QGIS User Guide

リリース *1.8*

QGIS Project

2013 年 11 月 10 日

Contents

Chapter 1

はじめに

このドキュメントは、Quantum GIS のオリジナルユーザーガイドです. このドキュメントで説明されるソフトウェアとハードウェアは, ほとんどの場合は登録商標であり, そのあつかいは法に従うものとします.Quantum GIS のライセンスは GNU の General Public License（GPL）に従います. 詳細は Quantum GIS Homepage http://www.qgis.org を参照して下さい.

このドキュメントの詳細, データ, 結果等は著者と編集者の最善の知識と責任により記述され, 検証されています. それにもかかわらず, 内容に関して誤りがある可能性があります.

従って, すべてのデータは義務や保証を負うわけではありません. 著者, 編集者ならびに出版者は, 誤りとそこから生じる結果について, いかなる責任も負いません. 誤りがあれば指摘をいただくことをいつでも歓迎します.

This document has been typeset with reStructuredText. It is available as reST source code via github and online as HTML and PDF via http://documentation.qgis.org. 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/.

このドキュメントにおけるリンク

このドキュメントには内部リンクと外部リンクがあります. 外部リンクをクリックするとインターネットのアドレスを開きますが, 内部リンクをクリックするとこのドキュメント内を移動します. PDF フォームでは, 内部リンクは青色で表示され, 外部リンクは赤色で表示され、いずれもシステムブラウザにより処理されます.HTML フォームでは, 内部, 外部リンク双方ともブラウザは同様の表示と処理を行います.

ユーザ, インストールとコーディングガイドの著者と編集者:

Tara Athan	Radim Blazek	Godofredo Contreras	Otto Dassau	Martin Dobias
Peter Ersts	Anne Ghisla	Stephan Holl	N. Horning	Magnus Homann
Werner Macho	Carson J.Q. Farmer	Tyler Mitchell	K. Koy	Lars Luthman
Claudia A. Engel	Brendan Morely	David Willis	Jrgen E. Fischer	Marco Hugentobler
Larissa Junek	Diethard Jansen	Paolo Corti	Gavin Macaulay	Gary E. Sherman
Tim Sutton	Alex Bruy	Raymond Nijssen	Richard Duivenvoorde	Andreas Neumann

Sponsors

The update of this user manual was kindly sponsored by Kanton Solothurn, Switzerland.

インターネット: http://www.qgis.org

このドキュメントのライセンス

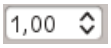
Chapter 2

記述ルール

このセクションではこのマニュアル全般にわたる統一した記述ルールについて列挙します. このマニュアルで利用する記述ルールは以下のとおりです:

GUI 記述ルール

GUI の記述スタイルは GUI の外観をまねるように意図されています. 一般的に これの目的は non-hover の外観を利用することです, ですからユーザーは GUI の外観を見てマニュアルの操作手引きと同じようなものを見出せます.

- メニューオプション: **:メニュー選択:‘レイヤ –> ラスタレイヤの追加 ‘** または **:メニュー選択:‘設定 –> ツールバー –> デジタイジング ‘**
- ツール:  ラスタレイヤの追加
- ボタン : **[デフォルトとして保存]**
- ダイアログボックスタイトル: **レイヤプロパティ**
- タブ: **一般情報**
- チェックボックス:  **描画**
- ラジオボタン:  *Postgis SRID*  *EPSG ID*
- 数値選択: 
- 文字列選択: 
- ファイルのブラウズ: 
- 色選択: 
- スライダ: 
- テキスト入力: 

影はクリック可能な GUI コンポーネントを表します.

テキストまたはキーボードについての記述ルール

このマニュアルではテキストに関するスタイル, キーボードコマンド, クラスやメソッドのコーディングを別のエンティティにするスタイルを含みます. これらは実際の見かけには依存しません.

- ハイパーリンク: http://qgis.org
- キーボード押下の組み合わせ: press `Ctrl+B`, Ctrl キー押下とホールドと B キーを同時に押すことを意味します.
- ファイル名: `lakes.shp`

- クラス名: **NewLayer**
- メソッド: *classFactory*
- サーバ: *myhost.de*
- ユーザ入力テキスト: `qgis --help`

Lines of code are indicated by a fixed-width font

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

プラットフォーム依存の操作

GUI の操作や少量のテキストはインラインで記述できます: クリック **ファイル** *QGIS* → *QGIS* **終了**.

これは Linux, Unix と Windows プラットフォームではファイルメニューオプションを最初にクリックしてからドロップダウンメニューから終了することを示します. また, Macintosh OSX プラットフォームでは,QGIS メニューオプションを最初にクリックしてドロップダウンメニューから終了することを示しています. より文字数の多い箇所では次のようにリスト形式で表示します:

- Linux Unix の部分です;
- Windows の場合です;
- MacOSX についての部分です.

次のように、パラグラフの先頭に付けて区別することもあります.

Linux、Unix、Macintosh OSX プラットフォーム向けの解説です. 文章中の解説手順に基づいて作業してください.

Windows プラットフォーム向けの解説です. 文章中の解説手順に基づいて作業してください.

ユーザーガイド中のスクリーンショットはいろいろなプラットフォームで作成されています. その時のプラットフォームはプラットフォームの種別を示すアイコンが図のキャプションの最後に表示されます.

Chapter 3

序文

地理情報システム (GIS) のすばらしい世界へようこそ!

Quantum GIS (QGIS) はオープンソースの地理情報システムです. このプロジェクトは 2002 年 5 月に開始され, 同じ年の 6 月 SourceForge のプロジェクトを立ち上げました. （かつては高価で独占的ソフトであった)GIS ソフトウェアを作成する作業は困難を伴いました. このソフトウェアはだれでもパーソナルコンピュータを使って地理情報に関する基本的作業に使う有効な手段になります.QGIS は多くの Unix,Windows,OS X で動作します.QGIS は　Qt toolkit (http://qt.nokia.com) と C++ で開発されています. これによっては QGIS は軽快で使いやすいグラフィカルユーザーインターフェース (GUI) を利用できるようになりました.

QGIS は GIS の一般的は機能や特徴をそなえた使いやすいシステムになることをねらってます. 最初の QGIS の開発目標は GIS データの表示システムでした. 多くの人が GIS のデータを見たいという要求を持っていたのでこの目標は達成されました.QGIS は多くの種類のラスタデータとベクタデータをサポートします. またプラグイン方式を利用することで新たなデータ形式に簡単に対応できます.

QGIS は GNU General Public License (GPL) でリリースされています. QGIS はこの ライセンスで開発されているのであなたはソースコードを調べたり改造することができます. いつでも無料で GIS プログラムにアクセスでき, 自由に改造できます. その場合 QGIS のライセンスの全てを適用する必要があります. ライセンスの詳細は Appendix *GNU General Public License*. を参照してください.

ちなみに: Up-to-date Documentation

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

---

3.1 GIS 入門

地理情報システム (GIS) (Mitchell 2005 **文献と** *Web* **参照**) とは地理空間データを作成, 表示, 検索, 解析するためのソフトウェアのことです. 空間データは同じ意味で別の言い方がいくつかあります. 地理データ, GIS データ, 地図データ, 位置データ, 座標データ, 地理空間データなどです.

空間データを利用するアプリケーションには様々な機能があります. 地図作成機能が空間データ利用に最もわかりやすい仕事でしょう. 地図プログラムは空間データにアクセスしてそれを描画して可視化します. 通常はコンピュータの画面や紙を利用して地図を表示します. アプリケーションでは静的な地図（単純なイメージ）かダイナミックに表示を変えられる地図を表示します. ダイナミックな地図はデスクトッププログラムか Web ページを使って地図のみかけを変えることができます.

多くの人たちは空間情報アプリケーションの機能は地図を作成するだけだと誤解しています. しかし空間データ解析は空間情報アプリケーションの別の重要な機能です. いくつかの典型的な解析処理はコンピュータの計算処理を含んでいます:

1. 位置間の距離計算
2. ある領域内の面積集計 (たとえば平方メートル)

3. どの地物が他の地物と重なりあっているかの判定
4. 地物間の重なり部分の集計
5. ある位置から指定した距離内にある地物の数
6. 等々...

これらのことは単純なことのように見えるかもしれません. しかしこれらの機能はいろいろな方法で多くの分野に適用できます. 分析の結果を地図上に表示することは経営の意思決定をサポートするレポートとして頻繁に使われます.

最近の位置情報サービスでは多くの機能を紹介しています. それらの機能の 多くは地図と解析処理の組み合わせで構成されています. たとえば携帯電話であなたの位置を記録できます. あなたが適切なソフトウェアを持っていれば歩いていける距離にあるレストランを携帯電話で探せます. これは空間情報テクノロジーのを使った新しいアプリケーションです. この機能のためには空間データを解析して結果を一覧にする ことが必要です.

3.1.1 それは何か新しい機能なんでしょうか?

いいえちがいます. 空間情報サービスをモバイルで利用するための新しい機器はたくさんあります. そのために多くのオープンソース空間情報アプリケーションは利用できますが, 既存の空間情報用ハードウェアとソフトウェアはなにか新しいものではありません. グローバルポジショニングシステム (GPS) レシーバーは 10 年以上もの間様々な産業で使われるようになり, ありふれたデバイスになりました. 同じようにデスクトップマッピングと解析ツールは大きなコマーシャルマーケットを形成しています. たとえば自然資源管理の産業などが主要な対象です.

新しいことというのは最新のハードウェアとソフトウェアが利用されていることと, 誰がそれを使っているかということです. 旧来のマッピングと解析ツールのユーザーは GIS アナリストか CAD ツール利用と同じようなデジタルマッピングについて高度に訓練されたユーザーです. 現在は家庭用 PC の計算能力とオープンソースソフトウェア (OSS) パッケージの利用によってホビイスト, プロフェッショナル,WEB 開発者等の大群が空間データを扱えるようになりました. 学習曲線は低下しています. コストも低下しています. 空間情報テクノロジの進化は加速しています.

どのように空間データは保存されているでしょうか？ 一言でいえば 2 つのタイプの空間データの利用が今日では幅広い支持を集めています. これに加えて伝統的な表形式データも空間アプリケーションで幅広く利用されています.

3.1.2 ラスタデータ

空間データの一つのタイプはラスタデータまたは単に” ラスタ” とよばれます. ラスタデータとして最も わかりやすい例がデジタル衛星写真や航空写真です. 標高の陰影図やデジタル標高モデルも典型的なラスタデータといえます. 任意のタイプの地図地物はラスタデータとしてあらわすことができます. しかし制限があります.

ラスタデータはセルによって構成される規則的な格子, またはピクセルで構成されるイメージで形成されています. それらは固定の行と列でできています. それぞれのセルは数値と地理上のサイズ (例 30x30 メーター) を持っています.

複数の重なったラスタは 1 個の色の値を使って表現されます (例　一つのラスタは赤、緑、青の値の重ね合わせでカラーイメージを作成します). 衛星イメージは複数の” バンド” で構成されます. それぞれのバンドは特有の光学波長持ち分離させられており, 空間的に重ね合わせられます. また広範なラスタはより大きなファイルサイズが必要になることが想像できます.

ラスタのセルサイズが小さくなればさらに詳細がわかりますが, これはファイルスペースの増大もまねきます. セルのサイズを記憶する目的と, 解析またはマッピングに利用するためのセルサイズのバランスを見出すことが計略として必要です.

3.1.3 ベクタデータ

ベクタデータも地理情報アプリケーションで利用されます. あなたが三角法と空間幾何学の授業で起きていたならばベクタデータの特徴になじんでいるはずです. 簡単にいうとベクタとは座標群を利用して位置を表す方法です. それぞれの座標は x と y の値で表現されている地理座標システムを参照しています.

これは学校で教えている x 軸と y 軸で表わされるデカルト座標系を参考にしています. あなたもこのようなグラフを退職後の貯えの減少や複合ローンの利息の増加計算に使ったかもしれません. しかしこの概念は空間データ解析とマッピングの本質的要素です.

あなたの目的に合致した空間情報表示方法はたくさんあります. これは地図投影という分野で別の日に勉強すべき分野です.

ベクタデータには 3 種類の形態があります, それぞれ進歩してさらに複合して構築されています.

1. 点 - 単一座標 (x y) で個別の地理的位置を表します
2. Lines - Multiple coordinates (x_1 y_1, x_2 y_2, x_3 y_3, ... x_n y_n) strung together in a certain order, like drawing a line from Point (x_1 y_1) to Point (x_2 y_2) and so on. These parts between each point are considered line segments. They have a length and the line can be said to have a direction based on the order of the points. Technically, a line is a single pair of coordinates connected together, whereas a line string is multiple lines connected together.
3. 多角形 - 複数のラインが 2 点以上の連続で並び, 最後の点が最初の点と等しい場合を多角形とします. 三角形, 円, 四角形,etc はすべて多角形です. 多角形の特徴は固定領域が内部にあることです.

Chapter 4

特徴

QGIS は通常の GIS の機能を本体のコア機能と多くのプラグインで提供してます. ここでは簡潔に 6 つのカテゴリーに分けて特徴を説明します.

4.1 データを見る

異なる形式, 投影法のベクタ, ラスタデータを内部形式に変換することなくそのまま 閲覧したりオーバーレイ表示することができます. 利用できるデータ形式は以下の通りです:

- Spatially-enabled tables and views using PostGIS, SpatiaLite and MSSQL Spatial, vector formats supported by the installed OGR library, including ESRI shapefiles, MapInfo, SDTS, GML and many more, see section *Working with Vector Data*.
- 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 *Working with Raster Data*.
- GRASS データベース (location/mapset) の GRASS ラスタとベクタ. *GRASS GIS* **の統合** 参照.
- Web Map Service (WMS) または Web Feature Service (WFS) の OGC 準拠オンライン空間データサービス, セクション *Working with OGC Data* 参照.
- OpenStreetMap data, see section **オープンストリートマップ**.

4.2 データの検索と表示地図の構成

表示地図の構成と空間データの検索のために使いやすいグラフィカルユーザーインターフェースを使えます 多くの便利なツールがグラフィカルユーザーインターフェースに含まれています:

- QGIS ブラウザ
- On the fly projection
- Map composer
- Overview panel
- Spatial bookmarks
- Identify/select features
- Edit/view/search attributes
- Feature labeling
- Change vector and raster symbology

- Add a graticule layer - now via fTools plugin and as decoration
- Decorate your map with a north arrow scale bar and copyright label
- Save and restore projects

4.3 データの作成、編集、管理と出力

様々な形式のベクタ形式地図を作成, 編集, 管理, 出力することができます. ラスタデータは GRASS にインポートして編集できます. また他の形式で出力できます. QGIS では以下のことができます:

- Digitizing tools for OGR supported formats and GRASS vector layer
- Create and edit shapefiles and GRASS vector layers
- Geocode images with the Georeferencer plugin
- 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 addedto list of GPS devices)
- Visualize and edit OpenStreetMap data
- Create PostGIS layers from shapefiles with the SPIT plugin
- Improved handling of PostGIS tables
- Manage vector attribute tables with the new attribute table (see section *Working with the Attribute Table*) or Table Manager plugin
- Save screenshots as georeferenced images

4.4 データ解析

You can perform spatial data analysis on PostgreSQL/PostGIS and other OGR supported formats using the fTools Python plugin. 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 *GRASS GIS* **の統合**). Or you work with SEXTANTE, which provides powerful a geospatial analysis framework to call native and third party algorithms from QGIS, such as GDAL, SAGA, GRASS, fTools and more (see section *SEXTANTE*).

4.5 インターネットへの地図公開

QGIS can be used to export data to a mapfile and to publish them on the Internet using a webserver with UMN MapServer installed. QGIS can also be used as a WMS, WMS-C or WFS and WFS-T client, and as WMS or WFS server (see section *Working with OGC Data*).

4.6 プラグインを使った QGIS 機能の拡張

QGIS ではプラグインアーキテクチャーで個別の機能拡張要求に対応できます. QGIS で提供するライブラリを利用してプラグインを作成することができます. また C++言語か Python スクリプトを利用して新たなアプリケーションを作成 することもできます!

4.6.1 コアプラグイン

1. Add Delimited Text Layer (Loads and displays delimited text files containing x,y coordinates)
2. Coordinate Capture (Capture mouse coordinates in different CRS)
3. データベース管理 (交換, 編集とレイヤとテーブルの閲覧,SQL クエリの実行)
4. Diagram Overlay (Placing diagrams on vector layer)
5. Dxf2Shp Converter (Convert DXF to Shape)
6. GPS Tools (Loading and importing GPS data)
7. GRASS (GRASS GIS integration)
8. GDALTools (Integrate GDAL Tools into QGIS)
9. Georeferencer GDAL (Adding projection information to raster using GDAL)
10. Heatmap tool (Generating raster heatmaps from point data)
11. Interpolation plugin (interpolate based on vertices of a vector layer)
12. Mapserver Export (Export QGIS project file to a MapServer map file)
13. Offline Editing (Allow offline editing and synchronizing with database)
14. OpenStreetMap plugin (Viewer and editor for openstreetmap data)
15. Oracle Spatial GeoRaster support
16. Plugin Installer (Download and install QGIS python plugins)
17. Raster terrain analysis (Raster based terrain analysis)
18. Road graph plugin (Shortest Path network analysis)
19. SPIT (Import Shapefile to PostgreSQL/PostGIS)
20. SQL Anywhere Plugin (Store vector layers within a SQL Anywhere database)
21. Zonal statictics plugin (Calculate count, sum, mean of raster for each polygon of a vector layer)
22. Spatial Query plugin (Makes spatial queries on vector layers)
23. eVIS (Event Visualization Tool)
24. fTools (Tools for vector data analysis and management)

4.6.2 外部 Python プラグイン

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 *QGIS* **外部プラグインをロードする**).

4.7 バージョン 1.8 の新機能

Please note that this is a release in our 'cutting edge' release series. As such it contains new features and extends the programmatic interface over QGIS 1.0.x and QGIS 1.7.0. 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.

QGIS Browser

A stand alone app and a new panel in QGIS. The browser lets you easily navigate your file system and connection based (PostGIS, WFS etc.) datasets, preview them and drag and drop items into the canvas.

DB Manager

The DB manager is now officially part of QGIS core. You can drag layers from the QGIS Browser into DB Manager and it will import your layer into your spatial database. Drag and drop tables between spatial databases and they will get imported. You can 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. You can also create, edit, delete, and empty tables, and move them to another schema.

Terrain Analysis Plugin

A new core plugin was added for doing terrain analysis (slope, aspect, hillshade, relief and ruggedness index).

New symbol layer types

- Line Pattern Fill
- Point Pattern Fill
- Ellipse renderer (render ellipse and also rectangles, triangles, crosses)

New plugin repository

Note that the old repository is now no longer supported by default; plugin authors are kindly requested to move their plugins to the new repository. Get the QGIS Plugins list at http://plugins.qgis.org/plugins/.

More new features

- Support for nesting projects within other projects to embed content from other project files
- Group Selected: Option to group layers to a group
- Message log: Lets you keep an eye on the messages QGIS generates during loading and operation
- GUI Customization: Allows setting up simplified QGIS interface by hiding various components of main window and widgets in dialogs
- Action Tool is now accessible from the map tools toolbar and allows you to click on a vector feature and execute an action
- New scale selector: select from a list of predefined scales
- Pan To Selected tool: Pans the map to selected feature(s); does not change the zoom level
- Copy and paste styles between layers
- Updated CRS selector dialog
- Define Legend-independent drawing order
- MSSQL Spatial Support - you can now connect to your Microsoft SQL Server spatial databases using QGIS
- Print Composers allows to have multiple lines on legend items using a specified character
- Expression based labeling
- Heatmap Plugin - a new core plugin has been added for generating raster heatmaps from point data
- The GPS live tracking user interface was overhauled and many fixes and improvements were added to it
- The menu was re-organised a little - we now have separate menus for Vector, Raster, Web and many plugins were updated to place their menus in the new Vector, Raster and Web top level menus
- Offset Curves - a new digitising tool for creating offset curves was added
- New tools in the Vector menu to Densify geometries and Build spatial index
- Export/add geometry column tool can export info using layer CRS, project CRS or ellipsoidal measurements
- Model/view based tree for rules in rule-based renderer
- Improvements in Spatial Bookmarks
- New Plugin metadata in metadata.txt

- Refactored postgres data provider: support for arbitrary key (including non-numeric and multi column), support for requesting a certain geometry type and/or srid in QgsDataSourceURI
- Added gdal_fillnodata to GDALTools plugin
- Support for PostGIS TopoGeometry datatype
- Python bindings for vector field symbol layer and general updates to the Python bindings
- Added a Benchmark program
- Added Row cache for attribute table
- UUID generation widget for attribute table
- Added support of editable views in SpatiaLite databases
- added expression based widget in field calculator
- Creation of event layers in analysis lib using linear referencing
- Load/save layer styles in the new symbology renderer from/to SLD document
- QGIS Server can act as WFS Server
- WFS Client support is now a core feature in QGIS
- Option to skip WKT geometry when copying from attribute table
- Support loading of zipped and gzipped layers
- The QGIS test suite now passes all tests on major platforms and nightly tests
- You can set tile size for WMS layers

Chapter 5

はじめましょう

本章では,QGIS のインストール,QGIS ウェブページにあるサンプルデータ, 最初の実行と, ラスタとベクタのレイヤの表示を行うサンプル実行について説明します.

5.1 インストール

QGIS のインストールはとても簡単です。 MS Windows 用と Mac OS X 用の標準インストールパッケージがあります. 各種 GNU/Linux 用バイナリパッケージ (rpm と deb) とインストールマネージャに追加するソフトウェアレポジトリが提供されています. バイナリパッケージの最新の情報は QGIS ウェブサイト http://qgis.osgeo.org/download/にあります.

5.1.1 ソースからのインストール

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 it online at https://github.com/qgis/Quantum-GIS/blob/master/INSTALL

5.1.2 外部メディアへのインストール

QGIS ではデフォルトの作業環境パス (例. ~/.qgis Linux の場合) を上書きする `-configpath` オプションがあります. ユーザー設定と QSettings もこのディレクトリに設定されます. たとえばこのオプションを使うとユーザーは QGIS のインストレーションをすべての外部プラグインと設定込みで USB フラッシュメモリ等で持ち運ぶことができます.

5.2 サンプルデータ

ユーザガイドには、QGIS サンプルデータセットをもとにした例があります.

Windows インストーラにはlqgl サンプルデータセットをダウンロードするオプションがあります. これにチェックを入れると `My Documents` フォルダにサンプルデータがダウンロードされ `GIS Database` フォルダにデータが作成されます. Windows エキスプローラをこのフォルダに移動すると便利です. サンプルデータセットインストールチェックボックスを選択しないこともlqgl初期インストールで指定することができます

- サンプル GIS データを利用する場合;
- QGIS ウェブサイト http://download.qgis.org からダウンロードして下さい; または
- もし上記の方法がうまくいかない場合lqgl をアンインストールしてデータインストールオプションをチェックして再インストールして下さい.

GNU/Linux と Mac OSX の rpm, deb または dmg 等のパッケージではデータセットのインストールは用意されていません. サンプルデータセットを利用したい場合は:file:*qgis_sample_data* を ZIP または TAR アーカイブ形式で http://download.osgeo.org/qgis/data/ からダウンロードしてあなたのシステム上で unzip または untar を行ってください Alaska データセットにはユーザガイドのスクリーンショットで使われているがすべての GIS データセットが含まれています, また小規模な GRASS データベースが含まれています. サンプルデータセットの投影法は Alaska Albers Equal Area で 単位は feet です. EPSG コードは 2964 です.

```
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]]
```

もし QGIS を GRASS のグラフィカルなフロントエンドとして利用したい場合, サンプルロケーション (例. Spearfish または SouthDakota) を 公式 GRASS GIS ウェッブサイト http://grass.osgeo.org/download/data.php で見つけることができます.

5.3 サンプルセッション

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`.

5.3.1 QGIS の起動

- QGIS を起動するにはコマンドプロンプトで “QGIS“とタイプするか プリコンパイルされたバイナリを利用する場合はアプリケーションメニューから起動できます.
- QGIS を起動するにはスタートメニューまたはデスクトップのショートカットを使うか QGIS プロジェクトファイルをダブルクリックして下さい.
- QGIS を起動するためにはスタートメニューかデスクトップショートカットの利用, または QGIS プロジェクトファイルをダブルクリックして下さい.

5.3.2 ラスタレイヤとベクタレイヤのサンプルデータセットからのロード

1. Click on the Load Raster icon.
2. フォルダ `qgis_sample_data/raster/`, を開いて ERDAS Img file `landcover.img` を選択した後 **[Open]** をクリックします.

3. ファイル名が表示されていないならファイルの種類コンボボックス (ダイアログの下部) が正しく設定されているか確認してください. この場合は, “Erdas Imagine Images (`*.img`, `*.IMG`)”. となっているか確認して下さい.
4. ここで  Load Vector アイコンをクリックします.
5. *Add Vector Layer* ダイアログで  *File* がソースタイプとして選択されている必要があります . ここで **[Browse]** をクリックしてベクタレイヤを選択して下さい.
6. Browse to the folder `qgis_sample_data/gml/`, select “GML” from the filetype combobox, then select the GML file `lakes.gml` and click **[Open]**, then in Add Vector dialog click **[OK]**.
7. いくつかの湖が表示されている場所を拡大して下さい.
8. 地図凡例にある `lakes` layer をダブルクリックして *Properties* ダイアログを開いて下さい.
9. *Style* タブをクリックして塗りつぶし色として青を選択して下さい.
10. *Labels* タブをクリックして  *Display lables* チェックボックスをチェックしてラベル表示を有効にして下さい.NAMES フィールドをラベルが含まれているフィールドとして選択して下さい.
11. ラベルを読みやすくするために白のふちどり（バッファ) をラベルのまわりに設定することができます., リストの左にある “Buffer” をクリックして  *Buffer labels?* をチェックしてください. そして 3 をバッファサイズとして選択して下さい.
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.

5.4 QGIS の起動と終了

あなたはセクション **サンプルセッション** で QGIS の起動方法を学んだはずです. ここではその部分の復習と QGIS が提供 しているコマンドラインオプションについて説明します.

- QGIS が PATH に設定されている場所にインストールされている場合コマンド プロンプトで: `qgis` とタイプするかデスクトップまたはアプリケーションメニューにあるリンク（またはショートカット）をダブルクリックすると QGIS を起動することができます.
- スタートメニューまたはデスクトップショートカットの利用または QGIS プロジェクトファイルのダブルクリックで QGIS を開始できます.
- アプリケーションフォルダーにあるアイコンをダブルクリックしてください. もし shell から QGIS を起動したい場合は次のコマンドを実行して下さい, /path-to-installation-executable/Contents/MacOS/Qgis.

QGIS を終了するためには以下のメニューオプションをクリックしてください|nix| *File* *QGIS* → *Quit* またはショートカット `Ctrl+Q`.

5.5 コマンドラインオプション

QGIS はコマンドラインから起動すると多くのオプションを指定できます. オプションの リストは `qgis --help` とコマンドラインで入力すると取得できます. QGIS で利用できるステートメントは以下のとおりです:

```
qgis --help
Quantum GIS - 1.8.0-Lisboa 'Lisboa' (exported)
Quantum GIS (QGIS) is a viewer for spatial data sets, including
raster and vector data.
Usage: qgis [options] [FILES]
  options:
```

```
        [--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
        [--optionspath path]            use the given QSettings path
        [--configpath path]             use the given path for all user configuration
        [--help]                        this text

  FILES:
    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
```

ちなみに: Example Using command line arguments

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`

コマンドラインオプション `--snapshot`

このオプションを使うと PNG 形式でカレントビューのスナップショットを作れますこの機能によってたくさんのプロジェクトをもっている場合でも簡単にスナップショットを作ることができます

このオプションを使うと 800x600 ピクセルの PNG ファイルが作成されます. `--width` と ‘‘–height‘‘ をコマンドライン引数に加えることでサイズの調整ができます. ‘‘–snapshot‘‘の後にファイル名を指定できます.

コマンドラインオプション `--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

コマンドラインオプション `--project`

QGIS をすでに存在するプロジェクトファイルとともに起動することが可能です. それは コマンドラインに `--project` オプションをつけてその後にプロジェクト名を追加する だけで実行できます. そうするとプロジェクトファイルに記述されたレイヤをロードして QGIS が起動します.

コマンドラインオプション `--extent`

ある地図の領域を指定して QGIS を起動する場合はこのオプションを使います. この場合 下記のようにカンマで区切られた書式の領域指定で領域を包含する長方形を指定する 必要があります:

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

コマンドラインオプション `--nologo`

このコマンドライン引数を指定すると QGIS 起動時にスプラッシュスクリーンを表示しません.

コマンドラインオプション `--noplugins`

起動時にプラグインのトラブルがある場合スタートアップ時にプラグインのロードを無効にすることができます. それらのプラグインは後にプラグインマネージャで有効にすることができます.

Command line option `--nocustomization`

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

コマンドラインオプション `--optionspath`

QGIS の設定情報をコンピュータ内の複数の場所に作成しておけます. そして QGIS の起動時にこのオプションを利用してどの設定を利用するのかを指定できます. *Options* を参照して利用しているオペレーティングシステムが どこに設定ファイルを保存しているかをチェックして下さい. 現在 QGIS システムでどのファイルに設定を書き込むべきかを特定する方法がありません. それゆえ新しい設定を作成する場合は既存の設定ファイルをコピーしたあとでファイルの名前を変更して下さい.

コマンドラインオプション `--configpath`

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

5.6 プロジェクト

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

Load saved projects into a QGIS session using *File* → *Open Project* or *File* → *Open Recent Project*.

If you wish to clear your session and start fresh, choose *File* → *New Project*. Either of these menu options will prompt you to save the existing project if changes have been made since it was opened or last saved.

以下の情報はプロジェクトファイルに保存されます:

- 追加されたレイヤ群
- シンボライゼーションを含むレイヤプロパティ
- マップビューの投影法
- 最後に表示された領域座標

プロジェクトは XML 形式で保存されます. よって、方法がわかれば QGIS を利用しなくてもプロジェクトファイルを編集することができます. ファイルの形式は以前の QGIS のバージョンに比較すると頻繁に更新されます. 古い QGIS のプロジェクトファイルはプロパティを設定することはできません. この問題を解決するためには *Settings* → *Options* で表示される *General* タブで選択設定できます:

Prompt to save project changes when required

Warn when opening a project file saved with an older version of QGIS

5.7 出力

QGIS のセッションから出力を行う方法はたくさんあります. セクション **プロジェクト** でプロジェクトファイルに出力する方法は解説しました. ここではその他の外部ファイルに出力する方法の例を説明します:

- Menu option *File* → 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 *File* → *New Print Composer* opens a dialog where you can layout and print the current map canvas (see Section **プリントコンポーザ**).

Chapter 6

QGIS GUI

When QGIS starts, you are presented with the GUI as shown below (the numbers 1 through 5 in yellow ovals refer to the six major areas of the interface as discussed below):

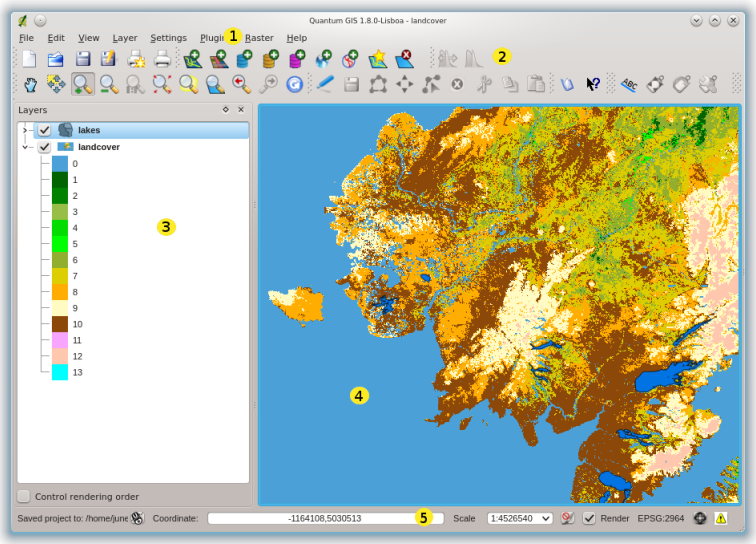


Figure 6.1: QGIS GUI with Alaska sample data

ノート: ウィンドウの装飾（タイトルバーとか）は利用している オペレーティングシステムやウィンドウマネージャによって見かけが異なります.

