** This option determines whether the tool should check for edge contamination. Edge contamination is defined as the possibility that a value may be underestimated due to grid cells outside of the domain not being considered when determining contributing area.

Default: *True*

Outputs

`Decayed Specific Catchment Area Grid` **[raster]** The D-Infinity Decaying Accumulation tool creates a grid of the accumulated mass at each location in the domain where mass moves with the D-infinity flow field, but is subject to first order decay in moving from cell to cell.

Console usage

```
processing.runalg('taudem:dinfinitydecayingaccumulation', -ang, -dm, -wg, -o, -nc, -dsca)
```

See also

D-Infinity Distance Down

Описание

Calculates the distance downslope to a stream using the D-infinity flow model. The D-infinity flow model is a multiple flow direction model, because the outflow from each grid cell is proportioned between up to 2 downslope grid cells. As such, the distance from any grid cell to a stream is not uniquely defined. Flow that originates at a particular grid cell may enter the stream at a number of different cells. The statistical method may be selected as the longest, shortest or weighted average of the flow path distance to the stream. Also one of several ways of measuring distance may be selected: the total straight line path (Pythagoras), the horizontal component of the straight line path, the vertical component of the straight line path, or the total surface flow path.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-infinity method. Flow direction is measured in radians, counter clockwise from east. This can be created by the tool **"D-Infinity Flow Directions"**.

`Pit Filled Elevation Grid` **[raster]** This input is a grid of elevation values. As a general rule, it is recommended that you use a grid of elevation values that have had the pits removed for this input. Pits are generally taken to be artifacts that interfere with the analysis of flow across them. This grid can be obtained as the output of the **"Pit Remove"** tool, in which case it contains elevation values where the pits have been filled to the point where they just drain.

`Stream Raster Grid` **[raster]** A grid indicating streams, by using a grid cell value of 1 on streams and 0 off streams. This is usually the output of one of the tools in the **"Stream Network Analysis"** toolset.

`Weight Path Grid` **[raster]** Optional.

A grid giving weights (loadings) to be used in the distance calculation. This might be used for example where only flow distance through a buffer is to be calculated. The weight is then 1 in the buffer and 0 outside it. Alternatively the weight may reflect some sort of cost function for travel over the surface, perhaps representing travel time or attenuation of a process. If this input file is not used, the loadings will assumed to be one for each grid cell.

`Statistical Method` **[selection]** Statistical method used to calculate the distance down to the stream. In the D-Infinity flow model, the outflow from each grid cell is proportioned between two downslope grid cells. Therefore, the distance from any grid cell to a stream is not uniquely defined. Flow that originates at a particular grid cell may enter the stream at a number of cells. The distance to the stream may be defined as the longest (maximum), shortest (minimum) or weighted average of the distance down to the stream.

Options:

- 0 — Minimum
- 1 — Maximum
- 2 — Average

Default: *2*

`Distance Method` **[selection]** Distance method used to calculate the distance down to the stream. One of several ways of measuring distance may be selected: the total straight line path (Pythagoras), the horizontal component of the straight line path (horizontal), the vertical component of the straight line path (vertical), or the total surface flow path (surface).

Options:

- 0 — Pythagoras
- 1 — Horizontal
- 2 — Vertical
- 3 — Surface

Default: *1*

`Check for edge contamination` **[boolean]** A flag that determines whether the tool should check for edge contamination. This is defined as the possibility that a value may be underestimated due to grid cells outside of the domain not being counted. In the context of Distance Down this occurs when part of a flow path traced downslope from a grid cell leaves the domain without reaching a stream grid cell. With edge contamination checking selected, the algorithm recognizes this and reports no data for the result. This is the desired effect and indicates that values for these grid cells is unknown due to it being dependent on terrain outside of the domain of data available. Edge contamination checking may be overridden in cases where you know this is not an issue or want to evaluate the distance using only the fraction of flow paths that terminate at a stream.

Default: *True*

Outputs

`D-Infinity Drop to Stream Grid` **[raster]** Grid containing the distance to stream calculated using the D-infinity flow model and the statistical and path methods chosen.

Console usage

```
processing.runalg('taudem:dinfinitydistancedown', dinf_flow_dir_grid, pit_filled_grid, stream_grid, weight_path
```

See also

D-Infinity Distance Up

Описание

This tool calculates the distance from each grid cell up to the ridge cells along the reverse D-infinity flow directions. Ridge cells are defined to be grid cells that have no contribution from grid cells further upslope. Given the convergence of multiple flow paths at any grid cell, any given grid cell can have multiple upslope ridge cells. There are three statictical methods that this tool can use: maximum distance, minimum distance and waited flow average over these flow paths. A variant on the above is to consider only grid cells that contribute flow with a proportion greater than a user specified threshold (t) to be considered as upslope of any given grid cell. Setting t=0.5 would result in only one flow path from any grid cell and would give the result equivalent to a D8 flow model, rather than D-infinity flow model, where flow is proportioned between two downslope grid cells. Finally there are several different optional paths that can be measured: the total straight line path (Pythagoras), the horizontal component of the straight line path, the vertical component of the straight line path, or the total surface flow path.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-infinity method. Flow direction is measured in radians, counter clockwise from east. This can be created by the tool **"D-Infinity Flow Directions"**.

`Pit Filled Elevation Grid` **[raster]** This input is a grid of elevation values. As a general rule, it is recommended that you use a grid of elevation values that have had the pits removed for this input. Pits are generally taken to be artifacts that interfere with the analysis of flow across them. This grid can be obtained as the output of the **"Pit Remove"** tool, in which case it contains elevation values where the pits have been filled to the point where they just drain.

`Slope Grid` **[raster]** This input is a grid of slope values. This is measured as drop/distance and it is most often obtained as the output of the **"D-Infinity Flow Directions"** tool.

`Statistical Method` **[selection]** Statistical method used to calculate the distance down to the stream. In the D-Infinity flow model, the outflow from each grid cell is proportioned between two downslope grid cells. Therefore, the distance from any grid cell to a stream is not uniquely defined. Flow that originates at a particular grid cell may enter the stream at a number of cells. The distance to the stream may be defined as the longest (maximum), shortest (minimum) or weighted average of the distance down to the stream.

Options:

- 0 — Minimum
- 1 — Maximum
- 2 — Average

Default: *2*

`Distance Method` **[selection]** Distance method used to calculate the distance down to the stream. One of several ways of measuring distance may be selected: the total straight line path (Pythagoras), the horizontal component of the straight line path (horizontal), the vertical component of the straight line path (vertical), or the total surface flow path (surface).

Options:

- 0 — Pythagoras
- 1 — Horizontal
- 2 — Vertical
- 3 — Surface

Default: *1*

`Proportion Threshold` **[number]** The proportion threshold parameter where only grid cells that contribute flow with a proportion greater than this user specified threshold (`t`) is considered to be upslope of any given grid cell. Setting `t=0.5` would result in only one flow path from any grid cell and would give the result equivalent to a D8 flow model, rather than D-Infinity flow model, where flow is proportioned between two downslope grid cells.

Default: *0.5*

`Check for edge contamination` **[boolean]** A flag that determines whether the tool should check for edge contamination. This is defined as the possibility that a value may be underestimated due to grid cells outside of the domain not being counted.

Default: *True*

Outputs

`D-Infinity Distance Up` **[raster]** Grid containing the distances up to the ridge calculated using the D-Infinity flow model and the statistical and path methods chosen.

Console usage

```
processing.runalg('taudem:dinfinitydistanceup', dinf_flow_dir_grid, pit_filled_grid, slope_grid, stat_method, d
```

See also

D-Infinity Reverse Accumulation

Описание

This works in a similar way to evaluation of weighted Contributing area, except that the accumulation is by propagating the weight loadings upslope along the reverse of the flow directions to accumulate the quantity of weight loading downslope from each grid cell. The function also reports the maximum value of the weight loading downslope from each grid cell in the Maximum Downslope grid.

This function is designed to evaluate and map the hazard due to activities that may have an effect downslope. The example is land management activities that increase runoff. Runoff is sometimes a trigger for landslides or debris flows, so the weight grid here could be taken as a terrain stability map. Then the reverse accumulation provides a measure of the amount of unstable terrain downslope from each grid cell, as an indicator of the danger of activities that may increase runoff, even though there may be no potential for any local impact.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-infinity method. Flow direction is measured in radians, counter clockwise from east. This can be created by the tool **"D-Infinity Flow Directions"**.

`Weight Grid` **[raster]** A grid giving weights (loadings) to be used in the accumulation.

Outputs

`Reverse Accumulation Grid` **[raster]** The grid giving the result of the **"Reverse Accumulation"** function. This works in a similar way to evaluation of weighted Contributing area, except that the accumulation is by propagating the weight loadings upslope along the reverse of the flow directions to accumulate the quantity of loading downslope from each grid cell.

`Maximum Downslope Grid` **[raster]** The grid giving the maximum of the weight loading grid downslope from each grid cell.

Console usage

```
processing.runalg('taudem:dinfinityreverseaccumulation', -ang, -wg, -racc, -dmax)
```

See also

D-Infinity Transport Limited Accumulation - 2

Описание

This function is designed to calculate the transport and deposition of a substance (e.g. sediment) that may be limited by both supply and the capacity of the flow field to transport it. This function accumulates substance flux (e.g. sediment transport) subject to the rule that transport out of any grid cell is the minimum between supply and transport capacity, `Tcap`. The total supply at a grid cell is calculated as the sum of the transport in from upslope grid cells, `Tin`, plus the local supply contribution, `E` (e.g. erosion). This function also outputs deposition, `D`, calculated as total supply minus actual transport.

Here `E` is the supply. `Tout` at each grid cell becomes `Tin` for downslope grid cells and is reported as Transport limited accumulation (`tla`). `D` is deposition (`tdep`). The function provides the option to evaluate concentration of a compound (contaminant) adhered to the transported substance. This is evaluated as follows:

Where `Lin` is the total incoming compound loading and `Cin` and `Tin` refer to the Concentration and Transport entering from each upslope grid cell.

If

else

where `Cs` is the concentration supplied locally and the difference in the second term on the right represents the additional supply from the local grid cell. Then,

`Cout` at each grid cell comprises is the concentration grid output from this function.

If the outlets shapefile is used the tool only evaluates that part of the domain that contributes flow to the locations given by the shapefile.

Transport limited accumulation is useful for modeling erosion and sediment delivery, including the spatial dependence of sediment delivery ratio and contaminant that adheres to sediment.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-infinity method. Flow direction is measured in radians, counter clockwise from east. This can be created by the tool **"D-Infinity Flow Directions"**.

`Supply Grid` **[raster]** A grid giving the supply (loading) of material to a transport limited accumulation function. In the application to erosion, this grid would give the erosion detachment, or sediment supplied at each grid cell.

`Transport Capacity Grid` **[raster]** A grid giving the transport capacity at each grid cell for the transport limited accumulation function. In the application to erosion this grid would give the transport capacity of the carrying flow.

`Input Concentration Grid` **[raster]** A grid giving the concentration of a compound of interest in the supply to the transport limited accumulation function. In the application to erosion, this grid would give the concentration of say phosphorous adhered to the eroded sediment.

`Outlets Shapefile` **[vector: point]** Optional.

This optional input is a point shapefile defining outlets of interest. If this file is used, the tool will only evaluate the area upslope of these outlets.

`Check for edge contamination` **[boolean]** This option determines whether the tool should check for edge contamination. Edge contamination is defined as the possibility that a value may be underestimated due to grid cells outside of the domain not being considered when determining the result.

Default: *True*

Outputs

`Transport Limited Accumulation Grid` **[raster]** This grid is the weighted accumulation of supply accumulated respecting the limitations in transport capacity and reports the transport rate calculated by accumulating the substance flux subject to the rule that the transport out of any grid cell is the minimum of the total supply (local supply plus transport in) to that grid cell and the transport capacity.

`Deposition Grid` **[raster]** A grid giving the deposition resulting from the transport limited accumulation. This is the residual from the transport in to each grid cell minus the transport capacity out of the grid cell. The deposition grid is calculated as the transport in + the local supply - the tranport out.

`Output Concentration Grid` **[raster]** If an input concentation in supply grid is given, then this grid is also output and gives the concentration of a compound (contaminant) adhered or bound to the transported substance (e.g. sediment) is calculated.

Console usage

```
processing.runalg('taudem:dinfinitytransportlimitedaccumulation2', dinf_flow_dir_grid, supply_grid, capacity_gr
```

See also

D-Infinity Transport Limited Accumulation

Описание

This function is designed to calculate the transport and deposition of a substance (e.g. sediment) that may be limited by both supply and the capacity of the flow field to transport it. This function accumulates substance flux (e.g. sediment transport) subject to the rule that transport out of any grid cell is the minimum between supply and transport capacity, `Tcap`. The total supply at a grid cell is calculated as the sum of the transport in from upslope grid cells, `Tin`, plus the local supply contribution, `E` (e.g. erosion). This function also outputs deposition, `D`, calculated as total supply minus actual transport.

Here `E` is the supply. `Tout` at each grid cell becomes `Tin` for downslope grid cells and is reported as Transport limited accumulation (`tla`). `D` is deposition (`tdep`). The function provides the option to evaluate concentration of a compound (contaminant) adhered to the transported substance. This is evaluated as follows:

Where `Lin` is the total incoming compound loading and `Cin` and `Tin` refer to the Concentration and Transport entering from each upslope grid cell.

If

else

where Cs is the concentration supplied locally and the difference in the second term on the right represents the additional supply from the local grid cell. Then,

Cout at each grid cell comprises is the concentration grid output from this function.

If the outlets shapefile is used the tool only evaluates that part of the domain that contributes flow to the locations given by the shapefile.

Transport limited accumulation is useful for modeling erosion and sediment delivery, including the spatial dependence of sediment delivery ratio and contaminant that adheres to sediment.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-infinity method. Flow direction is measured in radians, counter clockwise from east. This can be created by the tool **"D-Infinity Flow Directions"**.

`Supply Grid` **[raster]** A grid giving the supply (loading) of material to a transport limited accumulation function. In the application to erosion, this grid would give the erosion detachment, or sediment supplied at each grid cell.

`Transport Capacity Grid` **[raster]** A grid giving the transport capacity at each grid cell for the transport limited accumulation function. In the application to erosion this grid woul give the transport capacity of the carrying flow.

`Outlets Shapefile` **[vector: point]** Optional.

This optional input is a point shapefile defining outlets of interest. If this file is used, the tool will only evaluate the area upslope of these outlets.

`Check for edge contamination` **[boolean]** This option determines whether the tool should check for edge contamination. Edge contamination is defined as the possibility that a value may be underestimated due to grid cells outside of the domain not being considered when determining the result.

Default: *True*

Outputs

`Transport Limited Accumulation Grid` **[raster]** This grid is the weighted accumulation of supply accumulated respecting the limitations in transport capacity and reports the transport rate calculated by accumulating the substance flux subject to the rule that the transport out of any grid cell is the minimum of the total supply (local supply plus transport in) to that grid cell and the transport capacity.

`Deposition Grid` **[raster]** A grid giving the deposition resulting from the transport limited accumulation. This is the residual from the transport in to each grid cell minus the transport capacity out of the grid cell. The deposition grid is calculated as the transport in + the local supply - the tranport out.

Console usage

```
processing.runalg('taudem:dinfinitytransportlimitedaccumulation', dinf_flow_dir_grid, supply_grid, capacity_gri
```

See also

D-Infinity Upslope Dependence

Описание

The D-Infinity Upslope Dependence tool quantifies the amount each grid cell in the domain contributes to a destination set of grid cells. D-Infinity flow directions proportion flow from each grid cell between multiple downslope grid cells. Following this flow field downslope the amount of flow originating at each grid cell that reaches the destination zone is defined. Upslope influence is evaluated using a downslope recursion, examining grid cells downslope from each grid cell, so that the map produced identifies the area upslope where flow through the destination zone originates, or the area it depends on, for its flow.

The figures below illustrate the amount each source point in the domain `x` (blue) contributes to the destination point or zone `y` (red). If the indicator weighted contributing area function is denoted `I(y; x)` giving the weighted contribution using a unit value (1) from specific grid cells `y` to grid cells `x`, then the upslope dependence is: `D(x; y) = I(y; x)`.

This is useful for example to track where flow or a flow related substance or contaminant that enters a destination area may come from.

Parameters

`D-Infinity Flow Direction Grid` **[raster]** A grid giving flow direction by the D-Infinity method where the flow direction angle is determined as the direction of the steepest downward slope on the eight triangular facets formed in a 3x3 grid cell window centered on the grid cell of interest. This grid can be produced using the **"D-Infinity Flow Direction"** tool.

`Destination Grid` **[raster]** A grid that encodes the destination zone that may receive flow from upslope. This grid must be 1 inside the zone y and 0 over the rest of the domain.

Outputs

`Output Upslope Dependence Grid` **[raster]** A grid quantifing the amount each source point in the domain contributes to the zone defined by the destination grid.

Console usage

```
processing.runalg('taudem:dinfinityupslopedependence', -ang, -dg, -dep)
```

See also

Slope Average Down

Описание

This tool computes slope in a D8 downslope direction averaged over a user selected distance. Distance should be specified in horizontal map units.

Parameters

`D8 Flow Direction Grid` **[raster]** This input is a grid of flow directions that are encoded using the D8 method where all flow from a cells goes to a single neighboring cell in the direction of steepest descent.This grid can be obtained as the output of the **"D8 Flow Directions"** tool.

`Pit Filled Elevation Grid` **[raster]** This input is a grid of elevation values. As a general rule, it is recommended that you use a grid of elevation values that have had the pits removed for this input. Pits are generally taken to be artifacts that interfere with the analysis of flow across them. This grid can be obtained as the output of the **"Pit Remove"** tool, in which case it contains elevation values where the pits have been filled to the point where they just drain.

`Downslope Distance` **[number]** Input parameter of downslope distance over which to calculate the slope (in horizontal map units).

Default: *50*

Outputs

`Slope Average Down Grid` **[raster]** This output is a grid of slopes calculated in the D8 downslope direction, averaged over the selected distance.

Console usage

```
processing.runalg('taudem:slopeaveragedown', -p, -fel, -dn, -slpd)
```

See also

Slope Over Area Ratio

Описание

Calculates the ratio of the slope to the specific catchment area (contributing area). This is algebraically related to the more common ln(a/tan beta) wetness index, but contributing area is in the denominator to avoid divide by 0 errors when slope is 0.

Parameters

`Slope Grid` **[raster]** A grid of slope. This grid can be generated using ether the **"D8 Flow Directions"** tool or the **"D-Infinity Flow Directions"** tool.

`Specific Catchment Area Grid` **[raster]** A grid giving the contributing area value for each cell taken as its own contribution plus the contribution from upslope neighbors that drain in to it. Contributing area is counted in terms of the number of grid cells (or summation of weights). This grid can be generated using either the **"D8 Contributing Area"** tool or the **"D-Infinity Contributing Area"** tool.

Outputs

`Slope Divided By Area Ratio Grid` **[raster]** A grid of the ratio of slope to specific catchment area (contributing area). This is algebraically related to the more common `ln(a/tan beta)` wetness index, but contributing area is in the denominator to avoid divide by 0 errors when slope is 0.

Console usage

```
processing.runalg('taudem:slopeoverarearatio', -slp, -sca, -sar)
```

See also

.

18.8.3 Stream Network Analysis

D8 Extreme Upslope Value

Описание

Evaluates the extreme (either maximum or minimum) upslope value from an input grid based on the D8 flow model. This is intended initially for use in stream raster generation to identify a threshold of the slope times area product that results in an optimum (according to drop analysis) stream network.

If the optional outlet point shapefile is used, only the outlet cells and the cells upslope (by the D8 flow model) of them are in the domain to be evaluated.

By default, the tool checks for edge contamination. This is defined as the possibility that a result may be underestimated due to grid cells outside of the domain not being counted. This occurs when drainage is inwards from the boundaries or areas with "no data" values for elevation. The algorithm recognizes this and reports "no data" for the result for these grid cells. It is common to see streaks of "no data" values extending inwards from boundaries along flow paths that enter the domain at a boundary. This is the desired effect and indicates that the result for these grid cells is unknown due to it being dependent on terrain outside of the domain of data available. Edge contamination checking may be turned off in cases where you know this is not an issue or want to ignore these problems, if for example, the DEM has been clipped along a watershed outline.

Parameters

`D8 Flow Directions Grid` **[raster]** A grid of D8 flow directions which are defined, for each cell, as the direction of the one of its eight adjacent or diagonal neighbors with the steepest downward slope. This grid can be obtained as the output of the **"D8 Flow Directions"** tool.

`Upslope Values Grid` **[raster]** This is the grid of values of which the maximum or minimum upslope value is selected. The values most commonly used are the slope times area product needed when generating stream rasters according to drop analysis.

`Outlets Shapefile` **[vector: point]** Optional.

A point shape file defining outlets of interest. If this input file is used, only the area upslope of these outlets will be evaluated by the tool.

`Check for edge contamination` **[boolean]** A flag that indicates whether the tool should check for edge contamination.

Default: *True*

`Use max upslope value` **[boolean]** A flag to indicate whether the maximum or minimum upslope value is to be calculated.

Default: *True*

Outputs

`Extereme Upslope Values Grid` **[raster]** A grid of the maximum/minimum upslope values.

Console usage

```
processing.runalg('taudem:d8extremeupslopevalue', -p, -sa, -o, -nc, -min, -ssa)
```

See also

Length Area Stream Source

Описание

Creates an indicator grid (1, 0) that evaluates `A >= (M)(Ly)` based on upslope path length, D8 contributing area grid inputs, and parameters `M` and `y`. This grid indicates likely stream source grid cells. This is an experimental method with theoretical basis in Hack's law which states that for streams `L ~ A 0.6`. However for hillslopes with parallel flow `L ~ A`. So a transition from hillslopes to streams may be represented by `L ~ A 0.8` suggesting identifying grid cells as stream cells if `A > M (L (1/0.8))`.

Parameters

`Length Grid` **[raster]** A grid of the maximum upslope length for each cell. This is calculated as the length of the flow path from the furthest cell that drains to each cell. Length is measured between cell centers taking into account cell size and whether the direction is adjacent or diagonal. It is this length (`L`) that is used in the formula, `A >(M)(Ly)`, to determine which cells are considered stream cells. This grid can be obtained as an output from the **"Grid Network"** tool.

`Contributing Area Grid` **[raster]** A grid of contributing area values for each cell that were calculated using the D8 algorithm. The contributing area for a cell is the sum of its own contribution plus the contribution from all upslope neighbors that drain to it, measured as a number of cells. This grid is typically obtained as the output of the **"D8 Contributing Area"** tool. In this tool, it is the contributing area (`A`) that is compared in the formula `A > (M)(Ly)` to determine the transition to a stream.

`Threshold` **[number]** The multiplier threshold (`M`) parameter which is used in the formula: `A > (M)(Ly)`, to identify the beginning of streams.

Default: *0.03*

`Exponent` **[number]** The exponent (`y`) parameter which is used in the formula: `A > (M)(Ly)`, to identify the beginning of streams. In branching systems, Hack's law uggests that `L = 1/M A(1/y)` with `1/y = 0.6` (or 0.56) (`y` about 1.7). In parallel flow systems `L` is proportional to `A` (`y` about 1). This method tries to identify the transition between these two paradigms by using an exponent `y` somewhere in between (`y` about 1.3).

Default: *1.3*

Outputs

`Stream Source Grid` **[raster]** An indicator grid (1,0) that evaluates A >= (M)(L^y), based on the maximum upslope path length, the D8 contributing area grid inputs, and parameters `M` and `y`. This grid indicates likely stream source grid cells.

Console usage

```
processing.runalg('taudem:lengthareastreamsource', length_grid, contrib_area_grid, threshold, exponent, stream_s
```

See also

Move Outlets To Streams

Описание

Moves outlet points that are not aligned with a stream cell from a stream raster grid, downslope along the D8 flow direction until a stream raster cell is encountered, the "max_dist" number of grid cells are examined, or the flow path exits the domain (i.e. a "no data" value is encountered for the D8 flow direction). The output file is a new outlets shapefile where each point has been moved to coincide with the stream raster grid, if possible. A field "dist_moved" is added to the new outlets shapefile to indicate the changes made to each point. Points that are already on a stream cell are not moved and their "dist_moved" field is assigned a value 0. Points that are initially not on a stream cell are moved by sliding them downslope along the D8 flow direction until one of the following occurs: a) A stream raster grid cell is encountered before traversing the "max_dist" number of grid cells. In which case, the point is moved and the "dist_moved" field is assigned a value indicating how many grid cells the point was moved. b) More than the "max_number" of grid cells are traversed, or c) the traversal ends up going out of the domain (i.e., a "no data" D8 flow direction value is encountered). In which case, the point is not moved and the "dist_moved" field is assigned a value of -1.

Parameters

`D8 Flow Direction Grid` **[raster]** A grid of D8 flow directions which are defined, for each cell, as the direction of the one of its eight adjacent or diagonal neighbors with the steepest downward slope. This grid can be obtained as the output of the **"D8 Flow Directions"** tool.

`Stream Raster Grid` **[raster]** This output is an indicator grid (1, 0) that indicates the location of streams, with a value of 1 for each of the stream cells and 0 for the remainder of the cells. This file is produced by several different tools in the **"Stream Network Analysis"** toolset.

`Outlets Shapefile` **[vector: point]** A point shape file defining points of interest or outlets that should ideally be located on a stream, but may not be exactly on the stream due to the fact that the shapefile point locations may not have been accurately registered with respect to the stream raster grid.

`Maximum Number of Grid Cells to traverse` **[number]** This input paramater is the maximum number of grid cells that the points in the input outlet shapefile will be moved before they are saved to the output outlet shapefile.

Default: *50*

Outputs

`Output Outlet Shapefile` **[vector]** A point shape file defining points of interest or outlets. This file has one point in it for each point in the input outlet shapefile. If the original point was located on a stream, then the point was not moved. If the origianl point was not on a stream, the point was moved downslope according to the D8 flow direction until it reached a stream or the maximum distance had been reached. This file has an additional field "dist_moved" added to it which is the number of cells that the point was moved. This field is 0 if the cell was originally on a stream, -1 if it was not moved becuase there was not a stream within the maximum distance, or some positive value if it was moved.

Console usage

```
processing.runalg('taudem:moveoutletstostreams', -p, -src, -o, -md, -om)
```

See also

Peuker Douglas

Описание

Creates an indicator grid (1, 0) of upward curved grid cells according to the Peuker and Douglas algorithm.

With this tool, the DEM is first smoothed by a kernel with weights at the center, sides, and diagonals. The Peuker and Douglas (1975) method (also explained in Band, 1986), is then used to identify upwardly curving grid cells. This technique flags the entire grid, then examines in a single pass each quadrant of 4 grid cells, and unflags the highest. The remaining flagged cells are deemed "upwardly curved", and when viewed, resemble a channel network. This proto-channel network generally lacks connectivity and requires thinning, issues that were discussed in detail by Band (1986).

Parameters

`Elevation Grid` **[raster]** A grid of elevation values. This is usually the output of the **"Pit Remove"** tool, in which case it is elevations with pits removed.

`Center Smoothing Weight` **[number]** The center weight parameter used by a kernel to smooth the DEM before the tool identifies upwardly curved grid cells.

Default: *0.4*

`Side Smoothing Weight` **[number]** The side weight parameter used by a kernel to smooth the DEM before the tool identifies upwardly curved grid cells.

Default: *0.1*

`Diagonal Smoothing Weight` **[number]** The diagonal weight parameter used by a kernel to smooth the DEM before the tool identifies upwardly curved grid cells.

Default: *0.05*

Outputs

`Stream Source Grid` **[raster]** An indicator grid (1, 0) of upward curved grid cells according to the Peuker and Douglas algorithm, and if viewed, resembles a channel network. This proto-channel network generally lacks connectivity and requires thinning, issues that were discussed in detail by Band (1986).

Console usage

```
processing.runalg('taudem:peukerdouglas', elevation_grid, center_weight, side_weight, diagonal_weight, stream_s
```

See also

- Band, L. E., (1986), "Topographic partition of watersheds with digital elevation models", Water Resources Research, 22(1): 15-24.

- Peuker, T. K. and D. H. Douglas, (1975), "Detection of surface-specific points by local parallel processing of discrete terrain elevation data", Comput. Graphics Image Process., 4: 375-387.

Slope Area Combination

Описание

Creates a grid of slope-area values = `(Sm) (An)` based on slope and specific catchment area grid inputs, and parameters `m` and `n`. This tool is intended for use as part of the slope-area stream raster delineation method.

Parameters

`Slope Grid` **[raster]** This input is a grid of slope values. This grid can be obtained from the **"D-Infinity Flow Directions"** tool.

`Contributing Area Grid` **[raster]** A grid giving the specific catchment area for each cell taken as its own contribution (grid cell length or summation of weights) plus the proportional contribution from upslope neighbors that drain in to it. This grid is typically obtained from the **"D-Infinity Contributing Area"** tool.

`Slope Exponent` **[number]** The slope exponent (`m`) parameter which will be used in the formula: `(Sm)(An)`, that is used to create the slope-area grid.

Default: *2*

`Area Exponent` **[number]** The area exponent (`n`) parameter which will be used in the formula: `(Sm)(An)`, that is used to create the slope-area grid.

Default: *1*

Outputs

`Slope Area Grid` **[raster]** A grid of slope-area values = `(Sm)(An)` calculated from the slope grid, specific catchment area grid, `m` slope exponent parameter, and `n` area exponent parameter.

Console usage

```
processing.runalg('taudem:slopeareacombination', slope_grid, area_grid, slope_exponent, area_exponent, slope_ar
```

See also

Stream Definition By Threshold

Описание

Operates on any grid and outputs an indicator (1, 0) grid identifing cells with input values >= the threshold value. The standard use is to use an accumulated source area grid to as the input grid to generate a stream raster grid as the output. If you use the optional input mask grid, it limits the domain being evaluated to cells with mask values >= 0. When you use a D-infinity contributing area grid (`*sca`) as the mask grid, it functions as an edge contamination mask. The threshold logic is:

```
src = ((ssa >= thresh) & (mask >= s0)) ? 1:0
```

Parameters

`Accumulated Stream Source Grid` **[raster]** This grid nominally accumulates some characteristic or combination of characteristics of the watershed. The exact characteristic(s) varies depending on the stream network raster algorithm being used. This grid needs to have the property that grid cell values are monotonically increasing downslope along D8 flow directions, so that the resulting stream network is continuous. While this grid is often from an accumulation, other sources such as a maximum upslope function will also produce a suitable grid.

`Threshold` **[number]** This parameter is compared to the value in the Accumulated Stream Source grid (`*ssa`) to determine if the cell should be considered a stream cell. Streams are identified as grid cells for which ssa value is >= this threshold.

Default: *100*

`Mask Grid` **[raster]** Optional.

This optional input is a grid that is used to mask the domain of interest and output is only provided where this grid is >= 0. A common use of this input is to use a D-Infinity contributing area grid as the mask so that the delineated stream network is constrained to areas where D-infinity contributing area is available, replicating the functionality of an edge contamination mask.

Outputs

`Stream Raster Grid` **[raster]** This is an indicator grid (1, 0) that indicates the location of streams, with a value of 1 for each of the stream cells and 0 for the remainder of the cells.

Console usage

```
processing.runalg('taudem:streamdefinitionbythreshold', -ssa, -thresh, -mask, -src)
```

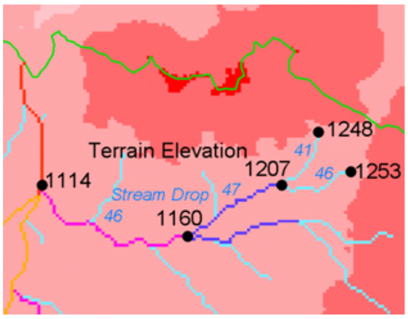
See also

Stream Drop Analysis

Описание

Applies a series of thresholds (determined from the input parameters) to the input accumulated stream source grid (`*ssa`) grid and outputs the results in the `*drp.txt` file the stream drop statistics table. This function is designed to aid in the determination of a geomorphologically objective threshold to be used to delineate streams. Drop Analysis attempts to select the right threshold automatically by evaluating a stream network for a range of thresholds and examining the constant drop property of the resulting Strahler streams. Basically it asks the question: Is the mean stream drop for first order streams statistically different from the mean stream drop for higher order streams, using a T-test. Stream drop is the difference in elevation from the beginning to the end of a stream defined as the sequence of links of the same stream order. If the T-test shows a significant difference then the stream network does not obey this "law" so a larger threshold needs to be chosen. The smallest threshold for which the T-test does not show a significant difference gives the highest resolution stream network that obeys the constant stream drop "law" from geomorphology, and is the threshold chosen for the "objective" or automatic mapping of streams from the DEM. This function can be used in the development of stream network rasters, where the exact watershed characteristic(s) that were accumulated in the accumulated stream source grid vary based on the method being used to determine the stream network raster.

The constant stream drop "law" was identified by Broscoe (1959). For the science behind using this to determine a stream delineation threshold, see Tarboton et al. (1991, 1992), Tarboton and Ames (2001).



Parameters

`D8 Contributing Area Grid` **[raster]** A grid of contributing area values for each cell that were calculated using the D8 algorithm. The contributing area for a cell is the sum of its own contribution plus the contribution from all upslope neighbors that drain to it, measured as a number of cells or the sum of weight loadings. This grid can be obtained as the output of the **"D8 Contributing Area"** tool. This grid is used in the evaluation of drainage density reported in the stream drop table.

`D8 Flow Direction Grid` **[raster]** A grid of D8 flow directions which are defined, for each cell, as the direction of the one of its eight adjacent or diagonal neighbors with the steepest downward slope. This grid can be obtained as the output of the **"D8 Flow Directions"** tool.

`Pit Filled Elevation Grid` **[raster]** A grid of elevation values. This is usually the output of the **"Pit Remove"** tool, in which case it is elevations with pits removed.

`Accumulated Stream Source Grid` **[raster]** This grid must be monotonically increasing along the downslope D8 flow directions. It it compared to a series of thresholds to determine the beginning of the streams. It is often generated by accumulating some characteristic or combination of characteristics of the watershed with the **"D8 Contributing Area"** tool, or using the maximum option of the **"D8 Flow Path Extreme"** tool. The exact method varies depending on the algorithm being used.

`Outlets Shapefile` **[vector: point]** A point shapefile defining the outlets upstream of which drop analysis is performed.

`Minimum Threshold` **[number]** This parameter is the lowest end of the range searched for possible threshold values using drop analysis. This technique looks for the smallest threshold in the range where the absolute value of the t-statistic is less than 2. For the science behind the drop analysis see Tarboton et al. (1991, 1992), Tarboton and Ames (2001).

Default: *5*

`Maximum Threshold` **[number]** This parameter is the highest end of the range searched for possible threshold values using drop analysis. This technique looks for the smallest threshold in the range where the absolute value of the t-statistic is less than 2. For the science behind the drop analysis see Tarboton et al. (1991, 1992), Tarboton and Ames (2001).

Default: *500*

`Number of Threshold Values` **[number]** The parameter is the number of steps to divide the search range into when looking for possible threshold values using drop analysis. This technique looks for the smallest threshold in the range where the absolute value of the t-statistic is less than 2. For the science behind the drop analysis see Tarboton et al. (1991, 1992), Tarboton and Ames (2001).

Default: *10*

`Spacing for Threshold Values` **[selection]** This parameter indicates whether logarithmic or linear spacing should be used when looking for possible threshold values using drop ananlysis.

Options:

- 0 — Logarithmic

- 1 — Linear

Default: *0*

Outputs

`D-Infinity Drop to Stream Grid` **[file]** This is a comma delimited text file with the following header line:

:: Threshold,DrainDen,NoFirstOrd,NoHighOrd,MeanDFirstOrd,MeanDHighOrd,StdDevFirstOrd,StdDevHighOrd

The file then contains one line of data for each threshold value examined, and then a summary line that indicates the optimum threshold value. This technique looks for the smallest threshold in the range where the absolute value of the t-statistic is less than 2. For the science behind the drop analysis, see Tarboton et al. (1991, 1992), Tarboton and Ames (2001).