QGIS の GUI は 5 つの領域に分割されています:

1. メニューバー
2. ツールバー
3. 地図凡例
4. 地図ビュー
5. ステータスバー

これらの 5 つの QGIS インターフェースについては次のセクションで 詳しく説明します. さらに 2 つのセクションでキーボードショートカットとコンテキストヘルプについて解説します.

6.1 メニューバー

The menu bar provides access to various QGIS features using a standard hierarchical menu. The top-level menus and a summary of some of the menu options are listed below, together with the icons of the corresponding tools as they appear on the toolbar, as well as keyboard shortcuts. Keyboard shortcuts can also be configured manually (shortcuts presented in this section are the defaults), using the [**Configure Shortcuts**] tool under *Settings*.

Although most menu options have a corresponding tool and vice-versa, the menus are not organized quite like the toolbars. The toolbar containing the tool is listed after each menu option as a checkbox entry. Some menu options only appear, if the corresponding plugin is loaded. For more information about tools and toolbars, see Section **ツールバー**.

6.1.1 File

メニューオプション	ショートカット	リファレンス	ツールバー
新規プロジェクト	Ctrl+N	see **プロジェクト**	**ファイル**
プロジェクトを開く	Ctrl+O	see **プロジェクト**	**ファイル**
最近使ったプロジェクトを開く →		see **プロジェクト**	
プロジェクトの保存	Ctrl+S	see **プロジェクト**	**ファイル**
プロジェクトを名前をつけて保存	Ctrl+Shift+S	see **プロジェクト**	**ファイル**
イメージで保存		see **出力**	
新プリントコンポーザ	Ctrl+P	see **プリントコンポーザ**	**ファイル**
コンポーザマネージャ		see **プリントコンポーザ**	**ファイル**
Print Composers →		see **プリントコンポーザ**	
終了	Ctrl+Q		

6.1.2 Edit

メニューオプション	ショートカット	リファレンス	ツールバー
取り消し	Ctrl+Z	see *Advanced digitizing*	**先進的なデジタイズ**
再実行	Ctrl+Shift+Z	see *Advanced digitizing*	**先進的なデジタイズ**
地物の切り取り	Ctrl+X	see *Digitizing an existing layer*	**デジタジング**
地物のコピー	Ctrl+C	see *Digitizing an existing layer*	**デジタジング**
地物のペースト	Ctrl+V	see *Digitizing an existing layer*	**デジタジング**
地物の追加	Ctrl+.	see *Digitizing an existing layer*	**デジタジング**
Move Feature(s)		see *Digitizing an existing layer*	**デジタジング**
選択物の削除		see *Digitizing an existing layer*	**デジタジング**
地物の簡素化		see *Advanced digitizing*	**先進的なデジタイズ**
リングの追加		see *Advanced digitizing*	**先進的なデジタイズ**
部分の追加		see *Advanced digitizing*	**先進的なデジタイズ**
リングの削除		see *Advanced digitizing*	**先進的なデジタイズ**
部分の削除		see *Advanced digitizing*	**先進的なデジタイズ**
地物の変形		see *Advanced digitizing*	**先進的なデジタイズ**
オフセットカーブ		see *Advanced digitizing*	**先進的なデジタイズ**
地物の分割		see *Advanced digitizing*	**先進的なデジタイズ**
選択地物の結合		see *Advanced digitizing*	**先進的なデジタイズ**
Merge attr. of selected Features		see *Advanced digitizing*	**先進的なデジタイズ**
ノードツール		see *Digitizing an existing layer*	**デジタジング**
ポイントシンボルを回転する		see *Advanced digitizing*	**先進的なデジタイズ**

After activating  Toggle editing mode for a layer, you will find the `Add Feature` icon in the *Edit* menu depending on the layer type (point, line or polygon).

6.1.3 Edit (extra)

メニューオプション	ショートカット	リファレンス	ツールバー
地物の追加		see *Digitizing an existing layer*	**デジタジング**
地物の追加		see *Digitizing an existing layer*	**デジタジング**
地物の追加		see *Digitizing an existing layer*	**デジタジング**

6.1.4 View

メニューオプション	ショートカット	リファレンス	ツールバー
地図のパン			地図ナビゲーション
選択部分に地図をパンする			地図ナビゲーション
拡大	Ctrl++		地図ナビゲーション
縮小	Ctrl+-		地図ナビゲーション
選択 →		see 地物の選択と選択解除	属性
地物情報表示	Ctrl+Shift+I		属性
計測 →		see 計測	属性
全域表示	Ctrl+Shift+F		地図ナビゲーション
レイヤの領域にズーム			地図ナビゲーション
選択部分のズーム	Ctrl+J		地図ナビゲーション
直前の表示領域にズーム			地図ナビゲーション
次表示領域にズーム			地図ナビゲーション
Zoom Actual Size			地図ナビゲーション
地図整飾 →		整飾 参照	
マップチップス			属性
新しいブックマーク	Ctrl+B	see 空間ブックマーク	属性
ブックマークを見る	Ctrl+Shift+B	see 空間ブックマーク	属性
再読み込み	Ctrl+R		地図ナビゲーション
タイルスケールスライダ		see *Tilesets*	タイルスケール

6.1.5 Layer

メニューオプション	ショートカット	リファレンス	ツールバー
New →		see *Creating a new Vector layer*	レイヤの管理
埋め込みレイヤとグループ ...		see プロジェクトの入れ子	
ベクタレイヤの追加	Ctrl+Shift+V	see *Working with Vector Data*	レイヤの管理
ラスタレイヤの追加	Ctrl+Shift+R	see *QGIS* にラスタデータをロードする	レイヤの管理
PostGIS レイヤの追加	Ctrl+Shift+D	see *PostGIS Layers*	レイヤの管理
SpatiaLite レイヤの追加	Ctrl+Shift+L	see *SpatiaLite Layers*	レイヤの管理
Add MSSQL Spatial Layer	Ctrl+Shift+M	see *MSSQL Spatial Layers*	レイヤの管理
WMS レイヤの追加	Ctrl+Shift+W	see *WMS Client*	レイヤの管理
デリミテッドテキストレイヤの追加		see デリミテッドテキストプラグイン	レイヤの管理
新規 *GPX* レイヤの作成		see *GPS* プラグイン	レイヤの管理
Oracle GeoRaster レイヤの追加		see *Oracle GeoRaster* プラグイン	レイヤの管理
SQL Anywhere レイヤの追加		see *SQL Anywhere* プラグイン	レイヤの管理
WFS レイヤの追加			レイヤの管理
スタイルのコピー		see スタイルタブ	

次のページに続く

Table 6.1 – 前のページからの続き

メニューオプション	ショートカット	リファレンス	ツールバー
スタイルの貼り付け		see **スタイルタブ**	
属性テーブルのオープン			**属性**
編集を保存する			**デジタジング**
編集モード切替			**デジタジング**
名前をつけて保存...			
選択をベクタファイルとして保存...		*Working with the Attribute Table* 参照	
レイヤの削除	Ctrl+D		
レイヤの *CRS* を設定する	Ctrl+Shift+C		
レイヤの *CRS* をプロジェクトに設定する			
プロパティ			
クエリ...			
ラベリング			
全体図に追加	Ctrl+Shift+O		**レイヤの管理**
全体図に全て追加			
全体図から全て削除			
全てのレイヤを表示	Ctrl+Shift+U		**レイヤの管理**
全てのレイヤを隠す	Ctrl+Shift+H		**レイヤの管理**

6.1.6 Settings

メニューオプション	ショートカット	リファレンス	ツールバー
パネル →		see **パネルとツールバー**	
ツールバー →		see **パネルとツールバー**	
フルスクリーンモードへ切り替え	Ctrl-F		
プロジェクトプロパティ ...	Ctrl+Shift+P	see **プロジェクト**	
カスタム *CRS* ...		see **カスタム空間参照システム**	
スタイルマネージャ...		see *Style Manager*	
ショートカットの構成 ...			
カスタマイゼーション ...		see *Customization*	
オプション ...		*Options* 参照	
スナッピングオプション ...			

6.1.7 Plugins

メニューオプション	ショートカット	リファレンス	ツールバー
Python **プラグインを呼び出す**		see *QGIS* **プラグイン**	
プラグインの管理		see **プラグインの管理**	
Python **コンソール**			
GRASS →		see *GRASS GIS* **の統合**	*GRASS*

6.1.8 Vector

メニューオプション	ショートカット	リファレンス	ツールバー
解析ツール →		see *fTools* **プラグイン**	
座標入力 →		see **座標取得プラグイン**	
データマネジメントツール →		see *fTools* **プラグイン**	
Dxf2Shp →		see *Dxf2Shp* **コンバータープラグイン**	**ベクター**
ジオメトリツール →		see *fTools* **プラグイン**	
ジオプロセッシングツール →		see *fTools* **プラグイン**	
GPS →		see *GPS* **プラグイン**	**ベクター**
調査ツール →		see *fTools* **プラグイン**	
道路グラフ →		see **道路グラフプラグイン**	
空間検索 →		see **空間検索プラグイン**	**ベクター**

6.1.9 Raster

メニューオプション	ショートカット	リファレンス	ツールバー
ラスタ計算機		see **ラスタ計算機**	
Georeferencer →		see **ジオレファレンサプラグイン**	**ラスタ**
ヒートマップ →		see **ヒートマッププラグイン**	**ラスタ**
データ補間 →		see **データ補間プラグイン**	**ラスタ**
Terrain Analysis		see *Raster Terrain Analysis Plugin*	
地域統計 →		see **地域統計プラグイン**	**ラスタ**
投影法 →		see *GDAL* **ツールズプラグイン**	
変換 →		see *GDAL* **ツールズプラグイン**	
抽出 →		see *GDAL* **ツールズプラグイン**	
解析 →		see *GDAL* **ツールズプラグイン**	
その他 →		see *GDAL* **ツールズプラグイン**	
GdalTools **設定**		see *GDAL* **ツールズプラグイン**	

6.1.10 Database

メニューオプション	ショートカット	リファレンス	ツールバー
DB **マネージャ** →		see *DB Manager* **プラグイン**	**データベース**
eVis →		see *eVis* **プラグイン**	**データベース**
オフライン編集 →		see **オフライン編集プラグイン**	**データベース**
Spit →		see *SPIT* **プラグイン**	**データベース**

6.1.11 Web

メニューオプション	ショートカット	リファレンス	ツールバー
MapServer **エキスポート** ... →		see *MapServer Export* **プラグイン**	*Web*
メニュー:*OpenStreetMap* –>		see **オープンストリートマップ**	*OpenStreetMap*

6.1.12 Help

メニューオプション	ショートカット	リファレンス	ツールバー
ヘルプコンテンツ	F1		**ヘルプ**
What's This?	Shift+F1		**ヘルプ**
API **文書**			
QGIS **ホームページ**	Ctrl+H		
QGIS **のバージョンをチェックする**			
アバウト			
QGIS **スポンサー**			

Please not that for Linux the Menu Bar items listed above are the default ones in KDE window manager. In GNOME, Settings menu is missing and its items are to be found here:

プロジェクトプロパティ	**ファイル**
オプション	**編集**
ショートカットの構成	**編集**
スタイルマネージャ	**編集**
カスタム *CRS*	**編集**
パネル →	**ビュー**
ツールバー →	**ビュー**
フルスクリーンモードへ切り替え	**ビュー**
タイルスケールスライダー	**ビュー**
ライブ *GPS* **トラッキング**	**ビュー**

6.2 ツールバー

ツールバーではメニューのほとんどと同じ機能を提供している上に対話的に地図を操作する機能を提供しています. ツールバーのそれぞれのアイテムではポップアップヘルプが提供されています. マウスでアイテムの上を動かすとツールの簡単な説明が表示されます.

Every menubar can be moved around according to your needs. Additionally every menubar can be switched off using your right mouse button context menu holding the mouse over the toolbars (read also **パネルとツールバー**).

ちなみに: ツールバーの復元

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 `\HKEY_CURRENT_USER\Software\QuantumGIS\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.

6.3 地図凡例

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.

レイヤは選択してドラッグで上下に移動することによって Z オーダリングを変えることができます.Z オーダリングとは, 凡例のリストでの表示順が地図表示のレイヤ表示順になることです.

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

1. Right click in the legend window and choose *Add 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 be nested inside other groups.

グループ用チェックボックスを使うとクループ内全レイヤの表示, 非表示を 1 回のクリックで行えます.

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 *Digitizing and editing a GRASS vector layer* for information on editing GRASS vector layers.

ラスタレイヤ選択時のマウス右ボタンメニュー

- *Zoom to layer extent*
- *Zoom to best scale (100 %)*
- *Show in overview*
- *Remove*
- *Set Layer CRS*
- *Set Project CRS from Layer*
- **プロパティ**
- *Rename*
- *Copy Style*
- *Add New Group*
- *Expand all*
- *Collapse all*
- *Update Drawing Order*

Additionally, according to layer position and selection

- *Make to toplevel item*
- *Group Selected*

ベクタレイヤ選択時のマウス右ボタンメニュー

- *Zoom to layer extent*
- *Show in overview*
- *Remove*
- *Set Layer CRS*
- *Set Project CRS from Layer*
- *Open attribute table*
- *Toggle editing* (not available for GRASS layers)
- *Save as*
- *Save selection as*
- *Query*
- *Show Feature Count*
- **プロパティ**

- *Rename*
- *Copy Style*
- *Add New Group*
- *Expand all*
- *Collapse all*
- *Update Drawing Order*

Additionally, according to layer position and selection

- *Make to toplevel item*
- *Group Selected*

レイヤグループ用マウス右ボタンメニュー

- *Zoom to group*
- *Remove*
- *Set group CRS*
- *Rename*
- *Add New Group*
- *Expand all*
- *Collapse all*
- *Update Drawing Order*

It is possible to select more than one layer or group at the same time by holding down the `Ctrl` key while selecting the layers with the left mouse button. You can then move all selected layers to a new group at the same time.

You are also able to 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 layerlist.

6.3.1 Working with the Legend independent layer order

Since QGIS 1.8 there is a widget that allows to define a legend independent drawing order. You can activate it in the menu *Settings* → *Panels*. Determine the drawing order of the layers in the map view here. Doing so makes it possible to order your layers in order of importance, for example, but to 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.

6.4 地図ビュー

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 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.

ちなみに: マウスホィールを使って地図をズームします

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 mouse cursor position is the center where the zoom occurs. You can customize the behavior of the mouse wheel zoom using the *Map tools* tab under the *Settings* → *Options* menu.

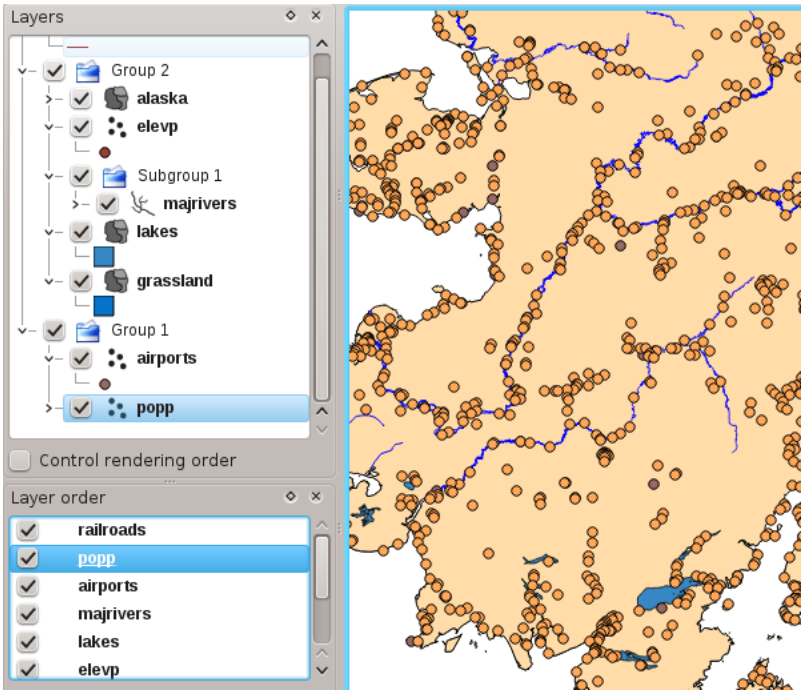


Figure 6.2: Define a legend independent layer order

ちなみに：矢印キーとスペースバーを使った地図パンニング

矢印を使って地図のパンを行えます. マウスカーソルを地図内に置いて右矢印キーを押すと東にパンします. 左矢印を押すと西にパンします. 上矢印キーを押すと北へパンします。下矢印を押すと南にパンします。 またスペースバーをパンに利用できます:スペースバーを押したままでマウスを動かすと地図をパンできます.

6.5 ステータスバー

ステータスバーにはマウスポインターがマップビュー内を移動した時の位置の地図座標 （たとえばメートルか度数）が表示されます. 座標表示の左側は小さいボタンになって いてマウスの位置座標の表示かマップビューの拡大、縮小した場合の現在の四隅の座標 表示を行うかの切り替えを行います.

Next to the coordinate display you find the scale display. It shows the scale of the map view. If you zoom in or out QGIS shows you the current scale. Since QGIS 1.8 there is a scale selector which allows you to choose between predefined scales from 1:500 until 1:1000000.

ステータスバーの中にあるプログレスバーには各レイヤをマップビューに描画する処理の進行状況が表示されます. ラスタレイヤで統計処理をするような場合プログレスバーは非常に長い処理の進行状態を 表示することになります.

If a new plugin or a plugin update is available, you will see a message at the far right of the status bar. On the right side of the status bar is a small checkbox which can be used to temporarily prevent layers being rendered to the map view (see Section **レンダリング** 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.

ちなみに：マップキャンバスにおける正しい縮尺を計算する

When you start QGIS, degrees is the default unit, and it tells QGIS that any coordinate in your layer is in degrees. To get correct scale values, you can either change this to meter manually in the *General* tab under *Settings* →

Project Properties or you can select a project Coordinate Reference System (CRS) clicking on the  CRS status icon in the lower right-hand corner of the statusbar. In the last case, the units are set to what the project projection specifies, e.g. '+units=m'.

Chapter 7

一般ツール

7.1 キーボードショートカット

QGIS provides default keyboard shortcuts for many features. You find them in Section **メニューバー**. Additionally the menu option *Settings* → *Configure Shortcuts* allows to change the default keyboard shortcuts and to add new keyboard shortcuts to QGIS features.

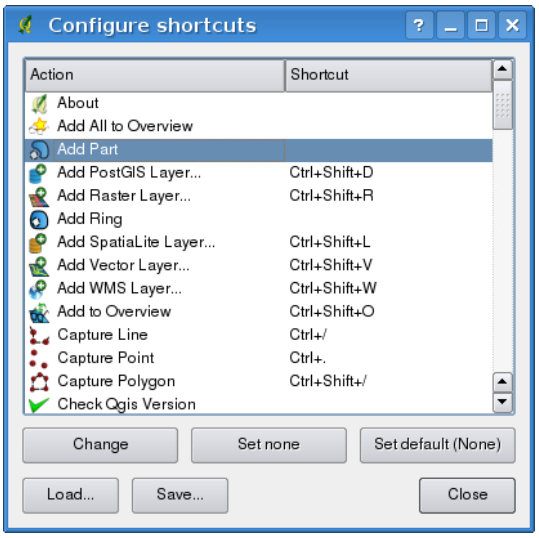


Figure 7.1: Define shortcut options (KDE)

構成はとても簡単です。リストから機能を選択し **[変更]**, **[無し]** を設定 または **デフォルトを設定]**をクリックして下さい. あなた自身の構成を作成したら, その設定を XML ファイルで保存して他の QGIS インストレーションでロードして利用することができます.

7.2 コンテキストヘルプ

特定のトピックでヘルプが必要な場合多くのダイアログに実装されている *Help* ボタンでコンテキストヘルプを利用することができます- サードパーティプラグインでは専用のウェッブページを指し示すことを注意して下さい.

7.3 レンダリング

デフォルトで QGIS レンダラはマップキャンバスに含まれる全ての可視レイヤ表示を更新しますイベントはマップキャンバスに含まれるもののリフレッシュを引き起こします:

- レイヤの追加
- パンまたはズーム
- QGIS ウィンドウのリサイズします
- レイヤまたはレイヤ群の表示、非表示を変更します

QGIS ではいくつもの方法で描画プロセスを管理できます.

7.3.1 スケール依存レンダリング

縮尺によって異なる描画方法を定義できます. あるレイヤが描画される最少と最大の縮尺を定義できます. 縮尺依存レンダリングの定義を行うためには, 地図凡例でレイヤ名をダブルクリックすると表示される **プロパティ** 画面を開いて下さい. 画面の **一般情報** タブで最小と最大の縮尺値を設定した後に,|checkbox|:guilabel:**縮尺依存レンダリングを使用する** チェックボックスをクリックして下さい.

QGIS ステータスバーでスケール値を見ることで, そのレイヤを表示するのと表示しないスケール値を決めることができます.

7.3.2 地図レンダリングの制御

地図レンダリングは以下の方法で制御することができます:

Suspending Rendering

描画を中止したい場合はステータスバーの右側角にある *Render*‘**チェックボックスをクリックしてください**. |*checkbox*| *:guilabel:*‘*Render*‘**がチェックされていない場合**, *QGIS* **はセクション** *:ref:*‘*redraw_events* に記述されているあらゆるイベントに反応せずキャンバスに再描画を行いません. 地図描画を行わないほうがいい場合は以下のような場合があります:

- 沢山のレイヤを追加して描画する前に描画方法を編集したい場合
- データ量が多いレイヤを追加して描画する前に縮尺依存描画条件を指定したい場合
- データ量が多いレイヤを追加して描画する前に特定の位置にズームしておきたい場合
- 上記の場合のいくつかの組み合わせ

Checking the *Render* checkbox enables rendering and causes an immediate refresh of the map canvas.

Setting Layer Add Option

新しくレイヤを追加した時に, すぐに描画しないオプションを設定できます. これはレイヤが地図に追加された時に, 地図凡例の可視属性チェックボックスがデフォルトでチェックされないことを意味します. このオプションを指定するためには **設定** → **オプション** → を選択して:guilabel:**レンダリング** タブをクリックしてください. *By default new layers added to the map should be displayed* のチェックを解除してください. すると, 地図に追加されたレイヤの表示属性は不可視の状態がデフォルトになります.

描画の中断

To stop the map drawing, press the ESC key. This will halt the refresh of the map canvas and leave the map partially drawn. It may take a bit of time between pressing ESC and the time the map drawing is halted.

ノート: 現在描画中断機能は利用できません - これは qt4 のポートに依存しています, なぜならばユーザーインターフェース (UI) に問題が発生してクラッシュするからです.

Updating the Map Display During Rendering

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* 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.

Influence Rendering Quality

To influence the rendering quality of the map you have 2 options. Choose menu option *Settings* → *Options* click on the *Rendering* tab and select or deselect following checkboxes.

- **線のジャギーを目立たなくします (描画パフォーマンスが低下します)**
- **ポリゴンの不正な塗りつぶしを修正します**

7.4 計測

計測は投影座標系 (e.g., UTM) と投影されていないデータ内で機能します。ロードされたマップは地理座標系（緯度/経度）で定義され、ラインや面積の計測結果は正確ではないでしょう。必要に応じ、適切なマップの座標系（ref:‘label_projections‘のセクションを参照）を設定することで解決します。すべての計測モジュールはデジタイジングモジュール由来のスナップ設定が使用されています。ベクターレイヤのラインやエリアにそって計測をしたい場合、これは便利です。

計測ツールを選択するためには をクリックして使いたいツールを選択してください.

7.4.1 距離, 面積と角度の計測

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 choose 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 tools 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.

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 **スナップ許容量と検索半径の設定**). So if you want to measure exactly along a line feature, or around a polygon feature, first set its snapping tolerance, then select the layer. Now, when using the measuring tools, each mouse click (within the tolerance setting) will snap to that layer.

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

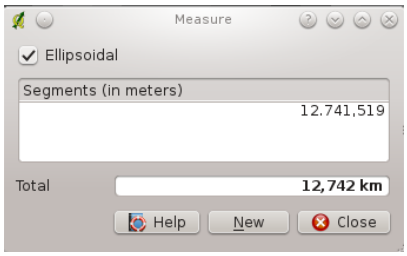


Figure 7.2: Measure Distance (KDE)

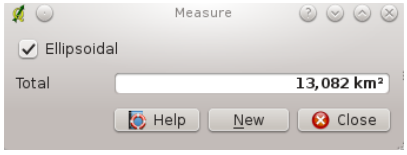


Figure 7.3: Measure Area (KDE)

7.4.2 地物の選択と選択解除

QGIS ツールバーはマップキャンバスで地物を選択するためにいくつかのツールを提供しています。１つまたはいくつかの地物をクリックのみで選択する場合は lmActionSelectlをクリックし、あなたのツールを選択します。

- Select single feature
- 矩形による地物選択
- 多角形による地物選択
- フリーハンドによる地物選択
- 半径による地物選択

To deselect all selected features click on Deselect features from all layers.

7.5 整飾

QGIS の装飾には著作権ラベル、北向き矢印とスケールバーが含まれています。これらは地図製作の要素として投下することで、マップを ’装飾 ’するために用いられます。

ノート: QGIS 1.8 以前では同じ機能は整飾プラグインで提供されています.

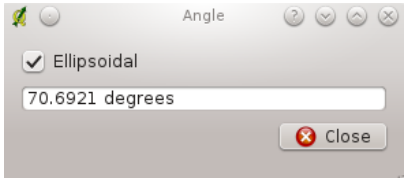


Figure 7.4: Measure Angle (KDE)

7.5.1 著作権ラベル

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

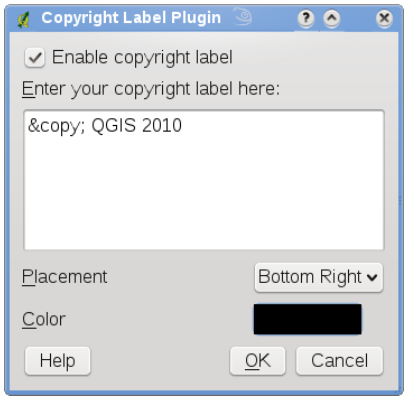


Figure 7.5: The copyright Dialog

1. メニューの ‘View –> Decorations –> Copyright Label‘を選択します。ダイアログが表示されます (figure_decorations_1 を参照すること)。
2. マップ上に配置したいテキストを入力します。例に示す通り HTML を使用することができます。
3. guilabel:*Placement* のドロップダウンリストの’Bottom Right’ からラベルの配置を選択します。
4. Make sure the *Enable Copyright Label* checkbox is checked
5. **[OK]**をクリックします。

In the example above (default) QGIS places a copyright symbol followed by the date in the lower right hand corner of the map canvas.

7.5.2 北向き矢印

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.

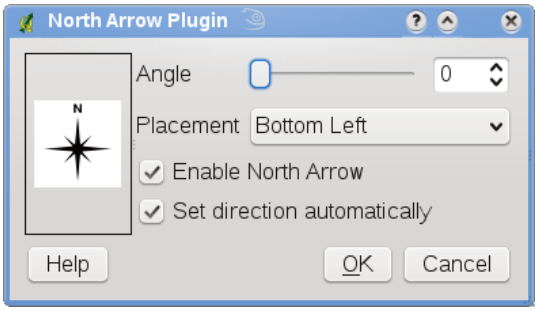


Figure 7.6: The North Arrow Dialog

7.5.3 スケールバー

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

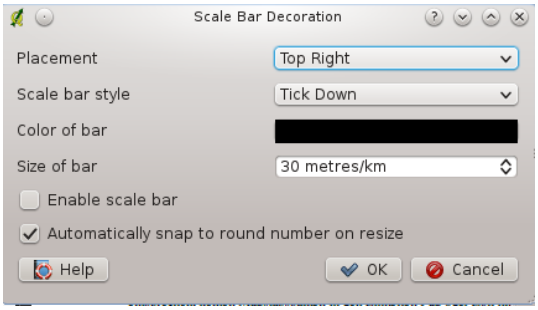


Figure 7.7: The Scale Bar Dialog

QGIS は、あなたのマップフレームと同じ単位スケールを表示することをサポートしています。もしレイヤの単位がメートルであるなら、フィート単位のスケールバーを作成することはできません。同様に、小数単位を使用している場合はメートル単位で距離を表示するスケールバーを作成することはできません。

スケールバーを追加するために：

1. メニューの ‘View –> Decorations –> Copyright Label‘を選択します。ダイアログが表示されます (figure_decorations_1 を参照すること)。
2. guilabel:*Placement* のドロップダウンリストの’Bottom Right’ からラベルの配置を選択します。
3. guilabel:‘Scale bar style‘の’Tick Down’ リストからスタイルを選択します。
4. guilabel:‘Color of bar‘の ‘black’ でバーの色を選択するか、デフォルト色の黒色を使用します。
5. バーのサイズとそのラベル（guilabel:‘Size of bar‘の ‘30 degrees’）を設定します。
6. Make sure the *Enable scale bar* checkbox is checked
7. :guilabel:‘Automatically snap to round number on resize‘オプションで、キャンバスサイズが変更された時に、切りの良い数字にスナップされるように選択することができます。
8. **[OK]**をクリックします。

ちなみに: Settings of Decorations

.qgs プロジェクトを保存する際、方位記号、スケールバーと著作権ラベルに加えた変更はそのプロジェクトに保存され、次回プロジェクトをロードした際に復元されます。

7.6 アノテーションツール

The *Text Annotation* tools 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 click on the item opens a dialog with various options. There is the text editor to enter the formatted text and other item settings. E.g. 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 (drag the map marker) or by moving only the balloon. The icons are part of GIS theme, and are used by default in the other themes too.

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

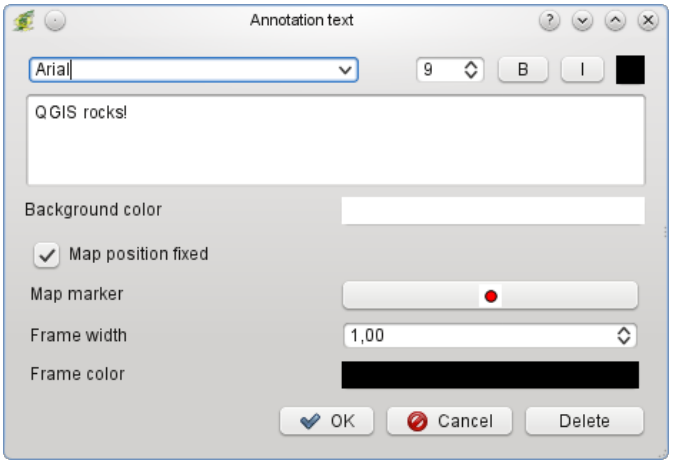


Figure 7.8: Annotation text dialog

7.6.1 注記の書式設定

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). It is similar to the designer forms for the *Identify features* tool, but displayed in an annotation item. Also see QGIS blog http://blog.qgis.org/node/143 for more information.

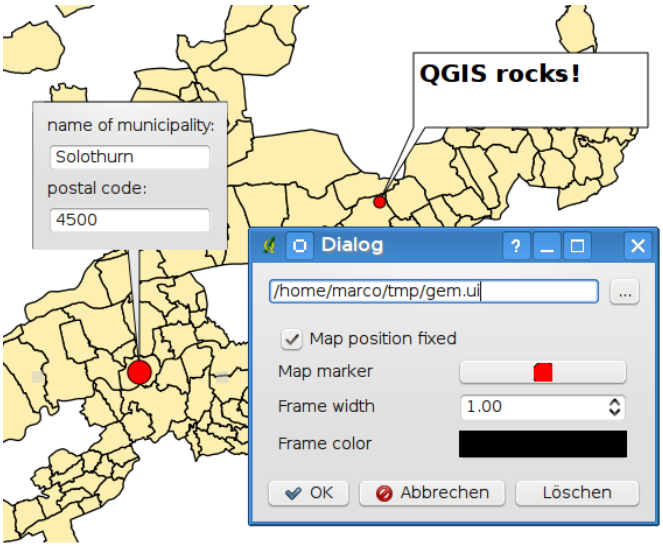


Figure 7.9: Customized qt designer annotation form

ノート: If you press `Ctrl+T` while an *Annotation* tool is active (move annotation, text annotation, form annotation), the visibility states of the items are inverted.