Console usage

```
processing.runalg('taudem:streamdropanalysis', d8_contrib_area_grid, d8_flow_dir_grid, pit_filled_grid, accum_s
```

See also

- Broscoe, A. J., (1959), "Quantitative analysis of longitudinal stream profiles of small watersheds", Office of Naval Research, Project NR 389-042, Technical Report No. 18, Department of Geology, Columbia University, New York.
- Tarboton, D. G., R. L. Bras and I. Rodriguez-Iturbe, (1991), "On the Extraction of Channel Networks from Digital Elevation Data", Hydrologic Processes, 5(1): 81-100.
- Tarboton, D. G., R. L. Bras and I. Rodriguez-Iturbe, (1992), "A Physical Basis for Drainage Density", Geomorphology, 5(1/2): 59-76.
- Tarboton, D. G. and D. P. Ames, (2001), "Advances in the mapping of flow networks from digital elevation data", World Water and Environmental Resources Congress, Orlando, Florida, May 20-24, ASCE, http://www.engineering.usu.edu/dtarb/asce2001.pdf.

Stream Reach and Watershed

Описание

This tool produces a vector network and shapefile from the stream raster grid. The flow direction grid is used to connect flow paths along the stream raster. The Strahler order of each stream segment is computed. The subwatershed draining to each stream segment (reach) is also delineated and labeled with the value identifier that corresponds to the WSNO (watershed number) attribute in the Stream Reach Shapefile.

This tool orders the stream network according to the Strahler ordering system. Streams that don't have any other streams draining in to them are order 1. When two stream reaches of different order join the order of the downstream reach is the order of the highest incoming reach. When two reaches of equal order join the downstream reach order is increased by 1. When more than two reaches join the downstream reach order is calculated as the maximum of the highest incoming reach order or the second highest incoming reach order + 1. This generalizes the common definition to cases where more than two reaches join at a point. The network topological connectivity is stored in the Stream Network Tree file, and coordinates and attributes from each grid cell along the network are stored in the Network Coordinates file.

The stream raster grid is used as the source for the stream network, and the flow direction grid is used to trace connections within the stream network. Elevations and contributing area are used to determine the elevation and contributing area attributes in the network coordinate file. Points in the outlets shapefile are used to logically split stream reaches to facilitate representing watersheds upstream and downstream of monitoring points. The program uses the attribute field "id" in the outlets shapefile as identifiers in the Network Tree file. This tool then translates the text file vector network representation in the Network Tree and Coordinates files into a shapefile. Further attributes are also evaluated. The program has an option to delineate a single watershed by representing the entire area draining to the Stream Network as a single value in the output watershed grid.

Parameters

`Pit Filled Elevation Grid` **[raster]** A grid of elevation values. This is usually the output of the **"Pit Remove"** tool, in which case it is elevations with pits removed.

`D8 Flow Direction Grid` **[raster]** A grid of D8 flow directions which are defined, for each cell, as the direction of the one of its eight adjacent or diagonal neighbors with the steepest downward slope. This grid can be obtained as the output of the **"D8 Flow Directions"** tool.

`D8 Drainage Area` **[raster]** A grid giving the contributing area value in terms of the number of grid cells (or the summation of weights) for each cell taken as its own contribution plus the contribution from upslope neighbors that drain in to it using the D8 algorithm. This is usually the output of the **"D8 Contributing Area"** tool and is used to determine the contributing area attribute in the Network Coordinate file.

`Stream Raster Grid` **[raster]** An indicator grid indicating streams, by using a grid cell value of 1 on streams and 0 off streams. Several of the **"Stream Network Analysis"** tools produce this type of grid. The Stream Raster Grid is used as the source for the stream network.

`Outlets Shapefile as Network Nodes` **[vector: point]** Optional.

A point shape file defining points of interest. If this file is used, the tool will only deliiniate the stream network upstream of these outlets. Additionally, points in the Outlets Shapefile are used to logically split stream reaches to facilitate representing watersheds upstream and downstream of monitoring points. This tool REQUIRES THAT THERE BE an integer attribute field "id" in the Outlets Shapefile, because the "id" values are used as identifiers in the Network Tree file.

`Delineate Single Watershed` **[boolean]** This option causes the tool to delineate a single watershed by representing the entire area draining to the Stream Network as a single value in the output watershed grid. Otherwise a seperate watershed is delineated for each stream reach. Default is *False* (seperate watershed).

Default: *False*

Outputs

`Stream Order Grid` **[raster]** The Stream Order Grid has cells values of streams ordered according to the Strahler order system. The Strahler ordering system defines order 1 streams as stream reaches that don't have any other reaches draining in to them. When two stream reaches of different order join the order of the downstream reach is the order of the highest incoming reach. When two reaches of equal order join the downstream reach order is increased by 1. When more than two reaches join the downstream reach order is calculated as the maximum of the highest incoming reach order or the second highest incoming reach order + 1. This generalizes the common definition to cases where more than two flow paths reaches join at a point.

`Watershed Grid` **[raster]** This output grid identified each reach watershed with a unique ID number, or in the case where the delineate single watershed option was checked, the entire area draining to the stream network is identified with a single ID.

`Stream Reach Shapefile` **[vector]** This output is a polyline shapefile giving the links in a stream network. The columns in the attribute table are:

- LINKNO — Link Number. A unique number associated with each link (segment of channel between junctions). This is arbitrary and will vary depending on number of processes used
- DSLINKNO — Link Number of the downstream link. -1 indicates that this does not exist
- USLINKNO1 — Link Number of first upstream link. (-1 indicates no link upstream, i.e. for a source link)
- USLINKNO2 — Link Number of second upstream link. (-1 indicates no second link upstream, i.e. for a source link or an internal monitoring point where the reach is logically split but the network does not bifurcate)
- DSNODEID — Node identifier for node at downstream end of stream reach. This identifier corresponds to the "id" attribute from the Outlets shapefile used to designate nodes
- Order — Strahler Stream Order
- Length — Length of the link. The units are the horizontal map units of the underlying DEM grid
- Magnitude — Shreve Magnitude of the link. This is the total number of sources upstream
- DS_Cont_Ar — Drainage area at the downstream end of the link. Generally this is one grid cell upstream of the downstream end because the drainage area at the downstream end grid cell includes the area of the stream being joined
- Drop — Drop in elevation from the start to the end of the link
- Slope — Average slope of the link (computed as drop/length)
- Straight_L — Straight line distance from the start to the end of the link
- US_Cont_Ar — Drainage area at the upstream end of the link
- WSNO — Watershed number. Cross reference to the `*w.shp` and `*w` grid files giving the identification number of the watershed draining directly to the link
- DOUT_END — Distance to the eventual outlet (i.e. the most downstream point in the stream network) from the downstream end of the link
- DOUT_START — Distance to the eventual outlet from the upstream end of the link
- DOUT_MID — Distance to the eventual outlet from the midpoint of the link

`Network Connectivity Tree` **[file]** This output is a text file that details the network topological connectivity is stored in the Stream Network Tree file. Columns are as follows:

- Link Number (Arbitrary — will vary depending on number of processes used)
- Start Point Number in Network coordinates (`*coord.dat`) file (Indexed from 0)
- End Point Number in Network coordinates (`*coord.dat`) file (Indexed from 0)
- Next (Downstream) Link Number. Points to Link Number. -1 indicates no links downstream, i.e. a terminal link
- First Previous (Upstream) Link Number. Points to Link Number. -1 indicates no upstream links
- Second Previous (Upstream) Link Numbers. Points to Link Number. -1 indicates no upstream links. Where only one previous link is -1, it indicates an internal monitoring point where the reach is logically split, but the network does not bifurcate
- Strahler Order of Link
- Monitoring point identifier at downstream end of link. -1 indicates downstream end is not a monitoring point
- Network magnitude of the link, calculated as the number of upstream sources (following Shreve)

`Network Coordinates` **[file]** This output is a text file that contains the coordinates and attributes of points along the stream network. Columns are as follows:

- X coordinate
- Y Coordinate
- Distance along channels to the downstream end of a terminal link
- Elevation
- Contributing area

Console usage

```
processing.runalg('taudem:streamreachandwatershed', -fel, -p, -ad8, -src, -o, -sw, -ord, -w, -net, -tree, -coord
```

See also

.

Глава 19

Компоновщик карты

With the Print Composer you can create nice maps and atlasses that can be printed or saved as PDF-file, an image or an SVG-file. This is a powerfull way to share geographical information produced with QGIS that can be included in reports or published.

The Print Composer provides growing layout and printing capabilities. It allows you to add elements such as the QGIS map canvas, text labels, images, legends, scale bars, basic shapes, arrows, attribute tables and HTML frames. You can size, group, align and position each element and adjust the properties to create your layout. The layout can be printed or exported to image formats, PostScript, PDF or to SVG (export to SVG is not working properly with some recent Qt4 versions; you should try and check individually on your system). You can save the layout as a template and load it again in another session. Finally, generating several maps based on a template can be done through the atlas generator. See a list of tools in table_composer_1:

Иконка	Описание	Иконка	Описание
	Save Project		New Composer
	Duplicate Composer		Composer Manager
	Загрузить из шаблона		Сохранить как шаблон
	Print or export as PostScript		Экспорт в изображение
	Экспорт в SVG		Экспорт в PDF
	Отменить последнее изменение		Вернуть отменённое действие
	Полный охват		Zoom to 100%
	Увеличить		Уменьшить
	Refresh View		
	Pan		Zoom to specific region
	Выбрать/переместить элемент		Переместить содержимое элемента
	Add new map from QGIS map canvas		Добавить изображение
	Добавить текст		Добавить легенду
	Add scale bar to print composition		Добавить фигуру
	Добавить стрелку		Добавить таблицу
	Add an HTML frame		
	Сгруппировать		Разгруппировать
	Lock Selected Items		Unlock All items
	Поднять		Опустить
	На передний план		На задний план
	Выровнять по левым краям		Выровнять по правым краям
	Центрировать		Центрировать по вертикали
	Выровнять по верхним краям		Выровнять по нижним краям
	Preview Atlas		First Feature
	Previous Feature		Next Feature
	Last feature		Print Atlas
	Export Atlas as Image		Atlas Settings

Таблица Composer 1: Инструменты Компоновщика карты

All Print Composer tools are available in menus and as icons in a toolbar. The toolbar can be switched off and on using the right mouse button over the toolbar.

19.1 First steps

19.1.1 Открытие новой компоновки

Before you start to work with the Print Composer, you need to load some raster and vector layers in the QGIS map canvas and adapt their properties to suit your own convenience. After everything is rendered and symbolized to your liking, click the New Print Composer icon in the toolbar or choose *File* → *New*

Print Composer. You will be prompted to choose a title for the new Composer.

19.1.2 Overview of the Print Composer

Opening the Print Composer provides you with a blank canvas that represents the paper surface when using the print option. Initially you find buttons on the left beside the canvas to add map composer items; the current QGIS map canvas, text labels, images, legends, scale bars, basic shapes, arrows, attribute tables and HTML frames. In this toolbar you also find toolbar buttons to navigate, zoom in on an area and pan the view on the composer and toolbar buttons to select a map composer item and to move the contents of the map item.

Figure_composer_overview shows the initial view of the Print Composer before any elements are added.

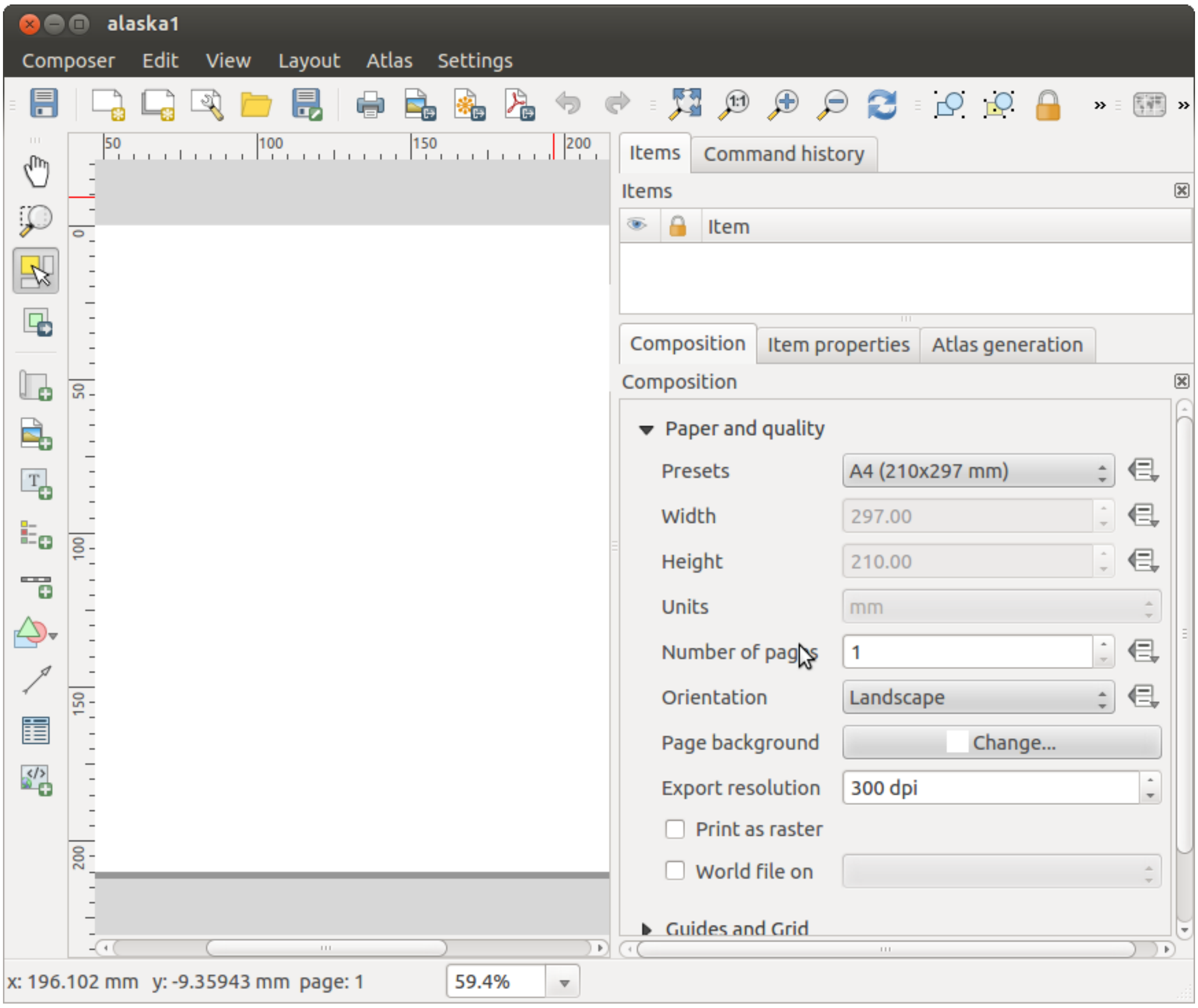


Рис. 19.1: Print Composer

On the right beside the canvas you find two panels. The upper panel holds the tabs *Items* and *Command History* and the lower panel holds the tabs *Composition*, *Item properties* and *Atlas generation*.

- The *Items* tab provides a list of all map composer items added to the canvas.
- The *Command history* tab displays a history of all changes applied to the Print Composer layout. With a mouse click, it is possible to undo and redo layout steps back and forth to a certain status.
- The *Composition* tab allows you to set paper size, orientation, the page background, number of pages and print quality for the output file in dpi. Furthermore, you can also activate the *Print*

as raster checkbox. This means all items will be converted to raster before printing or saving as PostScript or PDF. In this tab, you can also customize settings for grid and smart guides.

- The *Item Properties* tab displays the properties for the selected item. Click the Select/Move item icon to select an item (e.g., legend, scale bar or label) on the canvas. Then click the *Item Properties* tab and customize the settings for the selected item.
- The *Atlas generation* tab allows you to enable the generation of an atlas for the current Composer and gives access to its parameters.
- Finally, you can save your print composition with the Save Project button.

In the bottom part of the Print Composer window, you can find a status bar with mouse position, current page number and a combo box to set the zoom level.

You can add multiple elements to the Composer. It is also possible to have more than one map view or legend or scale bar in the Print Composer canvas, on one or several pages. Each element has its own properties and, in the case of the map, its own extent. If you want to remove any elements from the Composer canvas you can do that with the `Delete` or the `Backspace` key.

Инструменты навигации

To navigate in the canvas layout, the Print Composer provides some general tools:

- Увеличить
- Уменьшить
- Zoom to full extent
- Zoom to 100%
- Refresh the view (if you find the view in an inconsistent state)
- Pan composer
- Marquee zoom mode (zoom to a specific region of the Composer)

You can change the zoom level also using the mouse wheel or the combo box in the status bar. If you need to switch to pan mode while working in the Composer area, you can hold the `Spacebar` or the the mouse wheel. With `Ctrl+Spacebar`, you can temporarily switch to marquee zoom mode, and with `Ctrl+Shift+Spacebar`, to zoom out mode.

19.1.3 Sample Session

To demonstrate how to create a map please follow the next instructions.

1. On the left site, select the Add new map toolbar button and draw a rectangle on the canvas holding down the left mouse button. Inside the drawn rectangle the QGIS map view to the canvas.
2. Select the Add new scalebar toolbar button and place the map item with the left mouse button on the Print Composer canvas. A scalebar will be added to the canvas.
3. Select the Add new legend toolbar button and draw a rectangle on the canvas holding down the left mouse button. Inside the drawn rectangle the legend will be drawn.
4. Select the Select/Move item icon to select the map on the canvas and move it a bit.

5. While the map item is still selected you can also change the size of the map item. Click while holding down the left mouse button, in a white little rectangle in one of the corners of the map item and draw it to a new location to change it's size.
6. Click the *Item Properties* tab on the left lower panel and find the setting for the orientation. Change it the value of the setting *Map orientation* to '15.00° '. You should see the orientation of the map item change.
7. Finally, you can save your print composition with the Save Project button.

19.1.4 Print Composer Options

From *Settings* → *Composer Options* you can set some options that will be used as default during your work.

- *Compositions defaults* let you specify the default font to use.
- With *Grid appearance*, you can set the grid style and its color.
- *Grid defaults* defines spacing, offset and tolerance of the grid. There are three types of grid: **Dots**, **Solid** lines and **Crosses**.
- *Guide defaults* defines the tolerance for the guides.

19.1.5 Composition tab — General composition setup

In the *Composition* tab, you can define the global settings of your composition.

- You can choose one of the *Presets* for your paper sheet, or enter your custom *width* and *height*.
- Composition can now be divided into several pages. For instance, a first page can show a map canvas, and a second page can show the attribute table associated with a layer, while a third one shows an HTML frame linking to your organization website. Set the *Number of pages* to the desired value. You can choose the page *Orientation* and its *Exported resolution*. When checked, *print as raster* means all elements will be rasterized before printing or saving as PostScript or PDF.
- *Grid* lets you customize grid settings like *spacings*, *offsets* and *tolerance* to your need.
- In *Snap to alignments*, you can change the *Tolerance*, which is the maximum distance below which an item is snapped to smart guides.

Snap to grid and/or to smart guides can be enabled from the *View* menu. In this menu, you can also hide or show the grid and smart guides.

19.1.6 Composer items common options

Composer items have a set of common properties you will find on the bottom of the *Item Properties* tab: Position and size, Rotation, Frame, Background, Item ID and Rendering (See figure_composer_common_1).

- The *Position and size* dialog lets you define size and position of the frame that contains the item. You can also choose which *Reference point* will be set at the **X** and **Y** coordinates previously defined.
- The *Rotation* sets the rotation of the element (in degrees).
- The *Frame* shows or hides the frame around the label. Click on the **[Color]** and **[Thickness]** buttons to adjust those properties.
- The *Background* enables or disables a background color. Click on the **[Color...]** button to display a dialog where you can pick a color or choose from a custom setting. Transparency can also be adjusted throught the **alpha** field.

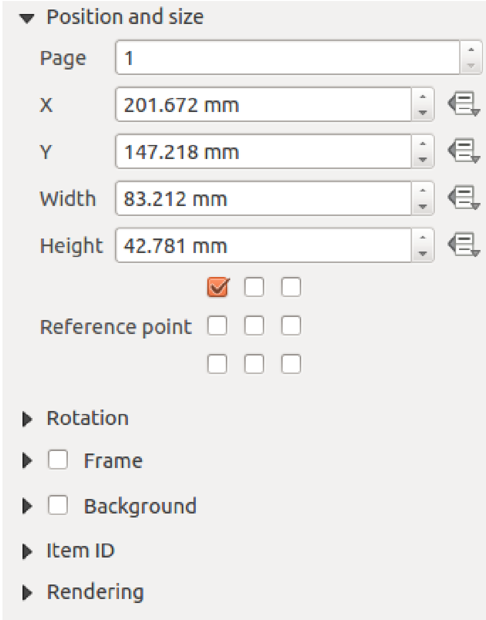


Рис. 19.2: Common Item properties Dialogs

- Use the *Item ID* to create a relationship to other Print Composer items. This is used with QGIS server and any potential web client. You can set an ID on an item (e.g., a map and a label), and then the web client can send data to set a property (e.g., label text) for that specific item. The GetProjectSettings command will list what items and which IDs are available in a layout.
- *Rendering* mode can be selected in the option field. See Rendering_Mode.

Примечание:

- If you checked *Use live-updating color chooser dialogs* in the QGIS general options, the color button will update as soon as you choose a new color from **Color Dialog** windows. If not, you need to close the **Color Dialog**.
- The Data defined override icon next to a field means that you can associate the field with data in the map item or use expressions. These are particularly helpful with atlas generation (See atlas_data_defined_overrides).

19.2 Rendering mode

QGIS now allows advanced rendering for Composer items just like vector and raster layers.

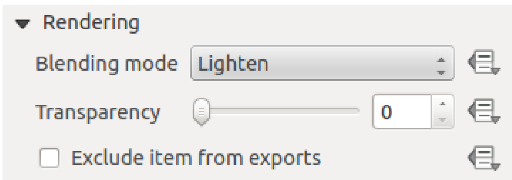


Рис. 19.3: Rendering mode

- *Transparency* : You can make the underlying item in the Composer visible with this tool. Use the slider to adapt the visibility of your item to your needs. You can also make a precise definition of the percentage of visibility in the the menu beside the slider.

- *Exclude item from exports*: You can decide to make an item not visible in all exports. After activating this checkbox, the item will not be included in PDF's, prints etc..
- *Blending mode*: You can achieve special rendering effects with these tools that you previously only may know from graphics programs. The pixels of your overlaying and underlaying items are mixed through the settings described below.
  - Normal: This is the standard blend mode, which uses the alpha channel of the top pixel to blend with the pixel beneath it; the colors aren't mixed.
  - Lighten: This selects the maximum of each component from the foreground and background pixels. Be aware that the results tend to be jagged and harsh.
  - Screen: Light pixels from the source are painted over the destination, while dark pixels are not. This mode is most useful for mixing the texture of one layer with another layer (e.g., you can use a hillshade to texture another layer).
  - Dodge: Dodge will brighten and saturate underlying pixels based on the lightness of the top pixel. So, brighter top pixels cause the saturation and brightness of the underlying pixels to increase. This works best if the top pixels aren't too bright; otherwise the effect is too extreme.
  - Addition: This blend mode simply adds pixel values of one layer with pixel values of the other. In case of values above 1 (as in the case of RGB), white is displayed. This mode is suitable for highlighting features.
  - Darken: This creates a resultant pixel that retains the smallest components of the foreground and background pixels. Like lighten, the results tend to be jagged and harsh.
  - Multiply: Here, the numbers for each pixel of the top layer are multiplied with the numbers for the corresponding pixel of the bottom layer. The results are darker pictures.
  - Burn: Darker colors in the top layer cause the underlying layers to darken. Burn can be used to tweak and colorise underlying layers.
  - Overlay: This mode combines the multiply and screen blending modes. In the resulting picture, light parts become lighter and dark parts become darker.
  - Soft light: This is very similar to overlay, but instead of using multiply/screen it uses color burn/dodge. This mode is supposed to emulate shining a soft light onto an image.
  - Hard light: Hard light is very similar to the overlay mode. It's supposed to emulate projecting a very intense light onto an image.
  - Difference: Difference subtracts the top pixel from the bottom pixel, or the other way around, to always get a positive value. Blending with black produces no change, as the difference with all colors is zero.
  - Subtract: This blend mode simply subtracts pixel values of one layer with pixel values of the other. In case of negative values, black is displayed.

19.3 Composer Items

19.3.1 The Map item

Click on the Add new map toolbar button in the Print Composer toolbar to add the QGIS map canvas. Now, drag a rectangle onto the Composer canvas with the left mouse button to add the map. To display the current map, you can choose between three different modes in the map *Item Properties* tab:

- **Прямоугольник** является режимом по умолчанию. Отображается пустой прямоугольник с текстом «Место изображения карты».
- **Cache** renders the map in the current screen resolution. If you zoom the Composer window in or out, the map is not rendered again but the image will be scaled.

- **Render** means that if you zoom the Composer window in or out, the map will be rendered again, but for space reasons, only up to a maximum resolution.

Cache is the default preview mode for newly added Print Composer maps.

You can resize the map element by clicking on the Select/Move item button, selecting the element, and dragging one of the blue handles in the corner of the map. With the map selected, you can now adapt more properties in the map *Item Properties* tab.

To move layers within the map element, select the map element, click the Move item content icon and move the layers within the map item frame with the left mouse button. After you have found the right place for an item, you can lock the item position within the Print Composer canvas. Select the map item and use the toolbar Lock Selected Items or the *Items* tab to Lock the item. A locked item can only be selected using the *Items* tab. Once selected you can use the *Items* tab to unlock individual items. The Unlock All Items icon will unlock all locked composer items.

Main properties

The *Main properties* dialog of the map *Item Properties* tab provides the following functionalities (see figure_composer_map_1):

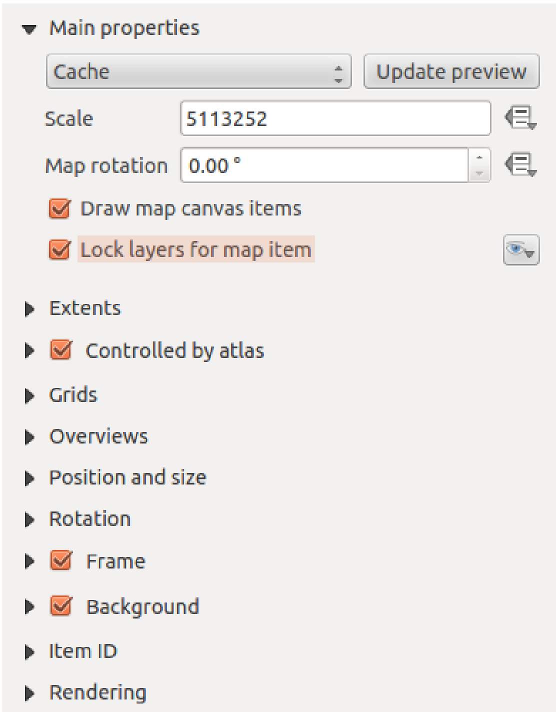


Рис. 19.4: Map Item properties Tab

- The **Preview** area allows you to define the preview modes 'Rectangle', 'Cache' and 'Render', as described above. If you change the view on the QGIS map canvas by changing vector or raster properties, you can update the Print Composer view by selecting the map element in the Print Composer and clicking the **[Update preview]** button.
- The field *Scale* 1,00 sets a manual scale.
- The field *Rotation* 1,00 allows you to rotate the map element content clockwise in degrees. Note that a coordinate frame can only be added with the default value 0.

- *Draw map canvas items* lets you show annotations that may be placed on the map canvas in the main QGIS window.
- You can choose to lock the layers shown on a map item. Check *Lock layers for map item*. After this is checked, any layer that would be displayed or hidden in the main QGIS window will not appear or be hidden in the map item of the Composer. But style and labels of a locked layer are still refreshed according to the main QGIS interface.
- The button allows you to add quickly all the presets views you have prepared in QGIS. Clicking on the button you will see the list of all the preset views: just select the preset you want to display. The map canvas will automatically lock the preset layers by enabling the *Lock layers for map item*: if you want to unselect the preset, just uncheck the and press on the button. See *Легенда* to find out how to create presets views.

Extents

The *Extents* dialog of the map item tab provides the following functionalities (see figure_composer_map_2):

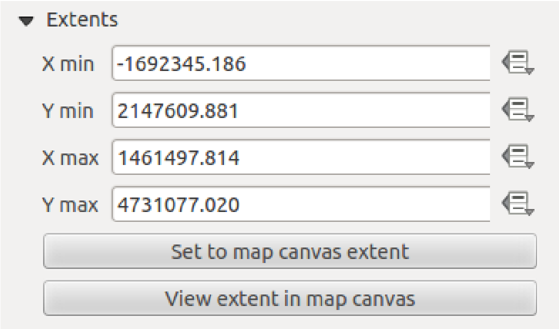


Рис. 19.5: Map Extents Dialog

- The **Map extents** area allows you to specify the map extent using X and Y min/max values and by clicking the **[Set to map canvas extent]** button. This button sets the map extent of the composer map item to the extent of the current map view in the main QGIS application. The button **[View extent in map canvas]** does exactly the opposite, it updates the extent of the map view in the QGIS application to the extent of the composer map item.

If you change the view on the QGIS map canvas by changing vector or raster properties, you can update the Print Composer view by selecting the map element in the Print Composer and clicking the **[Update preview]** button in the map *Item Properties* tab (see figure_composer_map_1).

Grids

The *Grids* dialog of the map *Item Properties* tab provides the the possibility to add several grids to a map item.

- With the plus and minus button you can add or remove a selected grid.
- With the up and down button you can move a grid in the list and set the drawing priority.

When you double click on the added grid you can give it another name.

After you have added a grid, you can active the checkbox *Show grid* to overlay a grid onto the map element. Expand this option to provides a lot of configuration options, see Figure_composer_map_4.

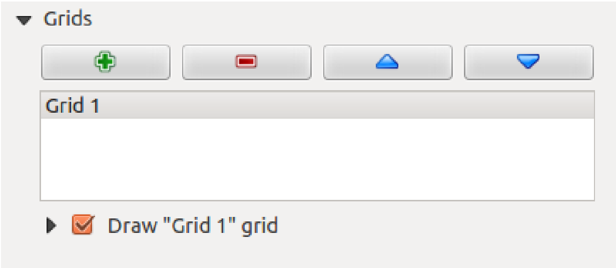


Рис. 19.6: Map Grids Dialog

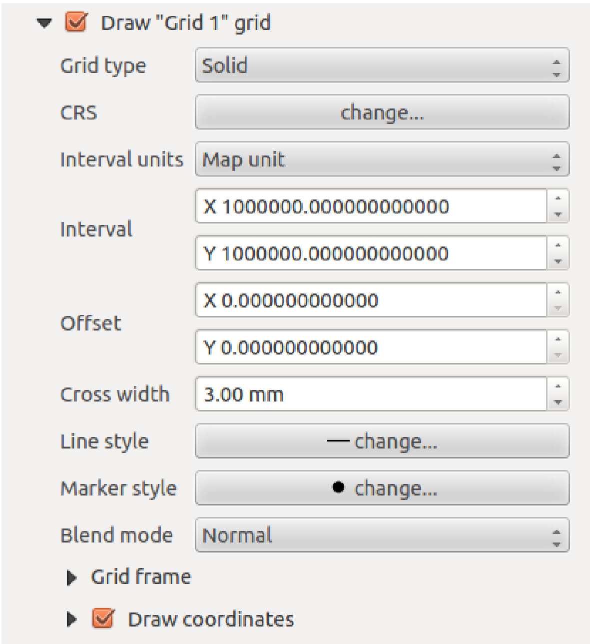


Рис. 19.7: Draw Grid Dialog

As grid type, you can specify to use a solid line or cross. Symbology of the grid can be chosen. See section Rendering_Mode. Furthermore, you can define an interval in the X and Y directions, an X and Y offset, and the width used for the cross or line grid type.

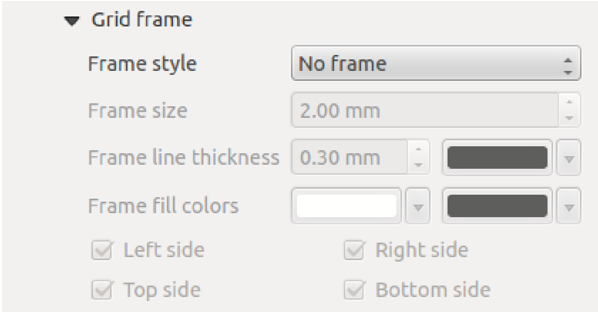


Рис. 19.8: Grid Frame Dialog

- There are different options to style the frame that holds the map. Following options are available: No Frame, Zebra, Interior ticks, Exterior ticks, Interior and Exterior ticks and Lineborder.
- Advanced rendering mode is also available for grids (see section Rendering_mode).
- The *Draw coordinates* checkbox allows you to add coordinates to the map frame. The annotation can be drawn inside or outside the map frame. The annotation direction can be defined as horizontal, vertical, horizontal and vertical, or boundary direction, for each border individually. Units can be in meters or in degrees. Finally, you can define the grid color, the annotation font, the annotation distance from the map frame and the precision of the drawn coordinates.

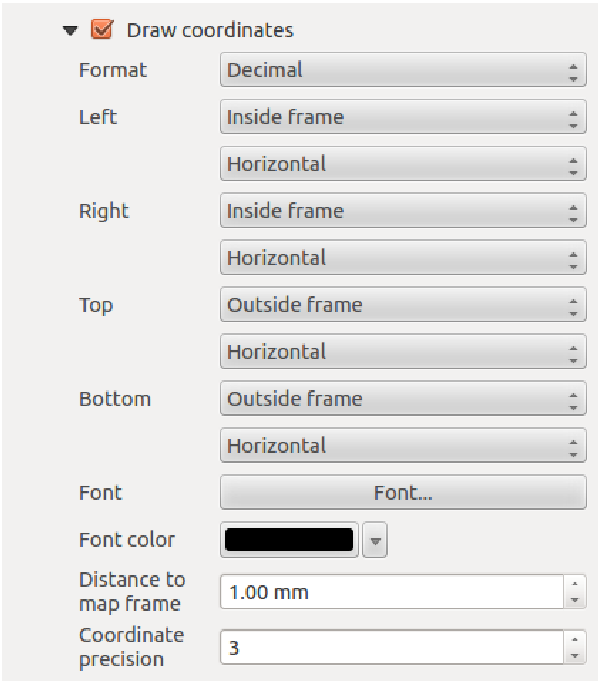


Рис. 19.9: Grid Draw Coordinates dialog

Overviews

The *Overviews* dialog of the map *Item Properties* tab provides the following functionalities:

You can choose to create an overview map, which shows the extents of the other map(s) that are available in the composer. First you need to create the map(s) you want to include in the overview map. Next you

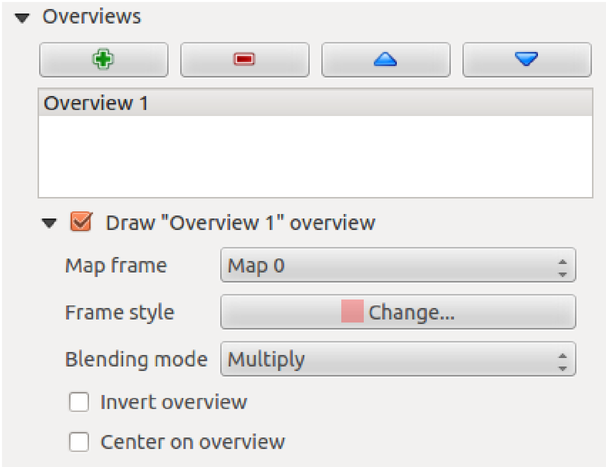


Рис. 19.10: Map Overviews Dialog

create the map you want to use as the overview map, just like a normal map.

- With the plus and minus button you can add or remove an overview.
- With the up and down button you can move an overview in the list and set the drawing priority.

Open *Overviews* and press the green plus icon-button to add an overview. Initially this overview is named 'Overview 1' (see Figure_composer_map_7). You can change the name when you double-click on the overview item in the list named 'Overview 1' and change it to another name.