7.7 空間ブックマーク

空間ブックマークを使用すると地理的な場所を” ブックマーク” し、あとでその位置に戻ることができます。

7.7.1 ブックマークの作成

ブックマークを作るには：

1. 関心のある領域にズームまたはパンします。
2. Select the menu option *View* → *New Bookmark* or press `Ctrl-B`.
3. ブックマークを説明する名称（255 文字まで）を入力します。
4. Press `Enter` to add the bookmark or **[Delete]** to remove the bookmark.

同じ名称で複数のブックマークを所有できることにご注意ください。

7.7.2 ブックマークの操作

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 can not edit the bookmark name or coordinates.

7.7.3 ブックマークへのズーム

From the *Geospatial Bookmarks* dialog, select the desired bookmark by clicking on it, then click **[Zoom To]**. You can also zoom to a bookmark by double-clicking on it.

7.7.4 ブックマークの削除

ブックマークを削除するには ‘地理空間ブックマーク ‘ダイアログにてそれを選択し、**[削除]**をクリックします。選択を確定するには **[はい]**をクリックし、削除をキャンセルするには **[いいえ]**をクリックします。

7.8 プロジェクトの入れ子

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

7.8.1 埋め込みレイヤ

次のダイアログで、他のプロジェクトのレイヤを埋め込むことができます。

1. Press  to look for another project from the Alaska dataset.
2. プロジェクトファイルの grassland を選択します。あなたはプロジェクトの中身を表示することができます。(see figure_embed_dialog_を参照してください)
3. Press `Ctrl` and klick on the layers grassland and regions. The layers are embedded in the map legend and the map view now.

埋め込まれている間が編集できる間は、スタイルやラベリングのようなプロパティは変更することができません。

Removing embedded layers

Right-click on the embedded layer and choose  *Remove* .

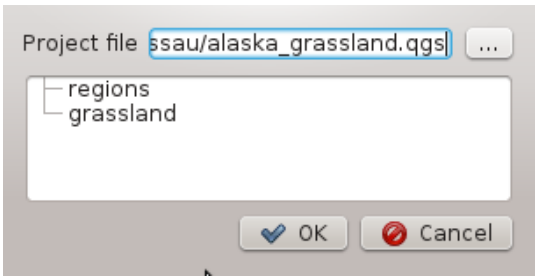


Figure 7.10: Select layers and groups to embed

Chapter 8

QGISの設定

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

8.1 パネルとツールバー

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).

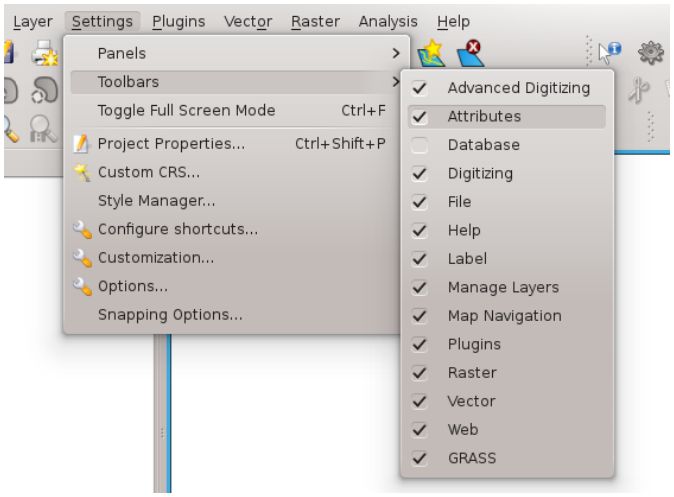


Figure 8.1: The Panels and Toolbars menu

ちなみに: Activating the QGIS Overview

QGIS では追加されたレイヤの全範囲のビューを提供するオーバービューパネルを提供します。これは:menus-election:'設定 –> パネル 'メニューの下から選択することができます。ビュー内で現在のマップ範囲を示す長方形があります。これによって現在見ているマップのどのエリアかを決定することができます。マップオーバービューのレイヤにラベリングが設定されていても、ラベルはマップのオーバービューにレンダリングされないことに注意してください。オーバービューで現在の領域を示す赤い四角形をクリック・ドラッグすると、メインマップのビューもそれに応じて更新されます。

ちなみに: Show Log Messages

Since QGIS 1.8 it's possible to track the QGIS messages. You can activate *Log Messages* in the menu *Settings* → *Panels* and follow the messages in the *General* and *Plugin* tab during loading and operation.

8.2 プロジェクトのプロパティ

設定 → *Project Properties* or :menuselection:‘設定 –> プロジェクトのプロパティ‘で表示されるプロジェクトのプロパティウィンドウで、プロジェクトの特定のオプションを設定します。これらを含んでいます：

- In the *General* tab the project title, selection and background color, layer units, precision, and the option to save relative paths to layers can be defined. You can define the layer units (only used when CRS transformation is disabled) and the precision of decimal places to use.
- *CRS* **座標参照システム** タブではこのプロジェクトの CRS を選択し、異なった CRS のレイヤを表示する際にラスタおよびベクタレイヤのオンザフライ再投影することを可能にします。
- ３つ目の:guilabel:‘Identifiable layers‘タブで、どのレイヤが identify tool に対応するかを設定（または無効化）することができます。（複数のレイヤの識別を無効にするには :ref:‘gui_options‘の Map tools の段落を参照）
- The tab *OWS Server* allows to define information about the QGIS mapserver Service Capabilities, the Extent and the CRS Restrictions as well as the WFS Capabilities. Activating the *Add WKT geometry to feature info response* will allow to query the WMS layers.

8.3 Options

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

8.3.1 General Tab

- *Prompt to save project changes when required*
- *Warn when opening a project file saved with an older version of QGIS*
- Change Selection and Background color
- Change the QGIS Style
- Change the icon theme (choose between ‘default’, ‘classic’ and ‘gis’)
- Change icon size between 16, 24 and 32 pixel.
- Change the menu size
- Define double click action in legend (choose between ‘open layer properties’ and ‘open ‘) attribute table.
- *Capitalize layer names in legend*
- *Display classification attribute names in legend*
- *Create raster icons in legend*
- *Hide splash screen at startup*
- *Show tips at startup*
- *Open identify results in a dock window (QGIS restart required)*
- *Open snapping options in a dock window (QGIS restart required)*

- *Open attribute table in a dock window*
- *Add PostGIS layers with double click and select in extended mode*
- *Add new layers to selected or current group*
- *Copy geometry in WKT representation from attribute table*
- *Attribute table behavior* (choose between 'Show all features' (default), 'Show selected features','Show features in current canvas')
- *Attribute table row cache*
- Define *Representation for NULL values*
- *Prompt for raster sublayers*  . 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 is 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
- *Scan for valid items in the browser dock*  . The 'Check extension' option was designed to speed up the loading of a directory, which can be time-consuming when 'Check file contents' is activated and there are many files (tens or hundreds).
- *Scan for contents of compressed files (.zip) in browser dock*  This option was also designed to speed up the loading of a directory. You have the following choices:
  - 'Basic Scan': checks that the extension is supported by one of the drivers
  - 'Full Scan': opens every file to check it is valid
  - 'Passthru': don't use this option it will be removed in the next QGIS version

8.3.2 GDAL tab

GDAL is a data exchange library for raster files. In this tab you can define which GDAL driver to be used for a raster format as in some cases more than one GDAL driver is available.

8.3.3 Plugins tab

- Add *Path(s) to search for additional C++ plugin libraries*.

8.3.4 Rendering Tab

- *By default new layers added to the map should be displayed*
- Define *Number of features to draw before updating the display*.
- *Use render caching where possible to speed up redraws*
- *Make lines appear less jagged at the expense of some drawing performance*
- *Fix problems with incorrectly filled polygons*

-  *Use new generation symbology for rendering*
- Define the default Raster settings for visualisation: 'RGB band selection',  *Use standard deviation* and 'Contrast Enhancement'
- Add/remove *Path(s) to search for Scalable Vector Graphics (SVG) symbols*

Additionally you can define whether to save the path for svg textures absolute or relative in the *General* tab of the *Settings* → *Project Properties* menu.

8.3.5 Map tools Tab

- The *Mode* setting determines which layers will be shown by the Identify tool. By switching to 'Top down' or 'Top down, stop at first' instead of 'Current layer' attributes for all identifiable layers (see the Project properties section under: **プロジェクト** to set which layers are identifiable) will be shown with the Identify tool.
-  *Open feature form, if a single feature is identified*
- Define *Search radius for identifying and displaying map tips as a percentage of the map width*
- Define *Ellipsoid for distance calculations*
- Define *Rubberband color* for measure tools
- Define *Decimal places*
-  *Keep base unit*
-  *Define preferred measurement units ('meters' or 'feet')*
-  *Define preferred angle units ('Degrees', 'Radians' or 'Gon')*
- Define *Mouse wheel action*  ('Zoom', 'Zoom and recenter', 'Zoom to mouse cursor', 'Nothing')
- Define *Zoom factor* for wheel mouse

8.3.6 Overlays Tab

- Define *Placement algorithm*  for labels, symboly and diagrams (choose between 'Central point' (standard), 'Chain', 'Popmusic tabu chain', 'Popmusic tabu' and 'Popmusic chain')

8.3.7 Digitizing Tab

- Define Rubberband *Line color* and *Line width*
- Define *Default snap mode*  ('To vertex', 'To segment', 'To vertex and segment')
- Define *Default snapping tolerance* in map units or pixel
- Define search radius for vertex edits in 'map units' or 'pixel'
-  *Show markers only for selected features*
- Define vertex *Marker style*  ('Cross' (default), 'Semi transparent circle' or 'None') and vertex *Marker size*.
-  *Suppress attributes pop-up windows after each created feature*
-  *Reuse last entered attribute values*

- *Validate geometries* Editing complex lines/polygons with many nodes can end up with very slow rendering. This is because the default validation procedures in QGIS can use 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.

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

- *Join style for curve offset*
- *Quadrantsegments for curve offset*
- *Miter limit for curve offset*

8.3.8 CRS Tab

The CRS tab is divided in two areas. The first area allows to define the default CRS for new projects.

- Select a CRS and *Always start new projects with this CRS*.
- *Enable on the fly re-projection by default*

The second area allows to define the action, when a new layer is created, or when a layer without CRS is loaded.

- *Prompt for Coordinate Reference System (CRS)*
- *Use project Coordinate Reference System (CRS)*
- *Use default Coordinate Reference System (CRS) displayed below*

8.3.9 Locale Tab

- *Overwrite system locale* and *Locale to use instead*
- Information about active system locale

8.3.10 Network Tab

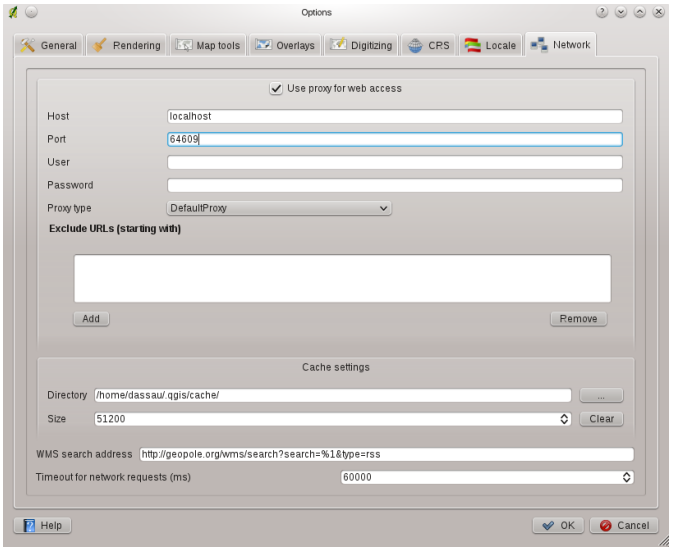


Figure 8.2: Proxy-settings in QGIS

- *Use proxy for web access* and define 'Host', 'Port', 'User', and 'Password'.
- Set the *Proxy type* according to your needs.
  - *Default Proxy*: Proxy is determined based on the application proxy set using
  - *Socks5Proxy*: Generic proxy for any kind of connection. Supports TCP, UDP, binding to a port (incoming connections) and authentication.
  - *HttpProxy*: Implemented using the "CONNECT" command, supports only outgoing TCP connections; supports authentication.
  - *HttpCachingProxy*: Implemented using normal HTTP commands, it is useful only in the context of HTTP requests
  - *FtpCachingProxy*: Implemented using an FTP proxy, it is useful only in the context of FTP requests
- Define *Cache settings* (path and size)
- Define *WMS search address*, default is `http://geopole.org/wms/search?search=\%1\&type=rss`
- Define *Timeout for network requests (ms)* - deeingebundenfault is 60000

Excluding some URLs can be added to the text box below the proxy-settings (see Figure_Network_Tab) by pressing the **[Add]** button. After that double-click into the just created URL-field and enter the URL you would like to exclude from using the proxy. Obviously the button **[Remove]** removes the selected entry.

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.

ちなみに: Using Proxies

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

You can modify the options according to your needs. Some of the changes may require a restart of QGIS before they will be effective.

- settings are saved in a texfile: $HOME/.config/QuantumGIS/qgis.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\QuantumGIS\qgis
```

8.4 Customization

The customization tool is a new development in QGIS 1.8.. It lets you (de)activate almost every element in the QGIS user interface. This can get very useful if you have a lot of plug-ins installed that you never use and that are filling your screen.

QGIS Customization is divided into five groups. In *Docks* you find the dock windows. Dock 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 **パネルとツールバー**). In *Menus* you can hide entries in the Menu bar. In the *Status Bar* features like the coordinate information can be daectivated. 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 you want to be hidden and find the corresponding entry in Customization (see figure_customization). You can also save your various different setups for different use cases as well. Before your changes are applied, you need to restart QGIS.

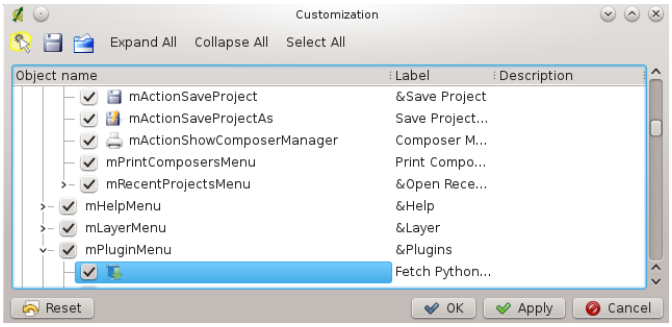


Figure 8.3: The Customization dialog

Chapter 9

投影法の利用方法

QGIS では、定義済みでない CRS(Coordinate Reference System=空間参照系) を持つレイヤのために、グローバルかつプロジェクトワイドな CRS を定義することができます。 また、カスタム空間参照系を定義できますし、実行時でのベクタレイヤの投影 (オンザフライプロジェクション) をサポートしています。 これらの機能によって、異なる CRS を持つレイヤを表示させ、確実にオーバレイさせることができるようになります。

9.1 投影法サポート概要

QGIS は、約 2700 の CRS をサポートしています。 これら CRS の個々の定義は、QGIS とともにインストールされている SQLite データベースに格納されています。通常、データベースを直接操作する必要はありません。実際にそういうことを行うと、投影法サポートが失敗することになりかねません。カスタム CRS はユーザデータベースに格納されます。 カスタム空間参照系の管理に関する情報は :ref:‘sec_custom_projections‘の章を参照してください。

QGIS で使用可能な CRS は、 European Petroleum Search Group (EPSG) と Institut Geographique National de France (IGNF) が定義した EPSG の定義をもとにし、GDAL で使用された spatial_references テーブルから多く抽出しました。EPSG ID はデータベース内にあり、QGIS で CRS を指定する際に使うことができます。

オンザフライ投影を使用するには、 使用するデータに空間参照系情報が含まれている必要があり、 含まれていない場合にはグローバルな CRS、レイヤに対して指定した CRS、またはプロジェクトに対して指定した CRS かを定義しなければなりません。 QGIS が使用する PostGIS レイヤは、レイヤが生成される時に指定されていた空間参照系 ID を使用します。 OGR データでは、QGIS は、フォーマットごとに特有になっている CRS を設定する手段が存在することを前提としています。 シェープファイルの場合は、Well Known Text (WKT) での CRS 設定を含むファイルを意味します。 投影法ファイルは同じシェープファイルと同じベース名を持ち、拡張子が prj です。 たとえば、*:alaska.shp* というシェープファイルに対しては、投影法ファイルは :file:‘alaska.prj‘という名前になります。

新しい CRS を選択した時、レイヤで利用される単位は **編集** (Gnome, OSX) または:guilabel:**設定** (KDE, Windows) メニューにある|mActionOptions| :guilabel:‘プロジェクトのプロパティ‘ダイアログの:guilabel:‘一般情報 ‘タブで自動的に変更されます。

9.2 投影法の指定

QGIS は新規プロジェクトにおいてグローバルなデフォルト投影法を使って起動します。グローバルデフォルト CRS は PSG:4326 - WGS 84 (`proj=longlat +ellps=WGS84 +datum=WGS84 +no_defs`) で、QGIS で事前に定義されています。このデフォルトは 図 1 が示す通り、新規プロジェクトを開始した際、デフォルトの座標参照系を定義するのに使用された最初のセクションで**[選択...]** ボタンをクリックして変更できます。この選択は、その後の QGIS セッションで使用するために保存されます。

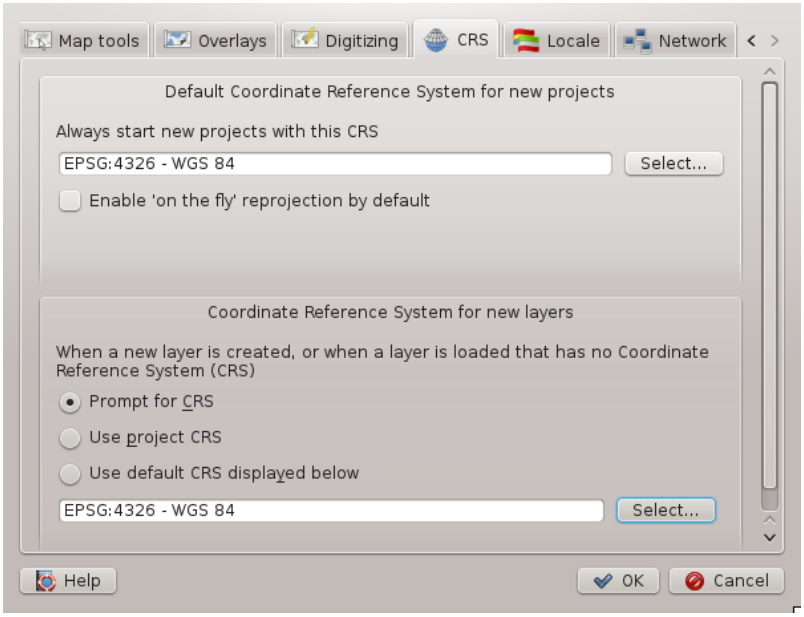


Figure 9.1: CRS tab in the QGIS Options Dialog

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 *Edit* → *Options* (Gnome, OSX) or *Settings* → *Options* (KDE, Windows).

The options shown in figure_projection_1 are:

- *Prompt for CRS*
- *Use project CRS*
- *Use default CRS displayed below*

CRS の情報なしに特定のレイヤの座標参照系を定義したい場合はラスタ (**一般情報タブ** を参照) およびベクタ (*General Tab* を参照) プロパティダイアログの:guilabel:‘一般情報 ‘タブで行うことができます。すでにレイヤで CRS が定義されている場合は、:ref:‘figure_vector_properties_1‘で示すように表示されます。

ちなみに: マップ凡例の CRS

Right-clicking on a layer in the Map Legend (Section **地図凡例**) provides two CRS short cuts. *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

9.3 Define On The Fly (OTF) Reprojection

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.

これを達成する方法は３つあります：

1. Select *Project Properties* from the *Edit* (Gnome, OSX) or *Settings* (KDE, Windows) menu.
2. ステータスバーの右下角にある|geographicl :sup:‘CRS ステータス ‘アイコンをクリックします。
3. Turn OTF on by default, by selecting the *CRS* tab of the *Options* dialog and selecting *Enable 'on the fly' reprojection by default*.

If you have already loaded a layer, and want to enable OTF projection, the best practice is to open the *Coordinate Reference System* 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.

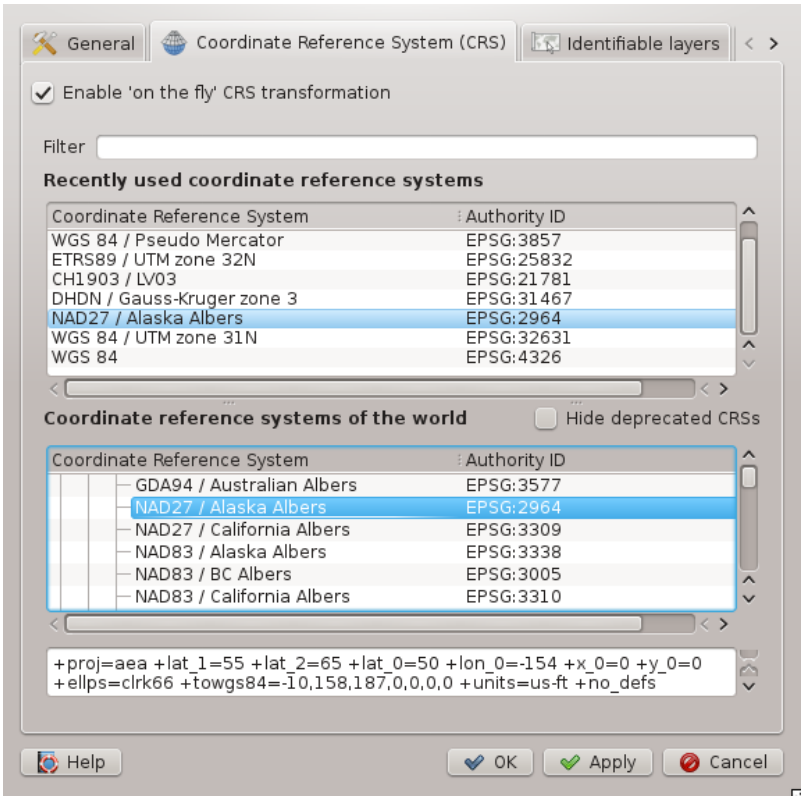


Figure 9.2: Projection Dialog

The *Coordinate Reference System* 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. **Coordinate Reference System** - this is a list of all CRS 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.
3. **Proj4 text** - 投影変換エンジンである Proj4 で使われる文字列です。この文字列は読み取り専用で、情報提供のために提供されます。
4. **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.
5. **最近利用した座標参照系** - 日常の GIS での作業でよく使う CRS があるなら、ダイアログの下部に「クイックアクセス」ボタンとして表示されます。これらのひとつをクリックすると、CRS を選択できます。

ちなみに: プロジェクトプロパティダイアログ

編集 (Gnome, OSX) または **設定** (KDE, Windows) メニューから:guilabel:‘プロジェクトのプロパティ‘ダイアログを開いた場合は、 :guilabel:‘座標参照系 ‘タブをクリックし、CRS 設定を表示します。

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

9.4 カスタム空間参照システム

QGIS が使用しなければならない CRS を提供していない場合は、カスタム CRS を定義できます。 CRS を定義するには:menuselection:**編集** (Gnome, OSX) または **設定** (KDE, Windows) メニューから **カスタム** *CRS* を選択します。 カスタム CRS は QGIS のユーザデータベースに格納されます。 また、このデータベースには、カスタム CRS だけでなく、空間ブックマークと他のカスタムデータが格納されます。

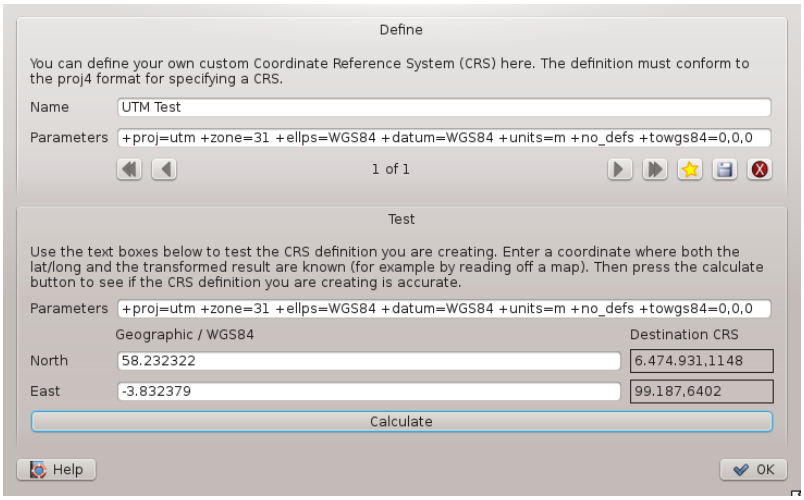


Figure 9.3: Custom CRS Dialog

Defining a custom CRS in QGIS requires a good understanding of the Proj.4 projection library. To begin, refer to the 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).

このマニュアルでは ‘‘proj.4‘‘の利用と関連のコマンドラインユーティリティについて記述されています。この地図作成パラメータはこのユーザマニュアルで記述された ‘‘proj.4‘‘で使用されており QGIS で使っていたものと同じです。

The *Custom Coordinate Reference System Definition* dialog requires only two parameters to define a user CRS:

1. 記述可能な名称
2. Proj4 書式による地図作成パラメータ.

新しい CRS を作成するには 新規 ボタンをクリックして、 名称と CRS パラメータを入力します。 その後 保存 ボタンをクリックして CRS を保存します。

注 新しい CRS を表現するには、 パラメータは `+proj=` -ブロックで開始されていなければいけません。

テスト ‘ブロック内の[計算]** ボタンをクリックし、*CRS* パラメータを**:guilabel:‘パラメータ ‘フィールドにペーストして、 まともな結果が得られるかを見ることで、*CRS* パラメータをテストできます。 知っている *WGS84* 緯度経度の値を**:guilabel:‘North‘、 :guilabel:‘East‘フィールドにそれぞれ入力します。 **[計算]** をクリックして、出てきた結果と、定義した CRS での知っている値とを比較します。

Chapter 10

QGISブラウザ

The QGIS Browser is a new panel in QGIS that lets you easily navigate in your database. You can have access to common vector files (e.g. ESRI shapefile or MapInfo files), databases (e.g.PostGIS or MSSQL Spatial) and WMS/WFS connections. You can also view your GRASS data (to get the data into QGIS see *GRASS GIS* **の統合**).

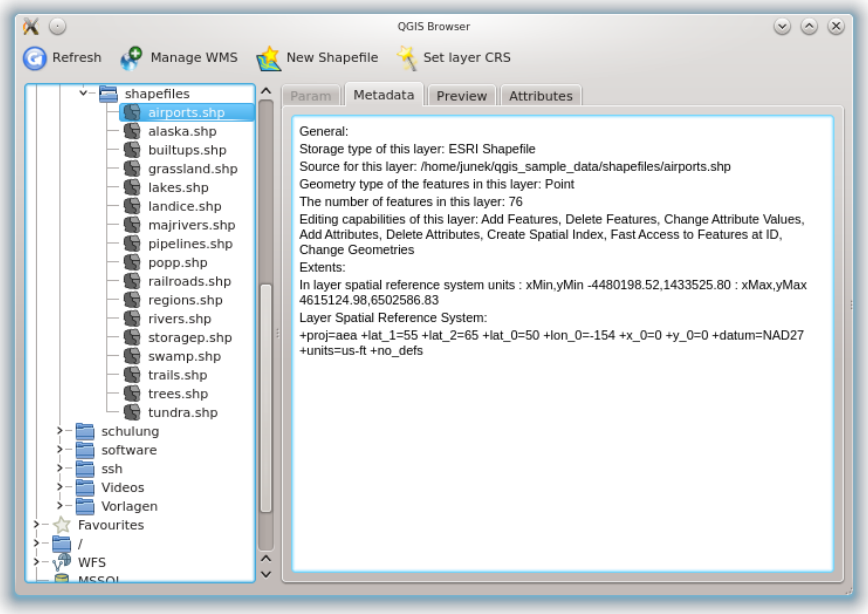


Figure 10.1: Qgis browser as a standalone application to view metadata, preview and attributes

データのプレビューに QGIS ブラウザを使います。ドラッグアンドドロップによって、簡単にデータをマップと凡例に表示できます。

1. QGIS ブラウザの有効：ツールバーで右クリックし、 :guilabel:‘ブラウザ ‘をクリックします。
2. 凡例ウィンドウにパネルをドラッグします。
3. guilabel:‘ブラウザ ‘タブをクリックします。
4. あなたのデータベースを参照し qgis_sample_data から shapefile フォルダを選択します。
5. Press the `Shift` key and klick on airports.shp and alaska.shp .
6. マウスの左ボタンを押し、マップキャンバスにファイルをドラッグアンドドロップします。

7. レイヤ上で右クリックし:guilabel:‘レイヤの CRS をプロジェクトに設定する ‘を選択します。より詳細な情報は:ref:‘label_projections‘を参照ください。
8. Click on  *Zoom Full* to make the layers visible.

QGIS ブラウザはスタンドアロンアプリケーションとして実行することも可能です。

QGIS ブラウザの起動

- コマンドプロンプトで “qbrowser” と入力します。
- |winlスタートメニューまたはデスクトップのショートカットをつかって QGIS を起動するか、QGIS プロジェクトファイルをダブルクリックします。
- QGIS ブラウザはあなたのアプリケーションフォルダでまだ利用可能になっていません。しかし、それは簡単に利用可能にすることができます。Finder で *Go* → *Go to map...* ‘**を使用し、**‘/Applications/QGIS.app/Contents/MacOS/bin‘‘フォルダを見つけます。:kbd:‘option - command‘のコンビネーションを使用し、アプリケーションフォルダにマウスの左ボタンを押しながら**qbrowser.app**にドラッグします。これで、QGIS ブラウザを起動するために使用できるリンクを作成します。

In figure_browser_standalone_metadata you can see the enhanced functionality of 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 *Metadata Tab*). 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.

Chapter 11

Working with Vector Data

11.1 Supported Data Formats

QGIS uses the OGR library to read and write vector data formats (GRASS vector and PostgreSQL support is supplied by native QGIS data provider plugins),including ESRI Shapefiles, MapInfo and Microstation file formats; PostGIS, SpatiaLite, Oracle Spatial databases and many more. The vector data can also be loaded in read mode from zip and gzip archives into QGIS. At the date of this document, 69 vector formats are supported by the OGR library (see OGR-SOFTWARE-SUITE **文献と** *Web* **参照**). The complete list is available at http://www.gdal.org/ogr/ogr_formats.html.

ノート: 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 was not build 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 `*.*`.

Working with GRASS vector data is described in Section *GRASS GIS* **の統合**.

This section describes how to work with several common formats: ESRI Shapefiles, PostGIS layers and SpatiaLite layers. Many of the features available in QGIS work the same, regardless of the vector data source. This is by design and includes the identify, select, labeling and attributes functions.

11.1.1 ESRI Shapefiles

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/).

A shapefile actually consists of several files. The following three are required:

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.

Loading a Shapefile

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

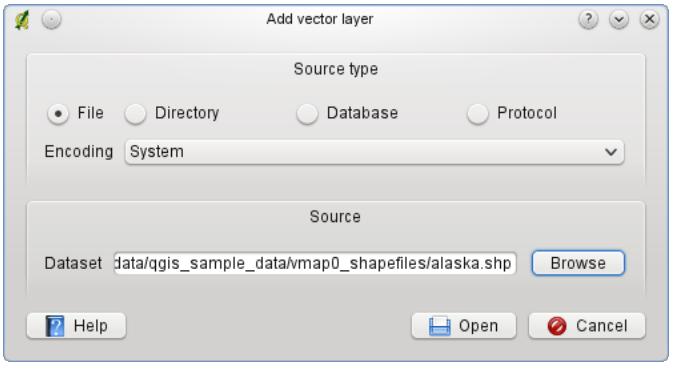


Figure 11.1: Add Vector Layer Dialog

From the available options check *File*. Click on button **[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 type for the shapefile if desired.

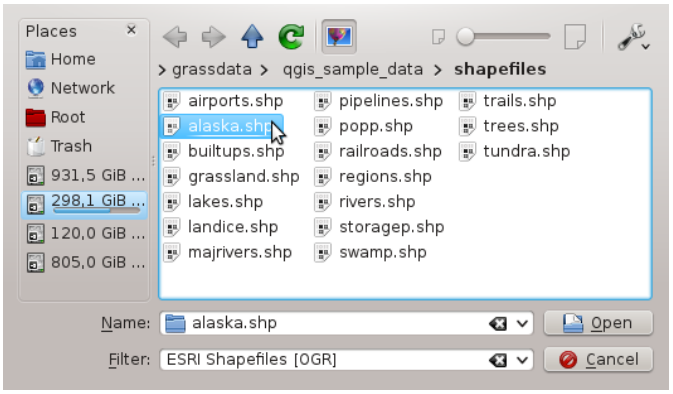


Figure 11.2: Open an OGR Supported Vector Layer Dialog

Selecting a shapefile from the list and clicking **[Open]** loads it into QGIS. Figure_vector_3 shows QGIS after loading the `alaska.shp` file.

ちなみに: Layer Colors

When you add a layer to the map, it is assigned a random color. When adding more than one layer at a time, different colors are assigned to each layer.

Once loaded, you can zoom around the shapefile 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 popup menu. See Section **スタイルタブ** for more information on setting symbology of vector layers.

ちなみに: Load layer and project from mounted external drives on OS X

On OS X, portable drives that are mounted besides the primary hard drive do not show up under *File* → *Open Project* as expected. 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 `return`. Then you can navigate to external drives and network mounts.

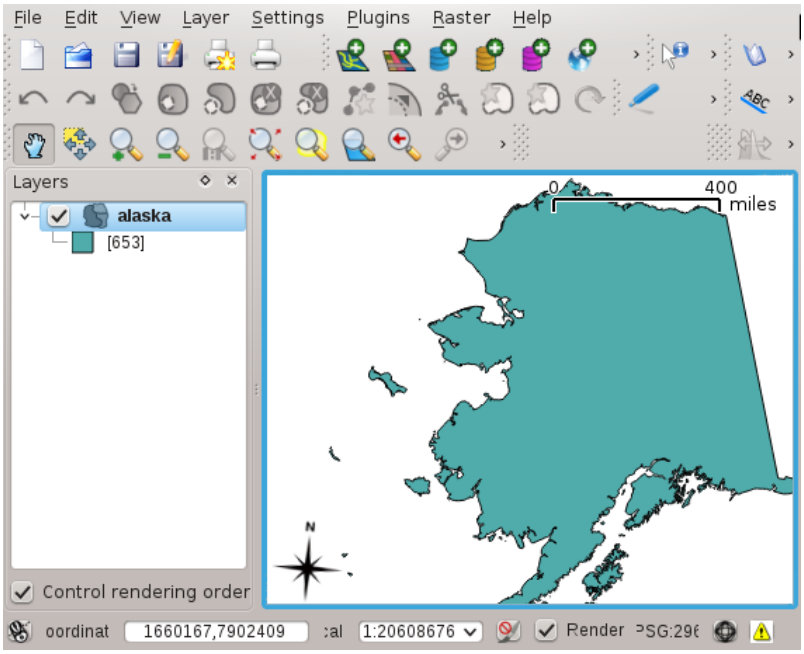


Figure 11.3: QGIS with Shapefile of Alaska loaded

Improving Performance Shape

To improve the performance of drawing a shapefile, you can create a spatial index. A spatial index will improve the speed of both zooming and panning. Spatial indexes used by QGIS have a `.qix` extension.

Use these steps to create the index:

- Load a shapefile.
- Open the *Layer Properties* dialog by double-clicking on the shapefile name in the legend or by right-clicking and choosing *Properties* from the popup menu.
- In the tab *General* click the **[Create Spatial Index]** button.

Problem loading a shape .prj file

If you load a shapefile with `.prj` file and QGIS is not able to read the coordinate reference system from that file, you have to define the proper projection manually within the *General* tab of the *Layer Properties* dialog of the layer. 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 that 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`.

11.1.2 Loading a MapInfo Layer

To load a MapInfo layer, click on the Add Vector Layer toolbar button or type `Ctrl+Shift+V`, change the file type filter *Filter* : to 'Mapinfo File [OGR]' and select the MapInfo layer you want to load.

11.1.3 Loading an ArcInfo Binary Coverage

 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*. Change to *Filter*  to 'Arc/Info Binary Coverage'. Navigate to the directory that contains the coverage files 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.

11.1.4 PostGIS Layers

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 with OGR layers in QGIS.

Creating a stored Connection

 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. 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 the same 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 5432.
- **Database**: Name of the database.
- **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. 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 login to the database.
- **Password**: Password used with *Username* to connect to the database.

Optional you can activate following checkboxes:

-  *Save Username*
-  *Save Password*
-  *Only look in the geometry_columns table*
-  *Only look in the 'public' schema*

- *Also list tables with no geometry*
- *Use estimated table metadata*

Once all parameters and options are set, you can test the connection by clicking on the **[Test Connect]** button.

ちなみに：QGIS User Settings and Security

Depending on your computing environment, storing passwords in your QGIS settings may be a security risk. Your customized settings for QGIS are stored based on the operating system:

- , the settings are stored in your home directory in `.qgis/`.
- , the settings are stored in the registry.

Loading a PostGIS Layer

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 *Importing Data into PostgreSQL* for a discussion on importing data into the database.

To load a layer from PostGIS, perform the following steps:

- If the *Add PostGIS layers* dialog is not already open, click on the Add PostGIS Layer toolbar button.
- Choose the connection from the drop-down list and click **[Connect]**.
- 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.
- Find the layer(s) you wish to add in the list of available layers.
- Select it by clicking on it. You can select multiple layers by holding down the `Shift` key while clicking. See Section **クエリビルダー** for information on using the PostgreSQL Query Builder to further define the layer.
- Click on the **[Add]** button to add the layer to the map.

ちなみに：PostGIS Layers

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.

Some details about PostgreSQL layers

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 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. In this case QGIS will try to find a column in the view that is derived from a suitable table column. It does this by parsing the view definition SQL. However there are several aspects of SQL that QGIS ignores these include the use of table aliases and columns that are generated by SQL functions.

If a suitable column cannot be found, 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 int4 and either a primary key or with a unique constraint, preferably indexed).

11.1.5 Importing Data into PostgreSQL

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

SPIT Plugin

QGIS comes with a core plugin named  SPIT (Shapefile to PostGIS Import Tool). SPIT can be used to load multiple shapefiles at one time and includes support for schemas. See Section *SPIT* **プラグイン** for more information.

shp2pgsql

PostGIS includes a 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 **投影法の利用方法** for more information on spatial reference systems and projections.

ちなみに: Exporting datasets from 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

Beside **shp2pgsql** and **SPIT** there is another tool for feeding geodata in PostGIS: **ogr2ogr**. This is part of your GDAL installation.

To import a shapefile into PostGIS, do the following:

```
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 see this by typing

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

If you like 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 *Improving Performance*).

Improving Performance

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).

The syntax for creating a GiST index is:

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

Note that for large tables, creating the index can take a long time. Once the index is created, you should perform a `VACUUM ANALYZE`. See the PostGIS documentation (POSTGIS-PROJECT **文献と** *Web* **参照**) for more information.

The following is an example of creating a GiST index:

```
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$
```

11.1.6 Vector layers crossing 180 ° longitude

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-1.4/ST_Shift_Longitude.html). As result, if we open such map in QGIS, we will see two far, distinct locations, that should show 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, right of New Zealand main islands.

Figure 11.4: Map in lat/lon crossing the 180 ° longitude line

A workaround 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 coordi-

nate is < 0 ° adds 360 ° to it. The result would be a 0 ° - 360 °version of the data to be plotted in a 180 ° centric map.

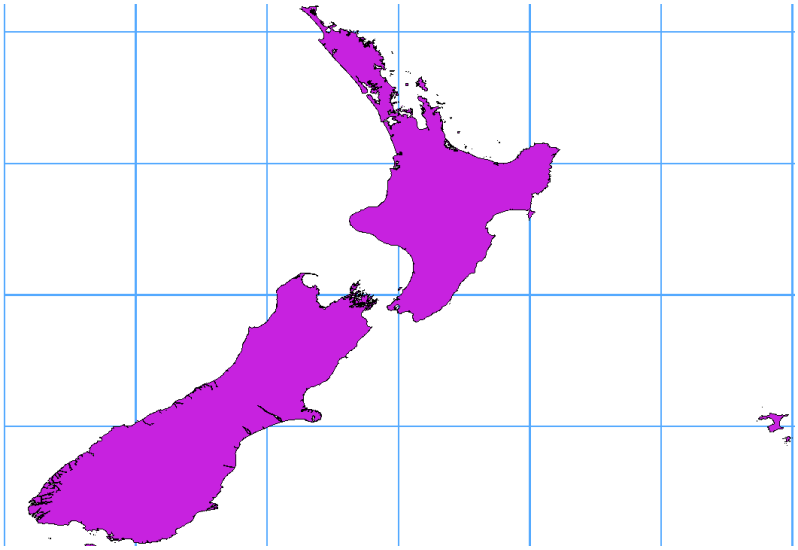


Figure 11.5: Crossing 180 ° longitude applying the **ST_Shift_Longitude** function

Usage

- Import data to PostGIS (*Importing Data into PostgreSQL*) using for example the PostGIS Manager plugin or the SPIT plugin
- Use the PostGIS command line interface to issue the following command (this is an example where "TABLE" is the actual name of your PostGIS table)

  ```
  gis_data=# update TABLE set the_geom=ST_Shift_Longitude(the_geom);
  ```

- If everything went right 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)

11.1.7 SpatiaLite Layers

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, which will allow you to either connect to a SpatiaLite database already known to QGIS, which you can choose from the dropdown 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, 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 also supports editable views in SpatiaLite.

Creating a new SpatiaLite layer

If you want to create a new SpatiaLite layer, please refer to section *Creating a new SpatiaLite layer*.

ちなみに: SpatiaLite data management Plugins

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

11.1.8 MSSQL Spatial Layers

QGIS also provides native MS SQL 2008 support. The Add MSSQL Spatial Layer is part of the new toolbar button or available in the MS SQL node in the QBrowser tree, providing drag and drop import support.

11.2 ベクタプロパティダイアログ

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 popup menu.

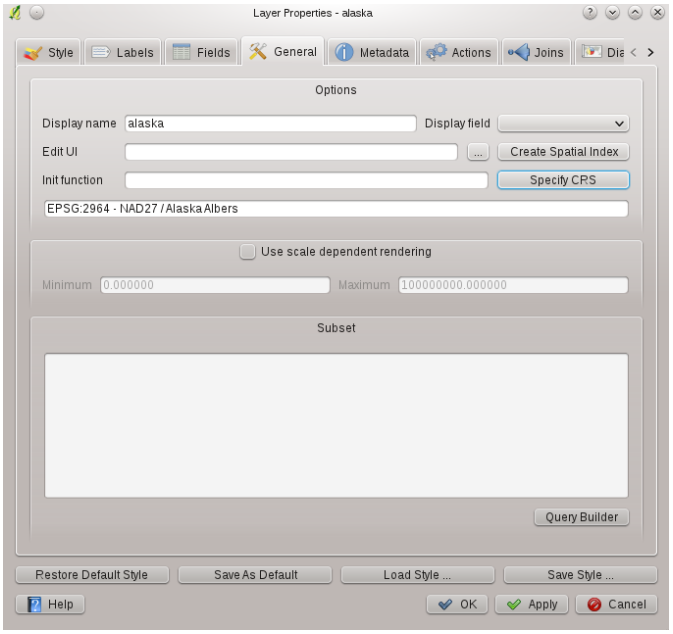


Figure 11.6: Vector Layer Properties Dialog

11.2.1 スタイルタブ

QGIS 1.4.0 から新しいシンボロジーが平行して導入され, 最終的には古いシンボロジーを置き換えられます. QGIS 1.8 では多彩な進化や機能が提供されている新しいシンボロジーがデフォルトで利用されてます.

古いシンボロジーについては *Old Symbology* の節で説明されています.

3 種類のシンボルがあります:マーカーシンボル (ポイント用), ラインシンボル (ライン用) と塗りつぶしとアウトライン洋シンボル (ポリゴン用) です. シンボルは 1 個またはそれ以上のシンボルレイヤを構成できます. いくつかのレイヤは色が固定されています-それらの色は変更できません. このことはマルチレイヤシ

ンボルを定義するときに便利です. マーカーシンボルのサイズと角度を定義できるのと同じようにラインシンボルの幅を定義できます.

利用可能なシンボルレイヤタイプ

- ポイントレイヤ
  - **フォントマーカー**: フォントを使った描画.
  - **シンプルマーカー**: ハードコーディングされたマーカーによる描画.
  - **SVG マーカー**: SVG ピクチャを使った描画.
  - **楕円マーカー**: 属性値を利用して楕円で描画を行う.
  - **ベクタフィールドマーカー r**: 属性値で提供されるベクタフィールドの値で描画する.
- ラインレイヤ
  - **ライン整飾**: ラインに整飾を加える, 例えばラインの方向を示す矢印.
  - **マーカーライン**: マーカーシンボルが繰り返し描画されるライン.
  - **シンプルライン**: 普通の描画方法のライン (幅 色　ペンスタイルの指定).
- ポリゴンレイヤ
  - **セントロイド塗りつぶし**: ポリゴンセントロイドをハードコーディングマーカーで塗りつぶします.
  - **SVG 塗りつぶし**: ポリゴンを SVG シンボルで塗りつぶします.
  - **シンプル塗りつぶし**: ポリゴンの通常の描画方法です (塗りつぶし色, パターンとアウトラインの指定).
  - ** ラインパターン塗りつぶし**: ポリゴンをラインパターンで塗りつぶします.
  - **ポイントパターン塗りつぶし**: ポリゴンをポイントパターンで塗りつぶします.
  - **アウトライン:ライン整飾**: ラインに整飾を加えます, 例えばラインの方向を示す矢印.
  - **アウトライン: マーカーライン**: ハードコーディングされたマーカーをアウトラインエリアとして使います.
  - **アウトライン:シンプルライン**: 幅 色　ペンスタイルを指定するアウトライン.

カラーランプ

カラーランプはレンダラ作成のために色の範囲を定義するのに使われます. このシンボルの色はカラーランプから設定されます.

3 種類のカラーランプタイプがあります:

- **階調**：1 色からいくつかの他の色での線形グラデーション。
- **ランダム**：カラースペースの指定されたエリアからランダムに生成された色。
- **ColorBrewer**: 色のスキーマから色のエリアと色の階級数の定義を作成します。

カラーランプは **[追加]**ボタンをクリックし :guilabel:‘スタイルマネージャ‘の :guilabel:‘カラーランプ‘タブで定義でき、カラーランプタイプを選択できます（vector_style_manager セクションを参照)。

スタイル

A style groups a set of various symbols and color ramps. You can define your prefered or frequently used symbols, and can use it without having to recreate it everytime. Style items (symbols and color ramps) have always a name by which they can be queried from the style. There is at least one default style in QGIS (modifiable) and the user can add further styles. In the lower part of the Style tab there are four buttons for managing styles: Use **[Restore Default Style]** to get back to your default settings, **[Save As Default]** to save your style as default, **[Load Style...]** to get to your own styles and **[Save Style]** to save your own styles. Layer styles can also be transferred from one layer to another layer. Activate a layer and choose *Layer* →  *Copy style* and switch to another layer. Then choose *Layer* →  *Paste style*.

レンダラ

The renderer is responsible for drawing a feature together with the correct symbol. There are four types of renderers: single symbol, categorized (called unique color in the old symbology), 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 renderer can be created by specifying a symbol and a color ramp - they will set the colors for symbols appropriately. **新世代シンボロジーで作業をする**

In the *Style* tab you can choose one of the five renderers: single symbol, categorized, graduated, rule-based and point displacement. For each data type (points, lines and polygons) vector symbol layer types are available (see vector_symbol_types). Depending on the chosen renderer, the symbology Depending on the chosen renderer, the *Style* tab provides different following sections. The new generation symbology dialog also provides a **[Style Manager]** button which gives access to the Style Manager (see Section *Style Manager*). The Style Manager allows you to edit and remove existing symbols and add new ones.

ちなみに：複数シンボルを選択して変更する

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

単一シンボルレンダラ

The Single Symbol Renderer is used to render all features of the layer using a single user-defined symbol. The properties, that can be adjusted in the `Style` tab, depend partially on the type of the layer, but all types share the following structure. In the top left part of the tab, there is a preview of the current symbol to be rendered. In the bottom part of the tab, there is a list of symbols already defined for the current style, prepared to be used via selecting them from the list. The current symbol can be modified using the **[Change]** button below the preview, which opens a *Symbol Properties* dialog, or the **[Change]** button right of the preview, which opens an ordinary *Color* dialog.

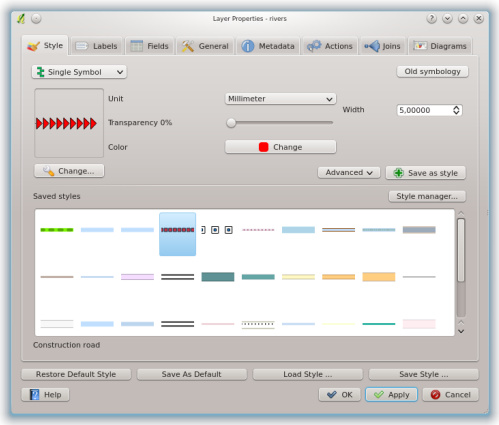


Figure 11.7: Single symbol line properties

In the *Style* tab you can apart from a general layer transparency also define to use millimeter or map units for the size scale. In the **[Advanced]** button next to the **[Save as style]** button you can use data-defined size scale and rotation. Here the *Symbol levels* → menu allows to enable and define the order in which the symbol layers are rendered (if the symbol consists of more than one layer).

After having done any needed changes, the symbol can be added to the list of current style symbols (using the **[Save as style]** button) and then 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). Currently in version 1.8 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 could be very handy sometimes to have this easy way of converting styles to rule-based.

Categorized Renderer

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

- The attribute (using the Column listbox)
- The symbol (using the Symbol dialog)
- The colors (using the Color Ramp listbox)

The **[Advanced]** button in the lower right corner of the dialog allows to set the fields containing rotation and size scale information. For convenience, the list in the bottom part of the tab 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.

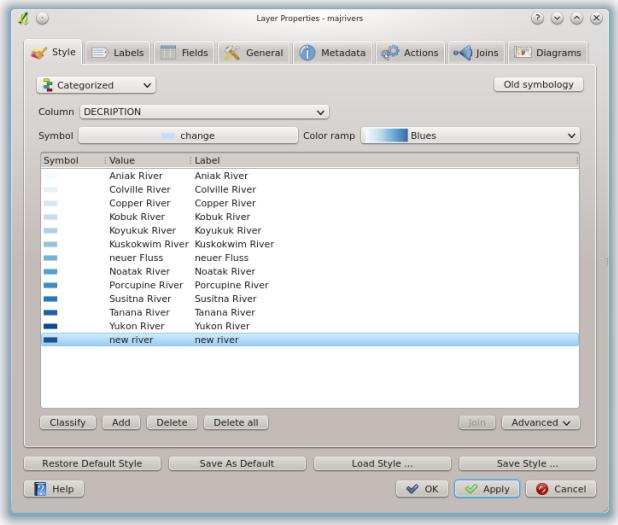


Figure 11.8: Categorized Symbolizing options

You can create a custom color ramp choosing *New color ramp...* from the Color ramp dropdown menu. A dialog will prompt for the ramp type: Gradient, Random, ColorBrewer, then each one has options for number of steps and/or multiple stops in the color ramp. See figure_symbology_3 for an example of custom color ramp.

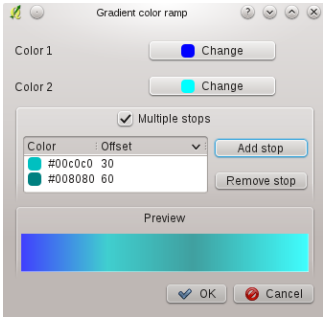


Figure 11.9: Example of custom gradient color ramp with multiple stops

Graduated Renderer

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

Like Categorized Renderer, it allows to define rotation and size scale from specified columns.

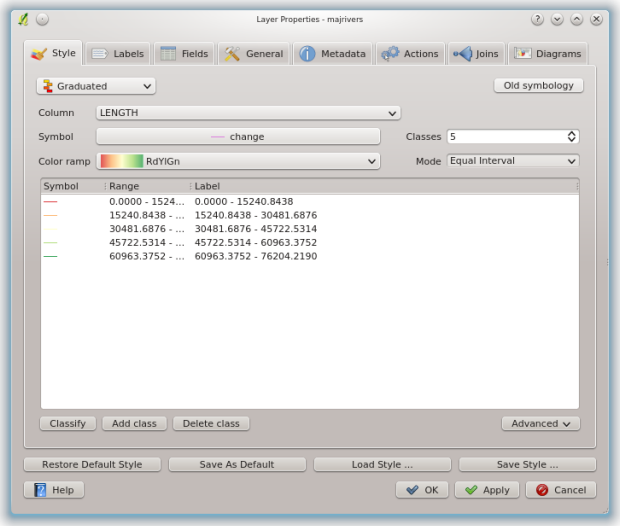


Figure 11.10: Graduated Symbolizing options

Analogue to the categorized rendered, the *Style* tab allows you to select:

- The attribute (using the Column listbox)
- The symbol (using the Symbol Properties button)
- The colors (using the Color Ramp list)

Additionally, you can specify the number of classes and also the mode how to classify features inside the classes (using the Mode list). The available modes are:

- Equal Interval
- Quantile
- Natural Breaks (Jenks)
- Standard Deviation
- Pretty Breaks

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

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

Rule-based rendering

The rule-based renderer is used to render all the features from a layer, using rule based symbols, whose color reflects the classification 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 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 clicking on it or click on '+' and click on the new rule. Then press the **[Edit]** button. In the *Rule properties* dialog you can define a label for the rule. Press the ... button to open the Expression 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 **フィールド演算**).

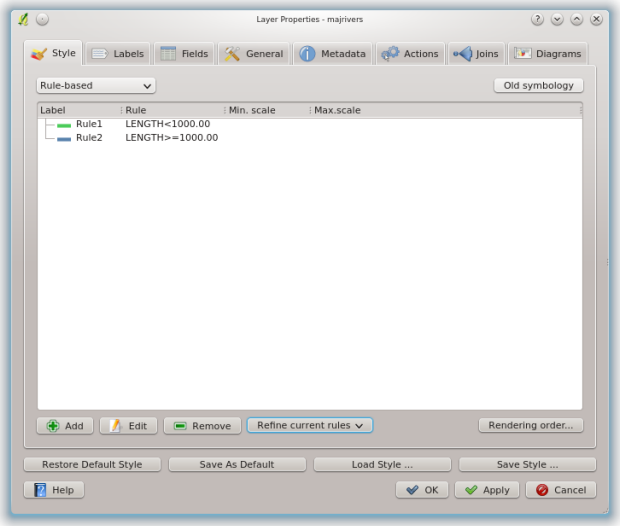


Figure 11.11: Rule-based Symbolizing options

Point displacement

The point displacement renderer offers 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.

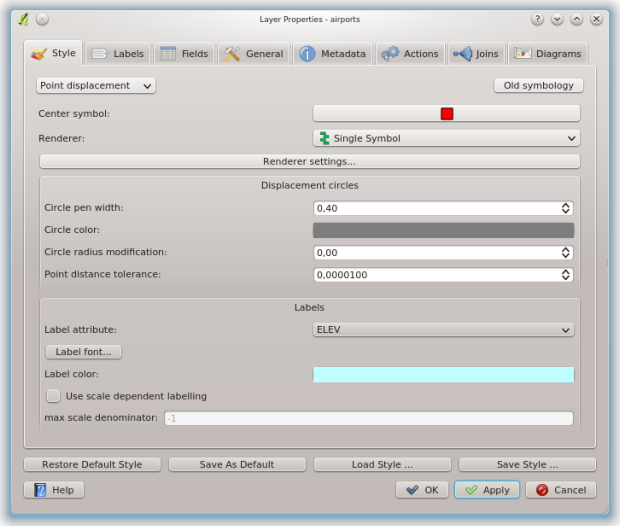


Figure 11.12: Point displacement dialog

Symbol Properties

The symbol properties dialog allows the user to specify different properties of the symbol to be rendered. In the bottom left part of the dialog, you find a preview of the current symbol as it will be displayed in the map canvas. Above the preview is the list of symbol layers. To start the *Symbol properties* dialog, click the **[Change...]** button in the *Style* tab of the *Layer Properties* dialog.

The buttons allow adding or removing layers, changing the position of layers, or locking layers for color changes. In the right part of the dialog, there are shown the settings applicable to the single symbol layer selected in the symbol layer list. The most important is the *Symbol Layer Type*  combobox, which allows you to choose the layer type. The available options depend on the layer type (Point, Line, Polygon). The symbol layer type

options are described in section vector_symbol_types. You can also change the symbol layer properties in the right part of the dialog. For example if you have chosen an SVG marker for a point layer it is now possible to change its color using *Color* button.

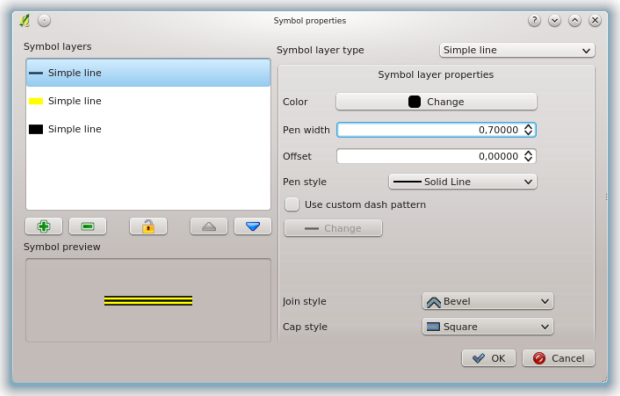


Figure 11.13: Line composed from three simple lines

11.2.2 Style Manager

The Style Manager is a small helper application, that lists symbols and color ramps available in a style. It also allows you to add and/or remove items. To launch the Style Manager, click on *Settings* → *Style Manager* in the main menu. Alternatively, you can access it via the *Style* tab.

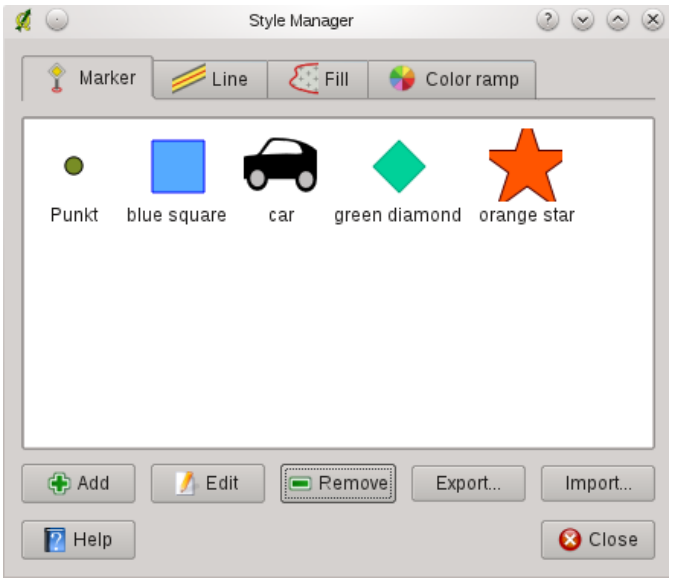


Figure 11.14: Style Manager to manage symbols and color ramps

11.2.3 Old Symbology

ノート: QGIS 1.8. still supports the usage of the old symbology, although it is recommended to switch to the new symbology, described in section vector_new_symbology, because the old symbology will be removed in one of the next releases.

If you want or need to switch back to the old symbology you can click on the **[Old symbology]** button in the *Style* tab of the *Layer Properties* dialog.

You can also make the old symobolgy the default, deactivating *Use new generation symbology for rendering* in the *Rendering* tab under *Settings* → *Options*.

The old QGIS symbology supports the following renderers:

- **Single symbol** - a single style is applied to every object in the layer.
- **Graduated symbol** - objects within the layer are displayed with different symbols classified by the values of a particular field.
- **Continuous color** - objects within the layer are displayed with a spread of colours classified by the numerical values within a specified field.
- **Unique value** - objects are classified by the unique values within a specified field with each value having a different symbol.

To change the symbology for a layer, simply double click on its legend entry and the vector *Layer Properties* dialog will be shown.

Style Options

Within this dialog you can style your vector layer. Depending on the selected rendering option you have the possibility to also classify your map features.

At least the following styling options apply for nearly all renderers:

- **Fill style** - Style for filling. Beside the given brushes you can select *Fill style:* 'Texture' and click the button for selecting your own texture file. Currently the fileformats `*.jpeg`, `*.xpm`, and `*.png` are supported.
- **Fill color** - fill-color of your features.
- **Outline options**
  - Outline style - Pen-style for your outline of your feature. You can also set this to 'no Pen'.
  - Outline color - color of the ouline of your feature.
  - Outline width - width of your features.

Once you have styled your layer you also could save your layer-style to a separate file (ending with `*.qml`). To do this, use the button **[Save Style...]**. No need to say that **[Load Style...]** loads your saved layer-style-file.

If you wish to always use a particular style whenever the layer is loaded, use the **[Save As Default]** button to make your style the default. Also, if you make changes to the style that you are not happy with, use the **[Restore Default Style]** button to revert to your default style.

Vector transparency

QGIS allows to set a transparency for every vector layer. This can be done with the slider *Transparency* inside the *Style* tab. This is very useful for overlaying several vector layers.

11.2.4 Labels Tab

As for the symbology QGIS 1.8 currently provides an old and a new labeling engine in parallel. The *Labels* tab still contains the old labeling. The new labeling is implemented as a core application and will replace the features of the old labels tab in one of the next versions.

We recommend to switch to the new labeling, described in section *New Labeling*.

The old labeling in the *Labels* tab allows you to enable labeling features and control a number of options related to fonts, placement, style, alignment and buffering. We will illustrate this by labeling the lakes shapefile of the QGIS sample dataset:

1. Load the Shapefile `alaska.shp` and GML file `lakes.gml` in QGIS
2. Zoom in a bit to your favorite area with some lake
3. Make the `lakes` layer active
4. Open the *Layer Properties* dialog
5. Click on the *Labels* tab
6. Check the *Display labels* checkbox to enable labeling
7. Choose the field to label with. We will use *Field containing label* `NAMES`
8. Enter a default for lakes that have no name. The default label will be used each time QGIS encounters a lake with no value in the `NAMES` field.
9. If you have labels extending over several lines, check *Multiline labels?*. QGIS will check for a true line return in your label field and insert the line breaks accordingly. A true line return is a **single** character `\n`, (not two separate characters, like a backlash `\` followed by the character `n`). To insert line returns in an attribute field configure the edit widget to be text edit (not line edit).
10. Click **[Apply]**.

Now we have labels. How do they look? They are probably too big and poorly placed in relation to the marker symbol for the lakes.

Select the `Font` entry and use the **[Font]** and **[Color]** buttons to set the font and color. You can also change the angle and the placement of the text-label.

To change the position of the text relative to the feature:

1. Beneath the Basic label options change the placement by selecting one of the radio buttons in the *Placement* group. To fix our labels, choose the *Right* radio button.
2. the `Font size units` allows you to select between *Points* or *Map units*.
3. Click **[Apply]** to see your changes without closing the dialog.

Things are looking better, but the labels are still too close to the marker. To fix this we can use the options on the `Offset` entry which is on the bottom of the menu. Here we can add offsets for the X and Y directions. Adding an X offset of 5 will move our labels off the marker and make them more readable. Of course if your marker symbol or font is larger, more of an offset will be required.

The last adjustment we'll make is to `Buffer` the labels. This just means putting a backdrop around them to make them stand out better. To buffer the lakes labels:

1. Click the *Buffer Labels* checkbox to enable buffering.
2. Choose a size for the buffer using the spin box.
3. Choose a color by clicking on **[Color]** and choosing your favorite from the color selector. You can also set some transparency for the buffer if you prefer.
4. Click **[Apply]** to see if you like the changes.

If you aren't happy with the results, tweak the settings and then test again by clicking **[Apply]**.

A buffer of 1 points seems to give a good result. Notice you can also specify the buffer size in map units if that works out better for you.

The advanced entries inside the *Label* tab allow you control the appearance of the labels using attributes stored in the layer. The entries beginning with `Data defined` allow you to set all the parameters for the labels using fields in the layer.

Note that the *Label* tab provides a `preview-box` where your selected label is shown.

11.2.5 New Labeling

The new Labeling core application provides smart labeling for vector point, line and polygon layers and only requires a few parameters. This new application will replace the current QGIS labeling, described in section *Labels Tab* and also supports on-the-fly transformated layers.

Using new labeling

1. Start QGIS and load a vector point, line or polygon layer.
2. Activate the layer in the legend and click on the Labeling icon in the QGIS toolbar menu.

Labeling point layers

First step is to activate the *Label this layer* checkbox and select an attribute column to use for labeling. Click ... if you want to define labels based on expressions. After that you can define the text style and the scale-based visibility in the *Label settings* tab (see Figure_labels_1). Choose the *Advanced* tab for the label placement and the labeling priority. You can define if every part of a multipart feature is to be labeled here. With the wrap label on character function you can define a character for a line break in the labels. The *Data defined settings* tab provides you with the attribute-based definition of Font properties, Buffer properties and Position.

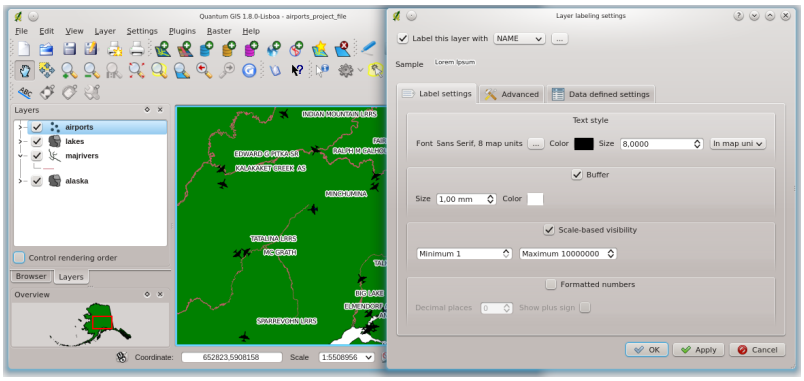


Figure 11.15: Smart labeling of vector point layers

Labeling line layers

First step is to activate the *Label this layer* checkbox in the *Label settings* tab and select an attribute column to use for labeling. Here you can also define labels based on expressions. After that you can define the text style and the scale-based visibility. Further labeling options are available through the *Advanced* tab. You can define the label placement and label distance, a line orientation dependend position and the labeling priority here. Furthermore you can define if every part of a multipart line is to be labeled, if lines shall be merged to avoid duplicate labels and if a direction symbol is added (see Figure_labels_2). It is also possible to supress labeling of features and wrap lables on characters. Use *Data defined settings* for attribute-based or database-connection-based settings.

Labeling polygon layers

First step is to activate the *Label this layer* checkbox and select an attribute column to use for labeling. Here you can also define labels based on expressions. In *Label settings* define the text style and the scale-based visibility (see Figure_labels_3). Use the *Advanced* tab for label placement, label distance and labeling priority. Define if every part of a multipart feature is to be labeled, suppress labeling of features and wrap labels on characters here. Use *Data defined settings* for attribute-based or database-connection-based settings.

Change engine settings

Additionally you can click the **[Engine settings]** button and select the search method, used to find the best label placement. Available is Chain, Popmusic Tabu, Popmusic Chain, Popmusic Tabu Chain and FALP.

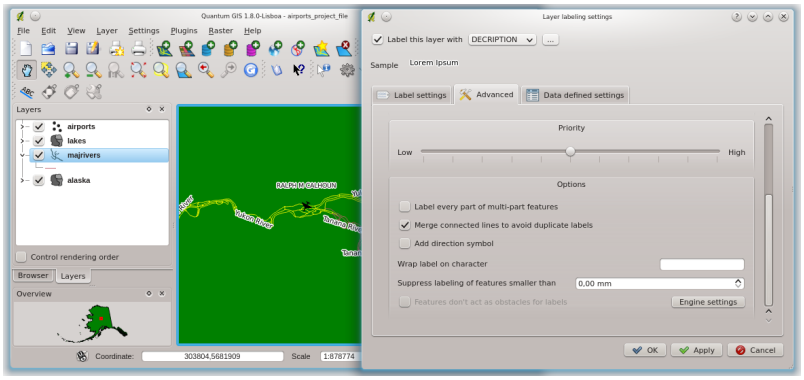


Figure 11.16: Smart labeling of vector line layers

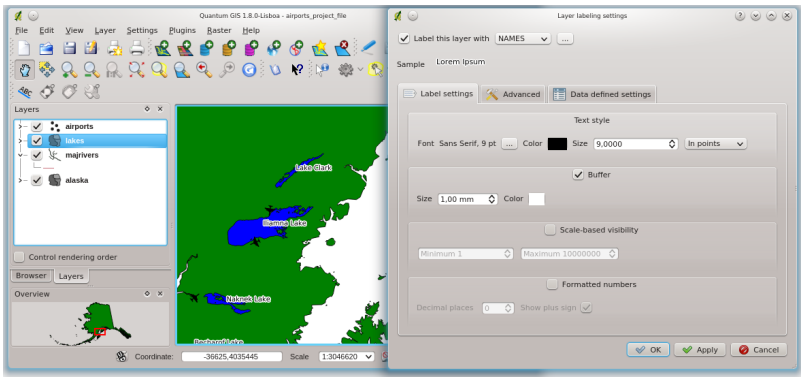


Figure 11.17: Smart labeling of vector polygon layers

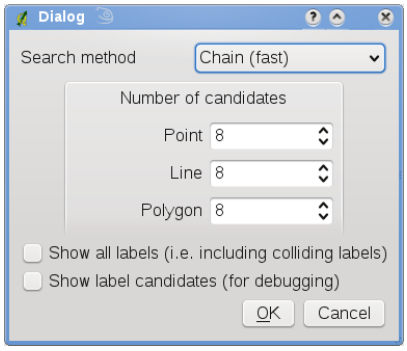


Figure 11.18: Dialog to change label engine settings

Furthermore the number of candidates can be defined for point, line and polygon features, and you can define whether to show all labels (including colliding labels) and label candidates for debugging.

Keywords to use in attribute columns for labeling

There is a list of supported key words, that can be used for the placement of labels in defined attribute columns.

- **For horizontal alignment**: `left`, `center`, `right`
- **For vertical alignment**: `bottom`, `base`, `half`, `top`
- **Colors can be specified in svg notation**, e.g. #ff0000
- **for bold, underlined, strikeout and italic**: 0 = false 1 = true

A combination of key words in one column also works, e.g.: `base right` or `bottom left`.

11.2.6 Fields Tab

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

At the moment only columns from PostGIS layers can be removed and added. The OGR library supports to add and remove columns, if you have a GDAL version >= 1.9 installed.

Edit Widget

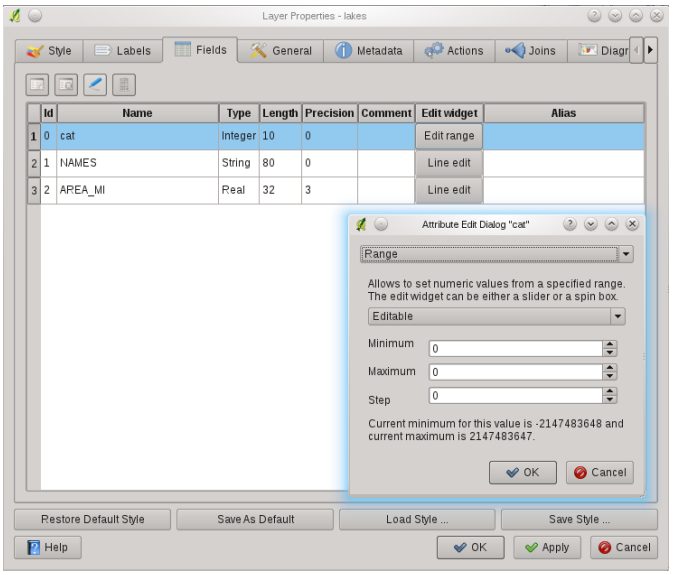


Figure 11.19: Dialog to select an edit widget for an attribute column 

Within the *Fields* tab 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:

- **Line edit**: an edit field which allows to enter simple text (or restrict to numbers for numeric attributes).
- **Classification**: Displays a combo box with the values used for classification, if you have chosen 'unique value' as legend type in the *Style* tab of the properties dialog.
- **Range**: Allows to set numeric values from a specific range. The edit widget can be either a slider or a spin box.
- **Unique values**: The user 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.

- **File name**: Simplifies the selection by adding a file chooser dialog.
- **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.
- **Enumeration**: Opens a combo box with values that can be used within the columns type. This is currently only supported by the postgres provider.
- **Immutable**: The immutable attribute column is read-only. The user is not able to modify the content.
- **Hidden**: A hidden attribute column is invisible. The user is not able to see its content.
- **Checkbox**: Displays a checkbox and you can define what attribute is added to the column when the checkbox is activated or not.
- **Text edit**: This opens a text edit field that allows multiple lines to be used.
- **Calendar**: Opens a calendar widget to enter a date. Column type must be text.
- **Value Relation**: Offers values from a related table in a combobox. You can select layer, key column and value column.
- **UUID Generator**: Generates a read-only UUID (Universally Unique Identifiers) field, if empty.

11.2.7 General Tab


The *General* tab is essentially like that of the raster dialog. There are several options available:

- Change the display name of the layer
- Set a display field to be used for the *Identify Results* dialog
- Define a certain Edit User Interface for the vector layer written with the Qt Creator IDE and tools at http://qt.digia.com/Product/Developer-Tools/
- Create a *Spatial Index* (only for OGR supported formats)
- Add an *Init function* for the layer. They will overwrite existing QGIS widget initializations, if applied
- *Update Extents* information for a layer
- View or change the projection of the specific vector layer, clicking on *Specify CRS*

Furthermore you can activate and set  *Use scale dependent rendering*, define provider specific options (e.g. encoding) and with the **[Query Builder]** button you can create a subset of the features in the layer that will be visualized (also refer to section **選択**).

11.2.8 Metadata Tab


The *Metadata* tab contains general information about the layer, including specifics about the type and location, number of features, feature type, and the editing capabilities. The *Extents* section, providing layer extent information, and the *Layer Spatial Reference System* section, providing information about the CRS of the layer. This is a quick way to get information about the layer.

Additionally you can add/edit a title for the layer and some abtract information. These information will be saved in the QGIS project file for following sessions and will be used for QGIS server.

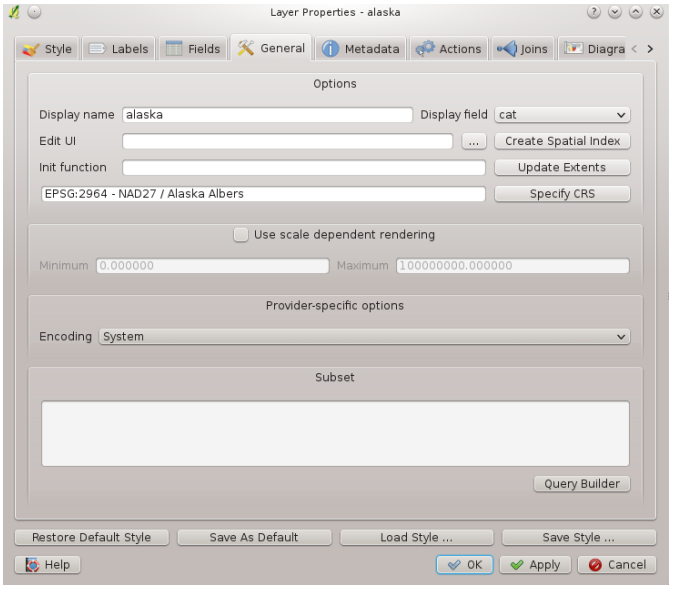


Figure 11.20: General tab in vector layers properties dialog

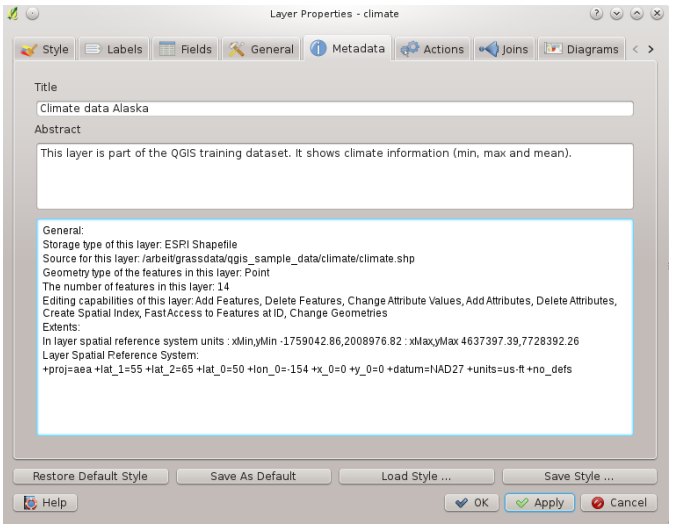


Figure 11.21: Metadata tab in vector layers properties dialog

11.2.9 Actions Tab

QGIS provides the ability to perform an action based on the attributes of a feature. This can be used to perform any number of actions, for example, running a program with arguments built from the attributes of a feature or passing parameters to a web reporting tool.

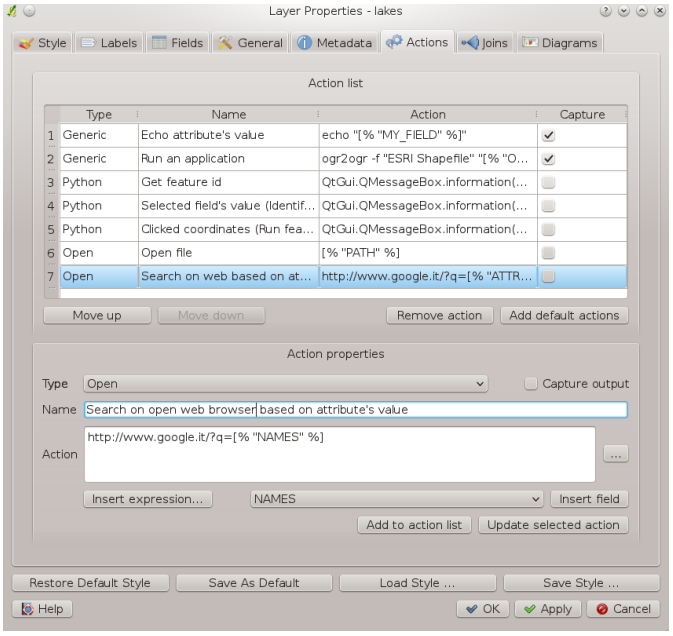


Figure 11.22: Overview action dialog with some sample actions

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 devided into 6 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 clicking on **[Add default actions]**. An example is performing a search based on an attribute value. This concept is used in the following discussion.

Defining Actions

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* tab. 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 so, by surrounding the field name (and the % character) with square brackets (e.g., `[%col10]`). This will prevent the `%col10` field name 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 *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 using preceeding the derived field name by `(Derived).`. For example, a point layer has an `X` and `Y` field and the value of these 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.

Two example actions are shown below:

- `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 sure, 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.

Using Actions

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 popup menu. Actions are listed in the popup menu by the name you assigned when defining the actions. 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 them into a file using bash and the `echo` command (so it will only work  or perhaps ). The layer in question has fields for a species name `taxon_name`, latitude `lat` and longitude `long`. I would like to be able to make a spatial selection of a 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"
```

After selecting a few localities and running the action on each one, opening the output file will show something like this:

```
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 create an action that does a Google search on the `lakes` layer. First we need to determine the URL needed 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. Make sure the `lakes` layer is loaded.
2. Open the *Layer Properties* dialog by double-clicking on the layer in the legend or right-click and choose *Properties* from the popup menu.
3. Click on the *Actions* tab.
4. Enter a name for the action, for example `Google Search`.
5. For the action, we need to provide the name of the external program to run. In this case, we can use Firefox. If the program is not in your path, you need to provide the full path.

6. Following the name of the external application, add the URL used for doing a Google search, up to but not included the search term: `http://google.com/search?q=`
7. The text in the *Action* field should now look like this: `firefox http://google.com/search?q=`
8. Click on the drop-down box containing the field names for the `lakes` layer. It's located just to the left of the **[Insert Field]** button.
9. From the drop-down box *The valid attribute names for this layer*  select 'NAMES' and click **[Insert Field]**.
10. Your action text now looks like this: `firefox http://google.com/search?q=%NAMES`
11. To finalize the action click the **[Insert action]** 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
```

We can now use the action. Close the *Layer Properties* dialog and zoom in to an area of interest. Make sure the `lakes` layer is active and identify a lake. In the result box you'll now see that our action is visible:

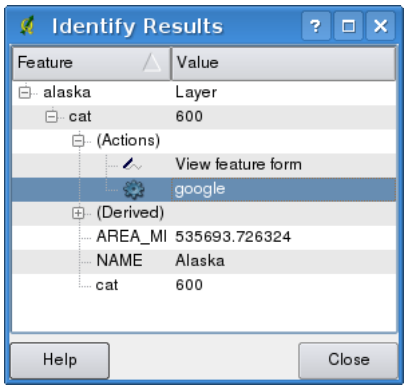


Figure 11.23: Select feature and choose action

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 **[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.

You can think of 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 on how to use **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 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 have to just remember that the action is one of type *Python* and to change the *command* and *imagerelpath* variables to fit our needs.

But what about if the relative path need 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 actions example if 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 name of files to be added to the project and the name to be given to the layer are data driven (*filename* and *layname* 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" %]')
```

11.2.10 Joins Tab


The *Joins* tab allows you to join a loaded attribute table to a loaded vector layer. As key columns you have to define a join layer, a join field and a target field. QGIS currently supports to join non spatial table formats supported by OGR, delimited text and the PostgreSQL provider (see figure_joins_1).

Additionally the add vector join dialog allows to:

-  *Cache join layer in virtual memory*
-  *Create attribute index on the join field*

11.2.11 Diagrams Tab


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

The current core implementation of diagrams provides support for piecharts and text diagrams. Text values of different data columns are displayed one below the other with a circle or a box and dividers. Diagram size is based on a fixed size or on linear scaling according to a classification attribute. The placement of the diagrams interacts with the new labeling, so position conflicts between diagrams and labels are detected and solved. In addition to chart positions can be fixed by the users hand.

We will demonstrate an example and overlay the alaska boundary layer a text diagram showing some temperature data from a climate vector layer. Both vector layers are part of the QGIS sample dataset (see Section **サンプルデータ**).

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`.

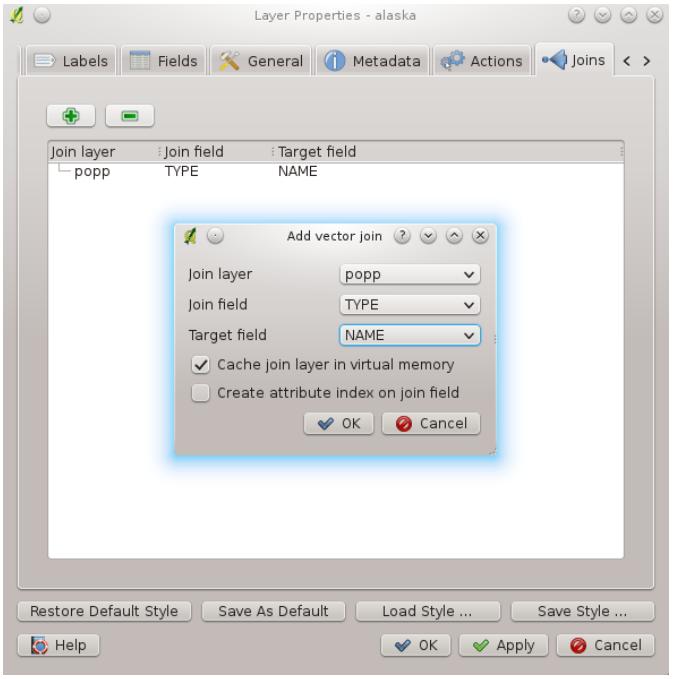


Figure 11.24: Join an attribute table to an existing vector layer

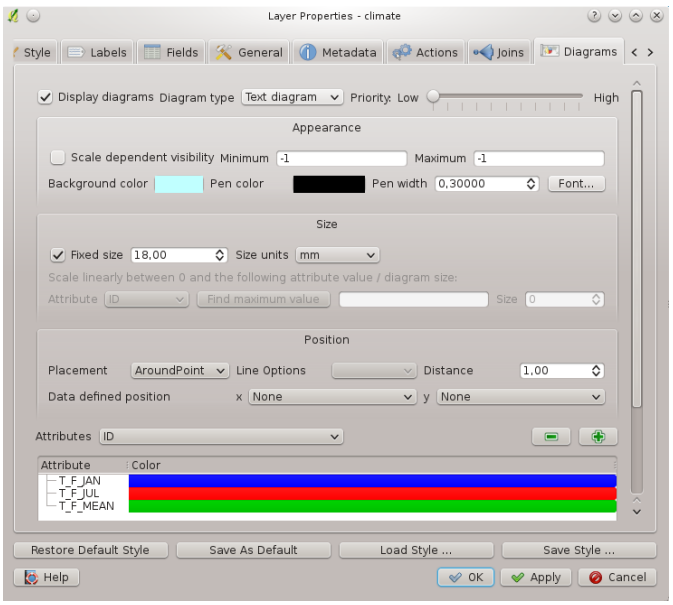


Figure 11.25: Vector properties dialog with diagram tab

2. Double click the `climate` layer in the map legend to open the *Layer Properties* dialog.
3. Click on the *Diagrams* tab, activate *Display diagrams* and from *Diagram type*  combobox select 'Text diagram'
4. As Background color we choose a light blue and set a fixed size to 18 mm.
5. Placement could be set to AroundPoint.
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 green **[+]** button, then `T_F_JUL` and finally `T_F_MEAN`.
7. Now click **[Apply]** to display the diagram in the QGIS main window.
8. You can now adapt the chart size, or change the attribute colors by double clicking on the color values in the attribute field. Figure_diagrams_2 gives an impression.
9. Finally click **[Ok]**.

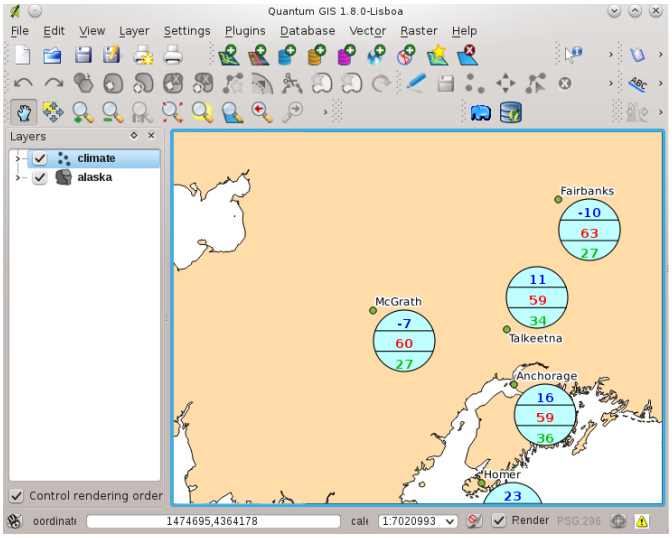


Figure 11.26: Diagram from temperature data overlayed on a map

Additionally in the *Settings* → *Options* dialog, there is a `Overlay` tab where it is possible to select the placement algorithm of the diagrams. The central point method is a generic one, the others use algorithms of the PAL library. They also consider diagram objects and labels in different layers. Also see section *Diagram Overlay Plugin* for additional diagram features.

11.3 編集

QGIS supports various capabilities for editing OGR, PostGIS and SpatiaLite vector layers.

ノート: The procedure for editing GRASS layers is different - see Section *Digitizing and editing a GRASS vector layer* for details.

ちなみに: 同時編集

QGIS のバージョンは誰があなたと一緒に地物の同時編集を行なっているかは追跡しません。最後に保存した人が編集権限を持ちます。

11.3.1 スナップ許容量と検索半径の設定

Before we can edit vertices, we must set the snapping tolerance and search radius to a value that allows us an optimal editing of the vector layer geometries.

Snapping tolerance

Snapping tolerance is the distance QGIS uses to `search` for the closest vertex and/or segment you are trying to connect 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 which work with tolerance.

1. A general, project wide snapping tolerance can be defined choosing *Settings* → *Options*. On Mac: go to *QIS* → *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 an 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 300ft should be fine at a scale of 1:10 000 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 which 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.

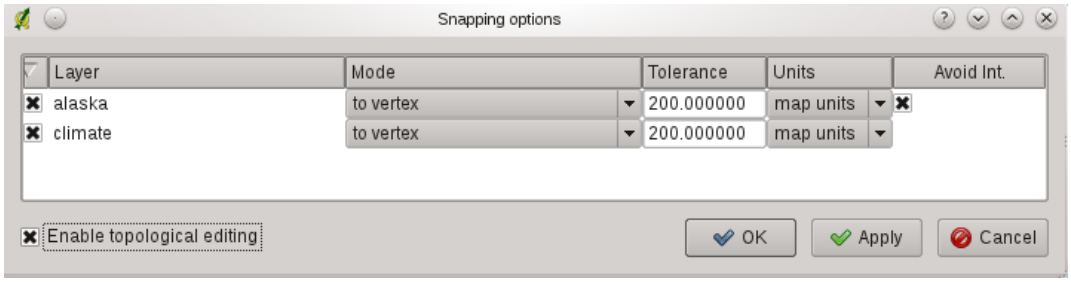


Figure 11.27: Edit snapping options on a layer basis

Search radius

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*. The same place where you define the general, project wide snapping tolerance.

11.3.2 Zooming and Panning

Before editing a layer, you should zoom in to your area of interest. This avoids waiting while all the vertex markers are rendered across the entire layer.

Apart from using the  pan and  zoom-in /  zoom-out icons on the toolbar with the mouse, navigating can also be done with the mouse wheel, spacebar and the arrow keys.

Zooming and panning with the mouse wheel

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.

Panning with the arrow keys

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 spacebar to temporarily cause mouse movements to pan then map. The `PgUp` and `PgDown` keys on your keyboard will cause the map display to zoom in or out without interrupting your digitizing session.

11.3.3 Topological editing

Besides layer based snapping options you can also define some 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.

Enable topological editing

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

Avoid intersections of new polygons

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 digitise the second one such that both intersect and QGIS then cuts the second polygon to the common boundary. The advantage is that users don't have to digitize all vertices of the common boundary.

11.3.4 Digitizing an existing layer

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). Layer editing is most versatile when used on PostgreSQL/PostGIS data sources.

In general, editing vector layers is divided into a digitizing and an advanced digitizing toolbar, described in Section *Advanced digitizing*. You can select and unselect both under *Settings* → *Toolbars* →. Using the basic digitizing tools you can perform the following functions:

Icon	Purpose	Icon	Purpose
	Toggle editing		Adding Features: Capture Point
	Adding Features: Capture Line		Adding Features: Capture Polygon
	Move Feature		Node Tool
	Delete Selected		Cut Features
	Copy Features		Paste Features
	Save edits and continue		

Table Editing: Vector layer basic editing toolbar

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 that layer.

Alternately, 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.

ちなみに: Save Regularly

Remember to Save Edits regularly. This will also check that your data source can accept all the changes.

Adding Features

You can use the Add Feature, Add Feature or Add Feature icons on the toolbar to put the QGIS cursor into digitizing mode.

For each feature, you first digitize the geometry, then enter its attributes. To digitize the geometry, left-click on the map area to create the first point of your new feature.

For lines and polygons, keep on left-clicking for each additional point you wish to capture. When you have finished adding points, right-click anywhere on the map area to confirm you have finished entering the geometry of that feature.

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* tab under the *Settings* → *Options* menu, you can also activate *Suppress attributes pop-up windows after each created feature* *Reuse last entered attribute values*.

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

ちなみに: Attribute Value Types

For editing the attribute types are validated during the entry. Because of this, it is not possible to enter a number into the 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.

Node Tool

For both PostgreSQL/PostGIS and shapefile-based layers, the Node Tool provides manipulation capabilites of feature vertices similar to CAD programs. It is possible to simply select multiple vertices at once and to move,

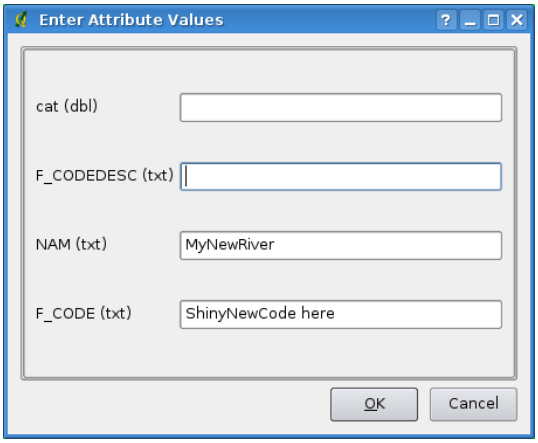


Figure 11.28: Enter Attribute Values Dialog after digitizing a new vector feature

add or delete them alltogether. The node tool also works with 'on the fly' projection turned on and supports the topological editing feature. This tool is, unlike other tools in Quantum GIS, persistent, so when some operation is done, selection stays active for this feature and tool. If the node tool couldn't find any features, a warning will be displayed.

Important is 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.

ちなみに: Vertex Markers

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 and click on the *Digitizing* tab and select the appropriate entry.

Basic operations

Start by activating the Node Tool and selecting a feature by clicking on it. Red boxes will appear at each vertex of this feature.

- **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 has to be moved if necessary.
- **Deleting vertices**: After selecting vertices for deletion, click the `Delete` key. Note that you cannot use the Node Tool to delete a complete feature; QGIS will ensure it retains the minimum number of vertices for the feature type you are working on. To delete a complete feature use the Delete Selected tool.
- **Moving vertices**: Select all the vertices you want to move. Click on a selected vertex or edge and drag in the direction you wish to move. All the selected vertices will move together. If snapping is enabled, the whole selection can jump to the nearest vertex or line.

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.

Cutting, Copying and Pasting Features

Selected features can be cut, copied and pasted between layers in the same QGIS project, as long as destination layers are set to  Toggle editing beforehand.

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 are copying some lakes to a new layer:

1. Load the layer you want to copy from (source layer)
2. Load or create the layer you want to copy to (target layer)
3. Start editing for target layer
4. Make the source layer active by clicking on it in the legend
5. Use the  Select Single Feature tool to select the feature(s) on the source layer
6. Click on the  Copy Features tool
7. Make the destination layer active by clicking on it in the legend
8. Click on the  Paste Features tool
9. Stop editing and save the changes

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 - feature and its attributes - gets copied, make sure the schemas match.

ちなみに: Congruency of Pasted Features

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.

Deleting Selected Features

If we want to delete an entire polygon, we can do that by first selecting the polygon using the regular  Select Single Feature tool. You can select multiple features for deletion. Once you have the selection set, use the  Delete Selected tool to delete the features.

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.