When you select the overview item in the list you can customize it.

- The *Draw "<name_overview>" overview* needs to be activated to draw the extent of selected map frame.
- The *Map frame* combo list can be used to select the map item whose extents will be drawn on the present map item.
- The *Frame Style* allows you to change the style of the overview frame.
- The *Blending mode* allows you to set different transparency blend modes. See Rendering_Mode.
- The *Invert overview* creates a mask around the extents when activated: the referenced map extents are shown clearly, whereas everything else is blended with the frame color.
- The *Center on overview* puts the extent of the overview frame in the center of the overview map. You can only activate one overview item to center, when you have added several overviews.

19.3.2 The Label item

To add a label, click the Add label icon, place the element with the left mouse button on the Print Composer canvas and position and customize its appearance in the label *Item Properties* tab.

The *Item Properties* tab of a label item provides the following functionality for the label item (see Figure_composer_label):

Main properties

- The main properties dialog is where the text (HTML or not) or the expression needed to fill the label is added to the Composer canvas.

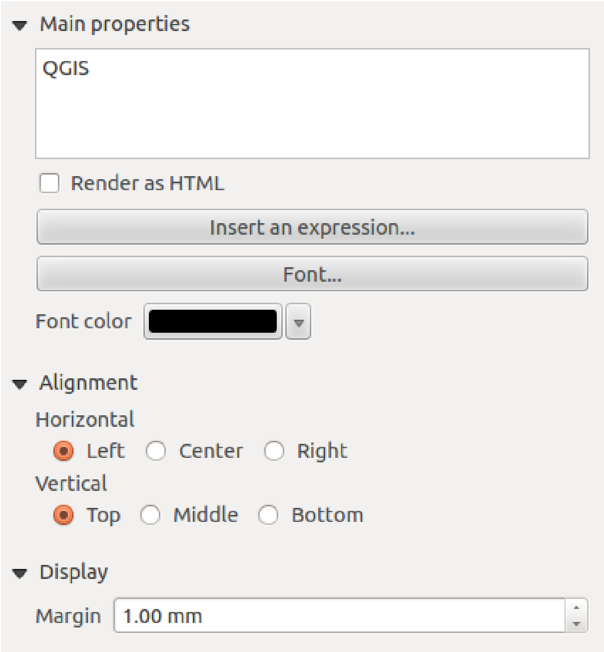


Рис. 19.11: Label Item properties Tab

- Labels can be interpreted as HTML code: check *Render as HTML*. You can now insert a URL, a clickable image that links to a web page or something more complex.
- You can also insert an expression. Click on **[Insert an expression]** to open a new dialog. Build an expression by clicking the functions available in the left side of the panel. Two special categories can be useful, particularly associated with the atlas functionality: geometry functions and records functions. At the bottom, a preview of the expression is shown.
- Define *Font* by clicking on the **[Font...]** button or a *Font color* selecting a color using the color selection tool.

Alignment and Display

- You can define the horizontal and vertical alignment in the *Alignment* zone.
- In the **Display** tag, you can define a margin in mm. This is the margin from the edge of the composer item.

19.3.3 The Image item

To add an image, click the Add image icon, place the element with the left mouse button on the Print Composer canvas and position and customize its appearance in the image *Item Properties* tab.

The image *Item Properties* tab provides the following functionalities (see figure_composer_image_1):

You first have to select the image you want to display. There are several ways to set the *image source* in the **Main properties** area.

1. Use the browse button ... of *image source* to select a file on your computer using the browse dialog. The browser will start in the SVG-libraries provided with QGIS. Besides `SVG`, you can also select other image formats like `.png` or `.jpg`.
2. You can enter the source directly in the *image source* text field. You can even provide a remote URL-address to an image.

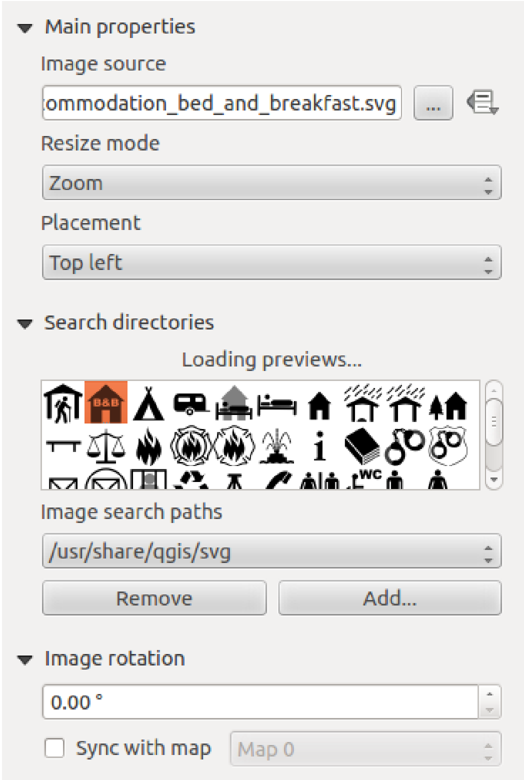


Рис. 19.12: Image Item properties Tab

3. From the **Search directories** area you can also select an image from *loading preview..* to set the image source.

4. Use the data defined button to set the image source from a record or using a regular expression.

With the *Resize mode* option, you can set how the image is displayed when the frame is changed, or choose to resize the frame of the image item so it matches the original size of the image.

You can select one of the following modes:

- Zoom: Enlarges the image to the frame while maintaining aspect ratio of picture.
- Stretch: Stretches image to fit inside the frame, ignores aspect ratio.
- Clip: Use this mode for raster images only, it sets the size of the image to original image size without scaling and the frame is used to clip the image, so only the part of the image inside the frame is visible.
- Zoom and resize frame: Enlarges image to fit frame, then resizes frame to fit resultant image.
- Resize frame to image size: Sets size of frame to match original size of image without scaling.

Selected resize mode can disable the item options 'Placement' and 'Image rotation'. The *Image rotation* is active for the resize mode 'Zoom' and 'Clip'.

With *Placement* you can select the position of the image inside it's frame. The **Search directories** area allows you to add and remove directories with images in SVG format to the picture database. A preview of the pictures found in the selected directories is shown in a pane and can be used to select and set the image source.

Images can be rotated with the *Image rotation* field. Activating the *Sync with map* checkbox synchronizes the rotation of a picture in the QGIS map canvas (i.e., a rotated north arrow) with the appropriate Print Composer image.

It is also possible to select a north arrow directly. If you first select a north arrow image from **Search directories** and then use the browse button [...] of the field *Image source*, you can now select one of the north arrow from the list as displayed in figure_composer_image_2.

Примечание: Many of the north arrows do not have an 'N' added in the north arrow, this is done on purpose for languages that do not use an 'N' for North, so they can use another letter.

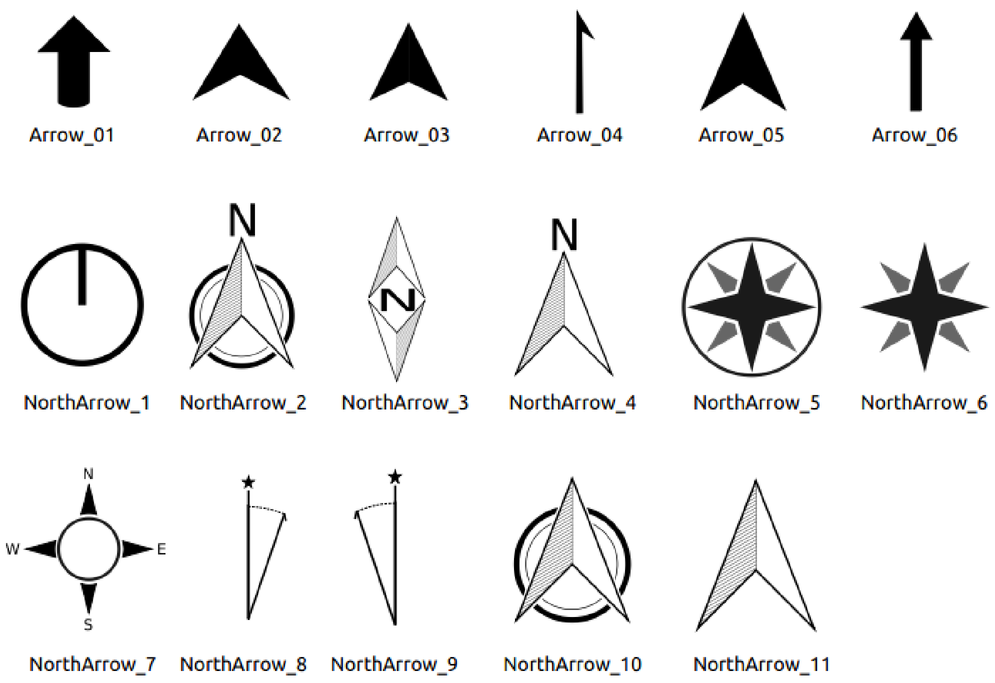


Рис. 19.13: North arrows available for selection in provided SVG library

19.3.4 The Legend item

To add a map legend, click the Add new legend icon, place the element with the left mouse button on the Print Composer canvas and position and customize the appearance in the legend *Item Properties* tab.

The *Item properties* of a legend item tab provides the following functionalities (see figure_composer_legend_1):

Main properties

The *Main properties* dialog of the legend *Item Properties* tab provides the following functionalities (see figure_composer_legend_2):

In Main properties you can:

- Change the title of the legend.
- Set the title alignment to Left, Center or Right.
- You can choose which *Map* item the current legend will refer to in the select list.
- You can wrap the text of the legend title on a given character.

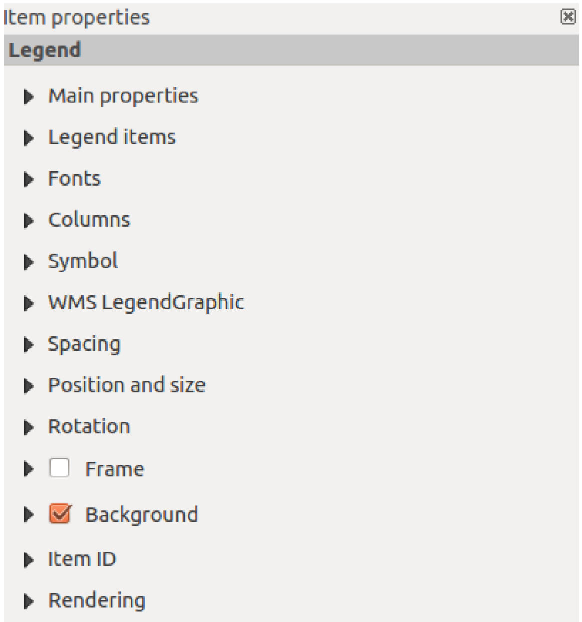


Рис. 19.14: Legend Item properties Tab

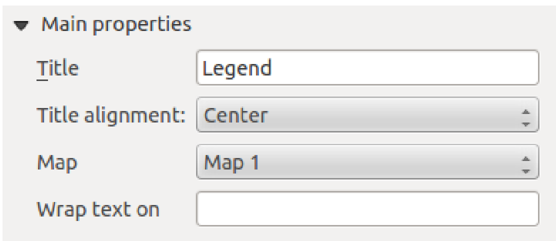


Рис. 19.15: Legend Main properties Dialog

Legend items

The *Legend items* dialog of the legend *Item Properties* tab provides the following functionalities (see figure_composer_legend_3):

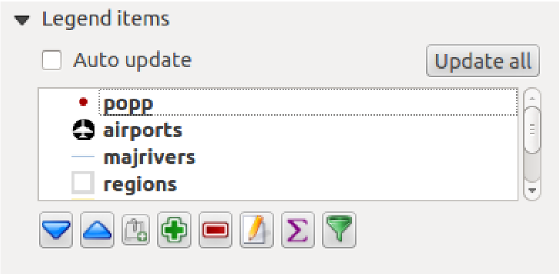


Рис. 19.16: Legend Legend Items Dialog

- The legend will be updated automatically if *Auto-update* is checked. When *Auto-update* is unchecked this will give you more control over the legend items. The icons below the legend items list will be activated.
- The legend items window lists all legend items and allows you to change item order, group layers, remove and restore items in the list, edit layer names and add a filter.
  - The item order can be changed using the **[Up]** and **[Down]** buttons or with 'drag-and-drop' functionality. The order can not be changed for WMS legend graphics.
  - Use the **[Add group]** button to add a legend group.
  - Use the **[plus]** and **[minus]** button to add or remove layers.
  - The **[Edit]** button is used to edit the layer-, groupname or title, first you need to select the legend item.
  - The **[Sigma]** button adds a feature count for each vector layer.
  - Use the **[filter]** button the filter the legend by map content, only the legend items visible in the map will be listed in the legend.

  After changing the symbology in the QGIS main window, you can click on **[Update]** to adapt the changes in the legend element of the Print Composer.

Fonts, Columns, Symbol

The *Fonts*, *Columns* and *Symbol* dialogs of the legend *Item Properties* tab provide the following functionalities (see figure_composer_legend_4):

- You can change the font of the legend title, group, subgroup and item (layer) in the legend item. Click on a category button to open a **Select font** dialog.
- You provide the labels with a **Color** using the advanced color picker, however the selected color will be given to all font items in the legen..
- Legend items can be arranged over several columns. Set the number of columns in the *Count* 1,00 field.
  - *Equal column widths* sets how legend columns should be adjusted.
  - The *Split layers* option allows a categorized or a graduated layer legend to be divided between columns.
- You can change the width and height of the legend symbol in this dialog.

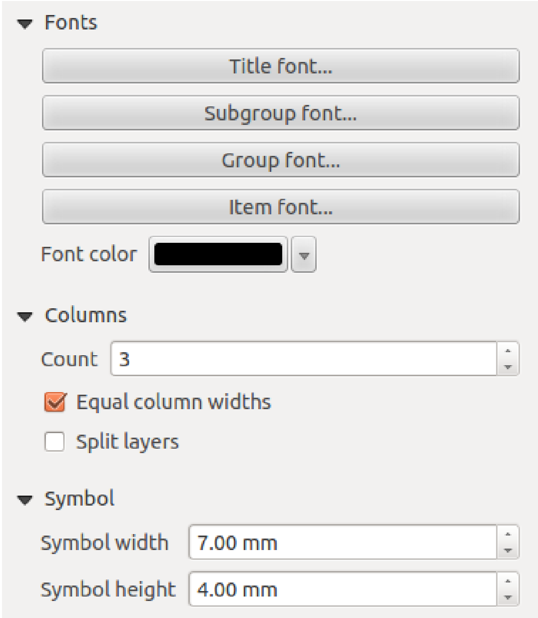


Рис. 19.17: Legend Fonts, Columns, Symbol and Spacing Dialogs

WMS legendGraphic and Spacing

The *WMS legendGraphic* and *Spacing* dialogs of the legend *Item Properties* tab provide the following functionalities (see figure_composer_legend_5):

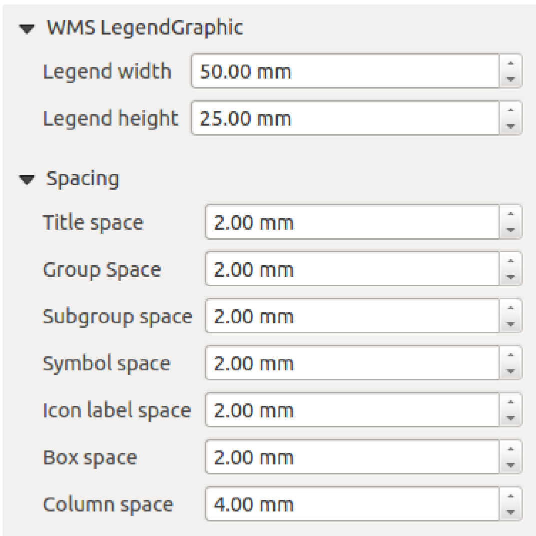


Рис. 19.18: WMS legendGraphic Dialogs

When you have added a WMS layer and you insert a legend composer item, a request will be send to the WMS server to provide a WMS legend, This Legend will only be shown if the WMS server provides the GetLegendGraphic capability. The WMS legend content will be provided as a raster image.

WMS legendGraphic is used to be able to adjust the *Legend width* and the *legend hight* of the WMS legend raster image.

Spacing around title, group, subgroup, symbol, icon label, box space or column space can be customized through this dialog.

19.3.5 The Scale Bar item

To add a scale bar, click the Add new scalebar icon, place the element with the left mouse button on the Print Composer canvas and position and customize the appearance in the scale bar *Item Properties* tab.

The *Item properties* of a scale bar item tab provides the following functionalities (see figure_composer_scalebar_1):

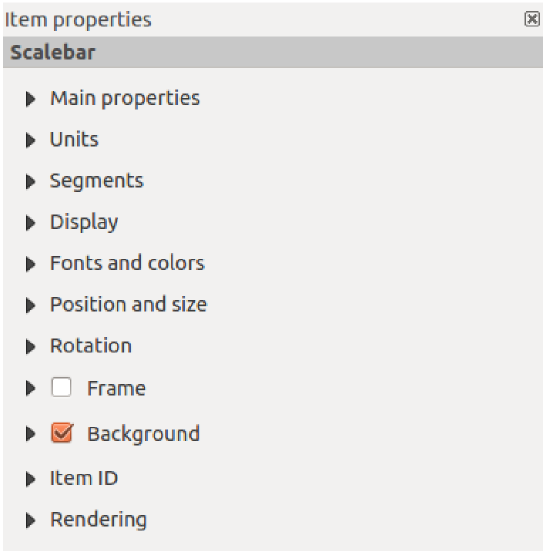


Рис. 19.19: Scale Bar Item properties Tab

Main properties

The *Main properties* dialog of the scale bar *Item Properties* tab provides the following functionalities (see figure_composer_scalebar_2):

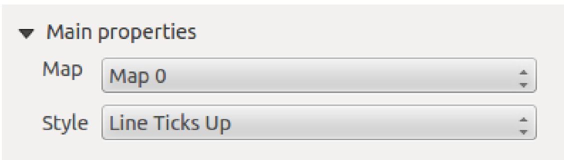


Рис. 19.20: Scale Bar Main properties Dialog

- First, choose the map the scale bar will be attached to.
- Then, choose the style of the scale bar. Six styles are available:
  - **Single box** and **Double box** styles, which contain one or two lines of boxes alternating colors.
  - **Middle**, **Up** or **Down** line ticks.
  - **Numeric**, where the scale ratio is printed (i.e., 1:50000).

Units and Segments

The *Units* and *Segments* dialogs of the scale bar *Item Properties* tab provide the following functionalities (see figure_composer_scalebar_3):

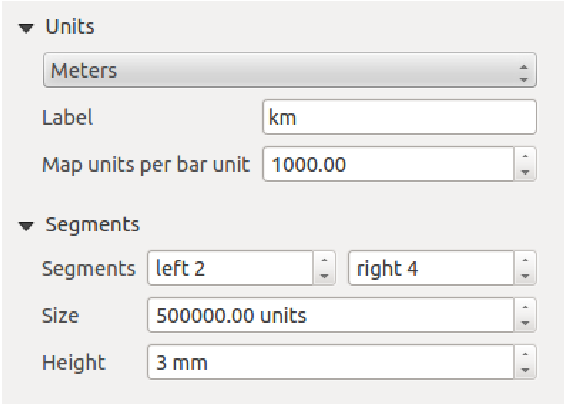


Рис. 19.21: Scale Bar Units and Segments Dialogs

In these two dialogs, you can set how the scale bar will be represented.

- Select the map units used. There are four possible choices: **Map Units** is the automated unit selection; **Meters**, **Feet** or **Nautical Miles** force unit conversions.
- The *Label* field defines the text used to describe the units of the scale bar.
- The *Map units per bar unit* allows you to fix the ratio between a map unit and its representation in the scale bar.
- You can define how many *Segments* will be drawn on the left and on the right side of the scale bar, and how long each segment will be (*Size* field). *Height* can also be defined.

Display

The *Display* dialog of the scale bar *Item Properties* tab provide the following functionalities (see figure_composer_scalebar_4):

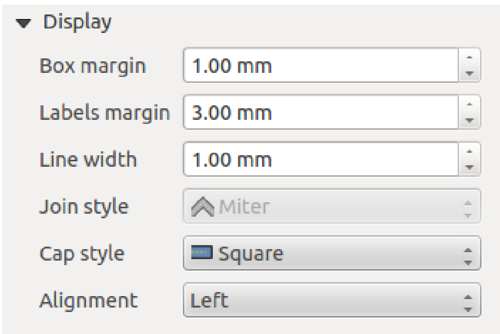


Рис. 19.22: Scale Bar Display

You can define how the scale bar will be displayed in its frame.

- *Box margin* : space between text and frame borders
- *Labels margin* : space between text and scale bar drawing
- *Line width* : line widht of the scale bar drawing
- *Join style* : Corners at the end of scalebar in style Bevel, Rounded or Square (only available for Scale bar style Single Box & Double Box)
- *Cap style* : End of all lines in style Square, Round or Flat (only available for Scale bar style Line Ticks Up, Down and Middle)

- *Alignment* : Puts text on the left, middle or right side of the frame (works only for Scale bar style Numeric)

Fonts and colors

The *Fonts and colors* dialog of the scale bar *Item Properties* tab provide the following functionalities (see figure_composer_scalebar_5):

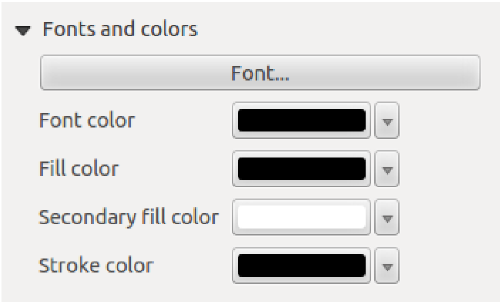


Рис. 19.23: Scale Bar Fonts and colors Dialogs 

You can define the fonts and colors used for the scale bar.

- Use the **[Font]** button to set the font
- *Font color*: set the font color
- *Fill color*: set the first fill color
- *Secondary fill color*: set the second fill color
- *Stroke color*: set the color of the lines of the Scale Bare

Fill colors are only used for scale box styles Single Box and Double Box. To select a color you can use the list option using the dropdown arrow to open a simple color selection option or the more advanced color selection option, that is started when you click in the colored box in the dialog.

19.3.6 The Basic Shape Items

To add a basic shape (ellipse, rectangle, triangle), click the  Add basic shape icon or the  Add Arrow icon, place the element holding down the left mouse. Customize the appearance in the *Item Properties* tab.

When you also hold down the `Shift` key while placing the basic shape you can create a perfect square, circle or triangle.

The *Shape* item properties tab allows you to select if you want to draw an ellipse, rectangle or triangle inside the given frame.

You can set the style of the shape using the advanced symbol style dialog with which you can define its outline and fill color, fill pattern, use markers etcetera.

For the rectangle shape, you can set the value of the corner radius to round of the corners.

Примечание: Unlike other items, you can not style the frame or the background color of the frame.

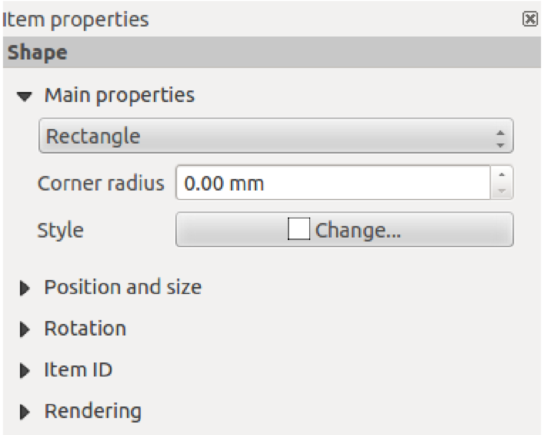


Рис. 19.24: Shape Item properties Tab

19.3.7 The Arrow item

To add an arrow, click the Add Arrow icon, place the element holding down the left mouse button and drag a line to draw the arrow on the Print Composer canvas and position and customize the appearance in the scale bar *Item Properties* tab.

When you also hold down the `Shift` key while placing the arrow, it is placed in an angle of exactly 45° .

The arrow item can be used to add a line or a simple arrow that can be used, for example, to show the relation between other print composer items. To create a north arrow, the image item should be considered first. QGIS has a set of North arrows in SVG format. Furthermore you can connect an image item with a map so it can rotate automatically with the map (see the_image_item).

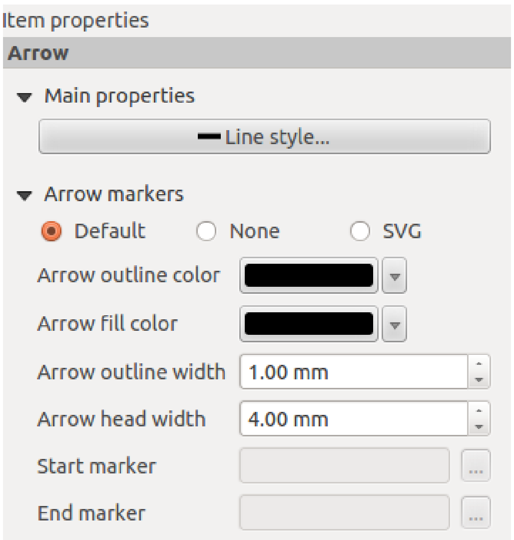


Рис. 19.25: Arrow Item properties Tab

Item Properties

The *Arrow* item properties tab allows you to configure an arrow item.

The **[Line style ...]** button can be used to set the line style using the line style symbol editor.

In *Arrows markers* you can select one of three radio buttons.

- *Default* : To draw a regular arrow, gives you options to style the arrow head
- *None* : To draw a line without arrow head
- *SVG Marker* : To draw a line with an SVG *Start marker* and/or *End marker*

For *Default* Arrow marker you can use following options to style the arrow head.

- *Arrow outline color* : Set the outline color of the arrow head
- *Arrow fill color* : Set the fill color of the arrow head
- *Arrow outline width* : Set the outline width of the arrow head
- *Arrow head width*: Set the size of the arrow head

For *SVG Marker* you can use following options.

- *Start marker* : Choose an SVG image to draw at the beginning of the line
- *End marker* : Choose an SVG image to draw at the end of the line
- *Arrow head width*: Sets the size of Start and/or headmarker

SVG images are automatically rotated with the line. The color of the SVG image can not be changed.

19.3.8 The Attribute Table item

It is possible to add parts of a vector attribute table to the Print Composer canvas: Click the Add attribute table icon, place the element with the left mouse button on the Print Composer canvas, and position and customize the appearance in the *Item Properties* tab.

The *Item properties* of an attribute table item tab provides the following functionalities (see figure_composer_table_1):

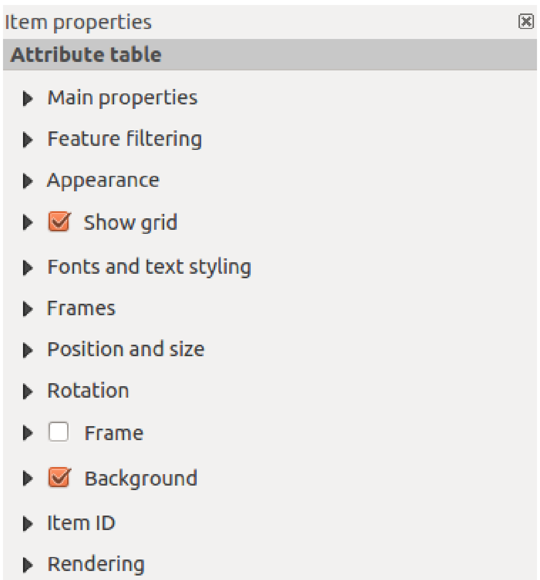


Рис. 19.26: Attribute table Item properties Tab

Main properties

The *Main properties* dialogs of the attribute table *Item Properties* tab provide the following functionalities (see figure_composer_table_2):

- For *Source* you can normally select only 'Layer features'.

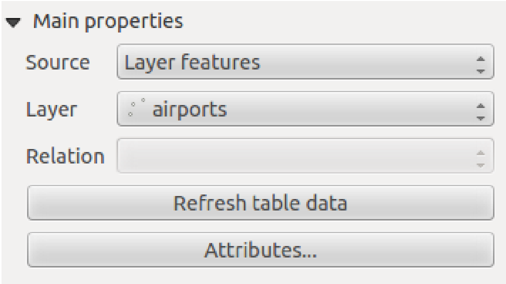


Рис. 19.27: Attribute table Main properties Dialog

- With *Layer* you can choose from the vector layers loaded in the project.
- The button **[Refresh table data]** can be used to refresh the table when the actual contents of the table has changed.
- The button **[Attributes...]** starts the *Select attributes* menu, see figure_composer_table_3, that can be used to change the visible contents of the table. After making changes use the **[OK]** button to apply changes to the table.

  In the *Columns* section you can:

  - Remove an attribute, just select an attribute row by clicking anywhere in a row and press the minus button to remove the selected attribute.
  - Add a new attribute use the plus button. At the end a new empty row appears and you can select empty cell of the column *Attribute*. You can select a field attribute from the list or you can select to build a new attribute using a regular expression.
  - Use the up and down arrows to change the order of the attributes in the table.
  - Select a cel in the Headings column to change the Heading, just type a new name.
  - Select a cel in the Alignment column and you can choose between Left, Center or Right alignment.
  - Select a cel in the Width column and you can change it from Automatic to a width in mm, just type a number. When you want to change it back to Automatic, use the cross.
  - The **[Reset]** button can allways be used to restore it to the original attribute settings.

  In the *Sorting* section you can:

  - Add an attribute to sort the table with. Select an attribute and set the sorting order to 'Ascending' or 'Descending' and press the plus button. A new line is added to the sort order list.
  - select a row in the list and use the up and down button to change the sort priority on attribute level.
  - use the minus button to remove an attribute from the sort order list.

Feature filtering

The *Feature filtering* dialogs of the attribute table *Item Properties* tab provide the following functionalities (see figure_composer_table_4):

You can:

- Define the *Maximum rows* to be displayed.
- Activate *Remove duplicate rows from table* to show unique records only.

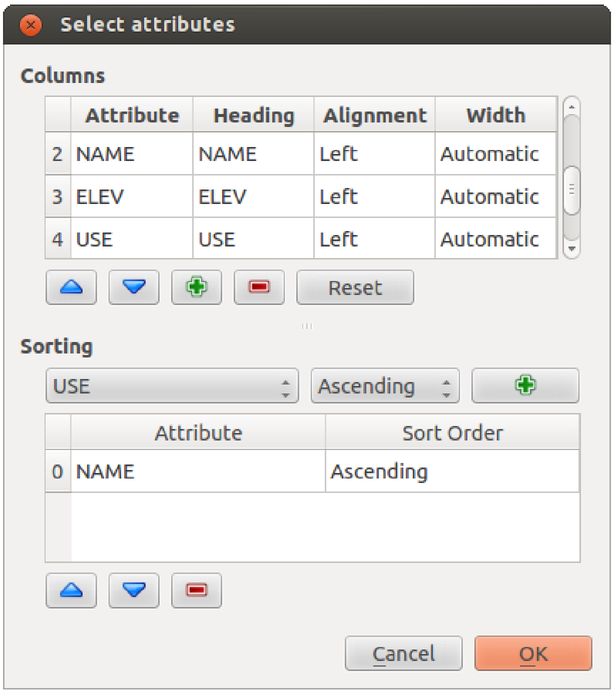


Рис. 19.28: Attribute table Select attributes Dialog

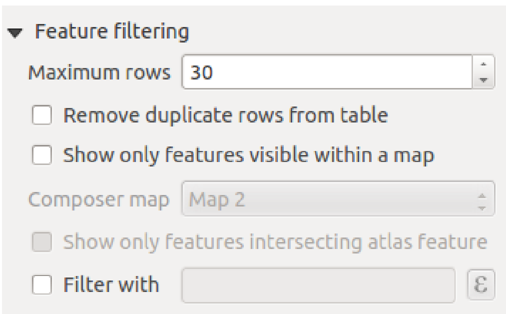


Рис. 19.29: Attribute table Feature filtering Dialog

- Activate *Show only visible features within a map* and select the corresponding *Composer map* to display the attributes of features only visible on selected map.
- Activate *Show only features intersecting Atlas feature* is only available when *Generate an atlas* is activated. When activated it will show a table with only the features shown on the map of that particular page of the atlas.
- Activate *Filter with* and provide a filter by typing in the input line or insert a regular expressing use the given expression button. A few examples of filtering statements you can use when you have loaded the airports layer from the Sample dataset:
  - `ELEV > 500`
  - `NAME = 'ANIAK'`
  - `NAME NOT LIKE 'AN%`
  - `regexp_match( attribute( $currentfeature, 'USE' ) , '[i]')`

  The last regular expression will include only the arpoirts that have a letter 'i' in the attribute field 'USE'.

Appearance

The *Appearance* dialogs of the attribute table *Item Properties* tab provide the following functionalities (see figure_composer_table_5):

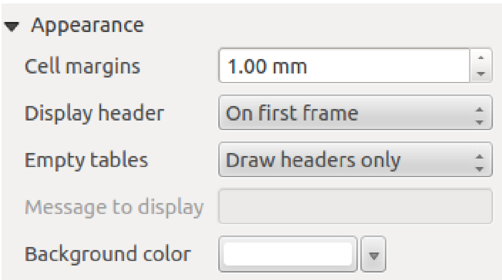


Рис. 19.30: Attribute table appearance Dialog

- With *Cell margins* you can define the margin around text in each cell of the table.
- With *Display header* you can select from a list one of 'On first frame', 'On all frames' default option, or 'No header'.
- The option *Empty table* controls what will be displayed when the result selection is empty.
  - **Draw headers only**, will only draw the header except if you have choosen 'No header' for *Display header*.
  - **Hide entire table**, will only draw the background of the table. You can activate *Don't draw background if frame is empty* in *Frames* to completely hide the table.
  - **Draw empty cells**, will fill the attribute table with empty cells, this option can also be used to provide additional empty cells when you have a result to show!
  - **Show set message**, will draw the header and adds a cell spanning all columns and display a message like 'No result' that can be provided in the option *Message to display*
- The option *Message to display* is only activated when you have selected **Show set message** for *Empty table*. The message provided will be shown in the table in the first row, when the result is an empty table.
- With *Background color* you can set the background color of the table.

Show grid

The *Show grid* dialog of the attribute table *Item Properties* tab provide the following functionalities (see figure_composer_table_6):

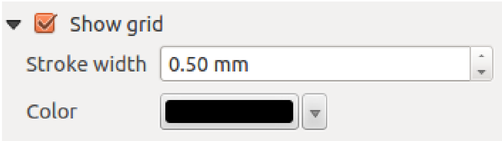


Рис. 19.31: Attribute table Show grid Dialog

- Activate *Show grid* when you want to display the grid, the outlines of the table cells.
- With *Stroke width* you can set the thickness of the lines used in the grid.
- The *Color* of the grid can be set using the color selection dialog.

Fonts and text styling

The *Fonts and text styling* dialog of the attribute table *Item Properties* tab provide the following functionalities (see figure_composer_table_7):

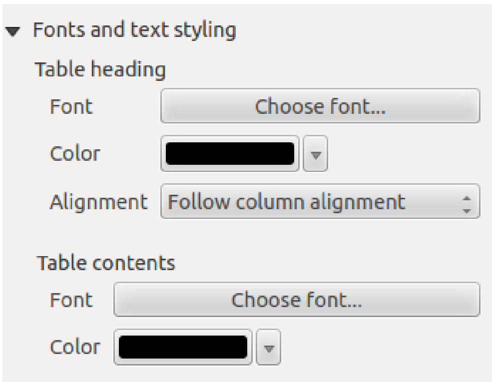


Рис. 19.32: Attribute table Fonts and text styling Dialog

- You can define *Font* and *Color* for *Table heading* and *Table contents*.
- For *Table heading* you can additionally set the *Alignment* and choose from *Follow column alignment*, *Left*, *Center* or *Right*. The column alignment is set using the *Select Attributes* dialog (see Figure_composer_table_3).

Frames

The *Frames* dialog of the attribute table *Item Properties* tab provide the following functionalities (see figure_composer_table_8):

- With *Resize mode* you can select how to render the attribute table contents:
  - *Use existing frames* displays the result in the first frame and added frames only.