ちなみに: Feature Deletion Support

When editing ESRI shapefiles, the deletion of features only works if QGIS is linked to a GDAL version 1.3.2 or greater. The OS X and Windows versions of QGIS available from the download site are built using GDAL 1.3.2 or higher.

Saving Edited Layers

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 Edits button. When you turn editing mode off with the 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.

ちなみに: Data Integrity

It is always a good idea to back up your data source before you start editing. While the authors of QGIS have made every effort to preserve the integrity of your data, we offer no warranty in this regard.

11.3.5 Advanced digitizing

Icon	Purpose	Icon	Purpose
	Undo		Redo
	Simplify Feature		Add Ring
	Add Part		Delete Ring
	Delete Part		Reshape Features
	Offset Curve		Split Features
	Merge Selected Features		Rotate Point Symbols
	Merge Attributes of Selected Features		

Table Advanced Editing: Vector layer advanced editing toolbar

Undo and Redo

The Undo and Redo tools allow the user 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 check box. Undo/Redo is however active, even if the widget is not displayed.

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.

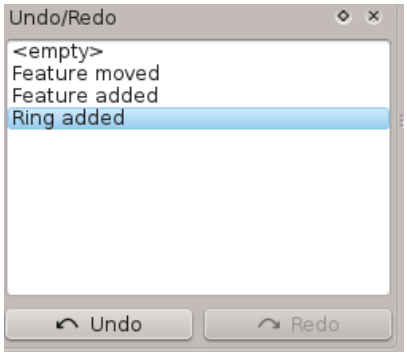


Figure 11.29: Redo and Undo digitizing steps

Simplify Feature

The  Simplify Feature tool allows to reduce the number of vertices of a feature, as long as the geometry doesn't change. You need to select a feature, it will be highlighted by a red rubber band and a slider appears. Moving the slider, the red rubber band is changing its shape to show how the feature is being simplified. Clicking **[OK]** the new, simplified geometry will be stored. If a feature cannot be simplified (e.g. MultiPolygons), a message shows up.

Add Ring

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

Add Part

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

Delete Ring

The  Delete Ring tool allows 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.

Delete Part

The  Delete Part tool allows to delete parts from multifeatures (e.g. to delete polygons from a multipolygon 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.

Reshape Features

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 major overhauls and the reshape line is not allowed to cross several polygon rings as this would generate an invalid polygon.

For example, you can edit the boundary of a polygon with this tool. First, click in the inner area of the polygon next to the point where you want to add a new vertex. Then, cross the boundary and add the vertices outside the polygon. To finish, right-click in the inner area of the polygon. The tool will automatically add a node where the new line crosses the border. It is also possible to remove part of the area from the polygon, starting the new line outside the polygon, adding vertices inside, and ending the line outside the polygon with a right click.

ノート: 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.

Offset Curves

The  Offset Curve tool is a new editing tool. It creates parallel shifts of lines and polygon rings. The tool can be applied to the edited layer (the geometries are modified) or also to background layers (creates copies of the lines / rings and adds it 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.

Split Features

You can split features using the  Split Features icon on the toolbar. Just draw a line across the feature you want to split.

Merge selected features

The  Merge Selected Features tool allows to merge features that have common boundaries and the same attributes.

Merge attributes of selected features

The  Merge Attributes of Selected Features tool allows to merge attributes of features with common boundaries and attributes without merging their boundaries.

Rotate Point Symbols

The  Rotate Point Symbols tool is currently only supported by the old symbology engine. It allows to change the rotation of point symbols in the map canvas, if you have defined a rotation column from the attribute table of the point layer in the *Style* tab of the *Layer Properties*. Otherwise 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.

ノート: If you hold the `Ctrl` key pressed, the rotation will be done in 15 degree steps.

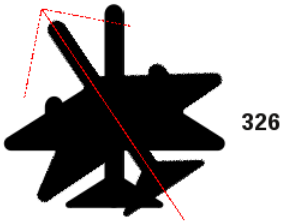


Figure 11.30: Rotate Point Symbols

11.3.6 Creating a new Vector layer

QGIS allows to create new Shapefile layers and new SpatiaLite layers. Creation of a new GRASS layer is supported within the GRASS-plugin. Please refer to section *Creating a new GRASS vector layer* for more information on creating GRASS vector layers.

Creating a new Shapefile layer

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).

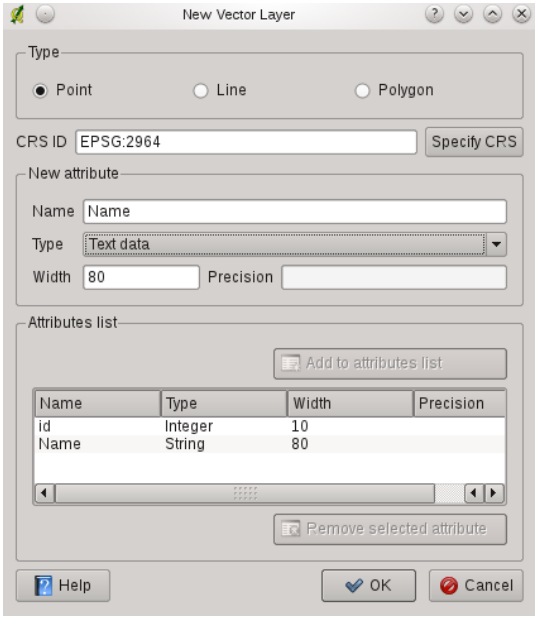


Figure 11.31: Creating a new Shapefile layer Dialog

To complete the creation of the new Shapefile layer, add the desired attributes by clicking on the **[Add]** 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* , and *Type: string* 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 *Digitizing an existing layer* above.

Creating a new SpatiaLite layer

To create a new SpatiaLite layer for editing, choose *New* → *New SpatiaLite Layer...* from the *Layer* menu. The *New SpatiaLite Layer* dialog will be displayed as shown in Figure_edit_6.

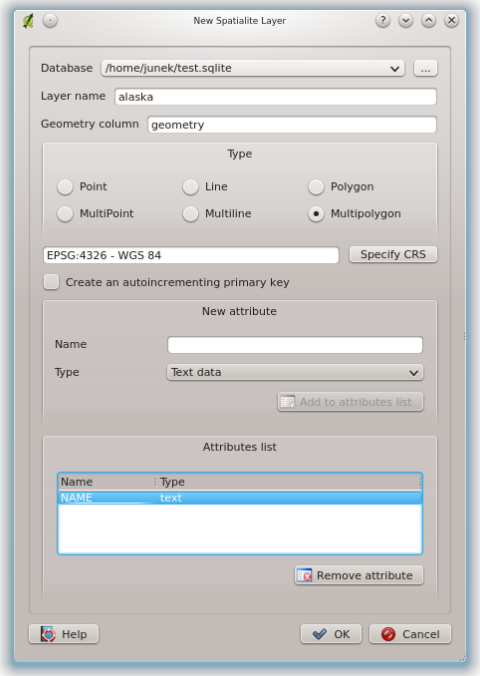


Figure 11.32: Creating a New SpatiaLite layer Dialog

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 and define the layer type and the EPSG SRID. If desired you can select to *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 according 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 *Digitizing an existing layer* above.

Further management of SpatiaLite-Layers can be done with the DB Manager see *DB Manager* **プラグイン**.

11.3.7 Working with the Attribute Table

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 menu *Layer* choose *Open Attribute Table*. It is also possible to rightclick on the layer and choose *Open Attribute Table* from the dropdown menu.

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

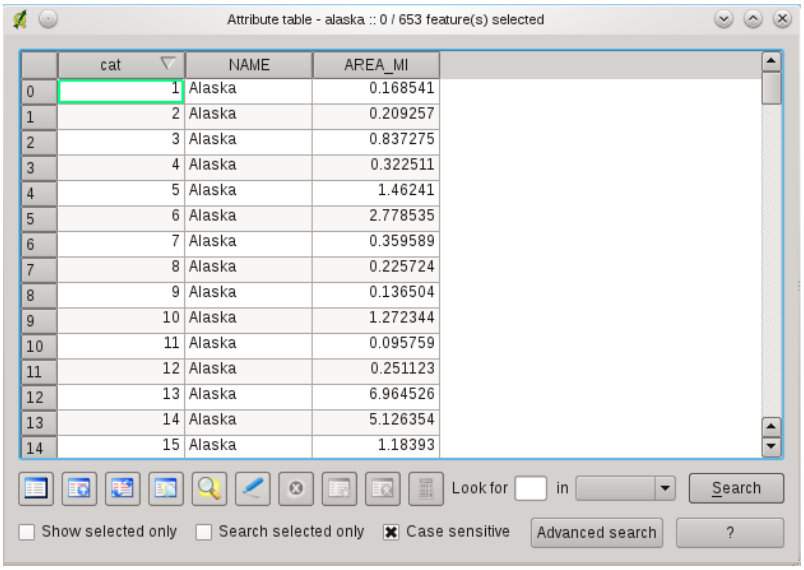


Figure 11.33: Attribute Table for Alaska layer

Selecting features in an attribute table

Each selected row in the attribute table displays the attributes of a selected feature in the layer. If the set of features selected in the main window is changed, the selection is also updated in the attribute table. Likewise, if the set of rows selected in the attribute table is changed, the set of features selected in the main window will be updated.

Rows can be selected by clicking on the row number on the left side of the row. **Multiple rows** can be marked by holding the `Ctrl` key. A **continuous selection** can be made by holding the `Shift` key and clicking on several row headers on the left side of the rows. All rows between the current cursor position and the clicked row are selected. Moving the cursor position in the attribute table, by clicking a cell in the table, does not change the row selection. Changing the selection in the main canvas does not move the cursor position in the attribute table.

The table can be sorted by any column, by clicking on the column header. A small arrow indicates the sort order (downward pointing means descending values from the top row down, upward pointing means ascending values from the top row down).

For a **simple search by attributes** on only one column the *Look for* field can be used. Select the field (column) from which the search should be performed from the dropdown menu and hit the **[Search]** button. The matching rows will be selected and the total number of matching rows will appear in the title bar of the attribute table, and in the status bar of the main window. For more complex searches use the Advanced search button ..., which will launch the Search Query Builder described in Section クエリビルダー.

To show selected records only, use the checkbox *Show selected only*. To search selected records only, use the checkbox *Search selected only*. The *Case sensitive* checkbox allows to select case sensitive. The other buttons at the bottom left of the attribute table window provide following functionality:

- Unselect all also with `Ctrl+U`
- Move selected to top also with `Ctrl+T`
- Invert selection also with `Ctrl+S`
- 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`

- Toggle editing mode to edit single values and to enable functionalities described below also with `Ctrl+E`
- 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`

ちなみに: Skip WKT geometry

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* → General tab *Copy geometry in WKT representation from attribute table*.

Save selected features as new layer

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 selection as* → to define the name of the output file, its format and CRS (see Section **地図凡例**). It is also possible to specify OGR creation options within the dialog.

Working with non spatial attribute tables

QGIS allows also to load non spatial tables. This includes currently tables supported by OGR, delimited text and the PostgreSQL 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 e.g. 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 *Fields Tab* to find out more.

11.4 クエリビルダー

クエリビルダーは SQL の WHERE 句を使用してテーブルのサブセットを定義し、メインウィンドウに結果を表示することを可能とします。そのクエリ結果は、新しいベクタレイヤとして保存することができます。

11.4.1 クエリ

Open the attribute table choosing Open Attribute Table from the menu bar. Click on the **[Advanced Search]** button to open the *Query builder*. For example, if you have a `towns` layer with a `population` field you could select only larger towns by entering `population > 100000` in the SQL box of the Query builder. Figure_attributes_2 shows an example of the Query builder populated with data from a PostGIS layer with attributes stored in PostgreSQL. The Fields, Values and Operators sections help the user 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 column, select the attribute

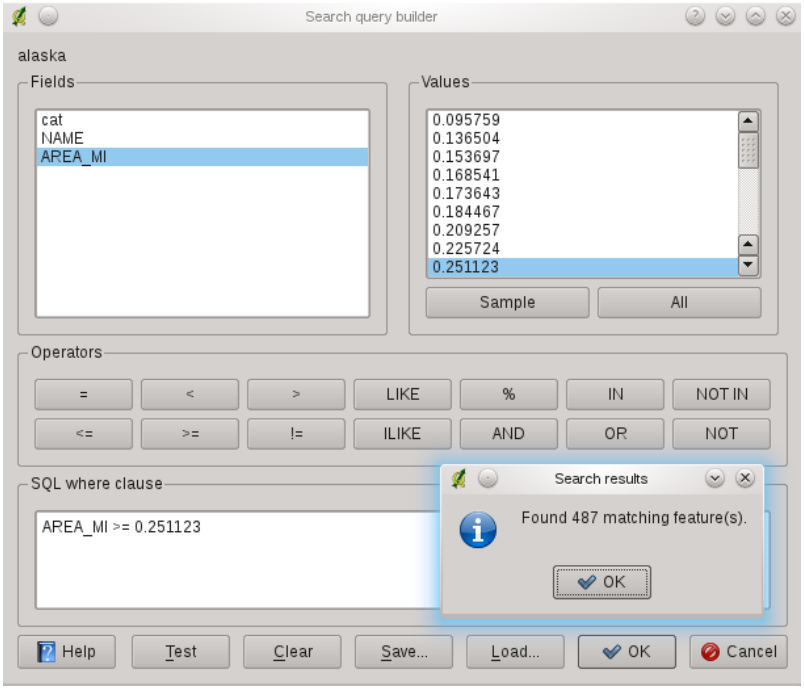


Figure 11.34: Query Builder

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`), logical operators (`AND`, `OR`, ...) are available.

The **[Test]** button shows a message box with the number of features satisfying the current query, which is usable in the process of query construction. The **[Clear]** button clears the text in the SQL where clause text field. The **[Save]** and **[Load]** button allow to save and load SQL queries. The **[OK]** button closes the window and selects the features satisfying the query. The **[Cancel]** button closes the window without changing the current selection.

ちなみに: Changing the Layer Definition

レイヤを定義するのに使われた SQL クエリを変更することでロードされた後に、レイヤ定義を変更することができます。これを行うには、 凡例上でレイヤをダブルクリックしベクタの:guilabel:**レイヤのプロパティ**‘**ダイアログ を開いてから** *:guilabel:*‘**一般情報** タブの**[クエリビルダ]**ボタンをクリックします。詳細については:ref:*vector_properties_dialog* のセクションを参照してください。

11.4.2 選択

With QGIS it is possible also to select features for visualisation using a similar query builder interface to that used in **クエリビルダー**. In the above section the purpose of the query builder is to highlight all selected features meeting the filter criteria in yellow. The rest of the features do not change their appearance.

もう１つの方法は 凡例内のレイヤを右クリックで選択し:guilabel:‘検索...‘を選択することです。ここで SQL クエリを実行すると選択された地物のみがマップビューで表示されます。SQL クエリにマッチしなかった地物はマップビューで表示されません。同様の機能 j は:guilabel:‘レイヤプロパティ‘ダイアログの :guilabel:‘一般情報 ‘タブからも利用可能です。右下で**[クエリビルダ]**ボタンを見つけることができるでしょう。前述の選択は、すべてのベクタデータプロバイダで使用することができます。

11.4.3 選択地物を新規レイヤに保存する

選択した地物は任意の OGR がサポートしたベクタフォーマットとして保存され、別の座標参照系（CRS）に変換することができます。レイヤのコンテキストメニューを開き **選択を名前をつけて保存** → をクリック後、出力ファイルの名称、フォーマット、CRS を定義します。(:ref:‘label_legend‘のセクションを参照)。ダイアログ内で OGR 作成オプションを指定することも可能です。

11.5 フィールド演算

属性テーブル内の|mActionCalculateField| :sup:‘フィールド計算機 ‘ボタンを使用すると、既存の属性値または定義された関数にもとづいて計算を実行することができます。例えば地物のジオメトリの長さや面積を計算することができます。計算結果は新しい属性カラムに書き込まれるか既存のカラムの値を上書きします。

フィールド計算機アイコンをクリックしてダイアログを開く前にベクタレイヤを編集モードにする必要があります（figure_attributes_3 を参照)。 このダイアログでは最初に、選択した地物のみを更新するかどうか、計算結果を新しい属性フィールドとして作成するか既存フィールドの更新にするかを選択しなければいけません。

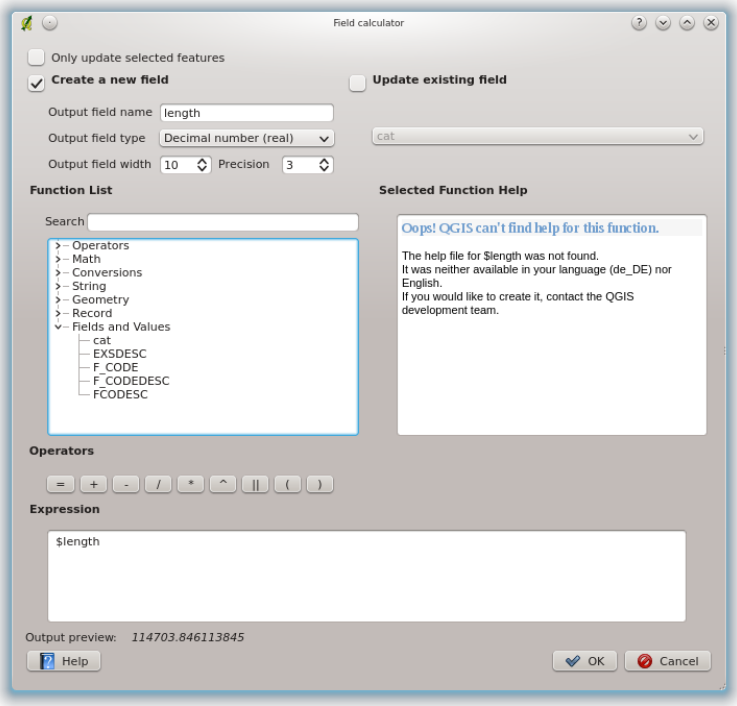


Figure 11.35: Field Calculator

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 signs before the dot, then the dot and another 3 signs for the precision.

フィールドリストにはフィールドと値だけでなく関数も含まれます。**選択された関数ヘルプ**で関数のヘルプを参照することができます。**式**では**関数リスト**で作成した計算式を確認できます。たいていは演算子を使いますが**演算子**で確認ください。

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 opens the **Field Values** list 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 provides several functions. In *Operators* you find mathematical operators. Find *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 doubleclick the function.

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

1. Load the Shapefile `railroads.shp` in QGIS and press  Open Attribute Table.
2. Click on  Toggle editing mode and open the  Field Calculator dialog.
3. :guilabel:'新しいフィールドを作る 'のチェックを選択し、新しいフィールドに計算結果を保存します。
4. 出力フィールド名として ''length''を追加し、出力フィールドタイプを ''real''、 フィールド長を 10、精度を 3 に指定します。
5. Now click on function `length` in the *Geometry* group to add it as `$length` into the Field calculator expression box and click **[Ok]**.
6. 属性テーブルで新規に ''length''カラムを見つけることができます。

The available functions are listed below.

```
column name "column name"            value of the field column name
'string'                             a string value
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
a OR b                               a or *b* is true
a AND b                              a and *b* is true
NOT a                                inverted truth value of a
sqrt(a)                              square root of a
sin(a)                               sinus of a
cos(a)                               cosinus of b
tan(a)                               tangens of a
asin(a)                              arcussinus of a
acos(a)                              arcuscosinus of a
atan(a)                              arcustangens of a
to int(a)                            convert string a to integer
to real(a)                           convert string a to real
to string(a)                         convert number a to string
lower(a)                             convert string a to lower case
upper(a)                             convert string a to upper case
length(a)                            length of string a
atan2(y,x)                           arcustangens of y/x using the signs of the two
                                     arguments to determine the quadrant of the result
replace(*a*, replacethis, withthat)  replace this with that in string a
regexp_replace(a,this,that)          replace the regular expression this with that
substr(*a*,from,len)                 len characters of string *a* starting from from
                                     (first character index is 1)
a || b                               concatenate strings a and b
$rownum                              number current row
$area                                area of polygon
$perimeter                           perimeter of polygon
$length                              length of line
$id                                  feature id
$x                                   x coordinate of point
$y                                   y coordinate of point
```

```
xat(n)                                  X coordinate of the point of an n-th line (indeces
                                        start at 0; negative values refer to the line end)
yat(n)                                  y coordinate of the point of an n-th line (indeces
                                        start at 0; negative values refer to the line end)
a = b                                   a and b are equal
a != b and a <> b                       a and b are not equal
a >= b                                  a is larger than or equal to b
a <= b                                  a is less than or equal to b
a > b                                   a is larger than b
a < b                                   a is smaller than b
a ~ b                                   a matches the regular expression b
a LIKE b                                a equals b
a ILIKE b                               a equals b (without regard to case-sensitive)
a |wedge| b                             a raised to the power of b
a * b                                   a multiplied by b
a / b                                   a divided by b
a + b                                   a plus b
a - b                                   a minus b
+ a                                     positive sign
- a                                     negative value of a
```

フィールド計算機の **関数リスト** にある **選択された関数ヘルプ**、**演算子**と**式**メニューもまたレイヤプロパティのスタイルタブでのルールに基づいたレンダリングを通して利用可能です。式は コアアプリケーション|mActionLabeling| :sup:‘ラベリング ‘においてラベリング|browsebutton|に基づいています。

Chapter 12

Working with Raster Data

12.1 ラスターデータの操作

This Section describes how to visualize and set raster layer properties. QGIS uses the GDAL library to read and write raster data formats, including Arc/Info Binary Grid, Arc/Info 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.

この文書の日付において、GDAL ライブラリでは 100 以上のラスターフォーマットがサポートされています（**文献と *Web* 参照** の GDAL-SOFTWARE-SUITE を参照）。完全なリストは http://www.gdal.org/formats_list.html で利用可能です。

ノート: 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 was not 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.

GRASS ラスターデータの操作については ref:‘sec_grass‘のセクションで説明されています。

12.1.1 ラスターデータとは？

GIS におけるラスターデータは地球上表面での上下の特徴を表す個別のセルの行列です。ラスターグリッドの各セルは同じサイズであり、セルはたいてい長方形です（QGIS では、それらは常に矩形でしょう）。典型的なラスターデータセットは航空写真や衛星画像のようなリモートセンシングデータ、標高マトリクスとしてモデル化されたデータを含みます。

ベクターデータとは異なり、ラスターデータは、典型的には、各セルに関連付けられたデータベースレコードを持っていません。それらは、そのピクセルの解像度とラスタレイヤの角ピクセルの X/ Y 座標によってジオコーディングします。これにより QGIS のマップキャンバスに正しくデータを配置することができます。

QGIS はラスタレイヤ内部ジオリファレンス情報（例：index:*GeoTiff*）を利用するか、適切なワールドファイルで正しくデータを表示します。

12.1.2 QGIS にラスタデータをロードする

Raster layers are loaded either by clicking on the  Load Raster 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 `Control` or `Shift` key and clicking on multiple items in the dialog *Open a GDAL Supported Raster Data Source*.

ラスタレイヤをマップの凡例にロードしたら、マウスの右ボタンでレイヤ名上をクリックし、アクティブレイヤの特定の地物を選択したり、レイヤのラスタプロパティを設定するためのダイアログを開くことができます。

ラスタレイヤの右マウスボタンメニュー

- **レイヤの領域にズーム**
- *Zoom to Best Scale (100%)*
- *Show in Overview*
- **削除**
- *Set Layer CRS*
- *Set Project CRS from Layer*
- *Properties*
- *Rename*
- *Copy Style*
- *Add New Group*
- **すべてを展開する**
- **すべてを折りたたむ**
- *Update Drawing Order*

12.2 ラスタのプロパティダイアログ

ラスタレイヤのプロパティを表示および設定するには、マップの凡例でレイヤ名をダブルクリックするか、レイヤ名をクリックし、コンテキストメニューから:guilabel:‘プロパティ‘を選択します:

This will open the *Raster Layer Properties* dialog, (see figure_raster_1).

There are several tabs on the dialog:

- **スタイル**
- **透過性**
- **カラーマップ**
- **一般情報**
- **メタデータ**
- **ピラミッド**
- **ヒストグラム**

12.2.1 スタイルタブ

QGIS can render raster layers in two different ways:

1. 単バンド - 画像の 1 バンドがグレーとして、あるいは擬似カラーまたはフリークアウトでレンダリングされます。
2. 3バンドカラー - 画像の 3 バンドがレンダリングされ、カラー画像を作成するために使用される赤、緑、青の成分を表す各バンドはカラー画像を作成するために使用されます。

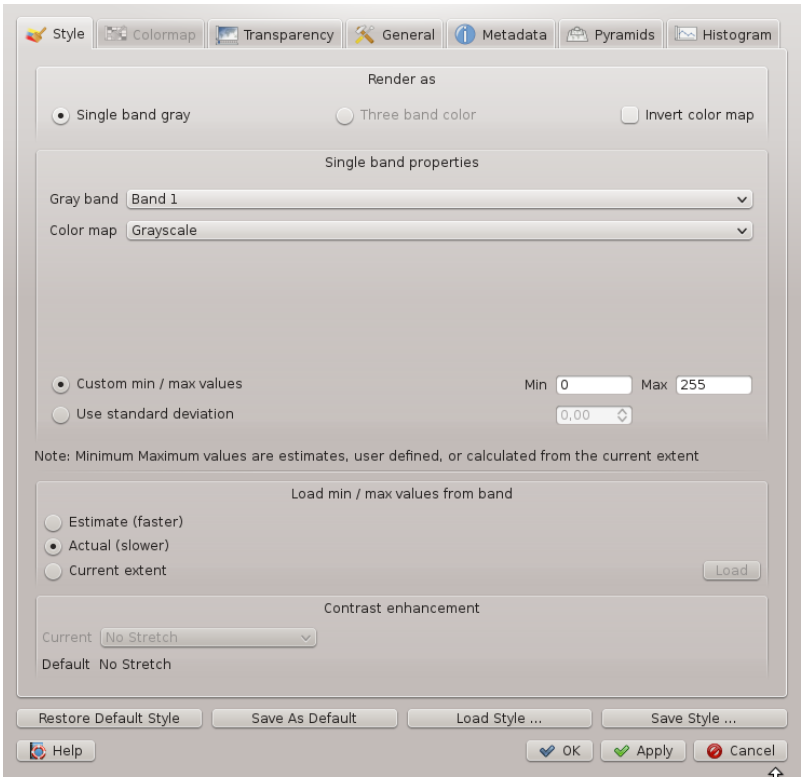


Figure 12.1: Raster Layers Properties Dialog

両方のレンダリングタイプで、 :guilabel:‘カラーマップを反転 ‘チェックボックスを使ってカラー出力を反転することができます。

単バンドレンダリング

この選択は 2 方法を提供しています。最初に、（データセットが複数のバンドを持っている場合の）レンダリングに使用したいバンドを選択することができます。

２つ目のオプションではレンダリングで利用可能なカラーテーブルの選択肢を提供します。

The following settings are available through the dropdownbox *Color map*

- Grayscale (default)
- Pseudocolor
- Freak Out
- カラーマップ

When selecting the entry ‘Colormap’ from *Color map* combobox, the tab *Colormap* becomes available. For more information see **カラーマップ**.

QGIS はレイヤの平均の標準偏差の与えられた数の範囲内にあるセルのみを表示するようデータを制限することができます。

ラスタのレンダリングに悪影響を与えるラスターグリッドで以上に高い値を持つセルが１～２個あった場合に便利です。このオプションは疑似カラーとフリーク愛との場合でのみ利用可能です。

３バンドカラー

この選択はラスタレイヤの見た目を変更する幅広いオプションを提供します。例えば、標準の RGB 順から何か他のものにカラーバンドを切り替えることができます。

同様に色のスケーリングが可能です。

ちなみに：マルチバンドラスタの単バンドを表示する

もしマルチバンド画像のシングルバンド（例えば赤）を表示したい場合は、あなたは、緑と青を “設定なし” にすると考えるかもしれません。しかしそれは正しい方法ではありません。赤のバンドを表示するには、イメージタイプをグレースケールに設定し、グレーで使用するバンドとして赤を選択します。

コントラスト強調

ノート： When adding GRASS rasters the option *Contrast enhancement* will be always set to automatically to *stretch to min max* regardless if the Quantum GIS general options this is set to another value.

12.2.2 透過性タブ

QGIS has the ability to display each raster layer at varying transparency levels. 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 rasterlayer, e.g. a shaded relief map overlayed by a classified rastermap. This will make the look of the map more three dimensional.

さらに*データなし*として扱うラスタの値を入力することができます。 これは手動もしくはlmActionContextHelpl :sup:‘画面から値を追加 ‘アイコンで設定出来ます。

An even more flexible way to customize the transparency can be done in the *Custom transparency options* section. The transparency of every pixel can be set here.

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. ラスタファイル :file:‘landcover‘をロードします。
2. Open the *Properties* dialog by double-clicking on the raster name in the legend or by right-clicking and choosing *Properties* from the popup menu.
3. **透過性** タブを選択します。
4. Click the Add values manually button. A new row will appear in the pixel-list.
5. ラスタ値（ここでは 0 を使用）を入力し、透過率を 20 %に調節します。
6. **[Apply]**ボタンを押し、マップを見ます。

より多くの値についてカスタムの透過率を調節するには、手順の 4 と 5 を繰り返します。

As you can see this 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.

12.2.3 カラーマップ

The *Colormap* tab is only available, when you have selected a singleband rendering within the *Style* tab (see **スタイルタブ**).

Three ways of color interpolation are available:

1. Discrete
2. Linear
3. Exact

The button **[Add Entry]** adds a color to the individual color table. Button **[Delete Entry]** deletes a color from the individual color table and the **[Sort]** 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 *Select 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.

The block *Generate new color map* allows you to create newly categorized colormaps. You only need to select the *number of entries*  and press the button *Classify*. Currently only one *Classification mode*  is supported - 'Equal interval'

12.2.4 一般情報タブ

The *General* tab displays basic information about the selected raster, including the layer source and display name in the legend (which can be modified). This tab also shows a thumbnail of the layer, its legend symbol, and the palette.

さらに、縮尺に応じた表示設定を行うことができます。 チェックボックスにチェックを入れ、データがマップキャンバスに表示される適当な縮尺を入力します。

同様に、座標参照系（CRS）が PROJ.4 形式で表示されます。 これは**[指定]**ボタンをクリックして変更できます。

12.2.5 メタデータタブ

メタデータ タブでは現在のラスタレイヤの各バンドの統計情報など、ラスタレイヤーに関する多くの情報を表示します。 統計情報は '必要なときに収集 'されるので、レイヤーの統計情報が未収集である可能性もあります。

This tab is mainly for information. You cannot change any values printed inside this tab.

12.2.6 ピラミッドタブ

高解像度のラスタレイヤーは QGIS 上での表示が遅くなってしまう可能性があります。 そこで、より低解像度のコピー画像群（ピラミッド）を作成すると、QGIS はズームレベルに応じて適切な解像度のコピー画像を選択して表示するので、パフォーマンスを大幅に改善することができます。

ピラミッドを作成するには、オリジナル画像があるディレクトリへの書き込み権限を持っている必要があります。

Several resampling methods can be used to calculate the pyramids:

- Average
- Nearest Neighbour

When checking the checkbox  *Build pyramids internally if possible* QGIS tries to build pyramids internally.

作成されたピラミッドはオリジナルデータを変更する可能性があり、一旦作成すると消去できない点にご注意ください。ラスタの' ノンピラミッド' 版を保存したい場合は、ピラミッド画像を作成する前にバックアップを作成しておいてください。

12.2.7 ヒストグラムタブ

The *Histogram* tab allows you to view the distribution of the bands or colors in your raster. It is generated automaticaly when you open *Histogram* tab. All existing bands will be displayed together. You can save the histogram as an image with the  button.

12.3 ラスタ計算機

The *Raster Calculator* in the *Raster* menu (see figure_raster_2) allows to perform calculations on basis of existing raster pixel values. The results are written to a new raster layer with a GDAL supported format.

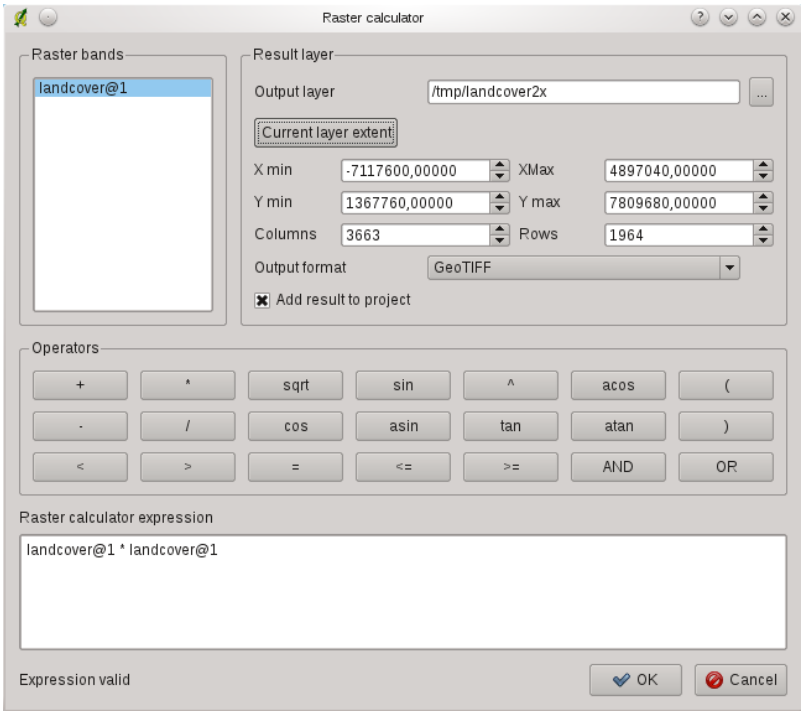


Figure 12.2: Raster Calculator

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 it into the box.

結果レイヤセクションでは、出力レイヤを定義する必要があります。入力ラスタレイヤに基づいて、または X、Y 座標と出力レイヤの解像度を設定するための行と列に基づいて計算領域を定義することができます。入力レイヤが異なる解像度をもつ場合、値が最近傍アルゴリズムを用いてリサンプリングされます。

The **Operators section** contains all usable 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 added to the legend area and can be visualized.

12.3.1 Examples

Convert elevation values from meter to feet

Creating an elevation raster feet from a raster in meter, you need to use the conversion factor for meters to feet: 3.28. The expression is:

```
elevation@1 * 3.28
```

Using a mask

If you want to mask out parts of a raster, because you are only interested in elevations above 0 meter, you can use following expression to create a mask and apply the result to a raster in one step.

```
(elevation@1 >= 0) * elevation@1
```

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.

Chapter 13

Working with OGC Data

13.1 Working with OGC Data

QGIS supports WMS and WFS as data sources.

13.1.1 What is OGC Data

The Open Geospatial Consortium (OGC), is an international organization with 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 to serve specific needs for interoperable location and geospatial technology, including GIS. Further information can be found under http://www.opengeospatial.org/.

Important OGC specifications are:

- **WMS** — Web Map Service
- **WFS** — Web Feature Service
- **WCS** — Web Coverage Service
- **CAT** — Web Catalog Service
- **SFS** — Simple Features for SQL
- **GML** — Geography Markup Language

OGC services are increasingly being used to exchange geospatial data between different GIS implementations and data stores. QGIS can now deal with three of the above specifications, being SFS (through support of the PostgreSQL / PostGIS data provider, see Section *PostGIS Layers*), WFS and WMS as a client.

13.1.2 WMS Client

Overview of WMS Support

QGIS currently can act as a WMS client that understands WMS 1.1, 1.1.1 and 1.3 servers. It has particularly been tested against publicly accessible servers such as DEMIS.

WMS servers act 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 would typically be JPEG or PNG.

WMS is generically a REST (Representational State Transfer) service rather than a fully-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 servers in the market and they all have their own interpretation of the WMS standard.

WMS layers can be added quite simply, as long as you know the URL to access the WMS server, you have a serviceable connection to that server, and the server understands HTTP as the data transport mechanism.

Selecting WMS Servers

The first time you use the WMS feature, there are no servers defined.

Begin by clicking the  Add WMS layer button inside the toolbar, or through the *Layer* → *Add WMS Layer...* menu.

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 tab *Layers*, select the **[New]** button. Then enter the parameters to connect to your desired WMS server, as listed in table_OGC_1:

Name	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.
Username	Username to access a secured WMS-server. This parameter is optional.
Password	Password for a basic authenticated WMS-server. This parameter is optional.
Ignore GetMap URI	*Ignore GetMap URI reported in capabilities*, use given URI from URL-field above.
Ignore GetFeatureInfo URI	*Ignore GetFeatureInfo URI reported in capabilities* , use given URI from URL-field above

Table OGC 1: WMS Connection Parameters

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 menu *Settings* → *Options* and click on the tab *Network & Proxy*. There you can add your proxy-settings and enable them by setting the *Use proxy for web access*. Make sure that you select the correct proxy type from the *Proxy type* dropdown menu.

Once the new WMS Server connection has been created, it will be preserved for future QGIS sessions.

ちなみに: On WMS Server URLs

Be sure, when entering in the WMS server URL, that you have the base URL. For example, you shouldn't have fragments such as `request=GetCapabilities` or `version=1.0.0` in your URL.

Loading WMS Layers

Once you have successfully filled in your parameters you can select 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 left bottom 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.

Image Encoding

The *Image encoding* section now lists the formats that are supported by both the client and server. Choose one depending on your image accuracy requirements.

ちなみに: Image Encoding

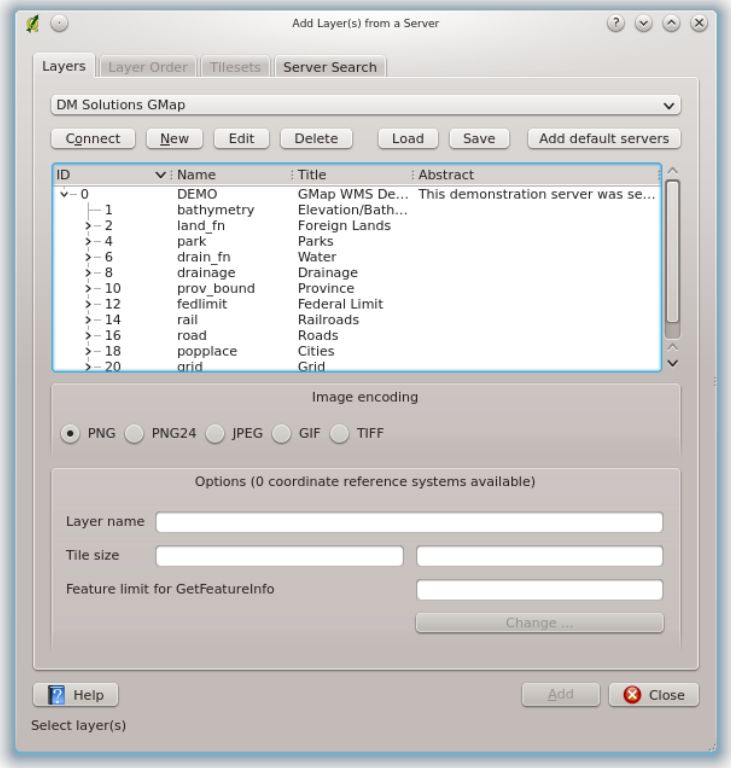


Figure 13.1: Dialog for adding a WMS server, showing its available layers

You will typically find that a WMS server offers you the choice of JPEG or PNG image encoding. JPEG is a lossy compression format, whereas PNG faithfully reproduces the raw raster data.

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 5 times the data transfer requirement compared to PNG.

Use PNG if you want precise representations of the original data, and you don't mind the increased data transfer requirements.

Options

The Options field provides a text field where you can add a *Layer name* for the WMS-layer. This name will be presented in the legend after loading the layer.

Below the layer name you can define *Tile size*, if you want to set tile sizes (eg. 256x256) to split up the WMS request into multiple requests.

The *Feature limit for GetFeatureInfo* defines what features from the server to query.

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.

Layer Order

The tab *Layer Order* 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.

ちなみに: WMS Layer Ordering

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 tab *Layer Order*.

Transparency

In this version of QGIS, the *Global transparency* setting from the *Layer Properties* is hard-coded to be always on, where available.

ちなみに：WMS Layer Transparency

The availability of WMS image transparency depends on the image encoding used: PNG and GIF support transparency, whilst JPEG leaves it unsupported.

Coordinate Reference System

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 **投影法の利用方法** will appear. The main difference with the WMS version of the screen is that only those CRSs supported by the WMS Server will be shown.

Server-Search

Within QGIS you can search for WMS-servers. Figure_OGC_2 shows the tab *Server Search* with the *Add Layer(s) from a Server* dialog.

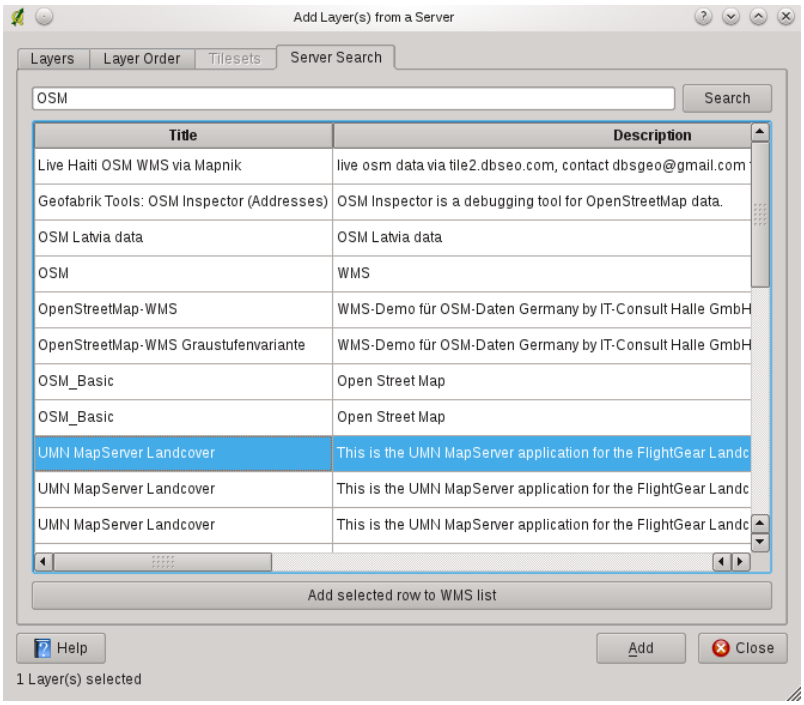


Figure 13.2: Dialog for searching WMS servers after some keywords

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 tab *Layers*. QGIS automatically has 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 frontend to the API of http://geopole.org.

Tilesets

When using WMS-C (Cached WMS) Services like http://labs.metacarta.com/wms-c/Basic.py you are able to browse through the tab *Tilesets* 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 from the *View* → *Tile scale slider*, which gives you the available scales from the tileserver with nice slider docked in.

Using the Identify Tool

Once you have added a WMS server, and if any layer from a WMS server is queryable, you can then use the  tool to select a pixel on the map canvas. A query is made to the WMS server for each selection made. The results of the query are returned in plain text. The formatting of this text is dependent on the particular WMS server used. **Viewing Properties**

Once you have added a WMS server, you can view its properties by right-clicking on it in the legend, and selecting *Properties*. **Metadata Tab**

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 cleaned by reading the WMS standards (see OPEN-GEOSPATIAL-CONSORTIUM **文献と** *Web* **参照**), but here are a few handy definitions:

- **Server Properties**
  - **WMS Version** — The WMS version supported by the server.
  - **Image Formats** — The list of MIME-types the server can respond with when drawing the map. QGIS supports whatever formats the underlying Qt libraries were built with, which is typically at least `image/png` and `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.
- **Layer Properties**
  - **Selected** — Whether or not this layer was selected when its server was added to this project.
  - **Visible** — Whether or not this layer is selected as visible in the legend. (Not yet used in this version of QGIS.)
  - **Can Identify** — Whether or not this layer will return any results when the Identify tool is used on it.
  - **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
  - **Can Zoom In** — Whether or not this layer can be zoomed in by the server. This version of QGIS assumes all WMS layers have this set to `Yes`. Deficient layers may be rendered strangely.
  - **Cascade Count** — WMS servers can act as a proxy to other WMS servers to get the raster data for a layer. This entry shows how many times the request for this layer is forwarded to peer WMS servers for a result.
  - **Fixed Width, Fixed Height** — Whether or not this layer has fixed source pixel dimensions. This version of QGIS assumes all WMS layers have this set to nothing. Deficient layers may be rendered strangely.
  - **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`.

- **Available in CRS** — The projections that this layer can be rendered in by the WMS server. These are listed in the WMS-native format.
- **Available in style** — The image styles that this layer can be rendered in by the WMS server.

WMS Client Limitations

Not all possible WMS Client functionality had been included in this version of QGIS. Some of the more notable exceptions follow.

Editing WMS Layer Settings

Once you've completed the  Add WMS layer procedure, there is no ability to change the settings. A workaround is to delete the layer completely and start again.

WMS Servers Requiring Authentication

Currently public 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 *Selecting WMS Servers* for details.

ちなみに：Accessing secured OGC-layers

If you need to access secured layers with other secured methods than basic authentication, you could use InteProxy as a transparent proxy, which does support several authentication methods. More information can be found at the InteProxy manual found on the website http://inteproxy.wald.intevation.org.

ちなみに：QGIS WMS Mapserver

From Version 1.7.0 QGIS has its own implementation of a WMS 1.3.0 Mapserver. Read more about this at chapter *QGIS Server*.

13.1.3 WFS and WFS-T Client

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 there are no default servers defined, so we have to add our own.

Loading a WFS Layer

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 dialog *Add WFS Layer from a Server* 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*  combobox
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 proxy-settings you have set in your preferences are also recognized.

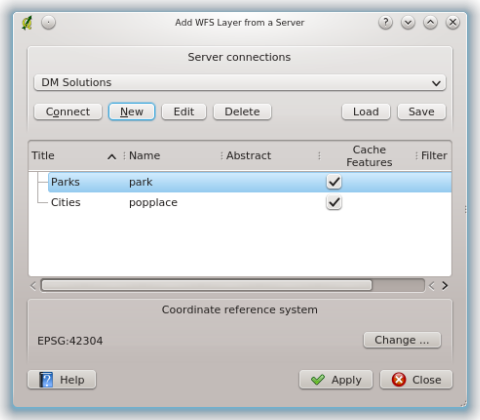


Figure 13.3: Adding a WFS layer

You'll notice the download progress is visualized in the left bottom 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 point 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 **メーリングリスト** for further information about the mailinglists.

ちなみに: Finding WFS Servers

You can find additional WFS servers by using Google or your favorite search engine. There are a number of lists with public URLs, some of them maintained and some not.

13.2 QGIS Server

QGIS Server は、オープンソース WMS1.3 と WFS1.0.0 の実装だけでなく、それに加え、主題マッピングのための高度な地図作成機能を実装しています。QGIS サーバは web サーバ（例. Apache, Lighttpd）と一緒に動作する C++で書かれた FastCGI/CGI（Common Gateway Interface）アプリケーションです。これは EU のプロジェクトオーケストラ、Sany とスイスウスター市が資金提供しています。

It uses QGIS as backend 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.

また、QGIS Server プロジェクトは、　現在のレイヤとシンボロジーを QGIS サーバの web プロジェクト（SLD で表現された地図作成表現ツールを含む）として出力する QGIS デスクトップのためのプラグインである'Publish to Web' プラグインを提供しています。

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. The 'Publish to Web' plugin currently supports basic symbolization, with more complex cartographic visualization rules introduced manually. As the configuration is performed with the SLD standard and its documented extensions, there is only one standardised language to learn, which greatly simplifies the complexity of creating maps for the Web.

次のマニュアルの 1 つでは、QGIS サーバをセットアップするための設定のサンプルを提供します。しかし、我々は、詳細を得るために次の URL の 1 つを読むことをお勧めします：

- 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/

13.2.1 Debian Squeeze のインストールサンプル

この時点で、Debian Squeeze のための HowTo となる短くて簡単なサンプル設定を提供します。他の多くの OS が QGIS サーバのためにパッケージを提供しています。もしソースからすべてを構築する必要がある場合は、上記のの URL を参照してください。

Apart from qgis and qgis-mapserver you need a webserver, 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, if the webserver and qgis server works 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 *Selecting WMS Servers*.

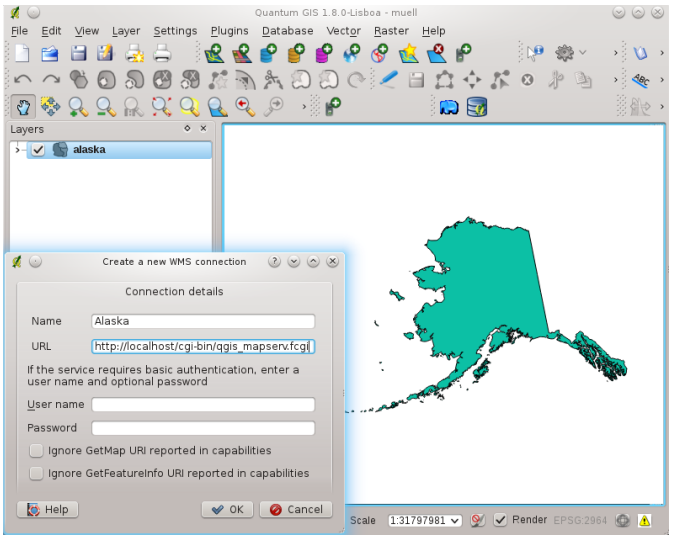


Figure 13.4: Standard WMS with USA boundaries included in the qgis server (KDE)

13.2.2 Creating a WMS/WFS from a QGIS project

To provide a new qgis wms/wfs server 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 define the project CRS, if not already done.

Then open the `OWS Server` tab in the menu *Settings* → *Project Properties* and define the general fields under 'Service Capabilities'. For `WMS Capabilities` define 'Coordinate System Restrictions' and 'Advertised Extend'. Additionally you can enable the checkbox *Add WKT geometry to feature into response* to make the layers queryable and add a 'Maximum width' and height that can be requested. For `WFS Capabilities` you only need to select the layers that you want to provide as WFS. 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 and WFS, add the WMS and WFS as described in *Loading WMS Layers* and *WFS and WFS-T Client* to QGIS and load the WMS. The URL is:

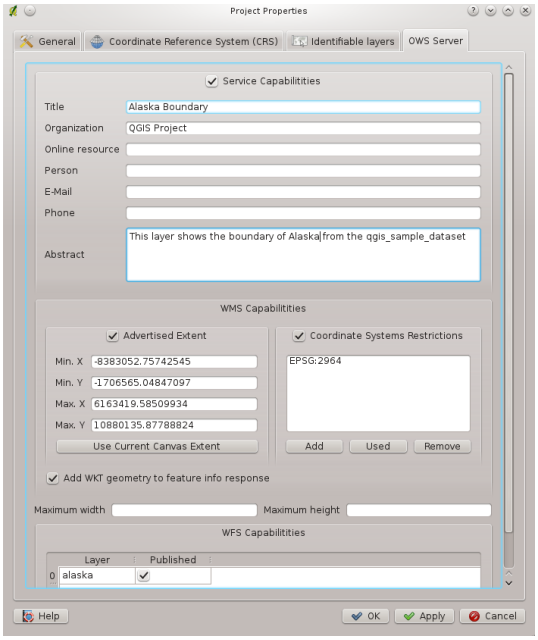


Figure 13.5: Definitions for a qgis project WMS/WFS server (KDE)

```
http://localhost/cgi-bin/project/qgis_mapserv.fcgi
```

Chapter 14

Working with GPS Data

14.1 GPS プラグイン

14.1.1 GPS とは？

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. It 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 receivers 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.

14.1.2 ファイルから GPS データを読み込み

GPS データの記録フォーマットには, 様々なフォーマットが存在します.QGIS では,GPX(GPS eXchange format) と呼ばれる, ウェイポイントの記録およびデータ交換フォーマットとして一般的なフォーマットに対応しています.GPX フォーマットは, 同一ファイルで, 複数のウェイポイント, 経路, 軌跡を扱うことが可能です

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 **サンプルデータ** for more information about the sample data.

1. GPS ツール ‘をクリックし、 :guilabel:‘GPX ファイルをロード tab (figure_GPS_1_参照)
2. Browse to the folder `qgis_sample_data/gps/`, select the GPX file `national_monuments.gpx` and click **[Open]**.

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.

ノート: GPS ユニットは, 様々なシステムでデータを蓄積することができます.(GPS ユニットやインターネットから)GPX ファイルをダンロードし,QGIS で読み込む際,GPX ファイルには,WGS84 型式 (緯度経度)

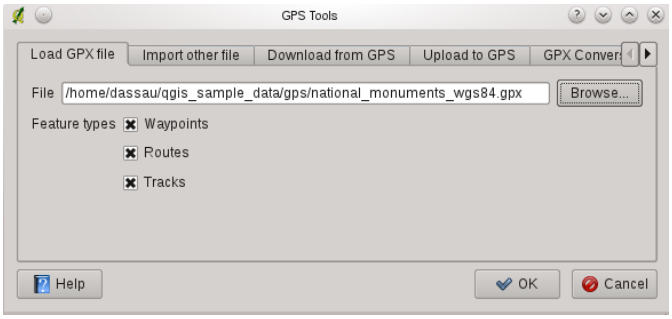


Figure 14.1: The *GPS Tools* dialog window

でデータが保存されていることが必要です.QGIS で GPX ファイルを扱う際, 当該ファイルが公式 GPX 仕様に則っているものとして動作します. 公式 GPX 仕様については, ‘http://www.topografix.com/GPX/1/1/‘ を参照してください

14.1.3 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.

14.1.4 GPS データのインポート

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.

14.1.5 GPS 装置から GPS データのダウンロード

QGIS は GPS デバイスから新しいベクタレイヤとして直接データをダウンロードするために GPSBabel を使用します。これを使用するため、GPS ツールダイアログ（Figure_GPS_2 を参照）の guilabel:‘GPS からダウンロード ‘タブを使用します。ここでは、GPS デバイスの種類、接続ポート（または GPS をサポートしている USB)、ダウンロードしたい地物のタイプ、保存された GPS ファイルの場所、そして新しいレイヤの名称を選択します。

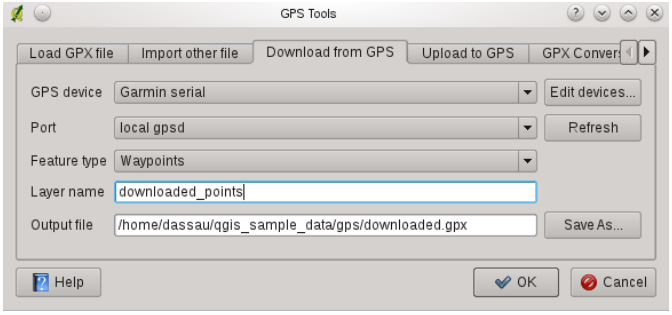


Figure 14.2: The download tool

GPS デバイスメニューで選択したデバイスタイプは、GPSBabel が GPS デバイスとどのように接続するかを決定します。GPS デバイスで動作する利用可能なタイプがない場合、新しいタイプを作成することができます（:ref:‘defining-new-device‘のセクションを参照すること）。

ポートはファイル名、もしくはオペレーティングシステムが GPS デバイスと接続するコンピュータの物理ポートへの参照として使用する他の名前かもしれません。または usb 対応 GPS ユニットのために、単純な usb である場合もあります。

- On Linux this is something like `/dev/ttyS0` or `/dev/ttyS1`
- On Windows it is `COM1` or `COM2`.

[OK]をクリックすると、デバイスからデータがダウンロードされm QGIS のレイヤとして現れます。

14.1.6 GPS データのデバイスへのアップロード

GPS ツールダイアログの:guilabel:‘GPS にアップロード ‘タブを使って QGIS のベクタレイヤから直接 GPS デバイスにデータをアップロードできます。これを行うには、単にアップロードしたいレイヤ（GPX レイヤでなければ行けません）、GPS デバイスの種類、それが接続されているポート（または USB）を選択します。お使いのデバイスがリストにない場合、ダウンロードツールと同じように、新しいデバイスタイプを指定することができます。

このツールは、QGIS の編集機能と組み合わせるのに非常に便利です。それでマップをロードし、ウェイポイントとルートを作成してからそれらをアップロードし、GPS デバイスで使用することを可能とします。

14.1.7 新しいデバイスタイプの定義

GPS デバイスには多くの異なるタイプがある。QGIS 開発者はすべてのものをテストできないため、もし:guilabel:*GPS* **からダウンロード** と :guilabel:‘GPS にアップロード ‘ツールにリストアップされたデバイスタイプではあなたのものが動作しない場合は、あなた自身のデバイスタイプを定義できます。あなたは GPS デバイスエディタを使用することがそれができ、 ダウンロードまたはアップロードタブの**[デバイスを編集]**ボタンをクリックすることで編集を開始出来ます。

To define a new device you simply click the **[New device]** button, enter a name, a download command and an upload command for your device, and click the **[Update device]** button. The name will be listed in the device menus in the upload and download windows, and 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` は、ウェイポイントをダウンロードする場合-w‘‘で、トラックをダウンロードする場合 ‘‘-r‘‘で、トラックをダウンロードする場合 ‘‘-t‘‘に置き換わります。これらはどの地物タイプをダウンロードするかを GPSBabel に伝えるためのコマンドラインオプションです。

`%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`.

アップロードコマンドはデバイスにデータをアップロードするために使用されます。同様のキーワードが使われますが、‘‘%in‘‘はアップロードされるレイヤに対する GPX ファイルの名称に置き換えられ、‘‘%out‘‘はポート名称に置き換えられます。

GPSBabel と利用可能なコマンドラインオプションについては http://www.gpsbabel.org でより学習できます。

いったん新しいデバイスタイプを作成すると、ダウンロードおよびアップロードツールのデバイスリストに表示されます。

14.2 Live GPS トラッキング

To activate Live GPS tracking in QGIS you need to select *Settings* → *GPS information*. You will get a new docked window on the left side of the canvas.

There are 4 possible screens in this GPS tracking window:

- |mActionToggleEditing|GPS 位置座標と手動で頂点と地物を入力します。
- |gpstrack_barchart|衛星との接続の GPS シグナル長。
- |gpstrack_polarchart|数と衛星の極性位置を示す GPS 極性画面。
- 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.

警告: あなたがキャンバスに自分の位置を記録したい場合は、最初に新しいベクタレイヤを作成し、あなたのトラックを記録することができるようにステータスを編集可能に切り替えなければいけません。

14.2.1 Position and additional attributes

If the GPS is receiving signals from satellites you will see your position in latitude, longitude and altitude together with additional attributes.

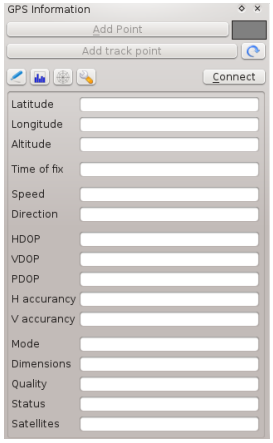


Figure 14.3: GPS tracking position and additional attributes

14.2.2 GPS シグナル長

Here you can see the signal strenght of the satellites you are receiving signals from.

14.2.3 GPS polar ウィンドウ

If you want to know where in the sky all the connected satellites are, you have to switch to the polar screen. You can also see the ID numbers of the satellites you are receiving signals from.

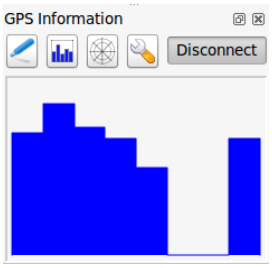


Figure 14.4: GPS tracking signal strength

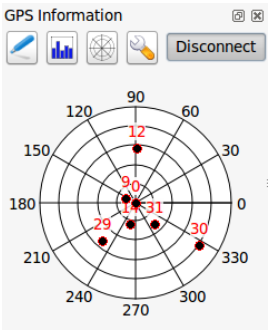


Figure 14.5: GPS tracking polar window

14.2.4 GPS オプション

In case of connection problems you can switch between:

- *Autodetect*
- *Internal*,
- *Serial device*
- *gpsd* (selecting Host, Port and Device your GPS is connected to).

A click on **[Connect]** again initiates the connection to the GPS receiver.

You can activate *Automatically save added features* when you are in editing mode. Or you can can activate *Automatically add points* to the map canvas with a certain width and color.

Activating *Cursor* you can use a slider to shrink and grow the position cursor on the canvas.

Activating *Map centering* allows to decide in which way the canvas will be updated. This includes 'always', 'when leaving' if your recorded coordinates start either to move out of 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 a 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]**.

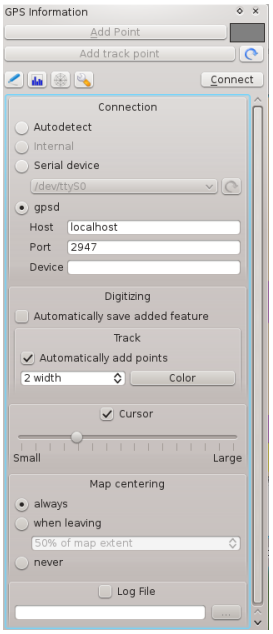


Figure 14.6: GPS tracking options window

Chapter 15

GRASS GIS の統合

GRASS プラグインは GRASS GIS (GRASS-PROJECT :ref:‘literature_and_web‘を参照) のデータベースや機能へのアクセスを提供します。これは GRASS のラスタおよびベクタレイヤの表示、 ベクタレイヤのデジタイズ、ベクタ属性の編集、新規ベクタレイヤの作成、300 個以上の GRASS モジュールを使った GRASS 2D と 3D データの解析を含みます。

このセクションではプラグインの機能と GRASS データの管理と操作の例を紹介します。以下のメインの機能は GRASS プラグインを立ち上げた時にツールバーメニューで提供されています 。機能については *GRASS* **プラグインの起動** に記述されています:

-  マップセットを開く
-  新しいマップセット
-  マップセットを閉じる
-  GRASS ベクタレイヤを追加
-  GRASS ラスタレイヤを追加
-  新しい GRASS ベクタを作成する
-  GRASS ベクタレイヤを編集す
-  GRASS ツールを開く
-  現在の GRASS リージョンを表示
-  現在の GRASS リージョンを編集

15.1 GRASS プラグインの起動

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 click 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 *Loading GRASS raster and vector layers*). Or you create a new GRASS `LOCATION` with QGIS (see section *Creating a new GRASS LOCATION*) and import some raster and vector data (see Section *Importing data into a GRASS LOCATION*) for further analysis with the GRASS Toolbox (see section *The GRASS toolbox*).

15.2 Loading GRASS raster and vector layers

With the GRASS plugin, you can load vector or raster layers using the appropriate button on the toolbar menu. As an example we use the QGIS alaska dataset (see Section **サンプルデータ**). It includes a small sample GRASS LOCATION with 3 vector layers and 1 raster elevation map.

1. Create a new folder 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. In the GRASS toolbar, click the Open mapset icon to bring up the MAPSET wizard.
5. For Gisdbase browse and select or enter the path to the newly created folder grassdata.
6. You should now be able to select the *LOCATION* alaska and the *MAPSET* demo.
7. Click **[OK]**. Notice that some previously disabled tools in the GRASS toolbar are now enabled.
8. Click on Add GRASS raster layer, choose the map name gtopo30 and click **[OK]**. The elevation layer will be visualized.
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 **ベクタプロパティダイアログ**, 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 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/data.php.

ちなみに: GRASS Data Loading

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 *GRASS* **プラグインの起動**.

15.3 GRASS LOCATION and MAPSET

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 LOCATION. 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, subregions, or as workspaces for individual team members (Neteler & Mitasova 2008 **文献と** *Web* **参照**). 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 data sets without importing them. But because this is not the usual way for beginners to work with GRASS, this functionality will not be described here.).