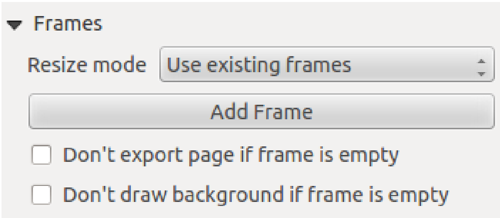


Рис. 19.33: Attribute table Frames Dialog

- *Extent to next page* will create as many frames (and corresponding pages) as necessary to display the full selection of attribute table. Each frame can be moved around on the layout. If you resize a frame, the resulting table will be divided up between the other frames. The last frame will be trimmed to fit the table.
- *Repeat until finished* will also create as many frames as the *Extend to next page* option, except all frames will have the same size.

- Use the **[Add Frame]** button to add another frame with the same size as selected frame. The result of the table that will not fit in the first frame will continue in the next frame when you use the Resize mode *Use existing frames*.
- Activate *Don't export page if frame is empty* prevents the page to be exported when the table frame has no contents. This means all other composer items, maps, scalebars, legends etc. will not be visible in the result.
- Activate *Don't draw background if frame is empty* prevents the background to be drawn when the table frame has no contents.

19.3.9 The HTML frame item

It is possible to add a frame that displays the contents of a website or even create and style your own HTML page and display it!

Click the Add HTML frame icon, place the element by dragging a rectangle holding down the left mouse button on the Print Composer canvas and position and customize the appearance in the *Item Properties* tab (see figure_composer_html_1).

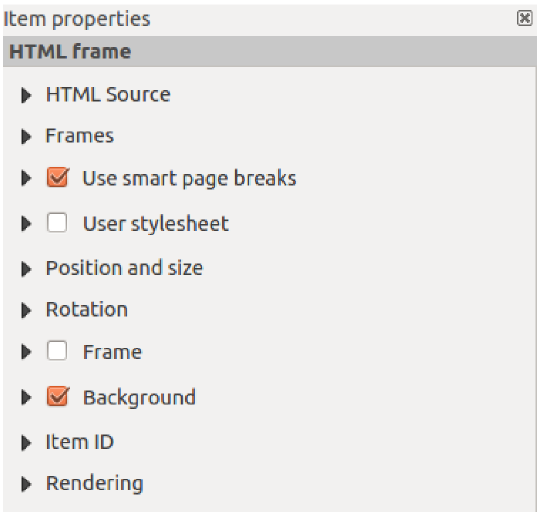


Рис. 19.34: HTML frame, the item properties Tab

HTML Source

As an HTML source, you can either set a URL and activate the URL radiobutton or enter the HTML source directly in the textbox provided and activate the Source radiobutton.

The *HTML Source* dialog of the HTML frame *Item Properties* tab provides the following functionalities (see figure_composer_html_2):

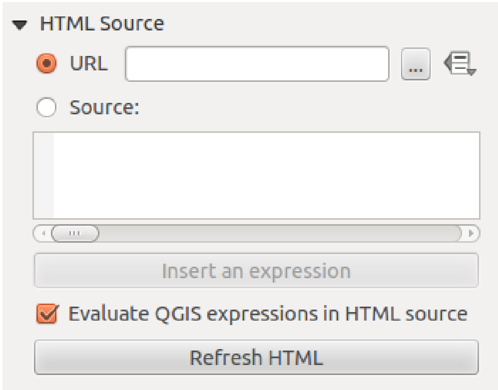


Рис. 19.35: HTML frame, the HTML Source properties

- In *URL* you can enter the URL of a webpage you copied from your internet browser or select an HTML file using the browse button .... There is also the option to use the Data defined override button, to provide an URL from the contents of an attribute field of a table or using a regular expression.
- In *Source* you can enter text in the textbox with some HTML tags or provide a full HTML page.
- The **[insert an expression]** button can be used to insert an expression like `[%Year($now)%]` in the Source textbox to display the current year. This button is only activated when radiobutton *Source* is selected. After inserting the expression click somewhere in the textbox before refreshing the HTML frame, otherwise you will lose the expression.
- Activate *Evaluate QGIS expressions in HTML code* to see the result of the expression you have included, otherwise you will see the expression instead.
- Use the **[Refresh HTML]** button to refresh the HTML frame(s) to see the result of changes.

Frames

The *Frames* dialog of the HTML frame *Item Properties* tab provides the following functionalities (see figure_composer_html_3):

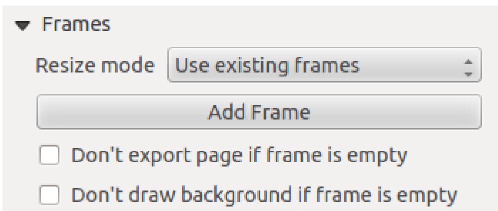


Рис. 19.36: HTML frame, the Frames properties

- With *Resize mode* you can select how to render the HTML contents:
  - *Use existing frames* displays the result in the first frame and added frames only.

  - *Extent to next page* will create as many frames (and corresponding pages) as necessary to render the height of the web page. Each frame can be moved around on the layout. If you resize a frame, the webpage will be divided up between the other frames. The last frame will be trimmed to fit the web page.
  - *Repeat on every page* will repeat the upper left of the web page on every page in frames of the same size.
  - *Repeat until finished* will also create as many frames as the *Extend to next page* option, except all frames will have the same size.
- Use the **[Add Frame]** button to add another frame with the same size as selected frame. If the HTML page that will not fit in the first frame it will continue in the next frame when you use *Resize mode* or *Use existing frames*.
- Activate *Don't export page if frame is empty* prevents the map layout from being exported when the frame has no HTML contents. This means all other composer items, maps, scalebars, legends etc. will not be visible in the result.
- Activate *Don't draw background if frame is empty* prevents the HTML frame being drawn if the frame is empty.

Use smart page breaks and User style sheet

The *Use smart page breaks* dialog and *Use style sheet* dialog of the HTML frame *Item Properties* tab provides the following functionalities (see figure_composer_html_4):

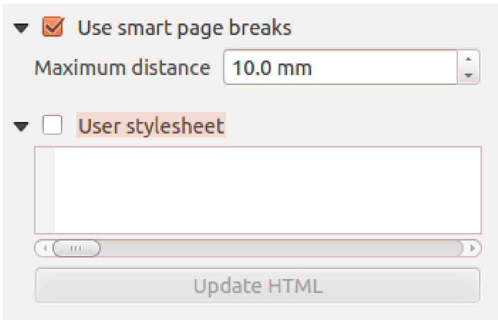


Рис. 19.37: HTML frame, Use smart page breaks and User stylesheet properties

- Activate *Use smart page breaks* to prevent the html frame contents from breaking mid-way a line of text so it continues nice and smooth in the next frame.
- Set the *Maximum distance* allowed when calculating where to place page breaks in the html. This distance is the maximum amount of empty space allowed at the bottom of a frame after calculating the optimum break location. Setting a larger value will result in better choice of page break location, but more wasted space at the bottom of frames. This is only used when *Use smart page breaks* is activated.
- Activate *User stylesheet* to apply HTML styles that often is provided in cascading style sheets. An example of style code is provide below to set the color of <h1> header tag to green and set the font and fontsize of text included in paragraph tags <p>.

```
h1 {color: #00ff00;
}
p {font-family: "Times New Roman", Times, serif;
   font-size: 20px;
}
```

- Use the **[Update HTML]** button to see the result of the stylesheet settings.

19.4 Manage items

19.4.1 Size and position

Each item inside the Composer can be moved/resized to create a perfect layout. For both operations the first step is to activate the Select/Move item tool and to click on the item; you can then move it using the mouse while holding the left button. If you need to constrain the movements to the horizontal or the vertical axis, just hold the `Shift` while moving the mouse. If you need a better precision, you can move a selected item using the `Arrow keys` on the keyboard; if the movement is too slow, you can speed up it by holding `Shift`.

A selected item will show squares on its boundaries; moving one of them with the mouse, will resize the item in the corresponding direction. While resizing, holding `Shift` will maintain the aspect ratio. Holding `Alt` will resize from the item center.

The correct position for an item can be obtained using snapping to grid or smart guides. Guides are set by clicking and dragging in the rulers. Guide are moved by clicking in the ruler, level with the guide and dragging to a new place. To delete a guide move it off the canvas. If you need to disable the snap on the fly just hold `Ctrl` while moving the mouse.

You can choose multiple items with the Select/Move item button. Just hold the `Shift` button and click on all the items you need. You can then resize/move this group just like a single item.

Once you have found the correct position for an item, you can lock it by using the items on the toolbar or ticking the box next to the item in the *Items* tab. Locked items are **not** selectable on the canvas.

Locked items can be unlocked by selecting the item in the *Items* tab and unchecking the tickbox or you can use the icons on the toolbar.

To unselect an item, just click on it holding the `Shift` button.

Inside the *Edit* menu, you can find actions to select all the items, to clear all selections or to invert the current selection.

19.4.2 Alignment

Raising or lowering functionalities for elements are inside the Raise selected items pull-down menu. Choose an element on the Print Composer canvas and select the matching functionality to raise or lower the selected element compared to the other elements (see table_composer_1). This order is shown in the *Items* tab. You can also raise or lower objects in the *Items* tab by clicking and dragging an object's label in this list.

There are several alignment functionalities available within the Align selected items pull-down menu (see table_composer_1). To use an alignment functionality, you first select some elements and then click on the matching alignment icon. All selected elements will then be aligned within to their common bounding box. When moving items on the Composer canvas, alignment helper lines appear when borders, centers or corners are aligned.

19.4.3 Copy/Cut and Paste items

The print composer includes actions to use the common Copy/Cut/Paste functionality for the items in the layout. As usual first you need to select the items using one of the options seen above; at this point the actions can be found in the *Edit* menu. When using the Paste action, the elements will be pasted according to the current mouse position.

Примечание: HTML items can not be copied in this way. As a workaround, use the **[Add Frame]** button in the *Item Properties* tab.

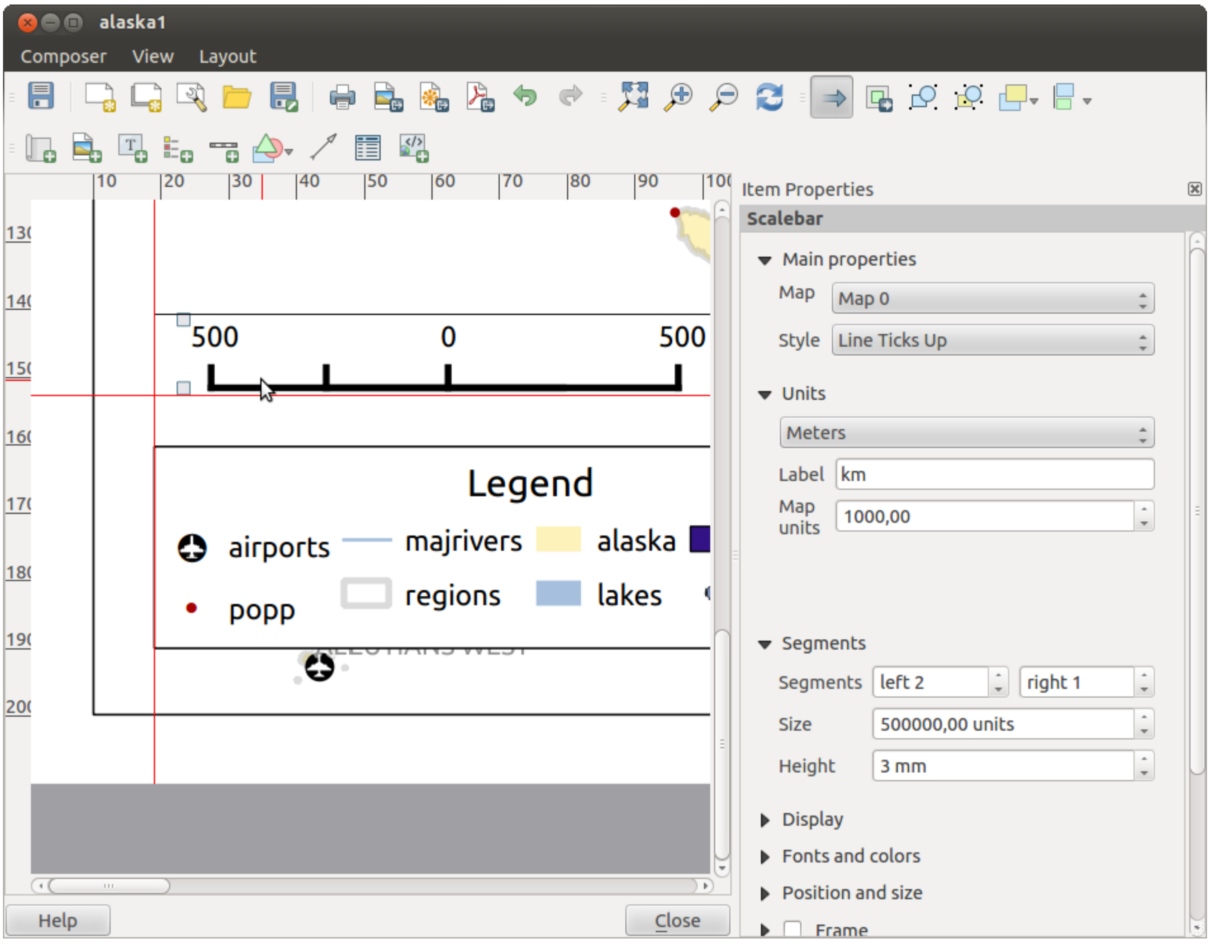


Рис. 19.38: Alignment helper lines in the Print Composer

19.5 Инструменты отмены и возврата

During the layout process, it is possible to revert and restore changes. This can be done with the revert and restore tools:

- Revert last changes
- Restore last changes

This can also be done by mouse click within the *Command history* tab (see figure_composer_29).

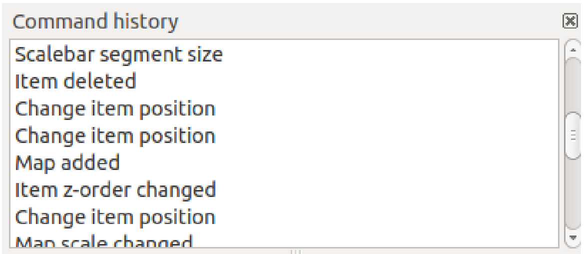


Рис. 19.39: Command history in the Print Composer

19.6 Atlas generation

The Print Composer includes generation functions that allow you to create map books in an automated way. The concept is to use a coverage layer, which contains geometries and fields. For each geometry in the coverage layer, a new output will be generated where the content of some canvas maps will be moved to highlight the current geometry. Fields associated with this geometry can be used within text labels.

Every page will be generated with each feature. To enable the generation of an atlas and access generation parameters, refer to the *Atlas generation* tab. This tab contains the following widgets (see Figure_composer_atlas):

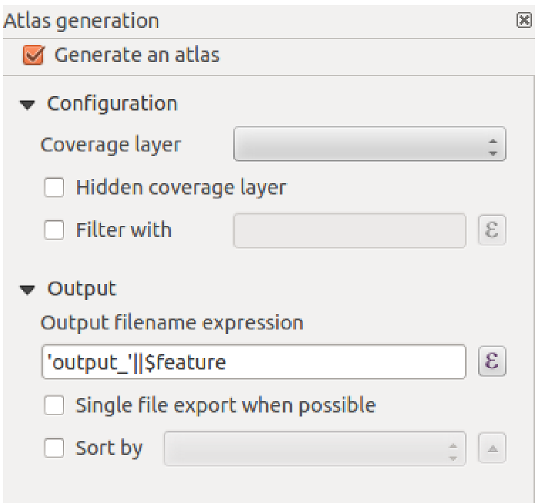


Рис. 19.40: Atlas generation tab

- *Generate an atlas*, which enables or disables the atlas generation.
- A *Coverage layer* combo box that allows you to choose the (vector) layer containing the geometries on which to iterate over.

- An optional *Hidden coverage layer* that, if checked, will hide the coverage layer (but not the other ones) during the generation.
- An optional *Filter with* text area that allows you to specify an expression for filtering features from the coverage layer. If the expression is not empty, only features that evaluate to `True` will be selected. The button on the right allows you to display the expression builder.
- An *Output filename expression* textbox that is used to generate a filename for each geometry if needed. It is based on expressions. This field is meaningful only for rendering to multiple files.
- A *Single file export when possible* that allows you to force the generation of a single file if this is possible with the chosen output format (PDF, for instance). If this field is checked, the value of the *Output filename expression* field is meaningless.
- An optional *Sort by* that, if checked, allows you to sort features of the coverage layer. The associated combo box allows you to choose which column will be used as the sorting key. Sort order (either ascending or descending) is set by a two-state button that displays an up or a down arrow.

You can use multiple map items with the atlas generation; each map will be rendered according to the coverage features. To enable atlas generation for a specific map item, you need to check *Controlled by Atlas* under the item properties of the map item. Once checked, you can set:

- An input box *Margin around feature* that allows you to select the amount of space added around each geometry within the allocated map. Its value is meaningful only when using the auto-scaling mode.
- A *Fixed scale* that allows you to toggle between auto-scale and fixed-scale mode. In fixed-scale mode, the map will only be translated for each geometry to be centered. In auto-scale mode, the map's extents are computed in such a way that each geometry will appear in its entirety.

19.6.1 Labels

In order to adapt labels to the feature the atlas plugin iterates over, you can include expressions. For example, for a city layer with fields CITY_NAME and ZIPCODE, you could insert this:

```
The area of [% upper(CITY_NAME) || ',' || ZIPCODE || ' is ' format_number($area/1000000,2) %] km2
```

The information *[% upper(CITY_NAME) || ‘,’ || ZIPCODE || ‘ is ‘ format_number($area/1000000,2) %]* is an expression used inside the label. That would result in the generated atlas as:

The area of PARIS,75001 is 1.94 km2

19.6.2 Data Defined Override Buttons

There are several places where you can use a Data Defined Override button to override the selected setting. These options are particularly usefull with Atlas Generation.

For the following examples the *Regions* layer of the QGIS sample dataset is used and selected for Atlas Generation. We also assume the paper format *A4 (210X297)* is selected in the *Composite* tab for field *Presets*.

With a *Data Defined Override* button you can dynamically set the paper orientation. When the height (north-south) of the extents of a region is greater than it's width (east-west), you rather want to use *portrait* instead of *landscape* orientation to optimize the use of paper.

In the *Composition* you can set the field *Orientation* and select *Landscape* or *Portrait*. We want to set the orientation dynamically using an expression depending on the region geometry. press the button of field *Orientation*, select *Edit ...* so the *Expression string builder* dialog opens. Give following expression:

```
CASE WHEN bounds_width($atlasgeometry) > bounds_height($atlasgeometry) THEN 'Landscape' ELSE 'Portrait' END
```

Now the paper orients itself automatically for each Region you need to reposition the location of the composer item as well. For the map item you can use the button of field *Width* to set it dynamically using following expression:

```
(CASE WHEN bounds_width($atlasgeometry) > bounds_height($atlasgeometry) THEN 297 ELSE 210 END) - 20
```

Use the button of field *Heigth* to provide following expression:

```
(CASE WHEN bounds_width($atlasgeometry) > bounds_height($atlasgeometry) THEN 210 ELSE 297 END) - 20
```

When you want to give a title above map in the center of the page, insert a label item above the map. First use the item properties of the label item to set the horizontal alignment to *Center*. Next activate from *Reference point* the upper middle checkbox. You can provide following expression for field *X* :

```
(CASE WHEN bounds_width($atlasgeometry) > bounds_height($atlasgeometry) THEN 297 ELSE 210 END) / 2
```

For all other composer items you can set the position in a similar way so they are correctly positioned when page is automatically rotated in portrait or landscape.

Information provided is derived from the excellent blog (in english and portugese) on the Data Defined Override options Multiple_format_map_series_using_QGIS_2.6 .

This is just one example of how you can use Data Defined Overrides.

19.6.3 Preview

Once the atlas settings have been configured and map items selected, you can create a preview of all the pages by clicking on *Atlas → Preview Atlas* and using the arrows, in the same menu, to navigate through all the features.

19.6.4 Generation

The atlas generation can be done in different ways. For example, with *Atlas → Print Atlas*, you can directly print it. You can also create a PDF using *Atlas → Export Atlas as PDF*: The user will be asked for a directory for saving all the generated PDF files (except if the *Single file export when possible* has been selected). If you need to print just a page of the atlas, simply start the preview function, select the page you need and click on *Composer → Print* (or create a PDF).

19.7 Создание вывода

Figure_composer_output shows the Print Composer with an example print layout, including each type of map item described in the sections above.

The Print Composer allows you to create several output formats, and it is possible to define the resolution (print quality) and paper size:

- The Print icon allows you to print the layout to a connected printer or a PostScript file, depending on installed printer drivers.
- The Export as image icon exports the Composer canvas in several image formats, such as PNG, BPM, TIF, JPG,...
- Export as PDF saves the defined Print Composer canvas directly as a PDF.

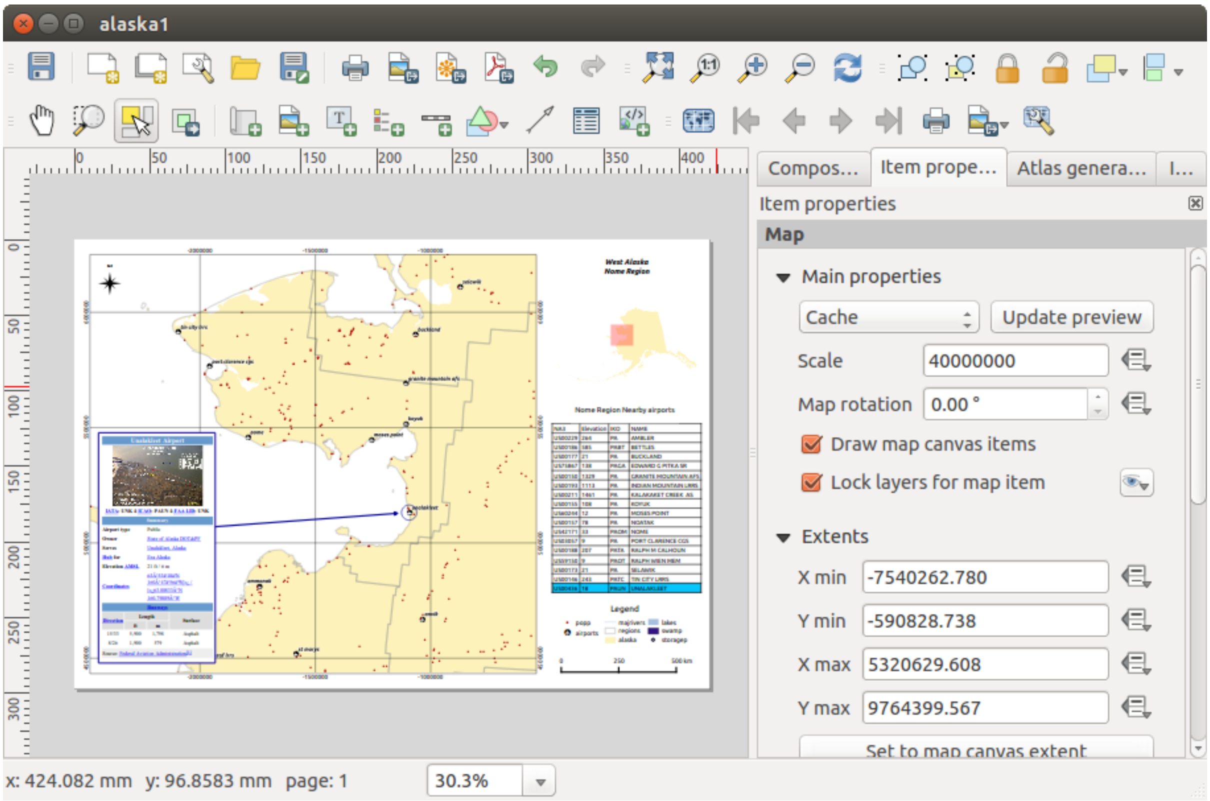


Рис. 19.41: Print Composer with map view, legend, image, scale bar, coordinates, text and HTML frame added

- The Export as SVG icon saves the Print Composer canvas as an SVG (Scalable Vector Graphic).

If you need to export your layout as a **georeferenced image** (i.e., to load back inside QGIS), you need to enable this feature under the Composition tab. Check *World file on* and choose the map item to use. With this option, the 'Export as image' action will also create a world file.

Примечание:

- Currently, the SVG output is very basic. This is not a QGIS problem, but a problem with the underlying Qt library. This will hopefully be sorted out in future versions.
- Exporting big rasters can sometimes fail, even if there seems to be enough memory. This is also a problem with the underlying Qt management of rasters.

19.8 Manage the Composer

With the Save as template and Add items from template icons, you can save the current state of a Print Composer session as a `.qpt` template and load the template again in another session.

The Composer Manager button in the QGIS toolbar and in *Composer → Composer Manager* allows you to add a new Composer template, create a new composition based on a previously saved template or to manage already existing templates.

By default, the Composer manager searches for user templates in ~/.qgis2/composer_template.

The New Composer and Duplicate Composer buttons in the QGIS toolbar and in *Composer → New Composer* and *Composer → Duplicate Composer* allow you to open a new Composer dialog, or to

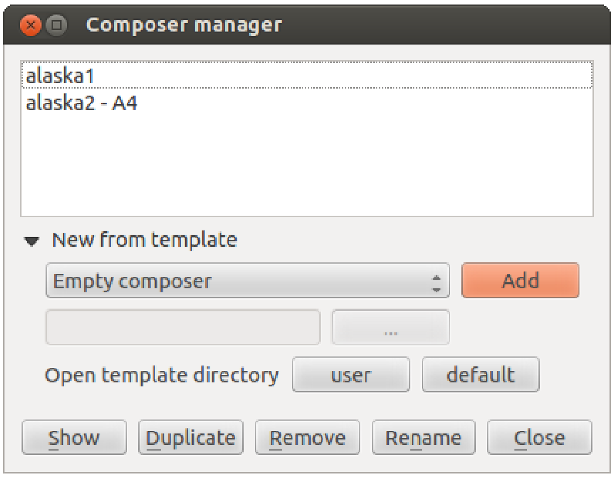


Рис. 19.42: The Print Composer Manager

duplicate an existing composition from a previously created one.

Finally, you can save your print composition with the Save Project button. This is the same feature as in the QGIS main window. All changes will be saved in a QGIS project file.

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Глава 20

Модули QGIS

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20.1 Модули QGIS

QGIS has been designed with a plugin architecture. This allows many new features and functions to be easily added to the application. Many of the features in QGIS are actually implemented as plugins.

You can manage your plugins in the plugin dialog which can be opened with *Plugins > Manage and install pluginsi ...*.

When a plugin needs to be updated, and if plugins settings have been set up accordingly, QGIS main interface could display a blue link in the status bar to tell you that there are some plugins updating waiting to be applied.

20.1.1 The Plugins Dialog

The menus in the Plugins dialog allow the user to install, uninstall and upgrade plugins in different ways. Each plugin have some metadatas displayed in the right panel:

- information if the plugin is experimental
- description
- rating vote(s) (you can vote for your prefered plugin!)
- tags
- some useful links as the home page, tracker and code repository
- author(s)
- version available

You can use the filter to find a specific plugin.

All

Here, all the available plugins are listed, including both core and external plugins. Use **[Upgrade all]** to look for new versions of the plugins. Furthermore, you can use **[Install plugin]**, if a plugin is listed but not installed, and **[Uninstall plugin]** as well as **[Reinstall plugin]**, if a plugin is installed. If a plugin is installed, it can be de/activated using the checkbox.

Installed

In this menu, you can find only the installed plugins. The external plugins can be uninstalled and reinstalled using the **[Uninstall plugin]** and **[Reinstall plugin]** buttons. You can **[Upgrade all]** here as well.

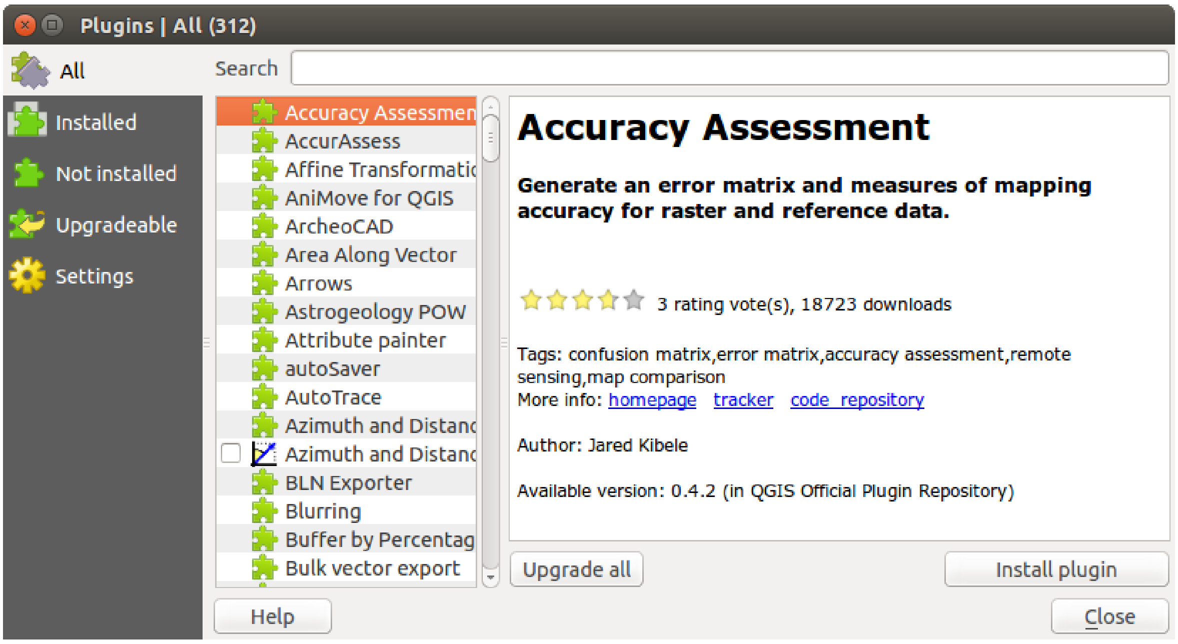

Рис. 20.1: The *All* menu

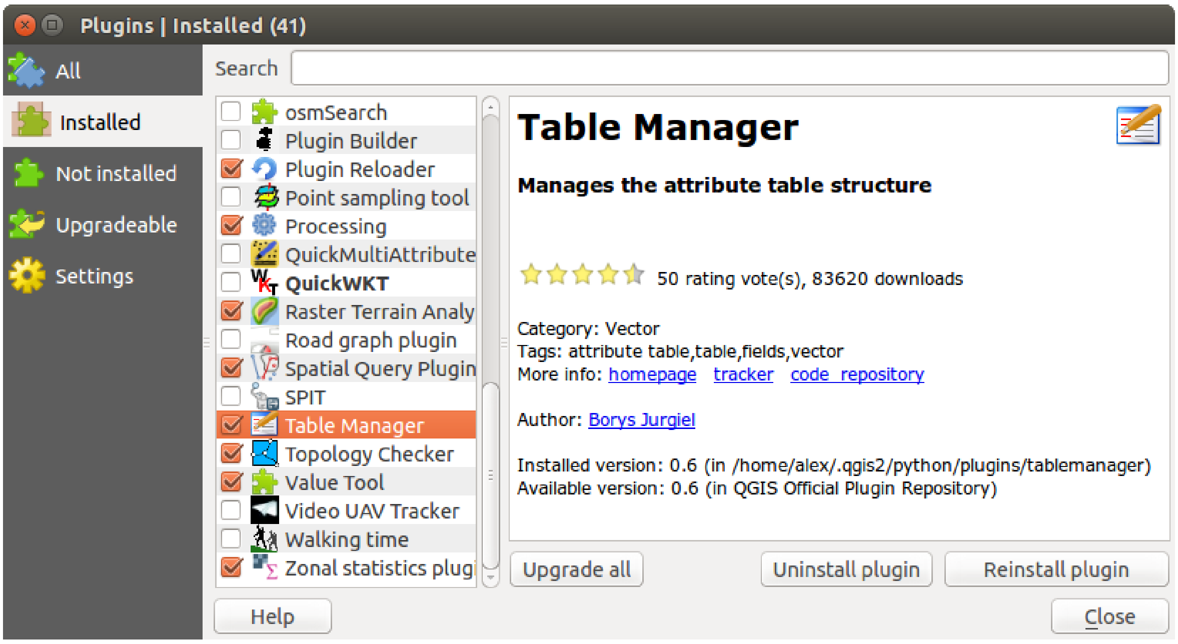

Рис. 20.2: The *Installed* menu

Not installed

This menu lists all plugins available that are not installed. You can use the **[Install plugin]** button to implement a plugin into QGIS.

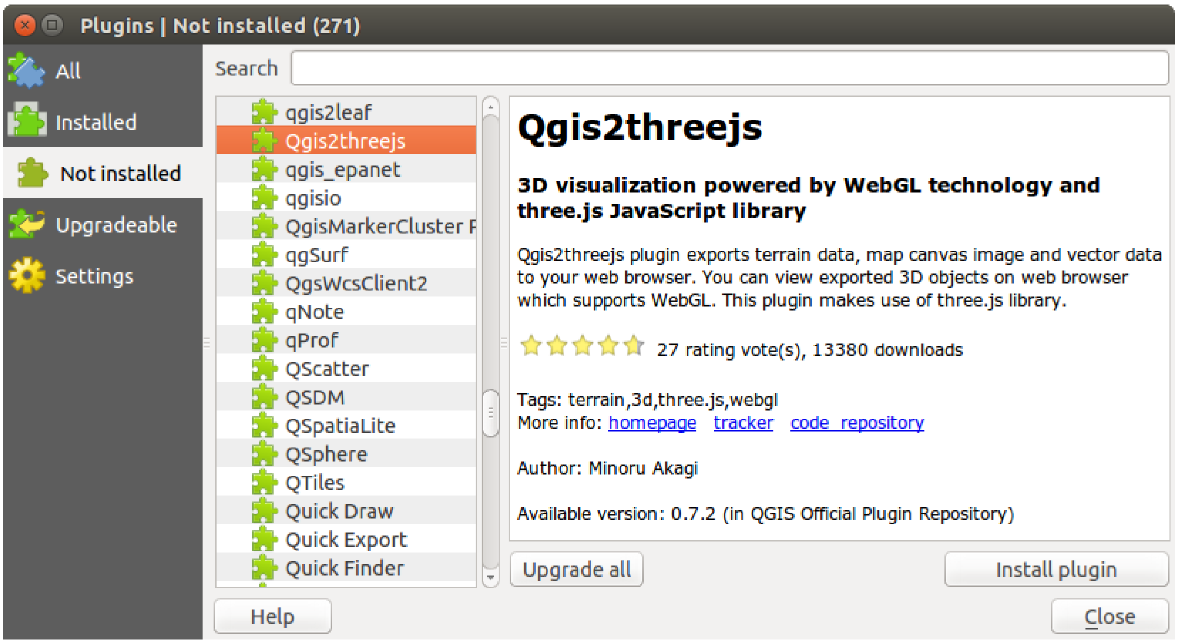

Рис. 20.3: The *Not installed* menu

Upgradeable

If you activated *Show also experimental plugins* in the *Settings* menu, you can use this menu to look for more recent plugin versions. This can be done with the **[Upgrade plugin]** or **[Upgrade all]** buttons.

Settings

In this menu, you can use the following options:

- *Check for updates on startup*. Whenever a new plugin or a plugin update is available, QGIS will inform you 'every time QGIS starts', 'once a day', 'every 3 days', 'every week', 'every 2 weeks' or 'every month'.
- *Show also experimental plugins*. QGIS will show you plugins in early stages of development, which are generally unsuitable for production use.
- *Show also deprecated plugins*. These plugins are deprecated and generally unsuitable for production use.

To add external author repositories, click **[Add...]** in the *Plugin repositories* section. If you do not want one or more of the added repositories, they can be disabled via the **[Edit...]** button, or completely removed with the **[Delete]** button.

The *Search* function is available in nearly every menu (except *Settings*). Here, you can look for specific plugins.

Совет: Core and external plugins

QGIS plugins are implemented either as **Core Plugins** or **External Plugins**. **Core Plugins** are maintained by the QGIS Development Team and are automatically part of every QGIS distribution.

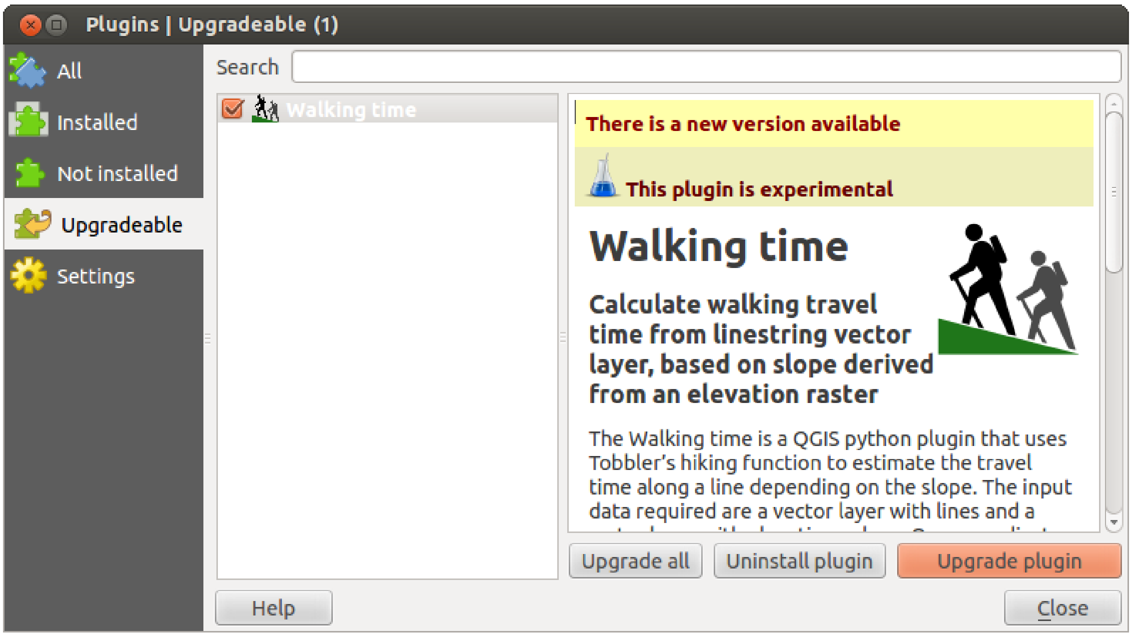

Рис. 20.4: The *Upgradeable* menu

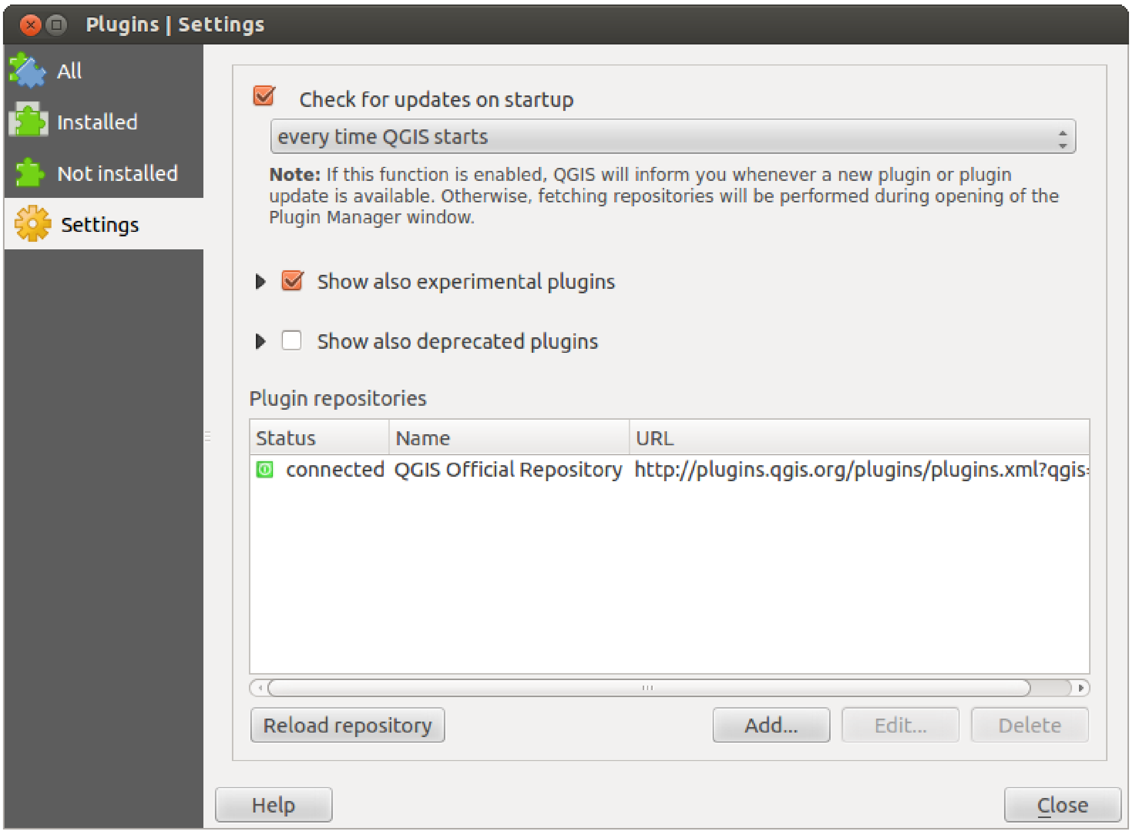

Рис. 20.5: The *Settings* menu

They are written in one of two languages: C++ or Python. **External Plugins** are currently all written in Python. They are stored in external repositories and are maintained by the individual authors.

Detailed documentation about the usage, minimum QGIS version, home page, authors, and other important information are provided for the 'Official' QGIS Repository at http://plugins.qgis.org/plugins/. For other external repositories, documentation might be available with the external plugins themselves. In general, it is not included in this manual.

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20.2 Использование модулей ядра QGIS

Иконка	Модуль	Описание	Раздел
	Захват координат	Захват кординат курсора в различных системах координат	*Модуль «Захват координат»*
	DB Manager	Управление базами данных в QGIS	*Модуль «DB Manager»*
	Преобразователь DXF2Shape	Преобразователь файлов из формата DXF в формат SHP	*Модуль «Преобразователь Dxf2Shp»*
	eVis	Инструмент визуализации событий	*Модуль eVis*
	Инструменты GPS	Набор инструментов для анализа, в том числе геометрического, обработки геоданных и исследований	*Модуль fTools*
	Инструменты GPS	Инструменты для загрузки и импорта данных GPS	*Модуль GPS*
	GRASS	Активация панели инструментов GRASS	*Интеграция с GRASS GIS*
	Инструменты GDAL	Растровые инструменты: упрощенный графический интерфейс для обычно используемых программ	*Модуль GDAL Tools*
	Привязка растров GDAL	Georeference rasters with GDAL	*Модуль привязки растров*
	Теплокарта	Create heatmap rasters from input vector points	*Модуль «Теплокарта»*
	Модуль интерполяции	Интерполяция по вершинам в векторном слое	*Модуль интерполяции*
	Оффлайновое редактирование	Оффлайновое редактирование слоёв и синхронизация с базами данных	*Оффлайновое редактирование*
	Доступ к данным Oracle Spatial GeoRaster	Доступ к данным Oracle Spatial GeoRaster	*Oracle Spatial GeoRaster Plugin*
	Менеджер модулей	Управление расширениями ядра и сторонними расширениями	*The Plugins Dialog*
	Морфометрический анализ	Расчет наклона, аспекта, неровностей и общего искривления с использованием цифровых моделей рельефа	*Морфометрический анализ*
	Road Graph plugin	Поиск кратчайшего маршрута на графе дорог	*Модуль «Road Graph»*
	Модуль SQL Anywhere	Работа с векторными данными в БД SQL Anywhere	*Модуль «SQL Anywhere»*
	Пространственные запросы	Модуль пространственных запросов для векторных слоёв	Пространственные запросы
	SPIT	Shapefile to PostgreSQL/PostGIS Import Tool	*Модуль SPIT*
	Зональная статистика	Расчет зональной статистики для полигонов	Зональная статистика
	MetaSearch	Interact with metadata catalogue services (CSW)	*MetaSearch*

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20.3 Модуль «Захват координат»

The coordinate capture plugin is easy to use and provides the ability to display coordinates on the map canvas for two selected coordinate reference systems (CRS).

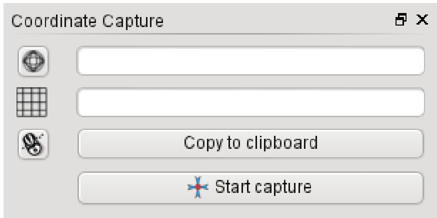

Рис. 20.6: Модуль «Захват координат»

1. Start QGIS, select *Project Properties* from the *Settings* (KDE, Windows) or *File* (Gnome, OSX) menu and click on the *Projection* tab. As an alternative, you can also click on the CRS status icon in the lower right-hand corner of the status bar.
2. Отметьте пункт *Включить преобразование координат «на лету»* и выберите нужную систему координат проекта (см. также раздел *Работа с проекциями*).
3. Activate the coordinate capture plugin in the Plugin Manager (see *The Plugins Dialog*) and ensure that the dialog is visible by going to *View* → *Panels* and ensuring that *Coordinate Capture* is enabled. The coordinate capture dialog appears as shown in Figure figure_coordinate_capture_1. Alternatively, you can also go to *Vector* → *Coordinate Capture* and see if *Coordinate Capture* is enabled.
4. Щелкните по кнопке Щелкните для выбора системы координат, используемой для вывода и выберите в диалоговом окне требуемую систему координат.
5. Для запуска захвата координат щелкните по кнопке **[Начать захват]**. Теперь вы можете щелкнуть в любом месте поля карты, и в модуле отобразятся координаты выбранного места в требуемой системе координат.
6. To enable mouse coordinate tracking, click the mouse tracking icon.
7. Также имеется возможность скопировать выбранные координаты в буфер обмена.

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20.4 Модуль «DB Manager»

The DB Manager Plugin is officially part of the QGIS core and is intended to replace the SPIT Plugin and, additionally, to integrate all other database formats supported by QGIS in one user interface. The DB Manager Plugin provides several features. You can drag layers from the QGIS Browser into the DB Manager, and it will import your layer into your spatial database. You can drag and drop tables between spatial databases and they will get imported. You can also use the DB Manager to execute SQL queries against your spatial database and then view the spatial output for queries by adding the results to QGIS as a query layer.

The *Database* menu allows you to connect to an existing database, to start the SQL window and to exit the DB Manager Plugin. Once you are connected to an existing database, the menus *Schema* and *Table* additionally appear.

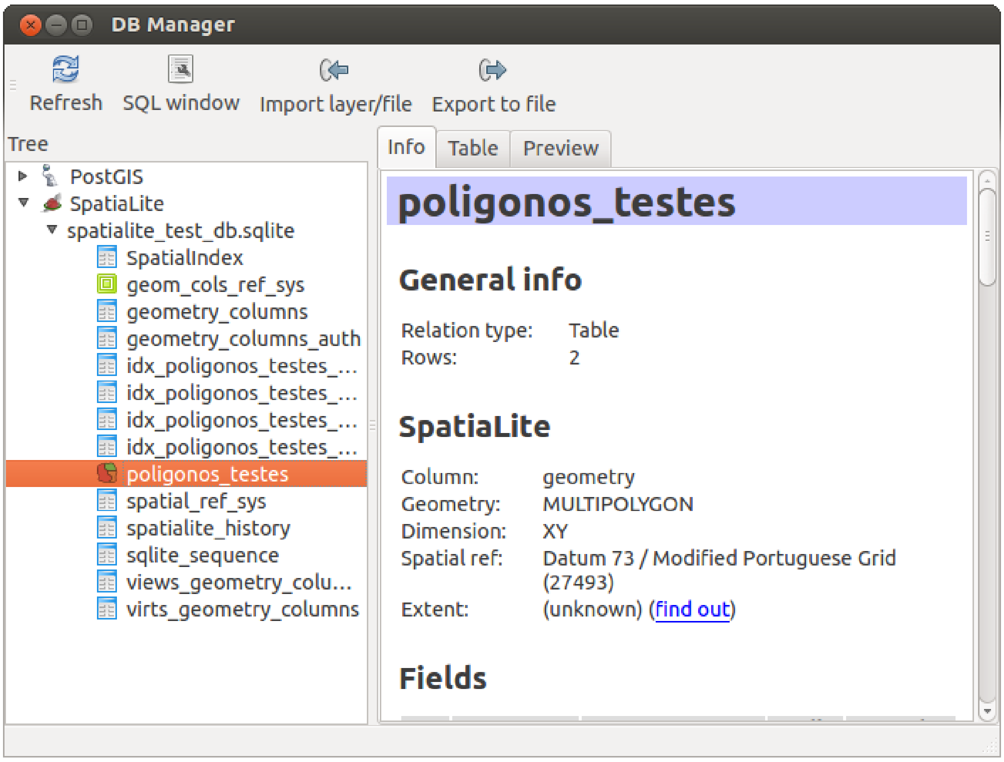

Рис. 20.7: Модуль «DB Manager»

The *Schema* menu includes tools to create and delete (empty) schemas and, if topology is available (e.g., PostGIS 2), to start a *TopoViewer*.

The *Table* menu allows you to create and edit tables and to delete tables and views. It is also possible to empty tables and to move tables from one schema to another. As further functionality, you can perform a VACUUM and then an ANALYZE for each selected table. Plain VACUUM simply reclaims space and makes it available for reuse. ANALYZE updates statistics to determine the most efficient way to execute a query. Finally, you can import layers/files, if they are loaded in QGIS or exist in the file system. And you can export database tables to shape with the Export File feature.

The *Tree* window lists all existing databases supported by QGIS. With a double-click, you can connect to the database. With the right mouse button, you can rename and delete existing schemas and tables. Tables can also be added to the QGIS canvas with the context menu.

If connected to a database, the **main** window of the DB Manager offers three tabs. The *Info* tab provides information about the table and its geometry, as well as about existing fields, constraints and indexes. It also allows you to run Vacuum Analyze and to create a spatial index on a selected table, if not already done. The *Table* tab shows all attributes, and the *Preview* tab renders the geometries as preview.

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20.5 Модуль «Преобразователь Dxf2Shp»

The dxf2shape converter plugin can be used to convert vector data from DXF to shapefile format. It requires the following parameters to be specified before running:

- **Input DXF file**: Enter the path to the DXF file to be converted.
- **Output Shp file**: Enter desired name of the shapefile to be created.
- **Output file type**: Specify the geometry type of the output shapefile. Currently supported types are polyline, polygon, and point.

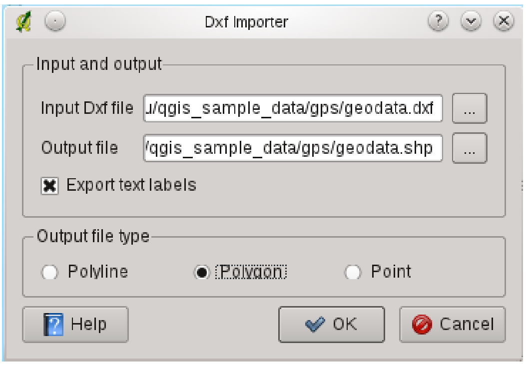

Рис. 20.8: Модуль «Преобразователь Dxf2Shp»

- **Export text labels**: When this checkbox is enabled, an additional shapefile point layer will be created, and the associated DBF table will contain information about the "TEXT" fields found in the DXF file, and the text strings themselves.

20.5.1 Использование модуля

1. Start QGIS, load the Dxf2Shape plugin in the Plugin Manager (see *The Plugins Dialog*) and click on the Dxf2Shape Converter icon, which appears in the QGIS toolbar menu. The Dxf2Shape plugin dialog appears, as shown in Figure_dxf2shape_1.
2. Enter the input DXF file, a name for the output shapefile and the shapefile type.
3. Активируйте *Экспорт текстовых меток*, если вам требуется создать дополнительный слой, содержащий надписи.
4. Нажмите кнопку **[OK]**.

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20.6 Модуль eVis

(This section is derived from Horning, N., K. Koy, P. Ersts. 2009. eVis (v1.1.0) User's Guide. American Museum of Natural History, Center for Biodiversity and Conservation. Available from http://biodiversityinformatics.amnh.org/, and released under the GNU FDL.)

The Biodiversity Informatics Facility at the American Museum of Natural History's (AMNH) Center for Biodiversity and Conservation (CBC) has developed the Event Visualization Tool (eVis), another software tool to add to the suite of conservation monitoring and decision support tools for guiding protected area and landscape planning. This plugin enables users to easily link geocoded (i.e., referenced with latitude and longitude or X and Y coordinates) photographs, and other supporting documents, to vector data in QGIS.

eVis is now automatically installed and enabled in new versions of QGIS, and as with all plugins, it can be disabled and enabled using the Plugin Manager (see *The Plugins Dialog*).

В состав eVis входит три модуля: инструмент подключения к базе данных, инструмент определения событий и обозреватель событий. Все эти модули работают совместно, позволяя просматривать геокодированные фотографии и прочие документы, связанные с объектами, хранящимися в векторных файлах, базах данных и таблицах.

20.6.1 Обозреватель событий

Модуль «Обозреватель событий» предназначен для отображения геокодированных фотографий, ссылающихся на векторные объекты карты, открытой в QGIS. Например, на точечные данные, загруженные в проект из векторного файла или в результате запроса к базе данных. Такие векторные объекты должны содержать атрибутивную информацию, описывающую местоположение, имя файла фотографии и (не обязательно) направление компаса камеры в момент съёмки. Векторный слой должен быть загружен в QGIS до запуска модуля «Обозреватель событий».

Запуск модуля «Обозреватель событий»

To launch the Event Browser module, click on *Database* → *eVis* → *eVis Event Browser*. This will open the *Generic Event Browser* window.

Окно *Обозреватель событий* состоит из трёх вкладок, расположенных сверху. Вкладка *Вывод* используется для просмотра фотографий и связанной с ними атрибутивной информации. Вкладка *Параметры* содержит набор настроек, позволяющих управлять поведением расширения eVis. И, наконец, вкладка *Внешние приложения* используется для сопоставления расширений файлов, отличных от изображений, и приложений, используемых в eVis для их отображения.

Назначение окна «Вывод»

To see the *Display* window, click on the *Display* tab in the *Event Browser* window. The *Display* window is used to view geocoded photographs and their associated attribute data.

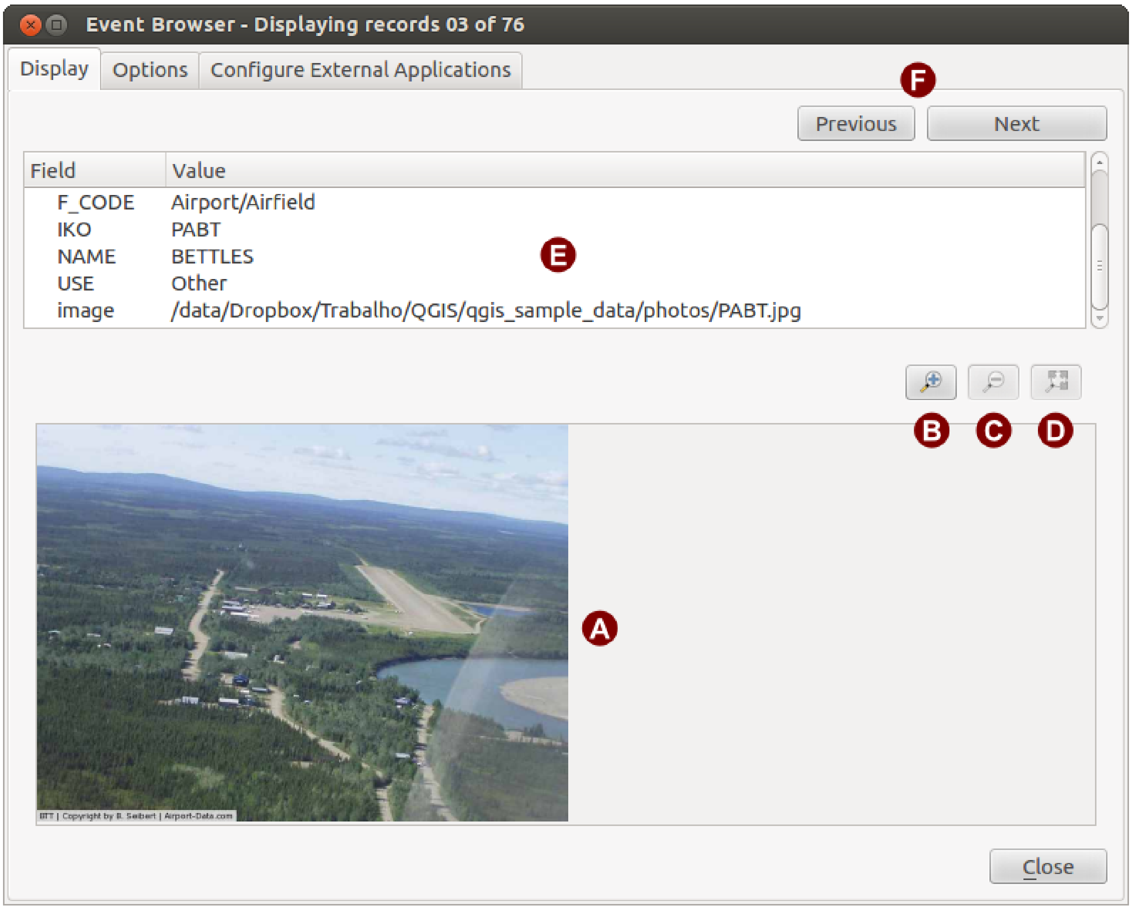


Рис. 20.9: Окно «Вывод» расширения eVis

1. **Область вывода изображения**: Область отображения фотографий.

2. **Кнопка «Увеличить»**: Увеличьте фотографию для просмотра мелких деталей. Если изображение полностью не помещается в окно просмотра, воспользуйтесь полосами прокрутки, расположенными с левой и с нижней стороны окна и позволяющими перемещаться по изображению.
3. **Кнопка «Уменьшить»**: Уменьшите фотографию для просмотра больших территорий.
4. **Увеличить до полного охвата**: Отобразить полный охват фотографии.
5. **Attribute information window**: All of the attribute information for the point associated with the photograph being viewed is displayed here. If the file type being referenced in the displayed record is not an image but is of a file type defined in the *Configure External Applications* tab, then when you double-click on the value of the field containing the path to the file, the application to open the file will be launched to view or hear the contents of the file. If the file extension is recognized, the attribute data will be displayed in green.
6. **Навигационные кнопки**: Если выделено более одного объекта, то используйте кнопки **[Предыдущее]** и **[Следующее]** для перехода между ними.

Назначение окна «Параметры»

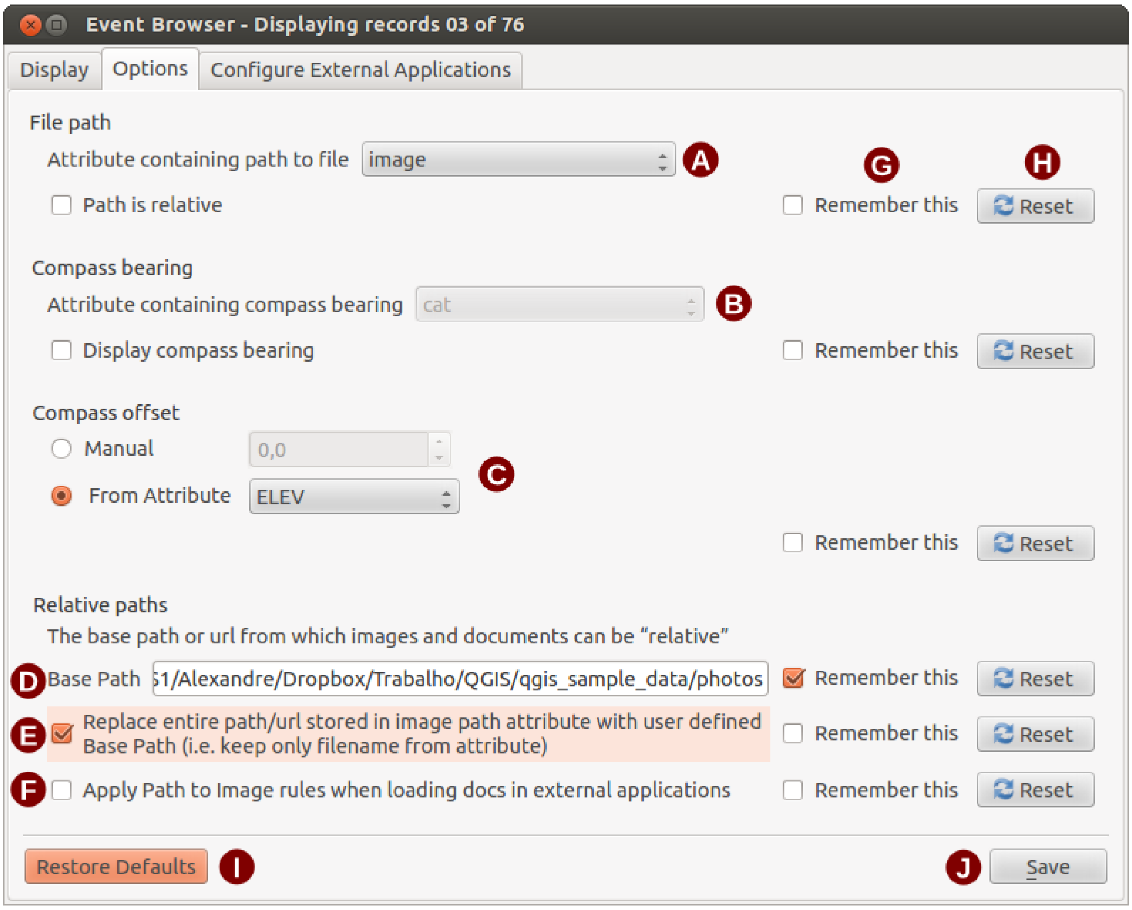


Рис. 20.10: Окно «Параметры» расширения eVis

1. **File path**: A drop-down list to specify the attribute field that contains the directory path or URL for the photographs or other documents being displayed. If the location is a relative path, then the checkbox must be clicked. The base path for a relative path can be entered in the *Base Path* text box below. Information about the different options for specifying the file location are noted in the section *Определение местоположения и названия фотографий* below.
2. **Compass bearing**: A drop-down list to specify the attribute field that contains the compass

bearing associated with the photograph being displayed. If compass bearing information is available, it is necessary to click the checkbox below the drop-down menu title.

3. **Compass offset**: Compass offsets can be used to compensate for declination (to adjust bearings collected using magnetic bearings to true north bearings). Click the *Manual* radio button to enter the offset in the text box or click the *From Attribute* radio button to select the attribute field containing the offsets. For both of these options, east declinations should be entered using positive values, and west declinations should use negative values.
4. **Базовый путь**: Базовый путь, относительно которого определяются относительные пути, определённые, как показано на рисунке Figure_eVis_2 (A).
5. **Replace path**: If this checkbox is checked, only the file name from A will be appended to the base path.
6. **Apply rule to all documents**: If checked, the same path rules that are defined for photographs will be used for non-image documents such as movies, text documents, and sound files. If not checked, the path rules will only apply to photographs, and other documents will ignore the base path parameter.
7. **Remember settings**: If the checkbox is checked, the values for the associated parameters will be saved for the next session when the window is closed or when the **[Save]** button below is pressed.
8. **Восстановить**: Сбросить и установить параметр в значение по умолчанию.
9. **Восстановить по умолчанию**: Сбросить значения всех полей и установить в значения по умолчанию. Данная операция эквивалентна последовательному нажатию кнопок **[Восстановить]** возле каждого параметра.
10. **Сохранить**: Сохранить настройки, не закрывая вкладку *Параметры*.

Назначение окна «Внешние приложения»

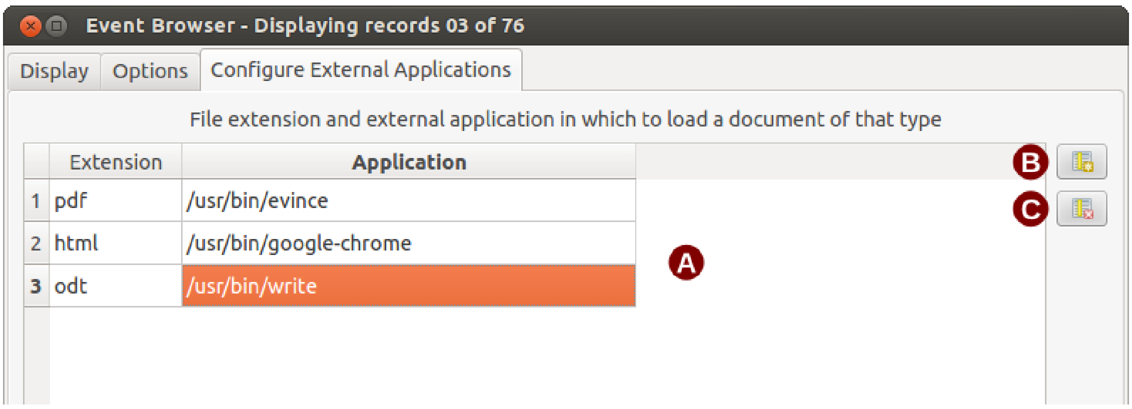


Рис. 20.11: Окно «Внешние приложения» расширения eVis

1. **Таблица сопоставления**: Таблица содержит типы файлов, которые можно открыть, используя eVis. Для каждого типа представляется расширение и путь к приложению, позволяющему открыть файл данного типа. Таким образом, появляется возможность открыть практически любой файл, например, видео, звуковую запись или текстовый документ, а не только изображение.
2. **Добавить новый тип файлов**: Добавить новый тип файлов с уникальным расширением и путь до приложения, которое его откроет.
3. **Удалить текущую строку**: Удалить из таблицы выбранный тип файлов.

20.6.2 Определение местоположения и названия фотографий

The location and name of the photograph can be stored using an absolute or relative path, or a URL if the photograph is available on a web server. Examples of the different approaches are listed in Table evis_examples.

```
X        Y        FILE                                               BEARING
780596   1784017  C:\Workshop\eVis_Data\groundphotos\DSC_0168.JPG    275
780596   1784017  /groundphotos/DSC_0169.JPG                         80
780819   1784015  http://biodiversityinformatics.amnh.org/\
                  evis_testdata/DSC_0170.JPG                         10
780596   1784017  pdf:http://www.testsite.com/attachments.php?\
                  attachment_id-12                                   76
```

20.6.3 Определение местоположения и названия прочих документов поддерживаемых форматов

Supporting documents such as text documents, videos, and sound clips can also be displayed or played by eVis. To do this, it is necessary to add an entry in the file reference table that can be accessed from the *Configure External Applications* window in the *Generic Event Browser* that matches the file extension to an application that can be used to open the file. It is also necessary to have the path or URL to the file in the attribute table for the vector layer. One additional rule that can be used for URLs that don't contain a file extension for the document you want to open is to specify the file extension before the URL. The format is — `file extension:URL`. The URL is preceded by the file extension and a colon; this is particularly useful for accessing documents from wikis and other web sites that use a database to manage the web pages (see Table evis_examples).

20.6.4 Обозреватель событий

When the *Event Browser* window opens, a photograph will appear in the display window if the document referenced in the vector file attribute table is an image and if the file location information in the *Options* window is properly set. If a photograph is expected and it does not appear, it will be necessary to adjust the parameters in the *Options* window.

If a supporting document (or an image that does not have a file extension recognized by eVis) is referenced in the attribute table, the field containing the file path will be highlighted in green in the attribute information window if that file extension is defined in the file reference table located in the *Configure External Applications* window. To open the document, double-click on the green-highlighted line in the attribute information window. If a supporting document is referenced in the attribute information window and the file path is not highlighted in green, then it will be necessary to add an entry for the file's filename extension in the *Configure External Applications* window. If the file path is highlighted in green but does not open when double-clicked, it will be necessary to adjust the parameters in the *Options* window so the file can be located by eVis.

If no compass bearing is provided in the *Options* window, a red asterisk will be displayed on top of the vector feature that is associated with the photograph being displayed. If a compass bearing is provided, then an arrow will appear pointing in the direction indicated by the value in the compass bearing display field in the *Event Browser* window. The arrow will be centered over the point that is associated with the photograph or other document.

To close the *Event Browser* window, click on the **[Close]** button from the *Display* window.

20.6.5 Определить события eVis

The 'Event ID' module allows you to display a photograph by clicking on a feature displayed in the QGIS map window. The vector feature must have attribute information associated with it to describe the location and name of the file containing the photograph and, optionally, the compass direction the camera was pointed when the image was acquired. This layer must be loaded into QGIS before running the 'Event ID' tool.

Запуск модуля «Определить события»

To launch the 'Event ID' module, either click on the Event ID icon or click on *Database* → *eVis* → *Event ID Tool*. This will cause the cursor to change to an arrow with an 'i' on top of it signifying that the ID tool is active.

Для просмотра фотографий, связанных с объектами активного векторного слоя, открытого в QGIS, поместите курсор на объект и щёлкните мышкой. После щелчка на объекте откроется окно *Обозреватель событий* и фотография, доступная для отображения в обозревателе, на месте щелчка или около него. Если доступно несколько фотографий, то для перемещения между различными объектами используйте кнопки **[Предыдущее]** и **[Следующее]**. Остальные управляющие элементы описаны в разделе *Обозреватель событий* данного руководства.

20.6.6 Соединение с БД

Модуль «Соединение с БД» представляет собой инструмент для соединения и запросов к базам данных или иным ресурсам ODBC, таким, как электронные таблицы.

eVis can directly connect to the following types of databases: PostgreSQL, MySQL, and SQLite; it can also read from ODBC connections (e.g., MS Access). When reading from an ODBC database (such as an Excel spreadsheet), it is necessary to configure your ODBC driver for the operating system you are using.

Загрузка модуля «Соединение с БД»

To launch the 'Database Connection' module, either click on the appropriate icon eVis Database Connection or click on *Database* → *eVis* → *Database Connection*. This will launch the *Database Connection* window. The window has three tabs: *Predefined Queries*, *Database Connection*, and *SQL Query*. The *Output Console* window at the bottom of the window displays the status of actions initiated by the different sections of this module.

Соединение с БД

Click on the *Database Connection* tab to open the database connection interface. Next, use the *Database Type* combo box to select the type of database that you want to connect to. If a password or username is required, that information can be entered in the *Username* and *Password* textboxes.

Enter the database host in the *Database Host* textbox. This option is not available if you selected 'MS Access' as the database type. If the database resides on your desktop, you should enter "localhost".

В поле *База данных* укажите имя базы данных. Если выбран тип «ODBC», то укажите здесь имя источника данных.

When all of the parameters are filled in, click on the **[Connect]** button. If the connection is successful, a message will be written in the *Output Console* window stating that the connection was established. If a connection was not established, you will need to check that the correct parameters were entered above.

1. **Database Type**: A drop-down list to specify the type of database that will be used.
2. **Сервер БД**: Адрес сервера баз данных.
3. **Port**: The port number if a MySQL or PostgreSQL database type is selected.
4. **Database Name**: The name of the database.
5. **Connect**: A button to connect to the database using the parameters defined above.

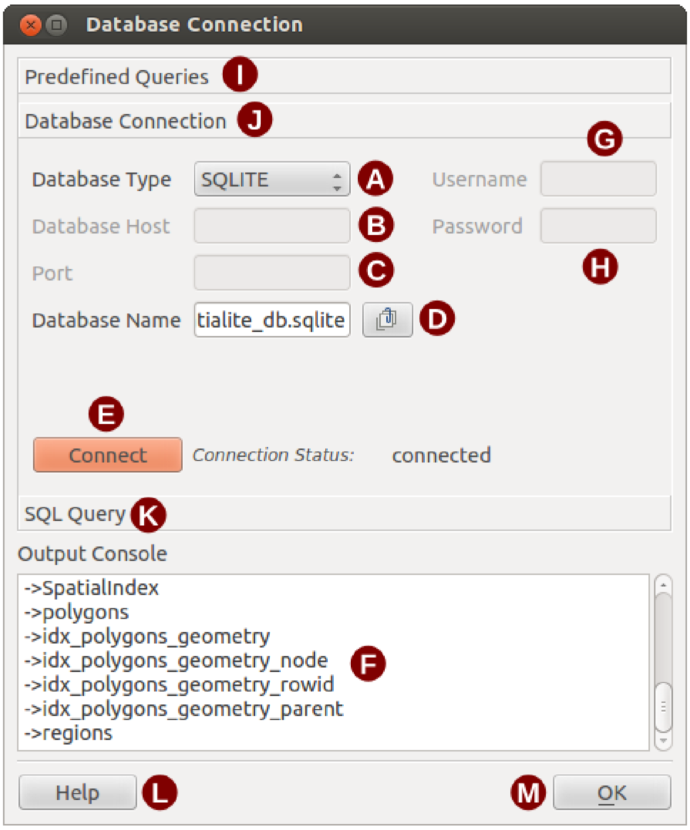


Рис. 20.12: Окно «Соединение с БД» расширения eVis

6. **Output Console**: The console window where messages related to processing are displayed.
7. **Пользователь**: Имя пользователя, указываемое в случае защиты доступа к базе данных паролем.
8. **Пароль**: Пароль, соответствующий имени пользователя.
9. **Предопределённые запросы**: Вкладка *Предопределённые запросы*.
10. **Соединение с БД**: Вкладка *Соединение с БД*.
11. **SQL-запрос**: Вкладка *SQL-запрос*.
12. **Help**: Displays the online help.
13. **OK**: Закрыть главное окно *Соединение с БД*.

Выполнение SQL-запросов

SQL queries are used to extract information from a database or ODBC resource. In eVis, the output from these queries is a vector layer added to the QGIS map window. Click on the *SQL Query* tab to display the SQL query interface. SQL commands can be entered in this text window. A helpful tutorial on SQL commands is available at http://www.w3schools.com/sql. For example, to extract all of the data from a worksheet in an Excel file, `select * from [sheet1$]` where `sheet1` is the name of the worksheet.

Click on the **[Run Query]** button to execute the command. If the query is successful, a *Database File Selection* window will be displayed. If the query is not successful, an error message will appear in the *Output Console* window.

В окне *Выбор файла БД* в поле *Имя нового слоя* введите имя слоя, который будет создан на основе результатов выборки.

1. **Текстовое поле «SQL-запрос»**: Место ввода SQL-запросов.

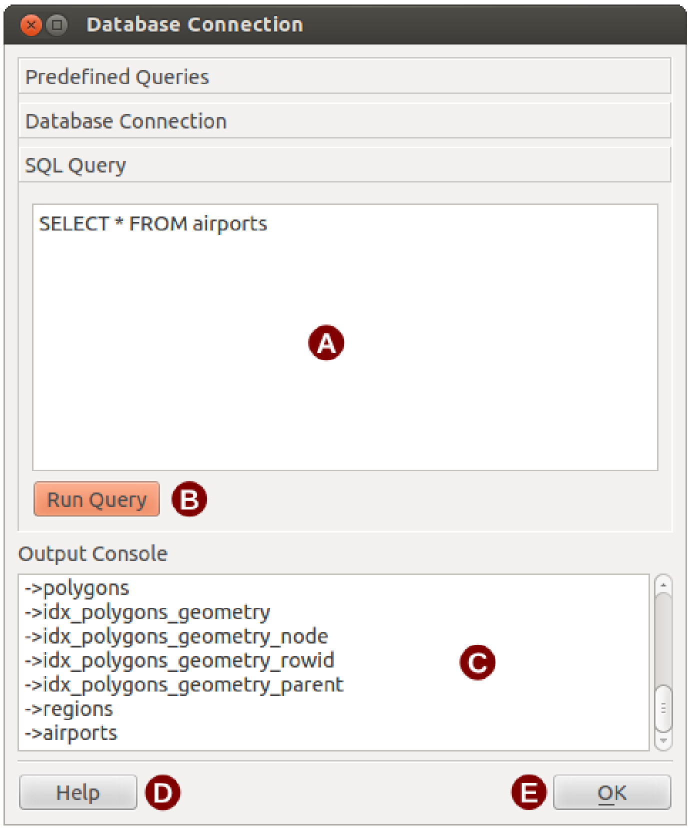


Рис. 20.13: Вкладка «SQL-запрос» расширения eVis

2. **Выполнить**: Кнопка выполнения SQL-запросов.
3. **Консоль вывода**: Консольное окно, в котором отображаются сообщения, связанные с работой модуля.
4. **Help**: Displays the online help.
5. **OK**: Закрыть главное окно *Соединение с БД*.

Use the *X Coordinate* and *Y Coordinate* combo boxes to select the fields from the database that stores the `X` (or longitude) and `Y` (or latitude) coordinates. Clicking on the **[OK]** button causes the vector layer created from the SQL query to be displayed in the QGIS map window.

To save this vector file for future use, you can use the QGIS 'Save as...' command that is accessed by right-clicking on the layer name in the QGIS map legend and then selecting 'Save as...'

Совет: Создание векторного слоя на основе данных листа Microsoft Excel

When creating a vector layer from a Microsoft Excel Worksheet, you might see that unwanted zeros ("0") have been inserted in the attribute table rows beneath valid data. This can be caused by deleting the values for these cells in Excel using the `Backspace` key. To correct this problem, you need to open the Excel file (you'll need to close QGIS if you are connected to the file, to allow you to edit the file) and then use *Edit* → *Delete* to remove the blank rows from the file. To avoid this problem, you can simply delete several rows in the Excel Worksheet using *Edit* → *Delete* before saving the file.

Запуск предопределённых запросов

With predefined queries, you can select previously written queries stored in XML format in a file. This is particularly helpful if you are not familiar with SQL commands. Click on the *Predefined Queries* tab to display the predefined query interface.

To load a set of predefined queries, click on the Open File icon. This opens the *Open File* window, which is used to locate the file containing the SQL queries. When the queries are loaded, their titles as defined in the XML file will appear in the drop-down menu located just below the Open File icon. The full description of the query is displayed in the text window under the drop-down menu.

Select the query you want to run from the drop-down menu and then click on the *SQL Query* tab to see that the query has been loaded into the query window. If it is the first time you are running a predefined query or are switching databases, you need to be sure to connect to the database.

Click on the **[Run Query]** button in the *SQL Query* tab to execute the command. If the query is successful, a *Database File Selection* window will be displayed. If the query is not successful, an error message will appear in the *Output Console* window.

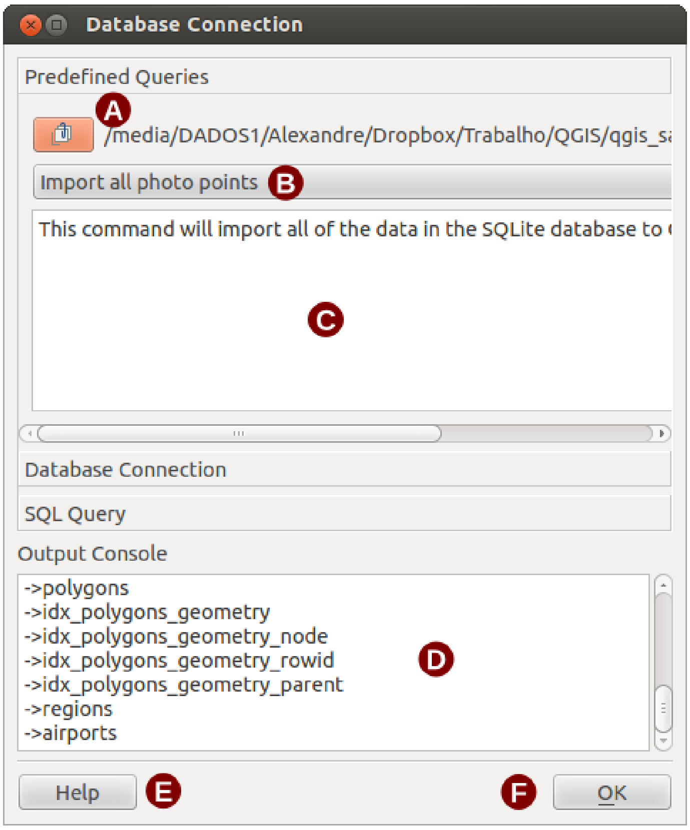


Рис. 20.14: The *eVis* Predefined Queries tab

1. **Открыть файл**: Вызов окна *Открыть файл* для поиска XML-файла, содержащего предопределённые запросы.
2. **Predefined Queries**: A drop-down list with all of the queries defined by the predefined queries XML file.
3. **Описание запроса**: Короткое описание запроса, берётся из XML-файла.
4. **Консоль вывода**: Консольное окно, в котором отображаются сообщения, связанные с работой модуля.
5. **Help**: Displays the online help.
6. **OK**: Закрыть главное окно *Соединение с БД*.

XML-формат предопределённых запросов eVis

XML-теги eVis

Тег	Описание
query	Определяет начало и конец запроса.
shortdescription	A short description of the query that appears in the eVis drop-down menu.
description	Более детальное описание запроса, отображается в текстовом поле вкладки *Предопределённые запросы*.
databasetype	The database type, defined in the Database Type drop-down menu in the Database Connection tab.
databaseport	The port as defined in the Port text box in the Database Connection tab.
databasename	The database name as defined in the Database Name text box in the Database Connection tab.
databaseusername	The database username as defined in the Username text box in the Database Connection tab.
databasepassword	The database password as defined in the Password text box in the Database Connection tab.
sqlstatement	SQL-запрос.
autoconnect	A flag ("true"" or "false") to specify if the above tags should be used to automatically connect to the database without running the database connection routine in the Database Connection tab.

Пример XML-файла, содержащего три запроса:

```
<?xml version="1.0"?>
<doc>
 <query>
   <shortdescription>Import all photograph points</shortdescription>
   <description>This command will import all of the data in the SQLite database to QGIS
      </description>
   <databasetype>SQLITE</databasetype>
   <databasehost />
   <databaseport />
   <databasename>C:\textbackslash Workshop/textbackslash
eVis\_Data\textbackslash PhotoPoints.db</databasename>
   <databaseusername />
   <databasepassword />
   <sqlstatement>SELECT Attributes.*, Points.x, Points.y FROM Attributes LEFT JOIN
      Points ON Points.rec_id=Attributes.point_ID</sqlstatement>
   <autoconnect>false</autoconnect>
 </query>
  <query>
   <shortdescription>Import photograph points "looking across Valley"</shortdescription>
   <description>This command will import only points that have photographs "looking across
      a valley" to QGIS</description>
   <databasetype>SQLITE</databasetype>
   <databasehost />
   <databaseport />
   <databasename>C:\Workshop\eVis_Data\PhotoPoints.db</databasename>
   <databaseusername />
   <databasepassword />
   <sqlstatement>SELECT Attributes.*, Points.x, Points.y FROM Attributes LEFT JOIN
      Points ON Points.rec_id=Attributes.point_ID where COMMENTS='Looking across
      valley'</sqlstatement>
   <autoconnect>false</autoconnect>
 </query>
 <query>
   <shortdescription>Import photograph points that mention "limestone"</shortdescription>
   <description>This command will import only points that have photographs that mention
      "limestone" to QGIS</description>
   <databasetype>SQLITE</databasetype>
   <databasehost />
   <databaseport />
   <databasename>C:\Workshop\eVis_Data\PhotoPoints.db</databasename>
   <databaseusername />
```

```
   <databasepassword />
   <sqlstatement>SELECT Attributes.*, Points.x, Points.y FROM Attributes LEFT JOIN
      Points ON Points.rec_id=Attributes.point_ID where COMMENTS like '%limestone%'
      </sqlstatement>
   <autoconnect>false</autoconnect>
 </query>
</doc>
```

.

20.7 Модуль fTools

The goal of the fTools Python plugin is to provide a one-stop resource for many common vector-based GIS tasks, without the need for additional software, libraries, or complex work-arounds. It provides a growing suite of spatial data management and analysis functions that are both fast and functional.

fTools is now automatically installed and enabled in new versions of QGIS, and as with all plugins, it can be disabled and enabled using the Plugin Manager (see *The Plugins Dialog*). When enabled, the fTools plugin adds a *Vector* menu to QGIS, providing functions ranging from Analysis and Research Tools to Geometry and Geoprocessing Tools, as well as several useful Data Management Tools.

20.7.1 Инструменты анализа

Иконка	Инструмент	Назначение
	Distance matrix	Измеряет расстояние между точками двух точечных слоёв и выдает результат в виде a) квадратной матрицы расстояний, b) линейной матрицы расстояний, или c) суммы расстояний. Можно ограничить расчет только для k ближайших точек.
	Сумма расстояний в полигонах	Рассчитывает сумму расстояний для линий линейного слоя в пределах каждого полигона другого (векторного полигонального) слоя.
	Количество точек в полигонах	Рассчитывает число точек точечного слоя, которые находятся в пределах каждого полигона другого (векторного полигонального) слоя.
	Список уникальных значений	List all unique values in an input vector layer field.
	Basic statistics	Рассчитывает основные статистики (среднее, стандартное отклонение, количество, сумму, коэффициент вариации) для указанного поля.
	Nearest neighbor analysis	Compute nearest neighbor statistics to assess the level of clustering in a point vector layer.
	Средние координаты	Рассчитывает среднеарифметические или средневзвешенные координаты центра для целого векторного слоя или для набора объектов, выбранного на основе уникальные значения из указанного поля.
	Пересечения линий	Рассчитывает местонахождения пересечений линий, создавая точечный шейп-файл с точками пересечений. Полезен для определения мест пересечений дорог или водотоков. Игнорирует пересечения линий с длинной > 0.

Таблица Ftools 1: Инструменты анализа fTools

20.7.2 Инструменты выборки

Иконка	Инструмент	Назначение
	Случайная выборка	Randomly select n number of features, or n percentage of features.
	Случайная выборка в подмножествах	Случайно выбирает набор объектов с уникальными значением указанного поля.
	Случайные точки	Создает псевдо-случайные точки в пределах границ указанного слоя.
	Регулярные точки	Создаёт регулярную сетку точек в пределах указаной области и экспортирует их в точечный шейп-файл.
	Векторная сетка	Generate a line or polygon grid based on user-specified grid spacing.
	Выделение по районам	Выделяет объекты на основе их положения относительно другого слоя, создавая новую выборку или добавляя/отнимая к/от текущей выборки.
	Полигон из границ слоя	Создаёт полигональный слой с единственным прямоугольным полигоном в соответствии с границами исходного растрового или векторного слоя.

Таблица Ftools 2: Инструменты выборки fTools

20.7.3 Инструменты геопроцессинга

Иконка	Инструмент	Назначение
	Выпуклые оболочки	Создает минимально возможные выпуклые оболочки, или выпуклые оболочки на основе указанного поля.
	Буферные зоны	Создает буферные зоны вокруг объектов заданного пользователем размера, или используя размер из значений указанного поля.
	Пересечение	Совмещает слои таким образом, что в выходном слое содержатся только участки, в которых оба слоя пересекаются.
	Объединение	Совмещает слои таким образом, что в выходном слое содержатся как участки пересечения, так и участки, принадлежащие только одному из слоев.
	Симметричная разность	Совмещает слои таким образом, что в выходном слое содержатся только те участки, в которых исходные слои не пересекаются.
	Отсечение	Совмещает слои таким образом, что в выходном слое содержатся только те участки, которые пересекаются со слоем отсечения.
	Разность	Совмещает слои таким образом, что в выходном слое содержатся только те участки, которые не пересекаются со слоем отсечения.
	Объединение по признаку	Объединяет объекты на основе значения указанного поля. Все объекты с одинаковым значением поля будут объединены в один объект.
	Удалить осколочные полигоны	Объединяет выделенные объекты с соседним полигоном, площадь или длина общей границы которого наибольшая.

Таблица Ftools 3: Инструменты геопроцессинга fTools

20.7.4 Инструменты обработки геометрии

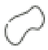
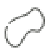
Икон-ка	Инструмент	Назначение
	Проверка геометрии	Check polygons for intersections, closed holes, and fix node ordering.
	Экспортировать / добавить поле геометрии	Добавляет к слою поле(я) с информацией о геометрии: (XCOORD, YCOORD) для точечного слоя, (LENGTH) для линейного и (AREA, PERIMETER) для полигонального.
	Центроиды полигонов	Вычисляет истинные центроиды для каждого полигона исходного полигонального слоя.
	Триангуляция Делоне	Calculate and output (as polygons) the Delaunay triangulation of an input point vector layer.
	Voronoi polygons	Calculate Voronoi polygons of an input point vector layer.
	Упростить геометрию	Упрощает линии или полигоны при помощи модифицированного алгоритма Дугласа – Пойкера.
	Добавить вершины	Densify lines or polygons by adding vertices.
	Разбить составные объекты	Преобразует составные объекты (мульти-полигоны или мульти-полилинии) в несколько простых объектов (полигонов или полилиний).
	Объединить объекты в составные	Объединяет несколько простых объектов в один составной на основе значения указанного поля.
	Преобразовать полигоны в линии	Преобразует полигоны в линии, составные полигоны преобразует в несколько простых полилиний.
	Преобразовать линии в полигоны	Преобразует линии в полигоны, составные линии преобразует в несколько простых полигонов.
	Извлечение узлов	Извлекает узлы из линий или полигонов, создавая точечный шейп-файл.

Таблица Ftools 4: Инструменты обработки геометрии fTools

Примечание: The *Simplify geometry* tool can be used to remove duplicate nodes in line and polygon geometries. Just set the *Simplify tolerance* parameter to 0 and this will do the trick.

20.7.5 Инструменты управления данными

Иконка	Инструмент	Назначение
	Задать текущую проекцию	Задает проекцию для шейп-файла, если ранее она не была задана.
	Объединение атрибутов по районам	Присоединяет дополнительные атрибуты к векторному слою на основе пространственного взаимного расположения. Атрибуты из одного векторного слоя присоединяются к атрибутивной таблице другого векторного слоя и экспортируются в шейп-файл.
	Разбить векторный слой	Делит векторный слой на несколько отдельных слоев на основе значения указанного поля.
	Объединение shape-файлов	Объединяет несколько шейп-файлов, находящихся в одной директории, в новый шейп-файл, основываясь на типе слоя (точечный, линейный, полигональный).
	Создать пространственный индекс	Create a spatial index for OGR- supported formats.

Таблица Ftools 5: Инструменты управления данными fTools

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20.8 Модуль GDAL Tools

20.8.1 What is GDAL Tools?

The GDAL Tools plugin offers a GUI to the collection of tools in the Geospatial Data Abstraction Library, http://gdal.osgeo.org . These are raster management tools to query, re-project, warp and merge a wide variety of raster formats. Also included are tools to create a contour (vector) layer, or a shaded relief from a raster DEM, and to make a VRT (Virtual Raster Tile in XML format) from a collection of one or more raster files. These tools are available when the plugin is installed and activated.

Библиотека GDAL

Библиотека GDAL состоит из набора программ, работающих из командной строки, каждая с большим набором опций. Пользователи, которым комфортно работать в командной строке, могут предпочесть её, в том числе из-за полного набора опций. Модуль «GDAL Tools» обеспечивает простой интерфейс к этим утилитам, но с ограниченным набором наиболее востребованных опций.

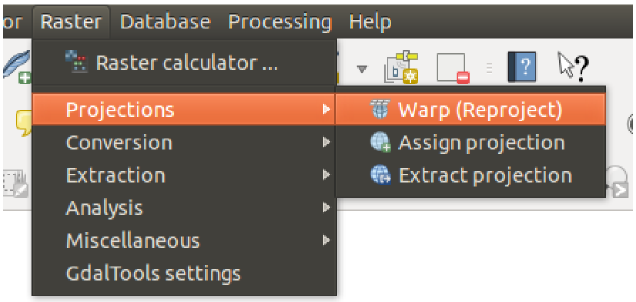

Рис. 20.15: Меню *GDALTools*

20.8.2 Список инструментов GDAL Tools

Проекции

Перепроецирование	This utility is an image mosaicing, reprojection and warping utility. The program can reproject to any supported projection, and can also apply GCPs stored with the image if the image is "raw" with control information. For more information, you can read on the GDAL website http://www.gdal.org/gdalwarp.html.
Назначить проекцию	This tool allows you to assign projection to rasters that are already georeferenced but miss projection information. Also with its help, it is possible to alter existing projection definitions. Both single file and batch mode are supported. For more information, please visit the utility page at the GDAL site, http://www.gdal.org/gdalwarp.html.
Извлечь проекцию	This utility helps you to extract projection information from an input file. If you want to extract projection information from a whole directory, you can use the batch mode. It creates both `.prj` and `.wld` files.

Преобразование

Растеризация	This program burns vector geometries (points, lines and polygons) into the raster band(s) of a raster image. Vectors are read from OGR-supported vector formats. Note that the vector data must in the same coordinate system as the raster data; on the fly reprojection is not provided. For more information see http://www.gdal.org/gdal_rasterize.html.
Создание полигонов	This utility creates vector polygons for all connected regions of pixels in the raster sharing a common pixel value. Each polygon is created with an attribute indicating the pixel value of that polygon. The utility will create the output vector datasource if it does not already exist, defaulting to ESRI shapefile format. See also http://www.gdal.org/gdal_polygonize.html.
Преобразовать формат	This utility can be used to convert raster data between different formats, potentially performing some operations like subsetting, resampling, and rescaling pixels in the process. For more information you can read on http://www.gdal.org/gdal_translate.html.
RGB в PCT	This utility will compute an optimal pseudocolor table for a given RGB image using a median cut algorithm on a downsampled RGB histogram. Then it converts the image into a pseudocolored image using the color table. This conversion utilizes Floyd-Steinberg dithering (error diffusion) to maximize output image visual quality. The utility is also described at http://www.gdal.org/rgb2pct.html.
PCT в RGB	This utility will convert a pseudocolor band on the input file into an output RGB file of the desired format. For more information, see http://www.gdal.org/pct2rgb.html.

Извлечение

Создать изолинии	This program generates a vector contour file from the input raster elevation model (DEM). On http://www.gdal.org/gdal_contour.html, you can find more information.
Обрезка	This utility allows you to clip (extract subset) rasters using selected extent or based on mask layer bounds. More information can be found at http://www.gdal.org/gdal_translate.html.

Анализ

Отсеивание	This utility removes raster polygons smaller than a provided threshold size (in pixels) and replaces them with the pixel value of the largest neighbor polygon. The result can be written back to the existing raster band, or copied into a new file. For more information, see http://www.gdal.org/gdal_sieve.html.
Сбросить в черный	This utility will scan an image and try to set all pixels that are nearly black (or nearly white) around the edge to exactly black (or white). This is often used to "fix up" lossy compressed aerial photos so that color pixels can be treated as transparent when mosaicing. See also http://www.gdal.org/nearblack.html.
Заполнить пустоты	This utility fills selected raster regions (usually nodata areas) by interpolation from valid pixels around the edges of the areas. On http://www.gdal.org/gdal_fillnodata.html, you can find more information.
Карта близости	This utility generates a raster proximity map indicating the distance from the center of each pixel to the center of the nearest pixel identified as a target pixel. Target pixels are those in the source raster for which the raster pixel value is in the set of target pixel values. For more information see http://www.gdal.org/gdal_proximity.html.
Сетка (Интерполяция)	This utility creates a regular grid (raster) from the scattered data read from the OGR datasource. Input data will be interpolated to fill grid nodes with values, and you can choose from various interpolation methods. The utility is also described on the GDAL website, http://www.gdal.org/gdal_grid.html.
Анализ рельефа	Tools to analyze and visualize DEMs. It can create a shaded relief, a slope, an aspect, a color relief, a Terrain Ruggedness Index, a Topographic Position Index and a roughness map from any GDAL-supported elevation raster. For more information, see http://www.gdal.org/gdaldem.html.

Прочее

Создать виртуальный растр (каталог)	This program builds a VRT (Virtual Dataset) that is a mosaic of the list of input GDAL datasets. See also http://www.gdal.org/gdalbuildvrt.html.
Объединение	This utility will automatically mosaic a set of images. All the images must be in the same coordinate system and have a matching number of bands, but they may be overlapping, and at different resolutions. In areas of overlap, the last image will be copied over earlier ones. The utility is also described at http://www.gdal.org/gdal_merge.html.
Информация	This utility lists various information about a GDAL-supported raster dataset. On http://www.gdal.org/gdalinfo.html, you can find more information.
Построить пирамиды	The gdaladdo utility can be used to build or rebuild overview images for most supported file formats with one of several downsampling algorithms. For more information, see http://www.gdal.org/gdaladdo.html.
Индекс мозаики	This utility builds a shapefile with a record for each input raster file, an attribute containing the filename, and a polygon geometry outlining the raster. See also http://www.gdal.org/gdaltindex.html.

GDAL Tools Settings

Use this dialog to embed your GDAL variables.

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20.9 Модуль привязки растров

The Georeferencer Plugin is a tool for generating world files for rasters. It allows you to reference rasters to geographic or projected coordinate systems by creating a new GeoTiff or by adding a world file to the existing image. The basic approach to georeferencing a raster is to locate points on the raster for which you can accurately determine coordinates.

Кнопки панели инструментов модуля

Икон-ка	Назначение	Икон-ка	Назначение
	Открыть растр		Начать привязку
	Создать сценарий GDAL		Загрузить контрольные точки
	Сохранить контрольные точки как		Параметры трансформации
	Добавить точку		Удалить точку
	Переместить точку		Прокрутка
	Увеличить		Уменьшить
	Увеличить до слоя		Предыдущий охват
	Следующий охват		Связать модуль привязки растров с QGIS
	Связать QGIS с модулем привязки растров		Full histogram stretch
	Local histogram stretch		

Таблица Georeferencer 1: Инструменты привязки растров

20.9.1 Стандартная процедура

As X and Y coordinates (DMS (dd mm ss.ss), DD (dd.dd) or projected coordinates (mmmm.mm)), which correspond with the selected point on the image, two alternative procedures can be used:

- The raster itself sometimes provides crosses with coordinates "written" on the image. In this case, you can enter the coordinates manually.
- Using already georeferenced layers. This can be either vector or raster data that contain the same objects/features that you have on the image that you want to georeference and with the projection that you want for your image. In this case, you can enter the coordinates by clicking on the reference dataset loaded in the QGIS map canvas.

Стандартная процедура привязки растровых изображений подразумевает выбор множественных точек на растре, обозначение их координат или выбор соответствующего типа преобразования. Исходя из введённых параметров и данных, модуль вычислит параметры файла привязки. Чем больше координат будет введено, тем точнее будет результат.

The first step is to start QGIS, load the Georeferencer Plugin (see *The Plugins Dialog*) and click on *Raster → Georeferencer* , which appears in the QGIS menu bar. The Georeferencer Plugin dialog appears as shown in figure_georeferencer_1.

Для этого примера мы будем использовать топографическую карту участка штата Южной Дакоты (США), взятую с сайта Геологического Комитета Южной Дакоты. Позже она может быть показана вместе с данными области GRASS spearfish60. Карту можно загрузить отсюда: http://grass.osgeo.org/sampledata/spearfish_toposheet.tar.gz.

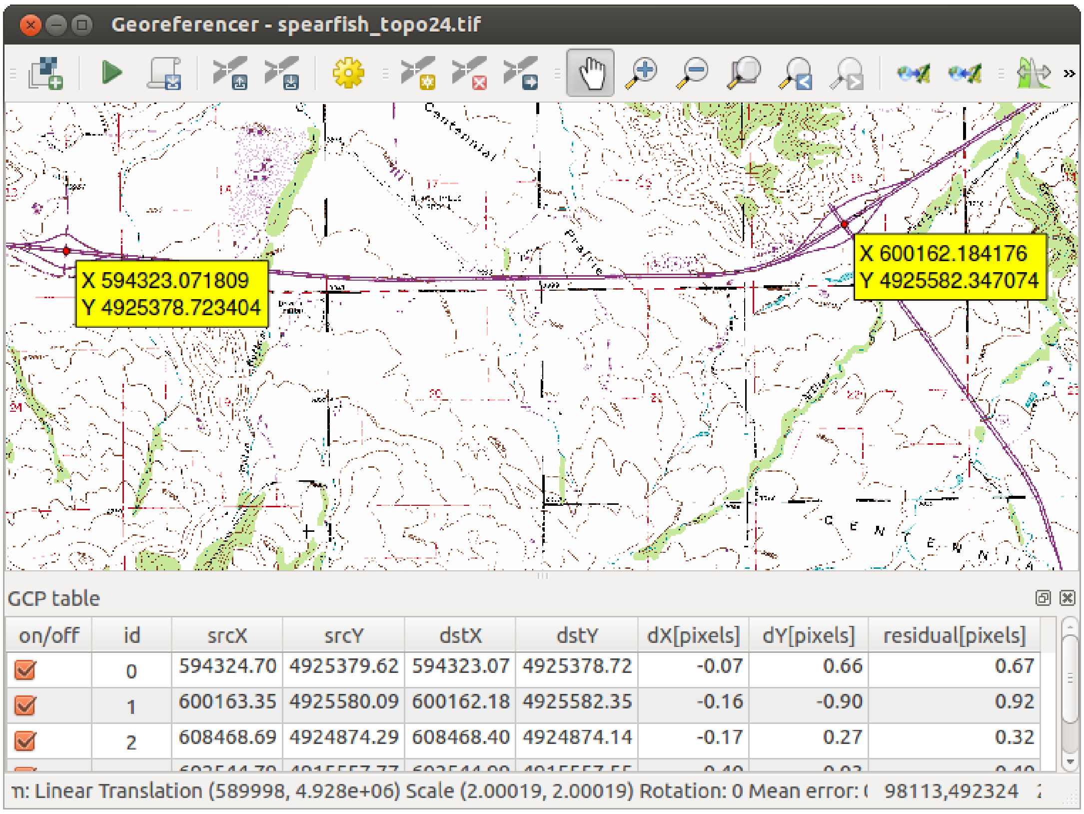

Рис. 20.16: Модуль привязки растров

Ввод контрольных точек

1. To start georeferencing an unreferenced raster, we must load it using the button. The raster will show up in the main working area of the dialog. Once the raster is loaded, we can start to enter reference points.

2. "Используя кнопку Добавить точку, следует добавить точки в основном рабочем окне и ввести их координаты (см. рисунок figure_georeferencer_2). Данную операцию можно проделать тремя путями:

   - Щелкнуть мышью по точке на растровом изображении и ввести координаты X и Y вручную.

   - Click on a point in the raster image and choose the From map canvas button to add the X and Y coordinates with the help of a georeferenced map already loaded in the QGIS map canvas.

   - Используя кнопку Переместить точку, можно перемещать созданные точки, если они расположенные не там, где нужно.

3. Continue entering points. You should have at least four points, and the more coordinates you can provide, the better the result will be. There are additional tools on the plugin dialog to zoom and pan the working area in order to locate a relevant set of GCP points.

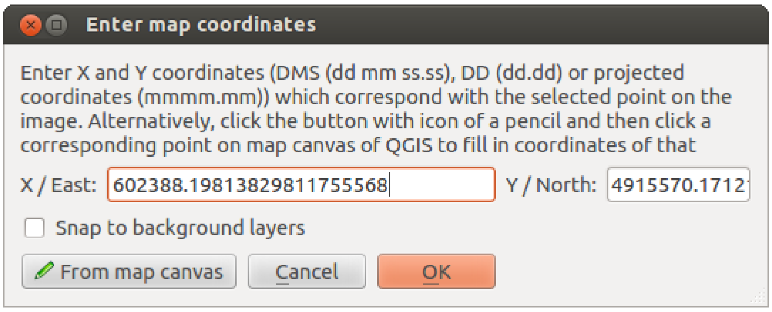

Рис. 20.17: Добавление точек на растр

Точки, добавленные на карту, сохраняются в отдельный текстовый файл (`[имя файла].points`), обычно в одном каталоге с растровым изображением. Это дает возможность повторно загрузить модуль привязки растров позже и добавить новые точки или удалить существующие для получения лучшего результата. Файл с точками содержит значения в формате: mapX, mapY, pixelX, pixelY. Можно использовать кнопки Загрузить контрольные точки и Сохранить котрольные точки для изменения этих файлов.

Определение параметров трансформации

После того, как контрольные точки добавлены на растровое изображение, необходимо определить параметры преобразования для привязки.

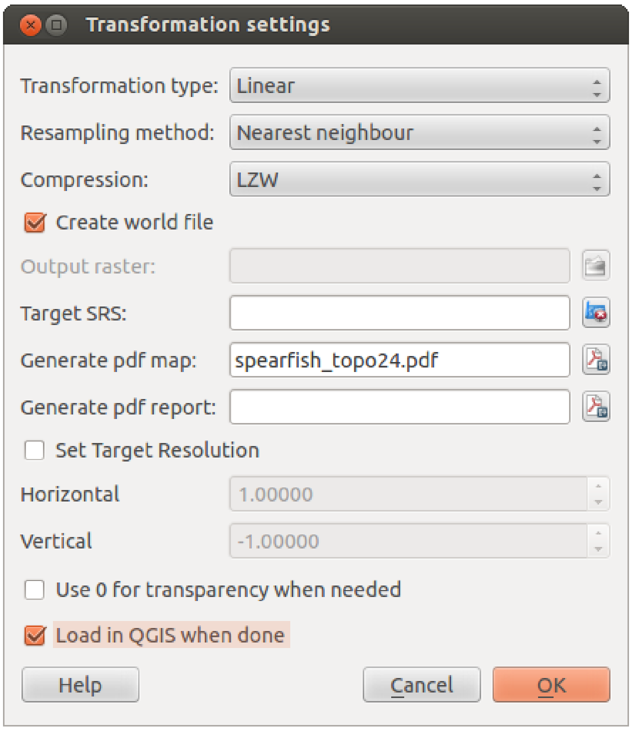

Рис. 20.18: Определение параметров трансформации модуля привязки

Доступные алгоритмы преобразования

Depending on how many ground control points you have captured, you may want to use different transformation algorithms. Choice of transformation algorithm is also dependent on the type and quality of input data and the amount of geometric distortion that you are willing to introduce to the final result.

Currently, the following *Transformation types* are available:

- The **Linear** algorithm is used to create a world file and is different from the other algorithms, as it does not actually transform the raster. This algorithm likely won't be sufficient if you are dealing with scanned material.
- **Трансформация Хельмерта** совершает простые трансформации с изменением масштаба и вращением.
- The **Polynomial** algorithms 1-3 are among the most widely used algorithms introduced to match source and destination ground control points. The most widely used polynomial algorithm is the second-order polynomial transformation, which allows some curvature. First-order polynomial transformation (affine) preserves colliniarity and allows scaling, translation and rotation only.
- **Алгоритм тонкостенного сплайна** — более современный метод привязки, дающий возможность ввода в данные местных деформаций. Данный алгоритм очень полезен, когда необходимо привязать растры с низким качеством изображения.
- **Проективная трансформация** — линейное вращение и сдвиг растра.

Определение метода пересчёта

Выбранный тип пересчёта будет, скорее всего, зависеть от исходных данных и конкретной цели операции. Если вы не желаете менять совокупную информацию изображения, вам, возможно, подойдет метод «ближайший сосед», тогда как «кубический» пересчет приведет к более сглаженному результату.

It is possible to choose between five different resampling methods:

1. Ближайший сосед
2. Линейный
3. Кубический
4. Кубический сплайн
5. Ланцоша

Установка параметров трансформации

Существует несколько параметров, которые необходимо задать для получения привязанного растра.

- The *Create world file* checkbox is only available if you decide to use the linear transformation type, because this means that the raster image actually won't be transformed. In this case, the *Output raster* field is not activated, because only a new world file will be created.
- For all other transformation types, you have to define an *Output raster*. As default, a new file ([filename]_modified) will be created in the same folder together with the original raster image.
- As a next step, you have to define the *Target SRS* (Spatial Reference System) for the georeferenced raster (see *Работа с проекциями*).
- If you like, you can **generate a pdf map** and also **a pdf report**. The report includes information about the used transformation parameters, an image of the residuals and a list with all GCPs and their RMS errors.
- Furthermore, you can activate the *Set Target Resolution* checkbox and define the pixel resolution of the output raster. Default horizontal and vertical resolution is 1.
- The *Use 0 for transparency when needed* can be activated, if pixels with the value 0 shall be visualized transparent. In our example toposheet, all white areas would be transparent.

- Finally, *Load in QGIS when done* loads the output raster automatically into the QGIS map canvas when the transformation is done.

Просмотр и изменение свойств растра

Выбор пункта *Свойства растра* в меню *Параметры* вызовет диалог свойств привязываемого слоя.

Настройки модуля

- You can define whether you want to show GCP coordiniates and/or IDs.
- As residual units, pixels and map units can be chosen.
- For the PDF report, a left and right margin can be defined and you can also set the paper size for the PDF map.
- Finally, you can activate to *Show Georeferencer window docked*.

Запуск преобразования

After all GCPs have been collected and all transformation settings are defined, just press the Start georeferencing button to create the new georeferenced raster.

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20.10 Модуль интерполяции

The Interplation plugin can be used to generate a TIN or IDW interpolation of a point vector layer. It is very simple to handle and provides an intuitive graphical user interface for creating interpolated raster layers (see Figure_interpolation_1). The plugin requires the following parameters to be specified before running:

- Input **Vector layers**: Specify the input point vector layer(s) from a list of loaded point layers. If several layers are specified, then data from all layers is used for interpolation. Note: It is possible to insert lines or polygons as constraints for the triangulation, by specifying either "points", "structure lines" or "break lines" in the *Type* combo box.
- **Interpolation attribute**: Select the attribute column to be used for interpolation or enable the *Use Z-Coordinate* checkbox to use the layer's stored Z values.
- **Interpolation Method**: Select the interpolation method. This can be either 'Triangulated Irregular Network (TIN)' or 'Inverse Distance Weighted (IDW)'.
- **Number of columns/rows**: Specify the number of rows and columns for the output raster file.
- **Файл вывода**: Выберите название для выходного растрового файла.
- *Добавить результат в проект* для загрузки результата на в проект.

20.10.1 Использование модуля

1. Запустите QGIS и загрузите точечный векторый слой (к примеру, `elevp.csv`).
2. Load the Interpolation plugin in the Plugin Manager (see *The Plugins Dialog*) and click on the *Raster* → *Interpolation* → *Interpolation* , which appears in the QGIS menu bar. The Interpolation plugin dialog appears as shown in Figure_interpolation_1.

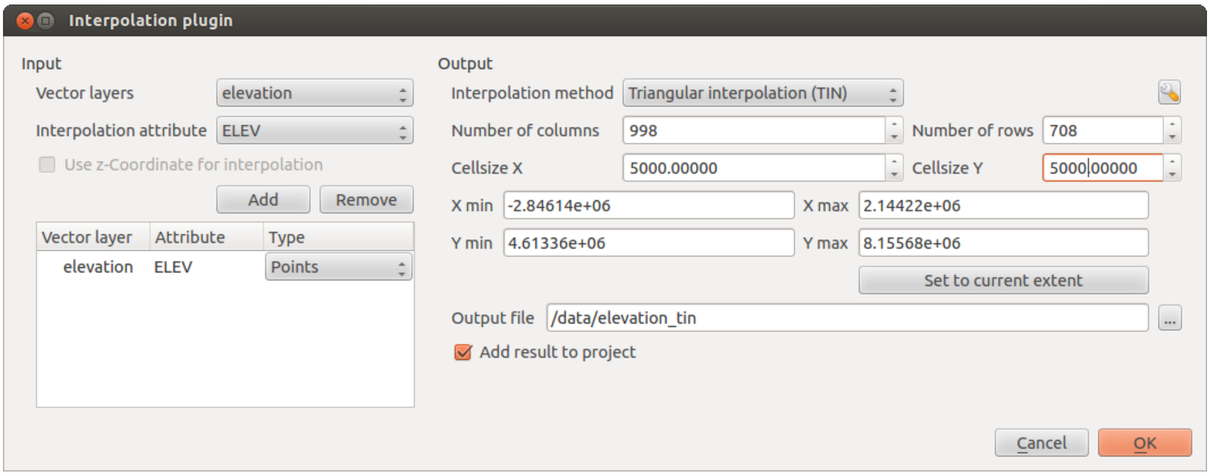

Рис. 20.19: Модуль интерполяции

3. Выберите исходный слой (к примеру, `elevp`) и колонку (к примеру, `ELEV`) для интерполяции.
4. Select an interpolation method (e.g., 'Triangulated Irregular Network (TIN)'), and specify a cell size of 5000 as well as the raster output filename (e.g., `elevation_tin`).
5. Нажмите кнопку **[OK]**.

.

20.11 Оффлайновое редактирование

For data collection, it is a common situation to work with a laptop or a cell phone offline in the field. Upon returning to the network, the changes need to be synchronized with the master datasource (e.g., a PostGIS database). If several persons are working simultaneously on the same datasets, it is difficult to merge the edits by hand, even if people don't change the same features.

Модуль Оффлайновое редактирование автоматизирует процесс синхронизации, копируя содержимое основного источника данных (обычно, базы PostGIS или WFS-T) в базу SpatiaLite и сохраняя все правки в специальных таблицах. При повторном подключении к основному источнику данных, все правки легко переносятся в основной источник.

20.11.1 Работа с модулем

- Open some vector layers (e.g., from a PostGIS or WFS-T datasource).
- Save it as a project.
- Go to *Database* → *Offline Editing* → *Convert to offline project* and select the layers to save. The content of the layers is saved to SpatiaLite tables.
- Редактируйте слои.
- After being connected again, upload the changes using *Database* → *Offline Editing* → *Synchronize*.

.

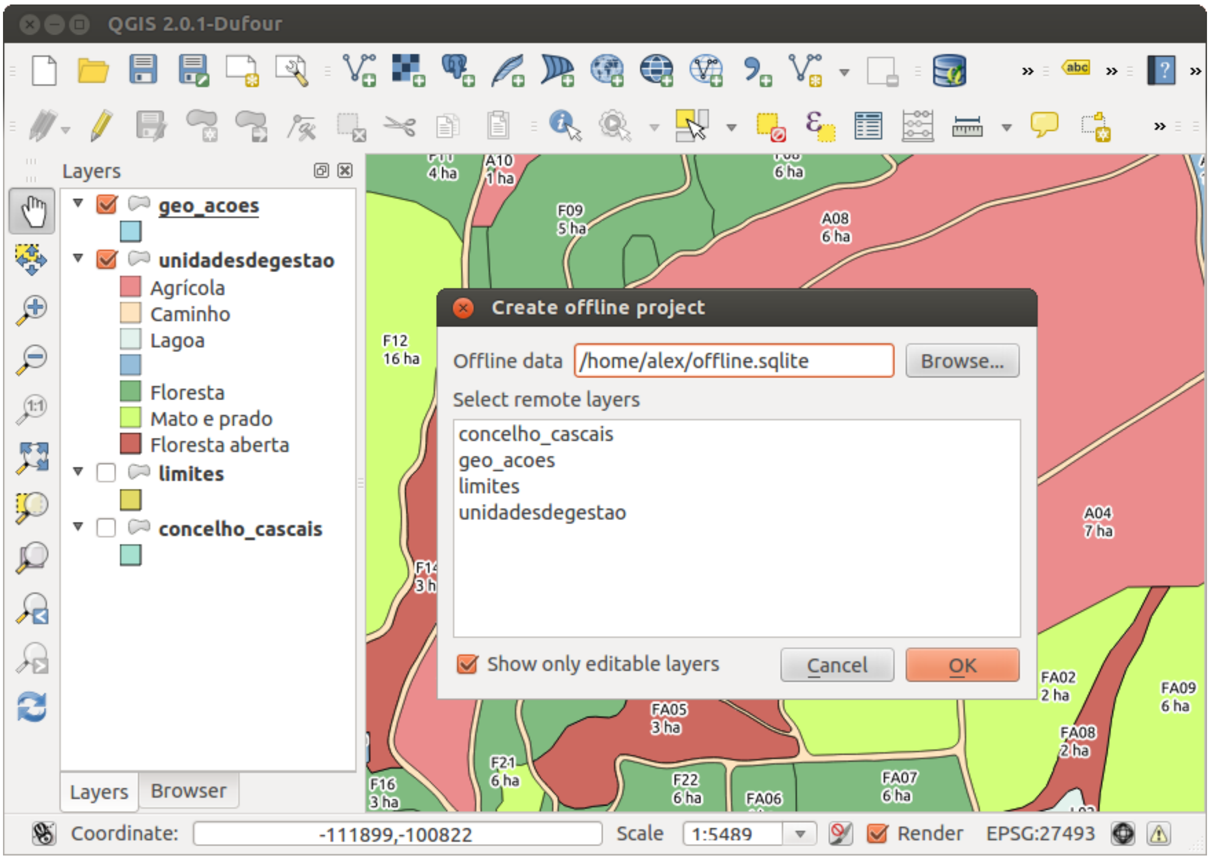

Рис. 20.20: Создание оффлайнового проекта из слоёв PostGIS или WFS

20.12 Oracle Spatial GeoRaster Plugin

In Oracle databases, raster data can be stored in SDO_GEORASTER objects available with the Oracle Spatial extension. In QGIS, the Oracle Spatial GeoRaster plugin is supported by GDAL and depends on Oracle's database product being installed and working on your machine. While Oracle is proprietary software, they provide their software free for development and testing purposes. Here is one simple example of how to load raster images to GeoRaster:

```
$ gdal_translate -of georaster input_file.tif geor:scott/tiger@orcl
```

Эта команда загрузит растр в таблицу GDAL_IMPORT по умолчанию, в качестве столбца под названием `RASTER`.

20.12.1 Управление соединениями

Firstly, the Oracle GeoRaster Plugin must be enabled using the Plugin Manager (see *The Plugins Dialog*). The first time you load a GeoRaster in QGIS, you must create a connection to the Oracle database that contains the data. To do this, begin by clicking on the Add Oracle GeoRaster Layer toolbar button – this will open the *Select Oracle Spatial GeoRaster* dialog window. Click on **[New]** to open the dialog window, and specify the connection parameters (See Figure_oracle_raster_1):

- **Name**: Enter a name for the database connection.
- **Database instance**: Enter the name of the database that you will connect to.
- **Username**: Specify your own username that you will use to access the database.

- **Password**: Provide the password associated with your username that is required to access the database.

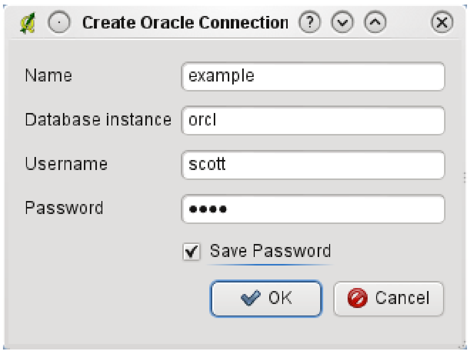

Рис. 20.21: Диалоговое окно «Создать соединение Oracle»

Теперь, в диалоговом окне *Выберите Oracle Spatial GeoRaster* (см. рисунок Figure_oracle_raster_2), нужно выбрать подключение из выпадающего списка и использовать кнопку **[Подключиться]** для установки соединения. Также существует возможность править параметры подключения посредством кнопки **[Правка]** или использовать кнопку **[Удалить]** для удаления соединения из списка.

20.12.2 Выбор растровых данных

Once a connection has been established, the subdatasets window will show the names of all the tables that contain GeoRaster columns in that database in the format of a GDAL subdataset name.

Выбрав один из таких наборов данных и нажав кнопку **[OK]**, можно выбрать название таблицы. Теперь будет показан другой список подчиненных наборов данных, содержащий названия колонок растровых данных из этой таблицы. Обычно это короткий список, так как большинство пользователей не держит больше 1-2 столбцов в одной таблице.

Click on one of the listed subdatasets and then click on **[Select]** to choose one of the table/column combinations. The dialog will now show all the rows that contain GeoRaster objects. Note that the subdataset list will now show the Raster Data Table and Raster Id pairs.

At any time, the selection entry can be edited in order to go directly to a known GeoRaster or to go back to the beginning and select another table name.

The selection data entry can also be used to enter a `WHERE` clause at the end of the identification string (e.g., `geor:scott/tiger@orcl,gdal_import,raster,geoid=`). See http://www.gdal.org/frmt_georaster.html for more information.

20.12.3 Отображение растровых данных

Finally, by selecting a GeoRaster from the list of Raster Data Tables and Raster Ids, the raster image will be loaded into QGIS.

The *Select Oracle Spatial GeoRaster* dialog can be closed now and the next time it opens, it will keep the same connection and will show the same previous list of subdatasets, making it very easy to open up another image from the same context.

Примечание: GeoRasters that contain pyramids will display much faster, but the pyramids need to be generated outside of QGIS using Oracle PL/SQL or gdaladdo.

The following is an example using `gdaladdo`:

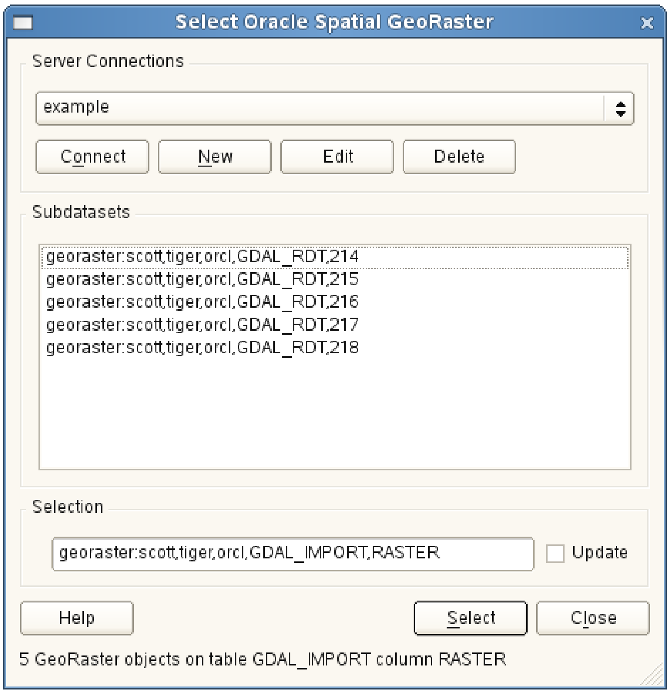

Рис. 20.22: Диалоговое окно «Выберите Oracle Spatial GeoRaster»

```
gdaladdo georaster:scott/tiger@orcl,georaster\_table,georaster,georid=6 -r
nearest 2 4 6 8 16 32
```

А это пример для PL/SQL:

```
$ sqlplus scott/tiger
SQL> DECLARE
 gr sdo_georaster;
BEGIN
    SELECT image INTO gr FROM cities WHERE id = 1 FOR UPDATE;
    sdo_geor.generatePyramid(gr, 'rLevel=5, resampling=NN');
    UPDATE cities SET image = gr WHERE id = 1;
    COMMIT;
END;
```

.

20.13 Морфометрический анализ

The Raster Terrain Analysis Plugin can be used to calculate the slope, aspect, hillshade, ruggedness index and relief for digital elevation models (DEM). It is very simple to handle and provides an intuitive graphical user interface for creating new raster layers (see Figure_raster_terrain_1).

Виды анализа:

- **Slope**: Calculates the slope angle for each cell in degrees (based on first- order derivative estimation).
- **Экспозиция**: Экспозиция (начиная с 0 градусов на север, против часовой стрелки).
- **Hillshade**: Creates a shaded map using light and shadow to provide a more three-dimensional appearance for a shaded relief map.

- **Ruggedness Index**: A quantitative measurement of terrain heterogeneity as described by Riley et al. (1999). It is calculated for every location by summarizing the change in elevation within the 3x3 pixel grid.
- **Relief**: Creates a shaded relief map from digital elevation data. Implemented is a method to choose the elevation colors by analysing the frequency distribution.

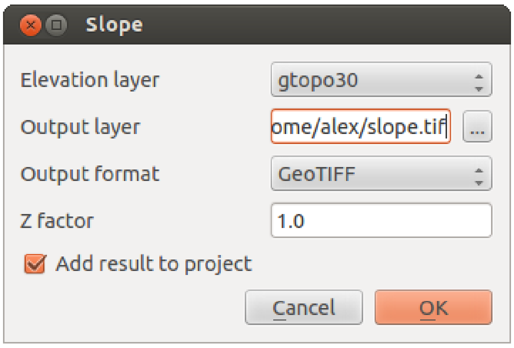

Рис. 20.23: Модуль морфометрического анализа (расчет угла уклонов)

20.13.1 Использование модуля

1. Запустите QGIS и загрузите растр цифровой модели рельефа `gtopo30` из демонстрационного набора данных GRASS.
2. Load the Raster Terrain Analysis plugin in the Plugin Manager (see *The Plugins Dialog*).
3. Select an analysis method from the menu (e.g., *Raster* → *Terrain Analysis* → *Slope*). The *Slope* dialog appears as shown in Figure_raster_terrain_1.
4. Укажите выходной файл и его формат.
5. Нажмите **[OK]**.

.

20.14 Модуль «Теплокарта»

Модуль «Создание теплокарт» использует ядерную оценку плотности распределения для создания растровой карты плотности (теплокарты) по исходному точечному векторному слою. Плотность вычисляется по числу точек в определенной области, больше количество точек даёт большее значение плотности. Теплокарты позволяют легко идентифицировать скопления точек и выявлять «горячие» области.

20.14.1 Активация модуля

First this core plugin needs to be activated using the Plugin Manager (see *The Plugins Dialog*). After activation, the heatmap icon can be found in the Raster Toolbar, and under the *Raster* → *Heatmap* menu.

Если кнопки не видно, возможно, у вас отключена соответствующая панель инструментов. Включить её можно из меню *Вид* → *Панели инструментов* → *Растр*.

20.14.2 Использование модуля

Clicking the *Heatmap* tool button opens the Heatmap plugin dialog (see figure_heatmap_2).

Для построения теплокарты необходимо задать следующие параметры:

- **Input point layer**: Lists all the vector point layers in the current project and is used to select the layer to be analysed.
- **Output raster**: Allows you to use the ... button to select the folder and filename for the output raster the Heatmap plugin generates. A file extension is not required.
- **Output format**: Selects the output format. Although all formats supported by GDAL can be choosen, in most cases GeoTIFF is the best format to choose.
- **Radius**: Is used to specify the heatmap search radius (or kernel bandwidth) in meters or map units. The radius specifies the distance around a point at which the influence of the point will be felt. Larger values result in greater smoothing, but smaller values may show finer details and variation in point density.

When the *Advanced* checkbox is checked, additional options will be available:

- **Rows** and **Columns**: Used to change the dimensions of the output raster. These values are also linked to the **Cell size X** and **Cell size Y** values. Increasing the number of rows or columns will decrease the cell size and increase the file size of the output file. The values in Rows and Columns are also linked, so doubling the number of rows will automatically double the number of columns and the cell sizes will also be halved. The geographical area of the output raster will remain the same!
- **Cell size X** and **Cell size Y**: Control the geographic size of each pixel in the output raster. Changing these values will also change the number of Rows and Columns in the output raster.
- **Функция ядра**: задаёт алгоритм по которому рассчитывается знижение влияния точки по мере увеличения расстояния от неё. Разные функции имеют разные коэффициенты уменьшения, поэтому тривесовая функция даёт больший вес на малых расстояниях от точки чем функция Евпанечникова. И как результат, тривесовая функция делает «горячие» точки более четкими, а функция Евпанечникова — сглаженными. В QGIS доступны основные функции ядра, описание которых можно найти в Википедии.
- **Decay ratio**: Can be used with Triangular kernels to further control how heat from a feature decreases with distance from the feature.
  - A value of 0 (=minimum) indicates that the heat will be concentrated in the centre of the given radius and completely extinguished at the edge.
  - Коэффициент равный 0.5 означает, что температура пикселей на краях буферной зоны будет в два раза ниже температуры в центре.
  - Если указано значение 1, распределение температуры будет равномерным по всей буферной зоне (это равнозначно использованию «Прямоугольной» функции ядра).
  - A value greater than 1 indicates that the heat is higher towards the edge of the search radius than at the centre.

Исходный точечный слой может содержать поля, которые можно использоваться при построении теплокарты:

- **Use radius from field**: Sets the search radius for each feature from an attribute field in the input layer.
- **Use weight from field**: Allows input features to be weighted by an attribute field. This can be used to increase the influence certain features have on the resultant heatmap.

Когда все параметры указаны, нажмите кнопку **[OK]**, чтобы запустить процесс создания теплокарты.

20.14.3 Пример создания теплокарты

For the following example, we will use the **airports** vector point layer from the QGIS sample dataset (see *Примеры данных*). Another exellent QGIS tutorial on making heatmaps can be found at http://qgis.spatialthoughts.com.

In Figure_Heatmap_1, the airports of Alaska are shown.

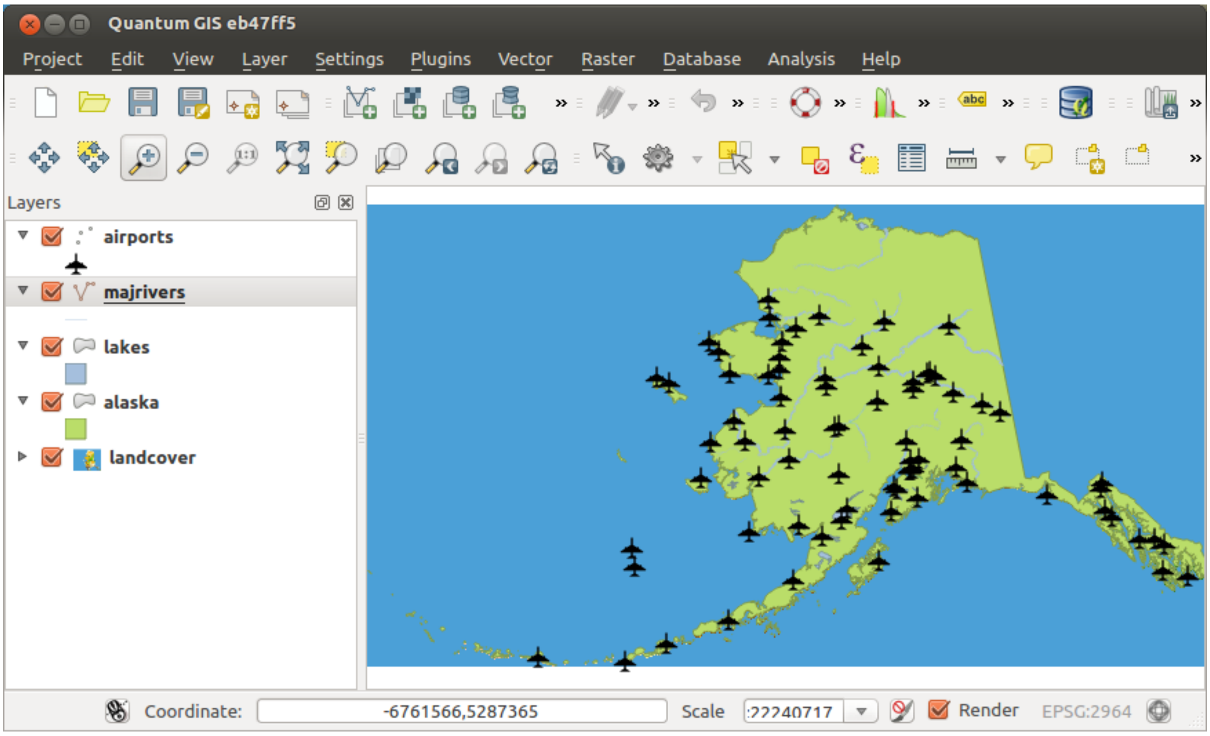

Рис. 20.24: Аэропорты Аляски

1. Select the *Heatmap* tool button to open the Heatmap dialog (see Figure_Heatmap_2).
2. In the *Input point layer* field, select `airports` from the list of point layers loaded in the current project.
3. Specify an output filename by clicking the ... button next to the *Output raster* field. Enter the filename `heatmap_airports` (no file extension is necessary).
4. В выпадающем списке *Формат вывода* выберите `GeoTiff`.
5. Установите в поле *Радиус* значение `1000000` метров.
6. Нажмите кнопку **[OK]** чтобы создать и загрузить в QGIS теплокарту (см. рисунок Figure_Heatmap_3).

QGIS создаст теплокарту и загрузить её в проект. По умолчанию итоговый растр отображается в оттенках серого цвета, светлым областям соответствует болбшая концентрация аэропортов. Чтобы теплокарта была легкочитаемой рекомендуется изменить её стиль отображения. с использованием правильного стиля

1. Откройте свойства слоя `heatmap_airports`. Для этого выберите слой в списке слоёв проекта, вызовите контекстное меню по правой клавише мыши и выберите пункт *Свойства*.
2. Перейдите на вкладку *Стиль*.
3. Измените стиль отрисовки в поле *Изображение* с «Одноканальное серое» на «Одноканальное псевдоцветное».

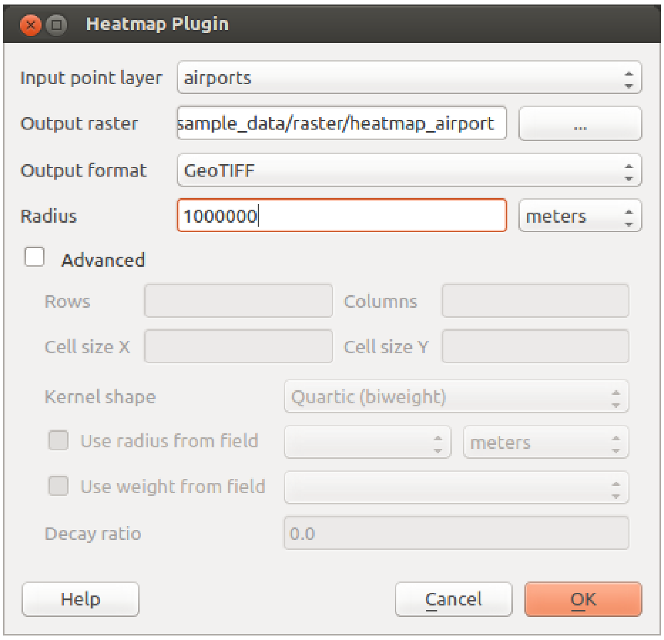

Рис. 20.25: Создание теплокарты

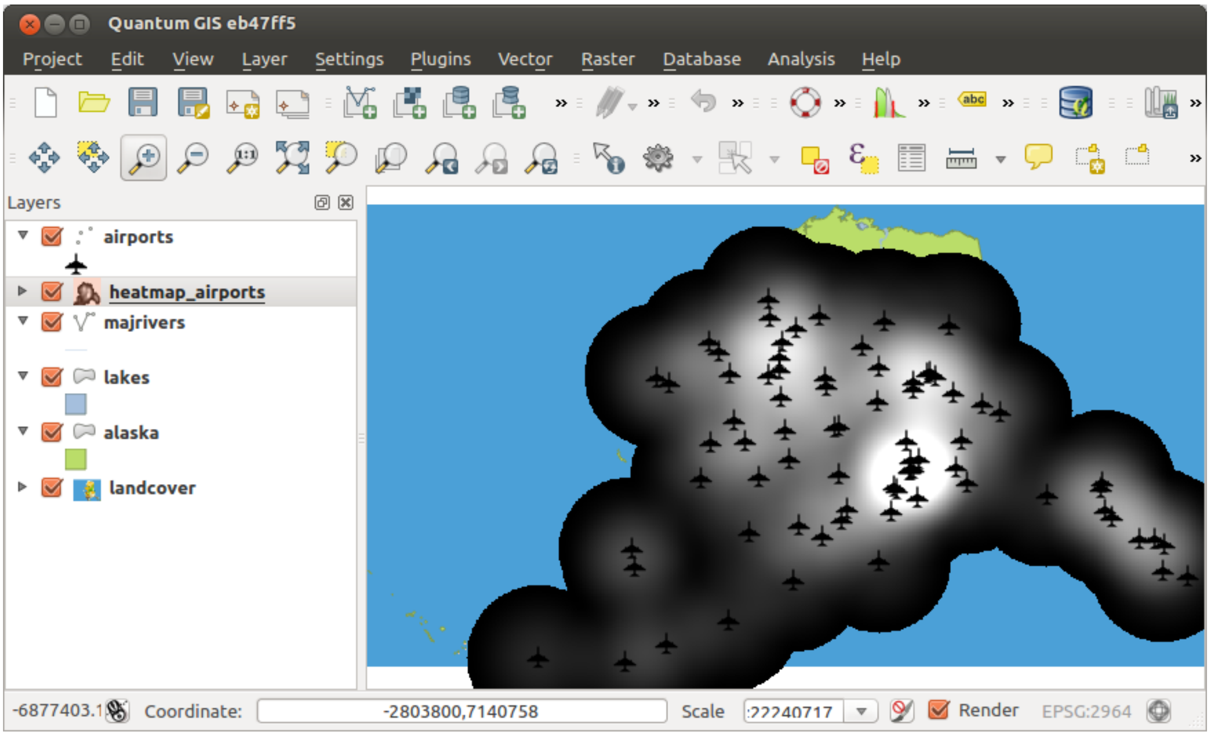

Рис. 20.26: После загрузки теплокарта отображается в оттенках серого

4. Выберите подходящую цветовую карту в группе *Создать цветовую карту*, например «YlOrRed».
5. Нажмите кнопку **[Загрузить]**в группе :guilabel:'Значения мин/макс' для получения минимального и максимального значений растра. Затем нажмите кнопку **[Классифицировать]** в группе *Создать цветовую карту*.
6. Нажмите кнопку **[OK]** чтобы закрыть окно и применить настройки отображения растра.

Конечный результат показан на рисунке Figure_Heatmap_4.

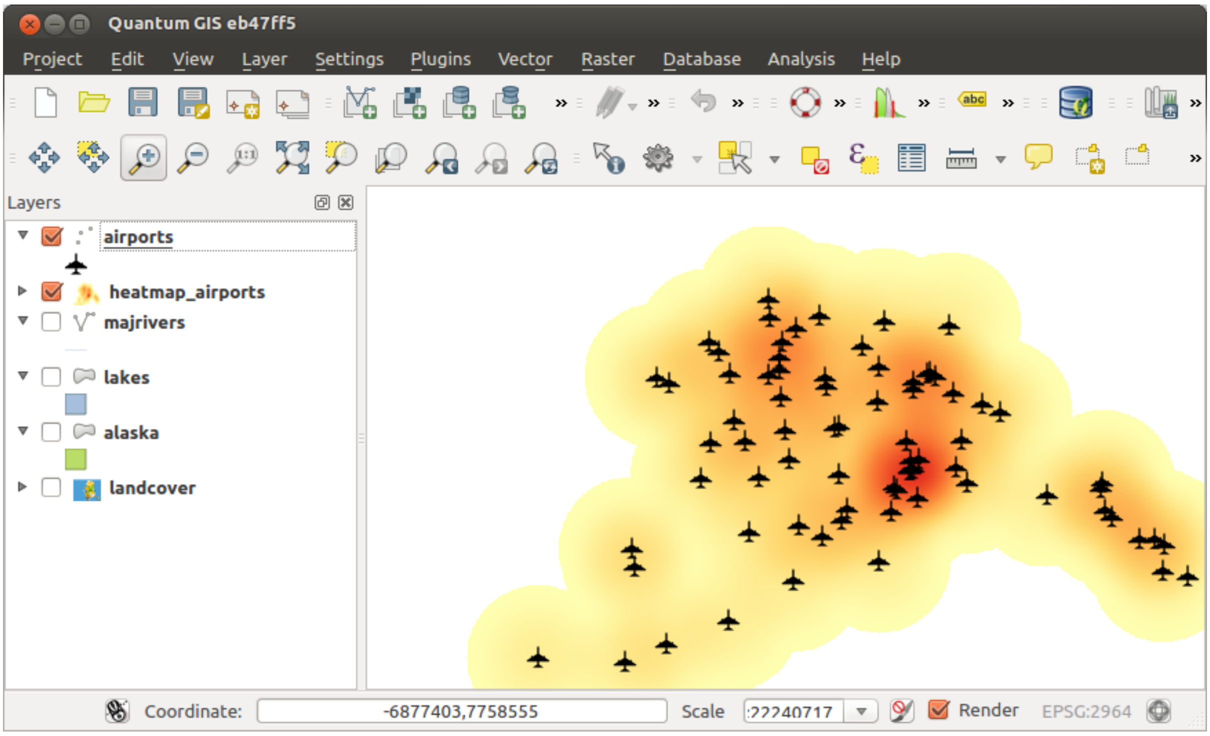

Рис. 20.27: Итоговая теплокарта аэропортов Аляски

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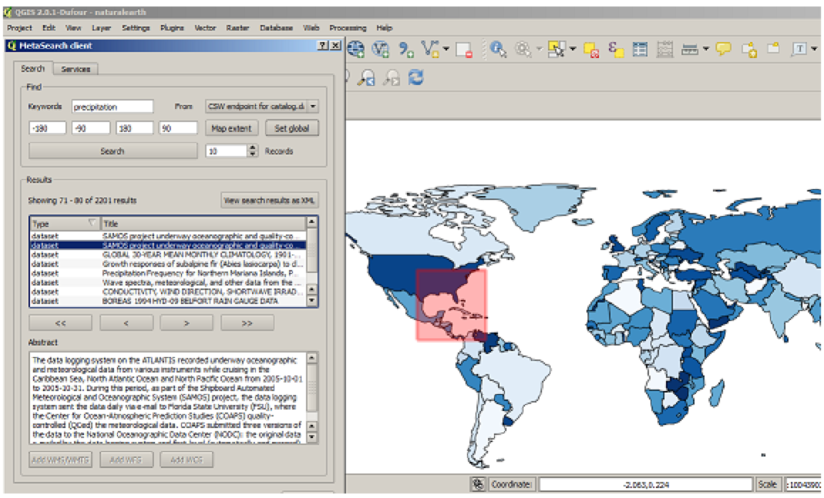
20.15 MetaSearch Catalogue Client



20.15.1 Introduction

MetaSearch is a QGIS plugin to interact with metadata catalogue services, supporting the OGC Catalogue Service for the Web (CSW) standard.

MetaSearch provides an easy and intuitive approach and user-friendly interface to searching metadata catalogues within QGIS.

20.15.2 Installation

MetaSearch is included by default with QGIS 2.0 and higher. All dependencies are included within MetaSearch.

Install MetaSearch from the QGIS plugin manager, or manually from http://plugins.qgis.org/plugins/MetaSearch.

20.15.3 Working with Metadata Catalogues in QGIS

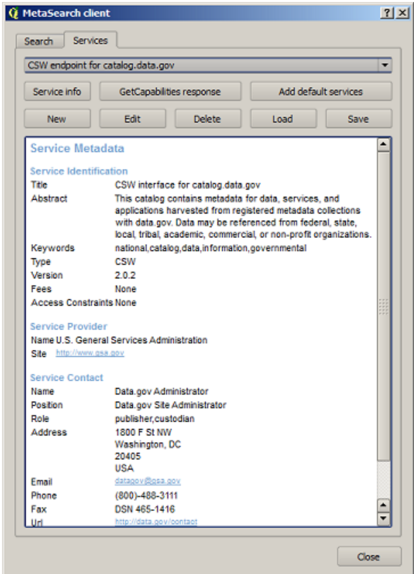
CSW (Catalogue Service for the Web)

CSW (Catalogue Service for the Web) is an OGC (Open Geospatial Consortium) specification, that defines common interfaces to discover, browse, and query metadata about data, services, and other potential resources.

Startup

To start MetaSearch, click the MetaSearch icon or select Web / MetaSearch / MetaSearch via the QGIS main menu. The MetaSearch dialog will appear. The main GUI consists of two tabs: 'Services' and 'Search'.

Managing Catalogue Services



The 'Services' tab allows the user to manage all available catalogue services. MetaSearch provides a default list of Catalogue Services, which can be added by pressing 'Add default services' button.

To all listed Catalogue Service entries, click the dropdown select box.

To add a Catalogue Service entry, click the 'New' button, and enter a Name for the service, as well as the URL/endpoint. Note that only the base URL is required (not a full GetCapabilities URL). Clicking ok will add the service to the list of entries.

To edit an existing Catalogue Service entry, select the entry you would like to edit and click the 'Edit' button, and modify the Name or URL values, then click ok.

To delete a Catalogue Service entry, select the entry you would like to delete and click the 'Delete' button. You will be asked to confirm deleting the entry.

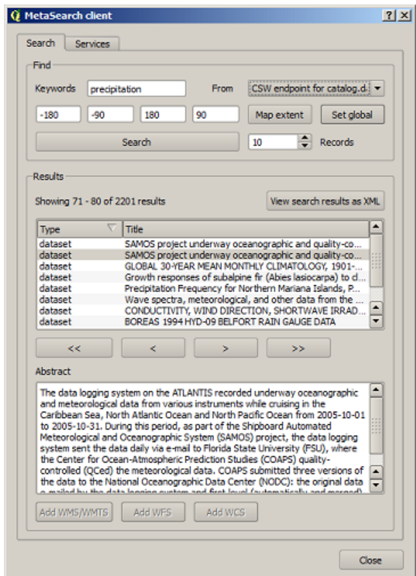
MetaSearch allows for loading and saving connections to an XML file. This is useful when you need to share settings between applications. Below is an example of the XML file format.

```
<?xml version="1.0" encoding="UTF-8"?>
<qgsCSWConnections version="1.0">
    <csw name="Data.gov CSW" url="http://catalog.data.gov/csw-all"/>
    <csw name="Geonorge - National CSW service for Norway" url="http://www.geonorge.no/geonetwork/srv/eng/csw"/
    <csw name="Geoportale Nazionale - Servizio di ricerca Italiano" url="http://www.pcn.minambiente.it/geoporta
    <csw name="LINZ Data Service" url="http://data.linz.govt.nz/feeds/csw"/>
    <csw name="Nationaal Georegister (Nederland)" url="http://www.nationaalgeoregister.nl/geonetwork/srv/eng/cs
    <csw name="RNDT - Repertorio Nazionale dei Dati Territoriali - Servizio di ricerca" url="http://www.rndt.go
    <csw name="UK Location Catalogue Publishing Service" url="http://csw.data.gov.uk/geonetwork/srv/en/csw"/>
    <csw name="UNEP/GRID-Geneva Metadata Catalog" url="http://metadata.grid.unep.ch:8080/geonetwork/srv/eng/csw
</qgsCSWConnections>
```

To load a list of entries, click the 'Load' button. A new window will appear; click the 'Browse' button and navigate to the XML file of entries you wish to load and click 'Open'. The list of entries will be displayed. Select the entries you wish to add from the list and click 'Load'.

The 'Service info' button displays information about the selected Catalogue Service such as service identification, service provider and contact information. If you would like to view the raw XML response, click the 'GetCapabilities response' button. A separate window will open displaying Capabilities XML.

Searching Catalogue Services



The 'Search' tab allows the user to query Catalogue Services for data and services, set various search parameters and view results.

The following search parameters are available:

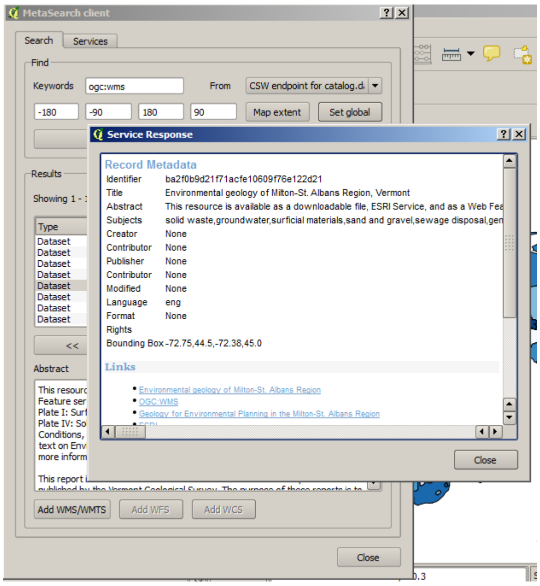
- **Keywords**: free text search keywords
- **From**: the Catalogue Service to perform the query against

- **Bounding box**: the spatial area of interest to filter on. The default bounding box is the map view / canvas. Click 'Set global' to do a global search, or enter custom values as desired
- **Records**: the number of records to return when searching. Default is 10 records

Clicking the 'Search' button will search the selected Metadata Catalogue. Search results are displayed in a list and are sortable by clicking on the column title. You can navigate through search results with the directional buttons below the search results. Clicking the 'View search results as XML' button opens a window with the service response in raw XML format.

Clicking a result will show the record's abstract in the 'Abstract' window and provides the following options:

- if the metadata record has an associated bounding box, a footprint of the bounding box will be displayed on the map
- double-clicking the record displays the record metadata with any associated access links. Clicking the links opens the link in the user's web browser
- if the record is an OGC web service (WMS/WMTS, WFS, WCS), the appropriate 'Add to WMS/WMTS|WFS|WCS' buttons will be enabled for the user to add to QGIS. When clicking this button, MetaSearch will verify if this is a valid OWS. The OWS will then be added to the appropriate QGIS connection list, and the appropriate WMS/WMTS|WFS|WCS connection dialogue will then appear



Settings

You can fine tune MetaSearch with the following settings:

- **Results paging**: when searching metadata catalogues, the number of results to show per page
- **Timeout**: when searching metadata catalogues, the number of seconds for blocking connection attempt. Default value is 10

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20.16 Модуль «Road Graph»

The Road Graph Plugin is a C++ plugin for QGIS that calculates the shortest path between two points on any polyline layer and plots this path over the road network.

Основные возможности:

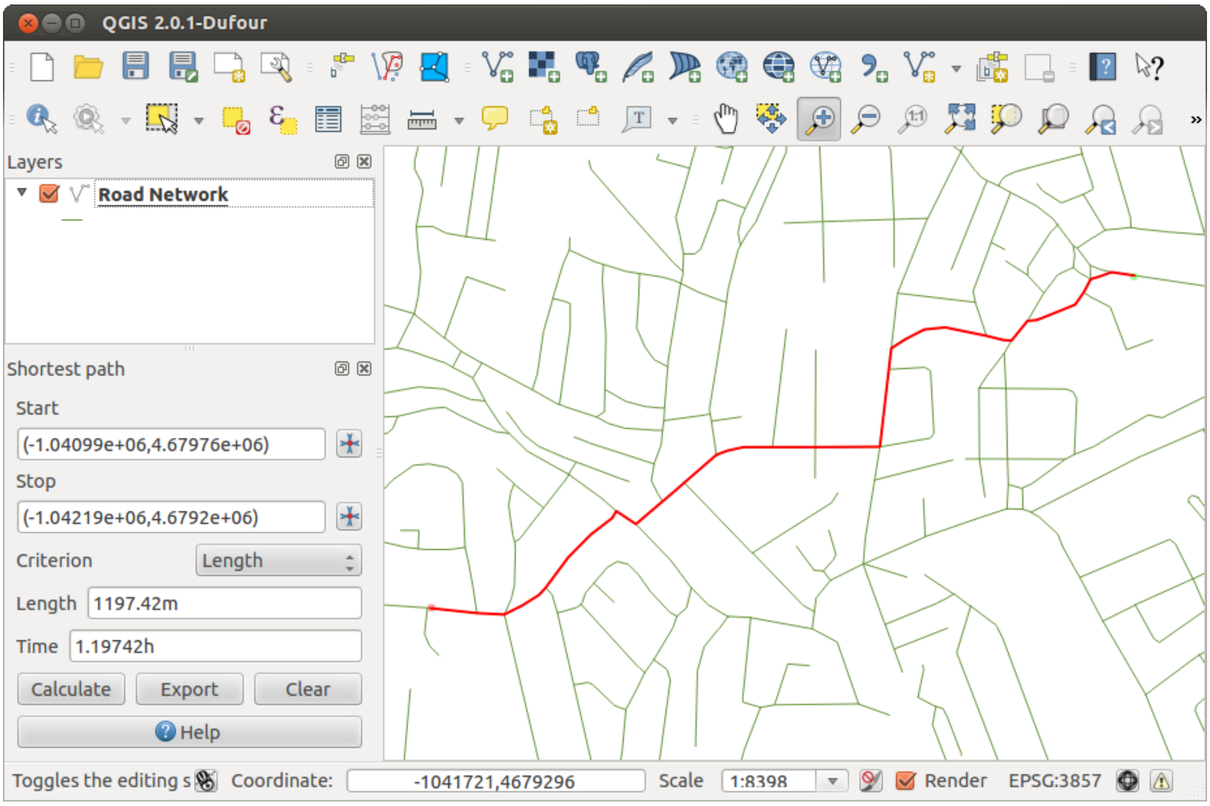

Рис. 20.28: Модуль Road Graph

- Calculates path, as well as length and travel time.
- Optimizes by length or by travel time.
- Exports path to a vector layer.
- Highlights roads directions (this is slow and used mainly for debug purposes and for the settings testing).

As a roads layer, you can use any polyline vector layer in any QGIS-supported format. Two lines with a common point are considered connected. Please note, it is required to use layer CRS as project CRS while editing a roads layer. This is due to the fact that recalculation of the coordinates between different CRSs introduces some errors that can result in discontinuities, even when 'snapping' is used.

In the layer attribute table, the following fields can be used:

- Speed on road section (numeric field).
- Direction (any type that can be cast to string). Forward and reverse directions correspond to a one-way road, both directions indicate a two-way road.

If some fields don't have any value or do not exist, default values are used. You can change defaults and some plugin settings in the plugin settings dialog.

20.16.1 Использование модуля

After plugin activation, you will see an additional panel on the left side of the main QGIS window. Now, enter some parameters into the *Road graph plugin settings* dialog in the *Vector* → *Road Graph* menu (see figure_road_graph_2).

After setting the *Time unit*, *Distance unit* and *Topology tolerance*, you can choose the vector layer in the *Transportation layer* tab. Here you can also choose the *Direction field* and *Speed field*. In the *Default settings* tab, you can set the *Direction* for the calculation.

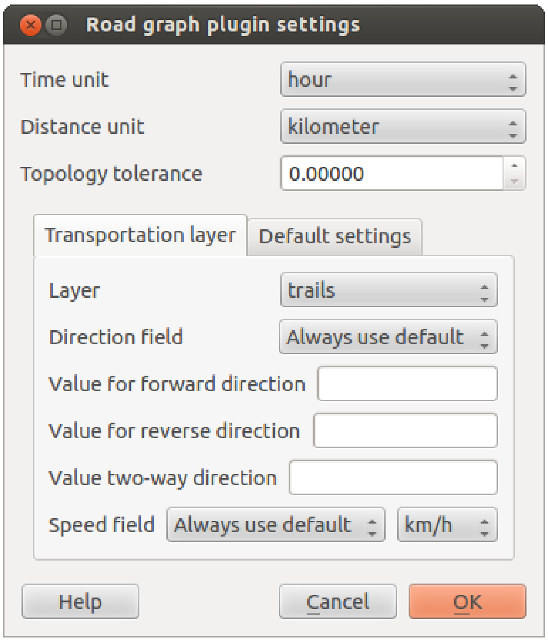

Рис. 20.29: Настройка модуля Road Graph

Finally, in the *Shortest Path* panel, select a Start and a Stop point in the road network layer and click on **[Calculate]**.

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20.17 Модуль «Пространственные запросы»

The Spatial Query Plugin allows you to make a spatial query (i.e., select features) in a target layer with reference to another layer. The functionality is based on the GEOS library and depends on the selected source feature layer.

Поддерживаются следующие операторы:

- Содержит
- Совпадает
- Накладывается
- Пересекает кривой
- Пересекает
- Не пересекает
- Касается
- Находится внутри

20.17.1 Использование модуля

As an example, we want to find regions in the Alaska dataset that contain airports. The following steps are necessary:

1. Запустите QGIS и загрузите слои `regions.shp` и `airports.shp`.

2. Load the Spatial Query plugin in the Plugin Manager (see *The Plugins Dialog*) and click on the Spatial Query icon, which appears in the QGIS toolbar menu. The plugin dialog appears.
3. Select the layer `regions` as the source layer and `airports` as the reference feature layer.
4. Select 'Contains' as the operator and click **[Apply]**.

Now you get a list of feature IDs from the query and you have several options, as shown in figure_spatial_query_1.

- Click on Create layer with list of items.
- Select an ID from the list and click on Create layer with selected.
- Select 'Remove from current selection' in the field *And use the result to* .
- Additionally, you can *Zoom to item* or display *Log messages*.

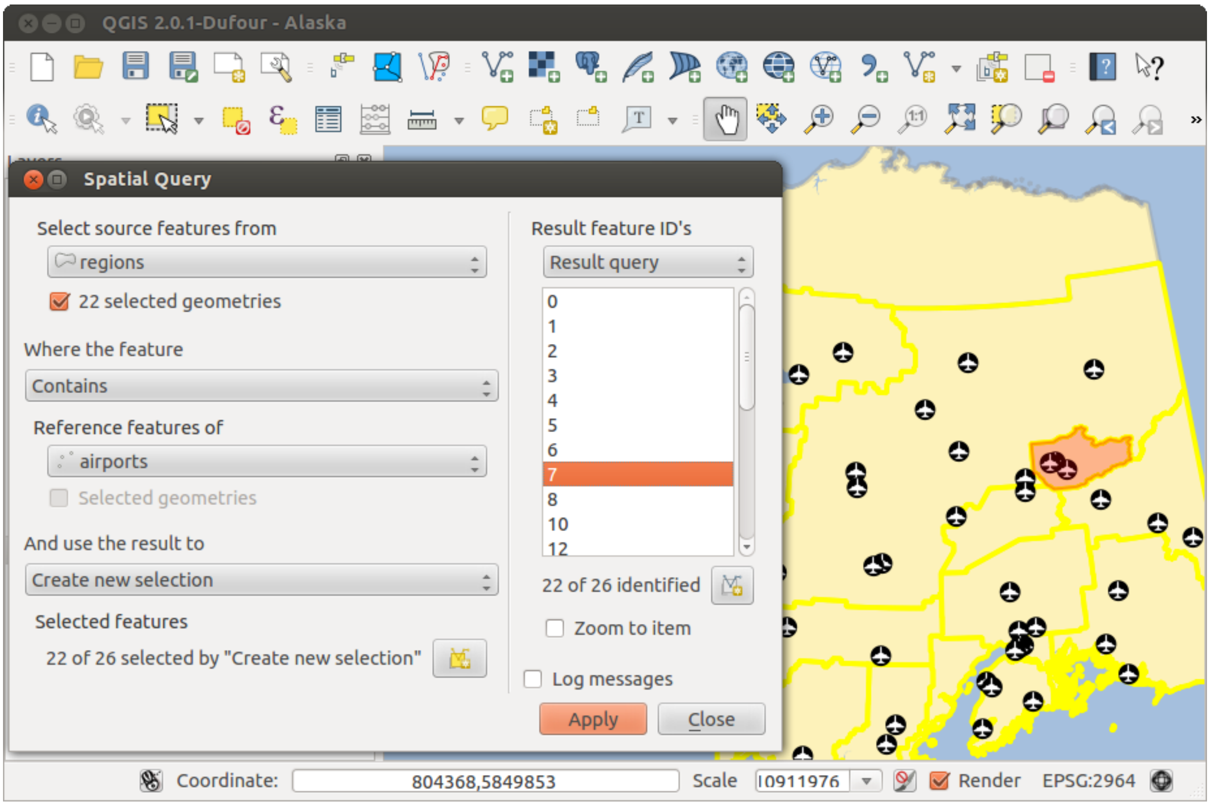

Рис. 20.30: Пространственный запрос — области с аэропортами

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20.18 Модуль SPIT

QGIS comes with a plugin named SPIT (Shapefile to PostGIS Import Tool). SPIT can be used to load multiple shapefiles at one time and includes support for schemas. To use SPIT, open the Plugin Manager from the *Plugins* menu, in the *Installed* menu check the box next to the *SPIT* and click **[OK]**.

To import a shapefile, use *Database* → *Spit* → *Import Shapefiles to PostgreSQL* from the menu bar to open the *SPIT - Shapefile to PostGIS Import Tool* dialog. Select the PostGIS database you want to connect to and click on **[Connect]**. If you want, you can define or change some import options. Now you can add one or more files to the queue by clicking on the **[Add]** button. To process the files, click on the **[OK]** button. The progress of the import as well as any errors/warnings will be displayed as each shapefile is processed. .

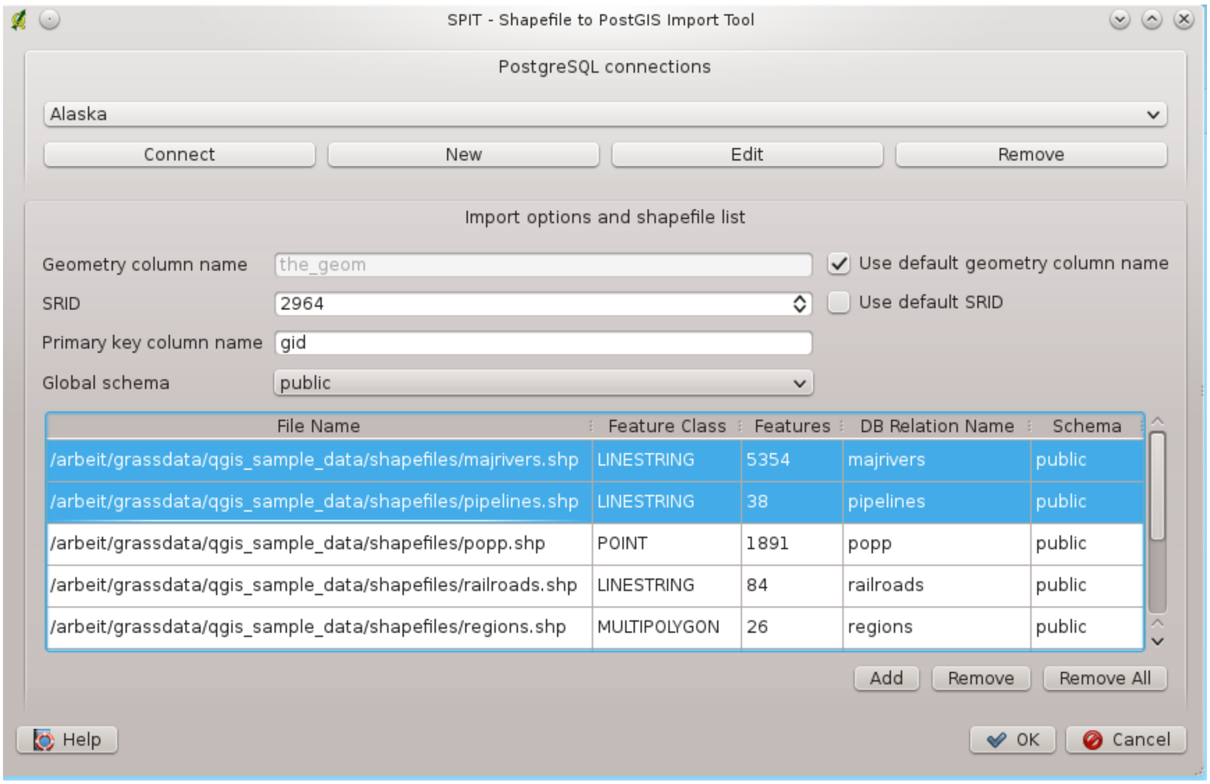

Рис. 20.31: Использование SPIT для импорта shape-файлов в PostGIS

20.19 Модуль «SQL Anywhere»

SQL Anywhere is a proprietary relational database management system (RDBMS) from Sybase. SQL Anywhere provides spatial support, including OGC, shapefiles and built-in functions to export to KML, GML and SVG formats.

SQL Anywhere allows you to connect to spatially enabled SQL Anywhere databases. The *Add SQL Anywhere layer* dialog is similar in functionality to the dialogs for PostGIS and SpatiaLite.

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20.20 Модуль «Проверка топологии»

Topology describes the relationships between points, lines and polygons that represent the features of a geographic region. With the Topology Checker plugin, you can look over your vector files and check the topology with several topology rules. These rules check with spatial relations whether your features 'Equal', 'Contain', 'Cover', are 'CoveredBy', 'Cross', are 'Disjoint', 'Intersect', 'Overlap', 'Touch' or are 'Within' each other. It depends on your individual questions which topology rules you apply to your vector data (e.g., normally you won't accept overshoots in line layers, but if they depict dead-end streets you won't remove them from your vector layer).

QGIS has a built-in topological editing feature, which is great for creating new features without errors. But existing data errors and user-induced errors are hard to find. This plugin helps you find such errors through a list of rules.

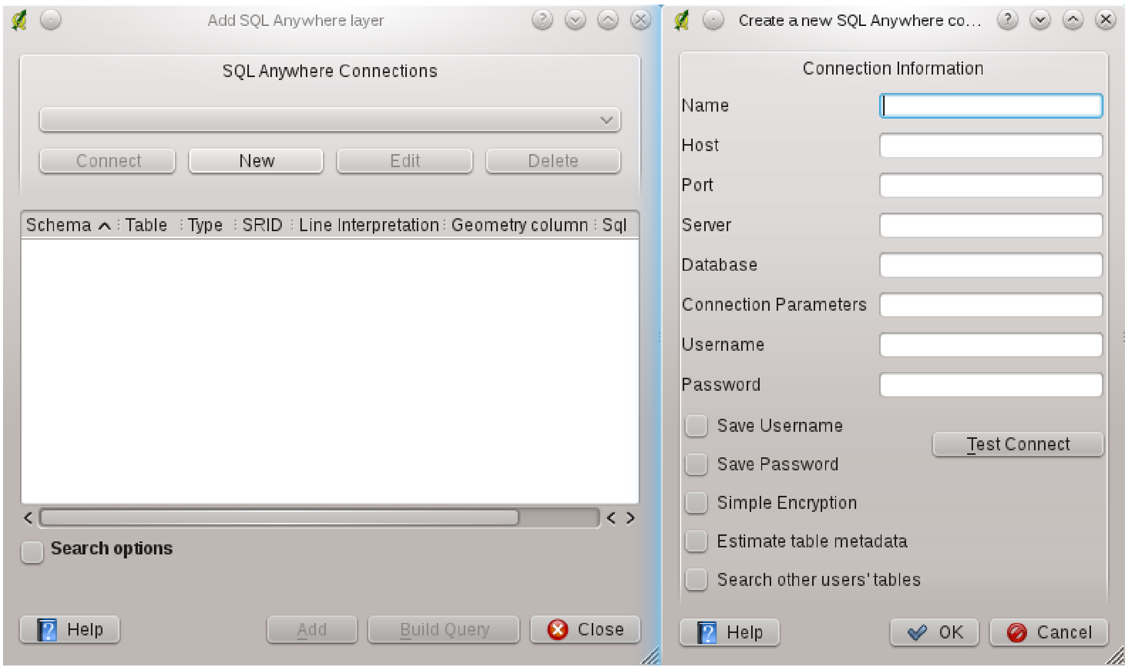

Рис. 20.32: Окно модуля SQL Anywhere

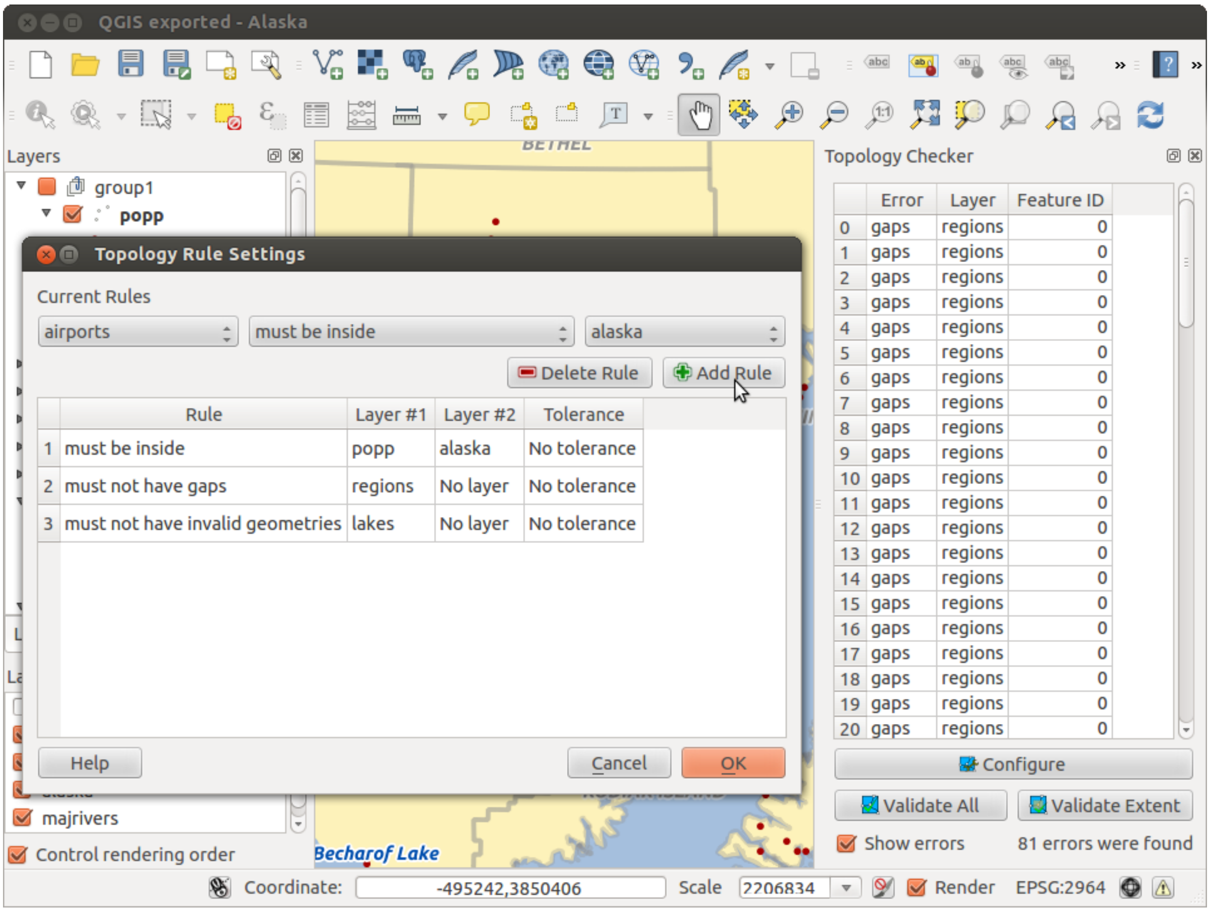

Рис. 20.33: Модуль «Проверка топологии»

Задавать правила проверки топологии в модуле «Проверка топологии» очень просто.

Точечные слои могут проверяться на соответствие следующим правилам:

- **Must be covered by**: Here you can choose a vector layer from your project. Points that aren't covered by the given vector layer occur in the 'Error' field.
- **Must be covered by endpoints of**: Here you can choose a line layer from your project.
- **Must be inside**: Here you can choose a polygon layer from your project. The points must be inside a polygon. Otherwise, QGIS writes an 'Error' for the point.
- **Must not have duplicates**: Whenever a point is represented twice or more, it will occur in the 'Error' field.
- **Must not have invalid geometries**: Checks whether the geometries are valid.
- **Must not have multi-part-geometries**: All multi-part points are written into the 'Error' field.

On **line layers**, the following rules are available:

- **End points must be covered by**: Here you can select a point layer from your project.
- **Must not have dangles**: This will show the overshoots in the line layer.
- **Must not have duplicates**: Whenever a line feature is represented twice or more, it will occur in the 'Error' field.
- **Must not have invalid geometries**: Checks whether the geometries are valid.
- **Must not have multi-part geometries**: Sometimes, a geometry is actually a collection of simple (single-part) geometries. Such a geometry is called multi-part geometry. If it contains just one type of simple geometry, we call it multi-point, multi-linestring or multi-polygon. All multi-part lines are written into the 'Error' field.
- **Must not have pseudos**: A line geometry's endpoint should be connected to the endpoints of two other geometries. If the endpoint is connected to only one other geometry's endpoint, the endpoint is called a psuedo node.

On **polygon layers**, the following rules are available:

- **Must contain**: Polygon layer must contain at least one point geometry from the second layer.
- **Must not have duplicates**: Polygons from the same layer must not have identical geometries. Whenever a polygon feature is represented twice or more it will occur in the 'Error' field.
- **Must not have gaps**: Adjacent polygons should not form gaps between them. Administrative boundaries could be mentioned as an example (US state polygons do not have any gaps between them...).
- **Must not have invalid geometries**: Checks whether the geometries are valid. Some of the rules that define a valid geometry are:
  - границы полигона должны быть замкнуты
  - границы внутренних полигонов («дырок») должны находиться внутри внешней границы полигона
  - внутренние полигоны («дырки») не должны пересекаться или касаться
  - внутренние полигоны не могут качаться друг друга только в одной точке
- **Must not have multi-part geometries**: Sometimes, a geometry is actually a collection of simple (single-part) geometries. Such a geometry is called multi-part geometry. If it contains just one type of simple geometry, we call it multi-point, multi-linestring or multi-polygon. For example, a country consisting of multiple islands can be represented as a multi-polygon.
- **Must not overlap**: Adjacent polygons should not share common area.
- **Must not overlap with**: Adjacent polygons from one layer should not share common area with polygons from another layer.

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20.21 Модуль «Зональная статистика»

With the *Zonal statistics* plugin, you can analyze the results of a thematic classification. It allows you to calculate several values of the pixels of a raster layer with the help of a polygonal vector layer (see figure_zonal_statistics). You can calculate the sum, the mean value and the total count of the pixels that are within a polygon. The plugin generates output columns in the vector layer with a user-defined prefix.

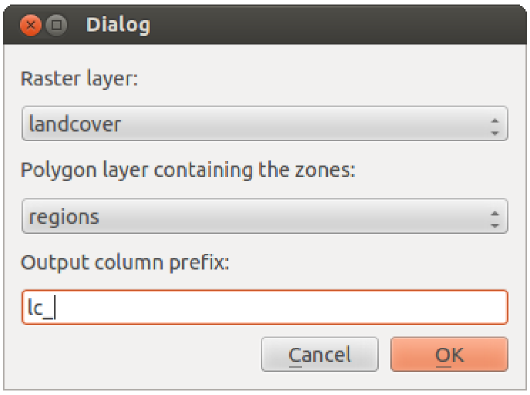

Рис. 20.34: Модуль «Зональная статистика» (KDE)

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Глава 21

Справка и поддержка

21.1 Списки рассылки

QGIS находится в состоянии активной разработки и поэтому иногда может работать не так, как вы ожидаете. Подписка на рассылку qgis-users является наиболее предпочтительным способом получения помощи. Ваш вопрос будет доступен широкой аудитории, а ответы смогут помочь другим.

21.1.1 qgis-users

Список рассылки предназначен как для обсуждения QGIS в целом, так и для специфических вопросов, касающихся установки и использования. Подписаться на список рассылки qgis-users можно посетив следующий URL: http://lists.osgeo.org/mailman/listinfo/qgis-user

21.1.2 fossgis-talk-liste

For the German-speaking audience, the German FOSSGIS e.V. provides the fossgis-talk-liste mailing list. This mailing list is used for discussion of open-source GIS in general, including QGIS. You can subscribe to the fossgis-talk-liste mailing list by visiting the following URL: https://lists.fossgis.de/mailman/listinfo/fossgis-talk-liste

21.1.3 qgis-developer

Если вы разработчик и сталкиваетесь с проблемами более технического характера, то, возможно, захотите присоединиться к рассылке qgis-developer здесь: http://lists.osgeo.org/mailman/listinfo/qgis-developer

21.1.4 qgis-commit

Each time a commit is made to the QGIS code repository, an email is posted to this list. If you want to be up-to-date with every change to the current code base, you can subscribe to this list at: http://lists.osgeo.org/mailman/listinfo/qgis-commit

21.1.5 qgis-trac

Эта рассылка оповещает о событиях, связанных с управлением проектом, в том числе, сообщениях об ошибках, задачах и пожеланиях. Подписаться на рассылку можно по адресу: http://lists.osgeo.org/mailman/listinfo/qgis-trac

21.1.6 qgis-community-team

This list deals with topics like documentation, context help, user guide, web sites, blog, mailing lists, forums, and translation efforts. If you would like to work on the user guide as well, this list is a good starting point to ask your questions. You can subscribe to this list at: http://lists.osgeo.org/mailman/listinfo/qgis-community-team

21.1.7 qgis-release-team

This list deals with topics like the release process, packaging binaries for various OSs and announcing new releases to the world at large. You can subscribe to this list at: http://lists.osgeo.org/mailman/listinfo/qgis-release-team

21.1.8 qgis-tr

Список рассылки посвящённый вопросам перевода. Если вы хотите работать над переводом руководств или интерфейса пользователя (GUI), то все свои вопросы нужно задавать здесь. Подписаться на рассылку можно по адресу: http://lists.osgeo.org/mailman/listinfo/qgis-tr

21.1.9 qgis-edu

This list deals with QGIS education efforts. If you would like to work on QGIS education materials, this list is a good starting point to ask your questions. You can subscribe to this list at: http://lists.osgeo.org/mailman/listinfo/qgis-edu

21.1.10 qgis-psc

Список рассылки используется Руководящим комитетом для обсуждения вопросов, связанных с общим управлением и направлением развития QGIS. Подписаться на рассылку можно здесь: http://lists.osgeo.org/mailman/listinfo/qgis-psc

You are welcome to subscribe to any of the lists. Please remember to contribute to the list by answering questions and sharing your experiences. Note that the qgis-commit and qgis-trac lists are designed for notification only and are not meant for user postings.

21.2 IRC

We also maintain a presence on IRC - visit us by joining the #qgis channel on irc.freenode.net. Please wait for a response to your question, as many folks on the channel are doing other things and it may take a while for them to notice your question. If you missed a discussion on IRC, not a problem! We log all discussion, so you can easily catch up. Just go to http://qgis.org/irclogs and read the IRC-logs.

Commercial support for QGIS is also available. Check the website http://qgis.org/en/commercial-support.html for more information.

21.3 Багтрекер

While the qgis-users mailing list is useful for general 'How do I do XYZ in QGIS?'-type questions, you may wish to notify us about bugs in QGIS. You can submit bug reports using the QGIS bug tracker at http://hub.qgis.org/projects/quantum-gis/issues. When creating a new ticket for a bug, please provide an email address where we can contact you for additional information.

Please bear in mind that your bug may not always enjoy the priority you might hope for (depending on its severity). Some bugs may require significant developer effort to remedy, and the manpower is not always available for this.

Предложения по усовершенствованию можно отправлять, используя ту же систему, что и ошибки. Пожалуйста, убедитесь, что для сообщения указан тип `Feature`.

If you have found a bug and fixed it yourself, you can submit this patch also. Again, the lovely redmine ticketsystem at http://hub.qgis.org/wiki/quantum-gis/issues has this type as well. Check the `Patch supplied` checkbox and attach your patch before submitting your bug. One of the developers will review it and apply it to QGIS. Please don't be alarmed if your patch is not applied straight away – developers may be tied up with other commitments.

21.4 Блог

The QGIS community also runs a weblog at http://planet.qgis.org/planet/, which has some interesting articles for users and developers as well provided by other blogs in the community. You are invited to contribute your own QGIS blog!

21.5 Модули

The website http://plugins.qgis.org provides the official QGIS plugins web portal. Here, you find a list of all stable and experimental QGIS plugins available via the 'Official QGIS Plugin Repository'.

21.6 Wiki

Lastly, we maintain a WIKI web site at http://hub.qgis.org/projects/quantum-gis/wiki where you can find a variety of useful information relating to QGIS development, release plans, links to download sites, message-translation hints and more. Check it out, there are some goodies inside!

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Приложение

22.1 GNU General Public License

Version 2, June 1991

Preamble

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