15.3.1 Creating a new GRASS LOCATION

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

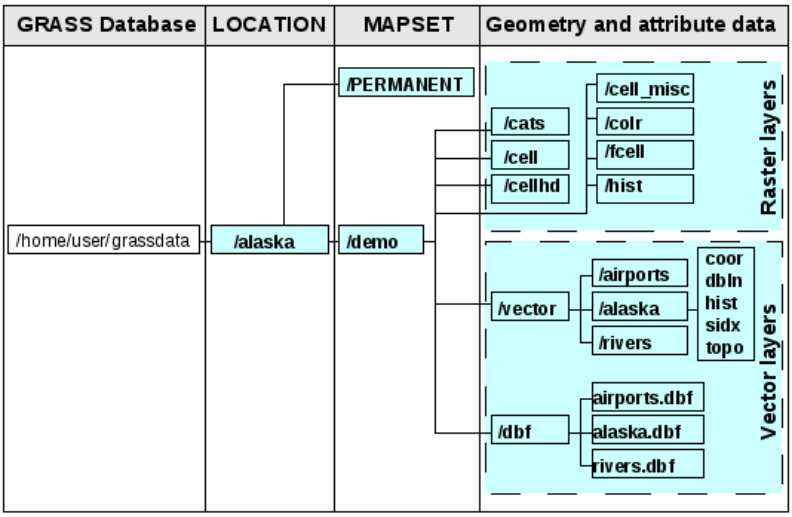


Figure 15.1: GRASS data in the alaska LOCATION

will be used for all examples and exercises in the following GRASS GIS related chapters. It is useful to download and install the dataset on your computer **サンプルデータ**).

1. Start QGIS and make sure the GRASS plugin is loaded.
2. Visualize the `alaska.shp` Shapefile (see Section *Loading a Shapefile*) from the QGIS alaska dataset **サンプルデータ**.
3. In the GRASS toolbar, click on the New mapset icon to bring up the `MAPSET` wizard.
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. We can use this wizard to create a new `MAPSET` within an existing `LOCATION` (see section *Adding a new MAPSET*) or to create a new `LOCATION` altogether. Click on the radio button *Create new location* (see figure_grass_location_2).
6. Enter a name for the `LOCATION` - we used alaska and click **[Next]**.
7. Define the projection by clicking on the radio button *Projection* to enable the projection list.
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 projector icon in the lower right-hand corner of the status bar (see Section **投影法の利用方法**)).
9. In *Filter* insert 2964 to select the projection.
10. Click **[Next]**.
11. To define the default region, we have to enter the `LOCATION` bounds in north, south, east, and west direction. Here we simply click on the button *Set current QGIS extent*, to apply the extend of the loaded layer `alaska.shp` as the GRASS default region extend.
12. Click **[Next]**.
13. We also need to define a `MAPSET` within our new `LOCATION`. You can name it whatever you like - we used demo (When creating a new `LOCATION`). GRASS automatically creates a special `MAPSET` called `PERMANENT` designed to store the core data for the project, its default spatial extend and coordinate system definitions (Neteler & Mitasova 2008 **文献と** *Web* **参照**)
14. Check out the summary to make sure it's correct and click **[Finish]**.

15. The new LOCATION alaska and two MAPSETs demo and PERMANENT are created. The currently opened working set is MAPSET demo, as you defined.
16. Notice that some of the tools in the GRASS toolbar that were disabled are now enabled.

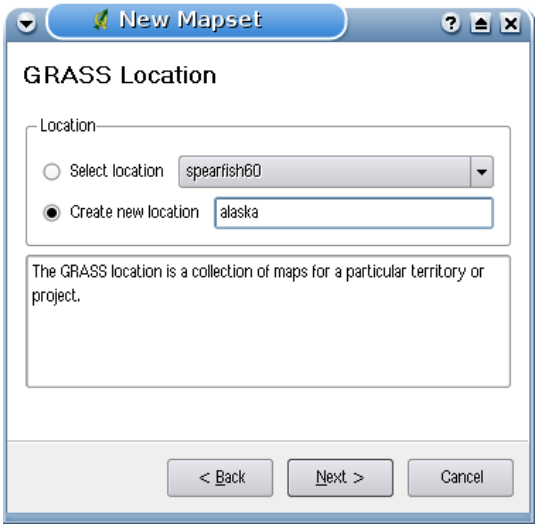


Figure 15.2: Creating a new GRASS LOCATION or a new MAPSET in QGIS

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 *Importing data into a GRASS LOCATION*). You can also use the already existing vector and raster data in the sample GRASS LOCATION alaska included in the QGIS alaska dataset **サンプルデータ** and move on to Section *The GRASS vector data model*.

15.3.2 Adding a new MAPSET

A user has only write access to a GRASS MAPSET he created. This means that besides access to his own MAPSET, each user can read maps in other user's MAPSETs, but he can modify or remove only the maps in his own MAPSET.

All MAPSETs include a WIND file that stores the current boundary coordinate values and the currently selected raster resolution (Neteler & Mitasova 2008 **文献と** *Web* **参照**, see Section *The GRASS region tool*).

1. Start QGIS and make sure the GRASS plugin is loaded.
2. In the GRASS toolbar, click on the  New mapset icon to bring up the MAPSET wizard.
3. Select the GRASS database (GISDBASE) folder grassdata with the LOCATION alaska, where we want to add a further MAPSET, called test.
4. Click **[Next]**.
5. We can use this wizard to create a new MAPSET within an existing LOCATION or to create a new LOCATION altogether. Click on the radio button *Select location* (see figure_grass_location_2) and click **[Next]**.
6. Enter the name text for the new MAPSET. Below in the wizard you see a list of existing MAPSETs and its owners.
7. Click **[Next]**, check out the summary to make sure it's all correct and click **[Finish]**.

15.4 Importing data into a GRASS LOCATION

This Section gives an example how to import raster and vector data into the alaska GRASS LOCATION provided by the QGIS alaska dataset. Therefore we use a landcover raster map landcover.img and a vector GML File

`lakes.gml` from the QGIS alaska dataset **サンプルデータ**.

1. Start QGIS and make sure the GRASS plugin is loaded.
2. In the GRASS toolbar, click the  icon to bring up the `MAPSET` wizard.
3. Select as GRASS database the folder `grassdata` in the QGIS alaska dataset, as `LOCATION alaska`, as `MAPSET demo` and click **[OK]**.
4. Now click the  icon. The GRASS Toolbox (see section *The GRASS toolbox*) dialog appears.
5. To import the raster map `landcover.img`, click the module `r.in.gdal` in the *Modules Tree* tab. This GRASS module allows 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 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.

15.5 The GRASS vector data model

It is important to understand the GRASS vector data model prior to digitizing.

In general, GRASS uses a topological vector model.

This means that areas are not represented as closed polygons, but by one or more boundaries. A boundary between two adjacent areas is digitized only once, and it is shared by both areas. Boundaries must be connected and closed without gaps. An area is identified (and labeled) by the **centroid** of the area.

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 prefere 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. Adjacent forest and lake can share the same boundary, but they have separate attribute tables. It is also possible to attach attributes to boundaries. For example, the boundary between lake and forest is a road, so it can have a different attribute table.

The 'layer' of the feature is defined by 'layer' inside GRASS. 'Layer' is the number which defines if there are 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.

Attributes in database tables are linked to geometry elements using a 'category' value.

'Category' (key, ID) is an integer attached to geometry primitives, and it is used as the link to one key column in the database table.

ちなみに: Learning the GRASS Vector Model

The best way to learn the GRASS vector model and its capabilities is to download one of the many GRASS tutorials where the vector model is described more deeply. See http://grass.osgeo.org/gdp/manuals.php for more information, books and tutorials in several languages.

15.6 Creating a new GRASS vector layer

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 *Digitizing and editing a GRASS vector layer*.

In GRASS it is possible to organize all sort 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 *Creating a new Vector layer*).

ちなみに: Creating an attribute table for a new GRASS vector layer

If you want to assign attributes to your digitized geometry features, make sure to create an attribute table with columns before you start digitizing (see figure_grass_digitizing_5).

15.7 Digitizing and editing a GRASS vector layer

The digitizing tools for GRASS vector layers are accessed using the  Edit GRASS vector layer icon on the toolbar. Make sure you have loaded a GRASS vector and it is the selected layer in the legend before clicking on the edit tool. Figure figure_grass_digitizing_2 shows the GRASS edit dialog that is displayed when you click on the edit tool. The tools and settings are discussed in the following sections.

ちなみに: Digitizing polygons in 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 is, that a topological vector model links attribute information of a polygon always to the centroid and not to the boundary.

Toolbar

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.

Figure 15.3: GRASS Digitizing Toolbar

Icon	Tool	Purpose
	New Point	Digitize new point
	New Line	Digitize new line
	New Boundary	Digitize new boundary (finish by selecting new tool)
	New Centroid	Digitize new centroid (label existing area)
	Move vertex	Move one vertex of existing line or boundary and identify new position
	Add vertex	Add a new vertex to existing line
	Delete vertex	Delete vertex from existing line (confirm selected vertex by another click)
	Move element	Move selected boundary, line, point or centroid and click on new position
	Split line	Split an existing line to 2 parts
	Delete element	Delete existing boundary, line, point or centroid (confirm selected element by another click)
	Edit attributes	Edit attributes of selected element (note that one element can represent more features, see above)
	Close	Close session and save current status (rebuilds topology afterwards)

Table GRASS Digitizing 1: GRASS Digitizing Tools

Category Tab

The *Category* tab allows you to define the way in which the category values will be assigned to a new geometry element.

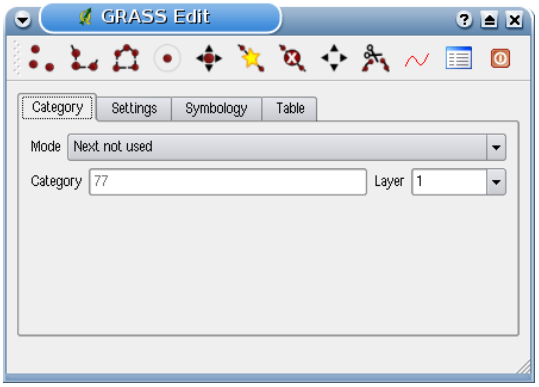


Figure 15.4: GRASS Digitizing Category Tab

- **Mode**: what category value shall 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 e.g. used for area boundaries, because the category values are connected via the centroid.
- **Category** - A number (ID) 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. Default layer number is 1.

ちなみに: Creating an additional GRASS 'layer' with QGIS

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.

Settings Tab

The *Settings* tab allows you to set the snapping in screen pixels. The threshold defines at what distance new points or line ends are snapped to existing nodes. This helps to prevent gaps or dangles between boundaries. The default is set to 10 pixels.

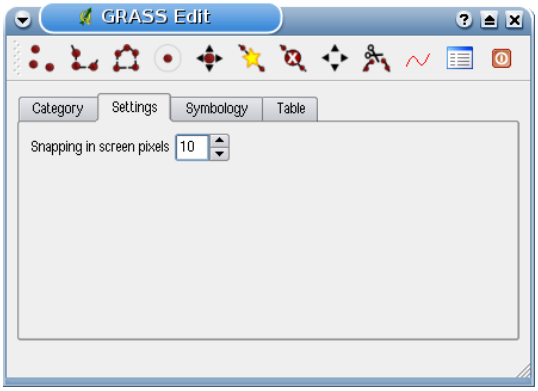


Figure 15.5: GRASS Digitizing Settings Tab

Symbology Tab

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).

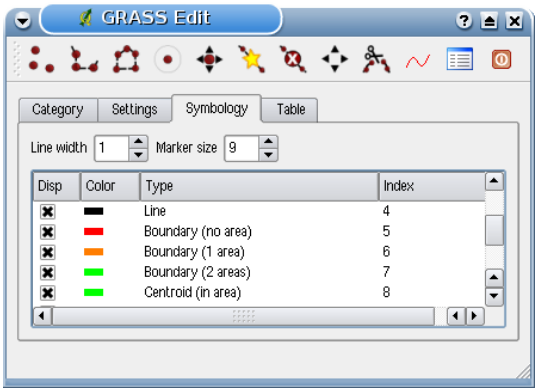


Figure 15.6: GRASS Digitizing Symbolog Tab

Table Tab

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 (see Section *Creating a new GRASS vector layer*).

ちなみに: GRASS Edit Permissions

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 permissions.

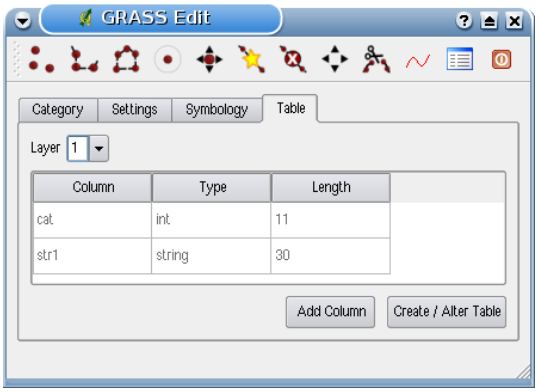


Figure 15.7: GRASS Digitizing Table Tab

15.8 The GRASS region tool

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/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]**. It also allows 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` provide a lot more parameters to define an appropriate region extend and resolution for your raster analysis. You can use these parameters with the GRASS Toolbox, described in Section *The GRASS toolbox*.

15.9 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` where you have write-permission (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`.

The GRASS Shell inside the GRASS Toolbox provides access to almost all (more than 330) GRASS modules through 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.

15.9.1 Working with GRASS modules

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.

A complete list of GRASS modules available in the graphical Toolbox in QGIS version 1.8.0 is available in the GRASS wiki (http://grass.osgeo.org/wiki/GRASS-QGIS_relevant_module_list).

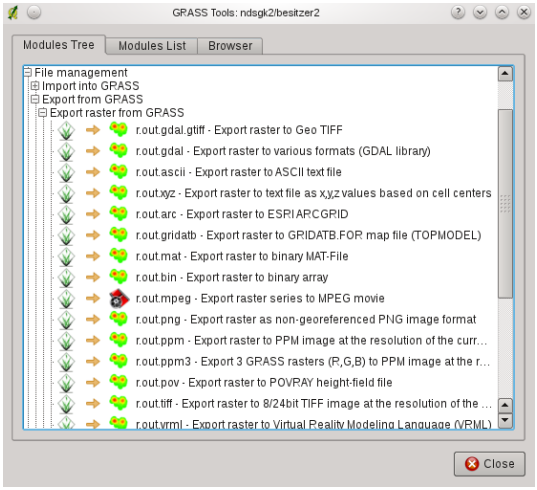


Figure 15.8: GRASS Toolbox and Module Tree

It is also possible to customize the GRASS Toolbox content. This procedure is described in Section *Customizing the GRASS Toolbox*.

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.

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*.

Options

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.

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 in QGIS 1.8.0 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 use, but will probably be part of more / all modules in the GRASS toolbox in future versions of QGIS. This allows to use the complete GRASS module options without the need to switch to the GRASS Shell.

Output

The *Output* tab provides information about the output status of the module. When you click the **[Run]** button, the module switches to the *Output* tab and you see information about the analysis process. If all works well, you will finally see a `Successfully finished` message.

Manual

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 if you use the module `g.manual`.

ちなみに: Display results immediately

If you want to display your calculation results immediately in your map canvas, you can use the 'View Output' button at the bottom of the module tab.

15.9.2 GRASS module examples

The following examples will demonstrate the power of some of the GRASS modules.

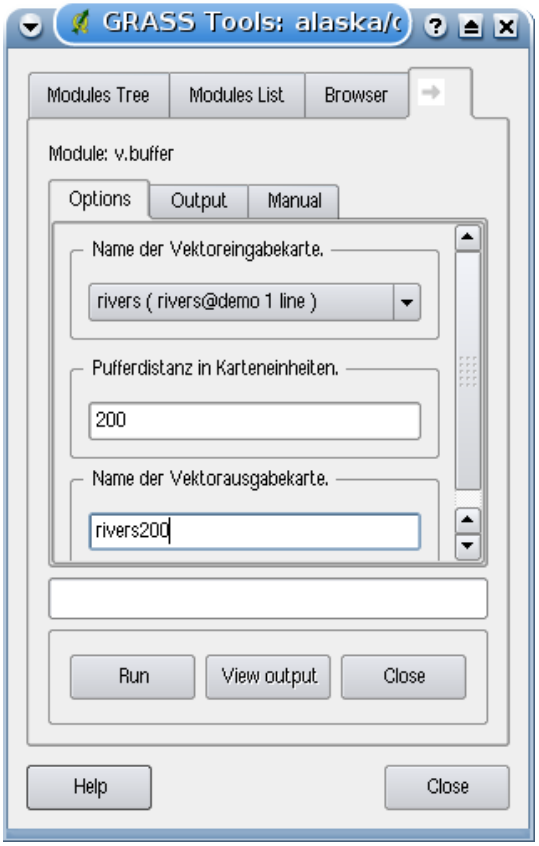


Figure 15.9: GRASS Toolbox Module Options

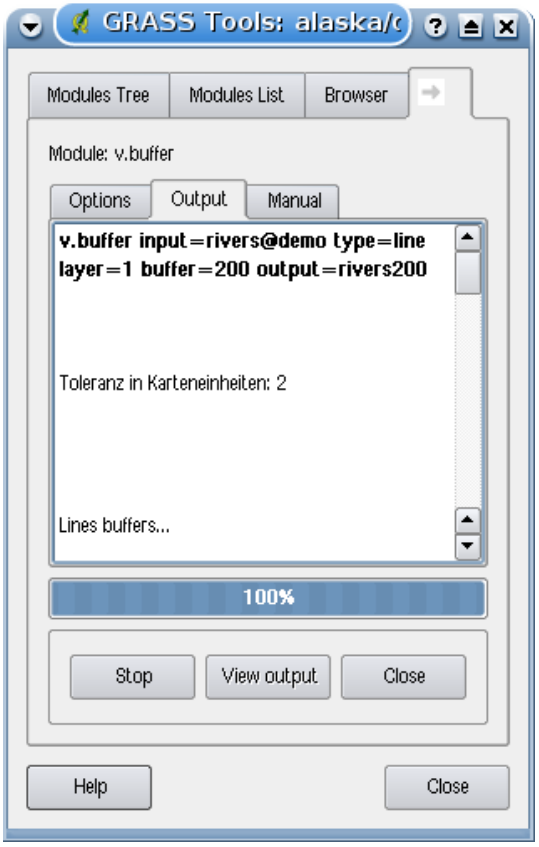


Figure 15.10: GRASS Toolbox Module Output

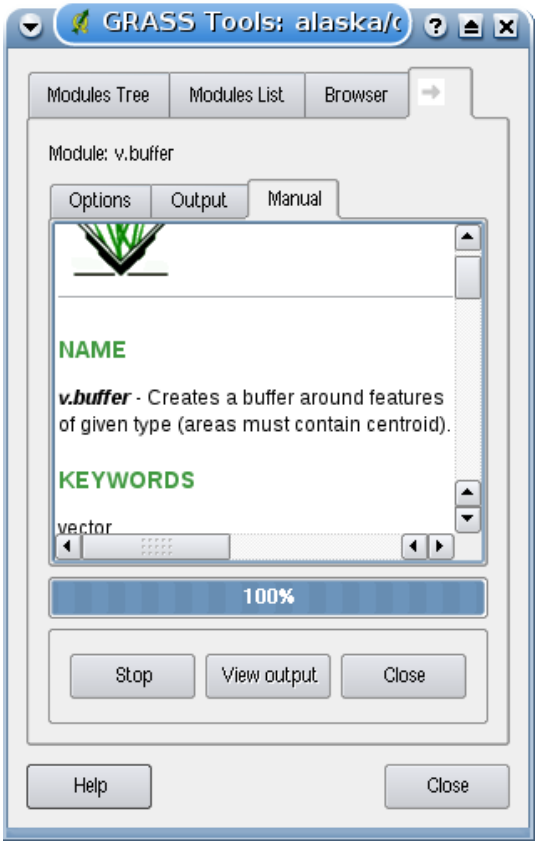


Figure 15.11: GRASS Toolbox Module Manual

Creating contour lines

The first example creates a vector contour map from an elevation raster (DEM). Assuming you have the Alaska `LOCATION` set up as explained in Section *Importing data into a GRASS LOCATION*.

- First open the location by clicking the Open mapset button and choosing the Alaska location.
- Now load the `gtopo30` elevation raster by clicking Add GRASS raster layer and selecting the `gtopo30` raster from the demo location.
- Now open the Toolbox with the Open GRASS tools button.
- 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 *Working with GRASS modules*. The `gtopo30` raster should appear as the *Name of input raster*.
- Type into the *Increment between Contour levels* 1,00 the value 100. (This will create contour lines at intervals of 100 meters.)
- Type into the *Name for output vector map* the name `ctour_100`.
- Click **[Run]** to start the process. Wait for several moments until the message `Successfully finished` appears in the output window. Then click **[View Output]** and **[close]**.

Since this is a large region, it will take a while to display. After it finishes rendering, you can open the layer properties window to change the line color so that the contours appear clearly over the elevation raster, as in **ベクタプロパティダイアログ**.

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 will be used when you have a highly detailed vector, but you are creating a very small scale map, so the detail is unnecessary.

ちなみに: The simplify tool

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 Chaikens 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.
- Check that the 'ctour_100' vector appears as the *Name of input vector*.
- 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]**.
- You may change the color of the vector to display it clearly on the raster background and to contrast with the original contour lines. You will notice that the new contour lines have smoother corners than the original while staying faithful to the original overall shape.

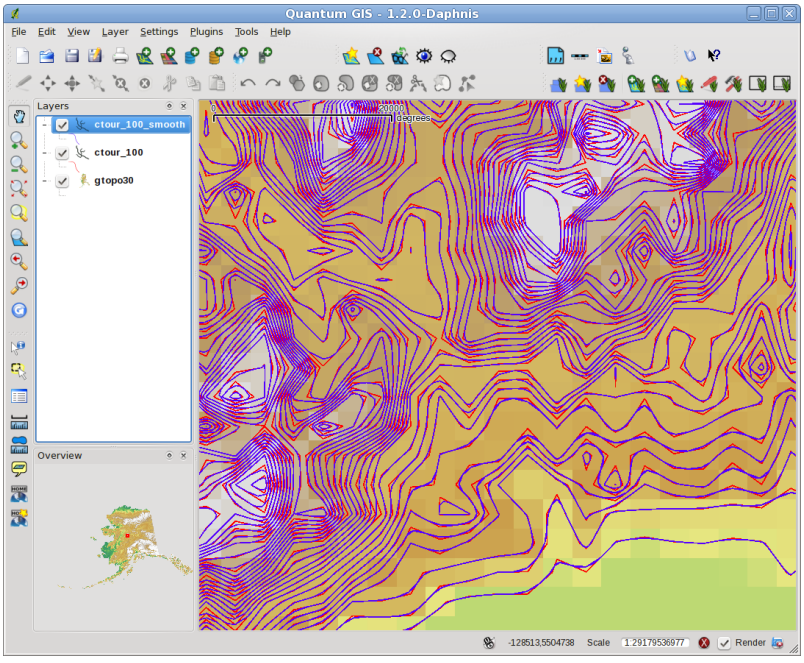


Figure 15.12: GRASS module v.generalize to smooth a vector map

ちなみに: Other uses for 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 3D effect

Several methods are used to display elevation layers and give a 3D 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 3D 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 and 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*.
- Then click **r.shaded.relief** to open the module.
- Change the *azimuth angle* 

270 to 315.
- Enter `gtopo30_shade` for the new hillshade raster, and click **[Run]**.
- When the process completes, add the hillshade raster to the map. You should see it displayed in grayscale.
- To view both the hill shading and the colors of the `gtopo30` together shift 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%.

You should now have the `gtopo30` elevation with its colormap and transparency setting displayed **above** the grayscale hillshade map. In order to see the visual effects of the hillshading, turn off the `gtopo30_shade` map, then turn it back on.

Using the GRASS shell

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.

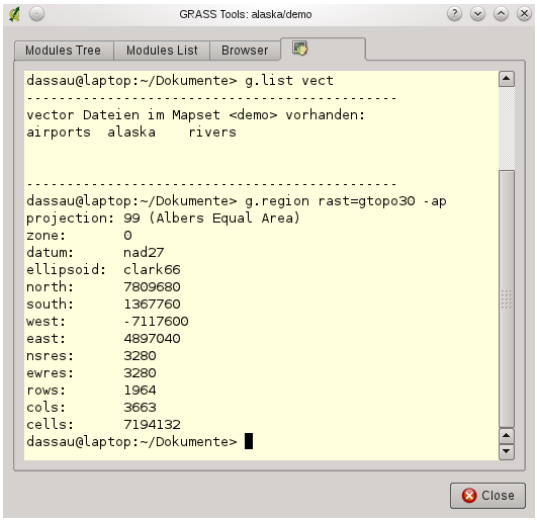


Figure 15.13: The GRASS shell, r.shaded.relief module

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 in QGIS.
- As explained above, shift the shaded relief raster below the gtopo30 raster in the Table of Contents, then check transparency of the colored gtopo30 layer. You should see that the 3D effect stands out more strongly compared to the first shaded relief map.

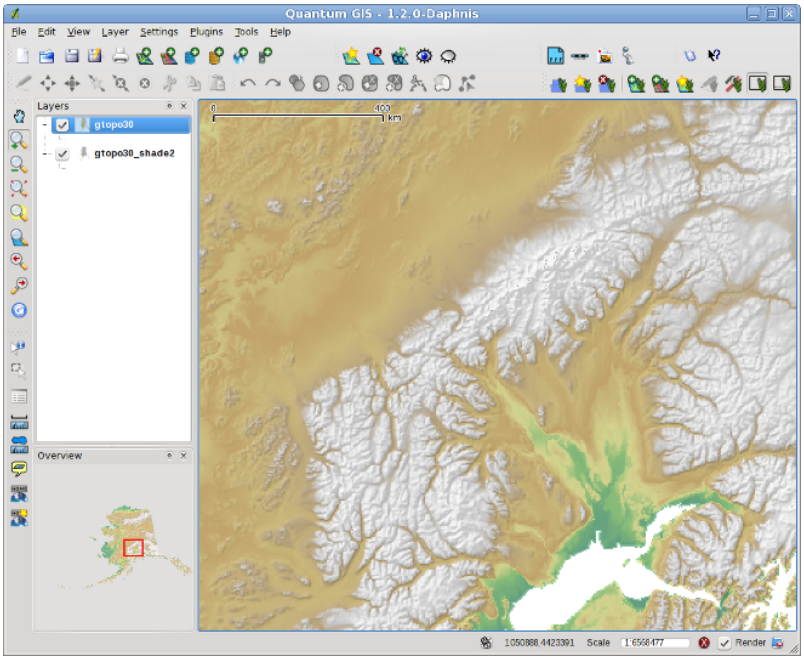


Figure 15.14: Displaying shaded relief created with the GRASS module r.shaded.relief

Raster statistics in a vector map

The next example shows how a GRASS module can aggregate raster data and add columns of statistics for each polygon in a vector map.

- Again using the Alaska data, refer to *Importing data into a GRASS LOCATION* to import the trees shapefile from the `shapefiles` directory into GRASS.
- Now an intermediary 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**.
- Enter as the *output vector map* 'forest_areas' and run the module.
- 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 :ref:sec_symbology in 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.

15.9.3 Working with the GRASS LOCATION browser

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 `MAPSETs`.

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.

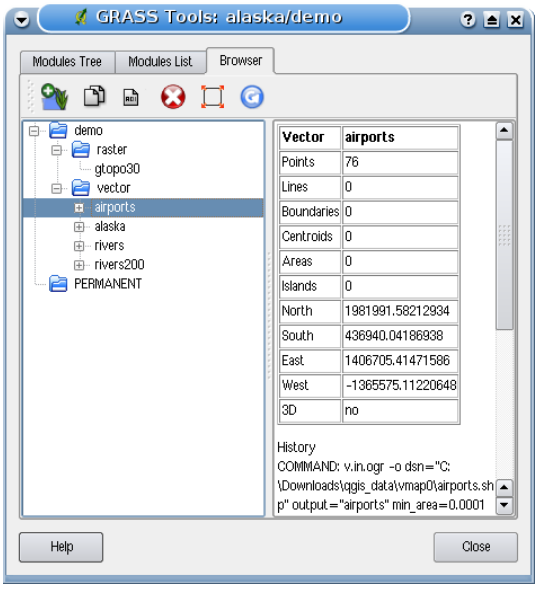


Figure 15.15: GRASS LOCATION browser

The toolbar inside the *Browser* tab offers following tools to manage the selected `LOCATION`:

- *Add selected map to canvas*
- *Copy selected map*
- *Rename selected map*
- *Delete selected map*
- *Set current region to selected map*
- *Refresh browser window*

The *Rename selected map* and *Delete selected map* only work with maps inside your currently selected `MAPSET`. All other tools also work with raster and vector layers in another `MAPSET`.

15.9.4 Customizing the GRASS Toolbox

Nearly all GRASS modules can be added to the GRASS toolbox. A XML interface is provided to parse the pretty simple XML files which configures the modules appearance and parameters inside the toolbox.

A sample XML file for generating the module `v.buffer` (v.buffer.qgm) looks like this:

```
<?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 the modules 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

Chapter 16

オープンストリートマップ

近年, オープンストリートマップ（OpenStreetMap: OSM）プロジェクトが人気を集めています. 多くの国では, 自由に利用できる地図データが無いからです. OSM プロジェクトの目的は, GPS データ, 航空写真, そして編集者自身が持つ知識を利用して, 自由に編集可能な世界地図を作成することです. これをサポートするために, QGIS では OSM データと連携するプラグインを提供しています.

QGIS のコアプラグインである OSM プラグインは, OSM データを扱うための基本機能を提供します. 具体的には, データの読み込み, インポート, 保存, ダウンロード, 編集, OSM サーバへのアップロードです. 実装においては, 既存の OSM エディタを参考にしました. 既存 OSM エディタの機能を取り入れることで, 最も良い結果がもたらされると考えました.

次のセクションは, OSM プロジェクトの理念に関する概要紹介です.

いくつかの段落は, OpenStreetMap の WEB サイト http://www.openstreetmap.org からコピーしたものです.

16.1 オープンストリートマップ（OSM）プロジェクト

オープンストリートマップは, 自由に編集可能な世界地図を作るプロジェクトです. 地図は, ポータブル GPS デバイス, 航空写真などの著作権フリーのソース, もしくは単純に編集者自身の地域に関する知識から作成されます. このプロジェクトがスタートしたのは, 一般的な地図のほとんどが利用にあたって法的もしくは技術的な制約があり, 創造的利用, 生産的利用や予想外の利用が制限されているためです. OSM の描画イメージとベクタデータセットはいずれも, Creative Commons Attribution ShareAlike 2.0 ライセンスのもとダウンロードできます.

オープンストリートマップは, Wikipedia のようなサイトに触発されました. 地図の表示 (図_OpenStreetMap_1 参照) では「編集」タブが特徴的で, リビジョンの履歴が全て保持されています. 登録ユーザは GPS トラックログをアップロードでき, 編集ツールを使ってベクタデータの編集を行うことができます.

OSM データの大本は, API によってサーバに保存できるオブジェクトクラスです. サポートされるデータは, **ノード**, **ウェイ**, **リレーション**の 3 種類です.

- **ノード（node）**は, 緯度/経度の座標です. 他の地物をつくるためのブロックであったり, 地物そのもの (Points Of Interest: POI) であったりします. タグは必要に応じて付けられます.
- **ウェイ（way）**は, 2 個以上のノードの組合わせで, 道路をはじめとした線形の地物を表現します. 同じノードを複数のウェイに用いることができます.
- **リレーション（relation）**は, ロールと結びついたゼロまたはそれ以上のプリミティブのグループです. オブジェクト間の関係を定義する場合に指定します. 抽象オブジェクトを作る場合もあります.

一般的な地図にあるさまざまな地物（POI, 道路, 鉄道, バス停など) は, これらのプリミティブによって定義されます. 地図の地物は OSM コミュニティの中では周知のもので, キーと値を利用したタグとして保存されます. OSM は通常, XML 形式で配布されます. XML ペイロードは OSM サーバーとの通信にも利用されています.

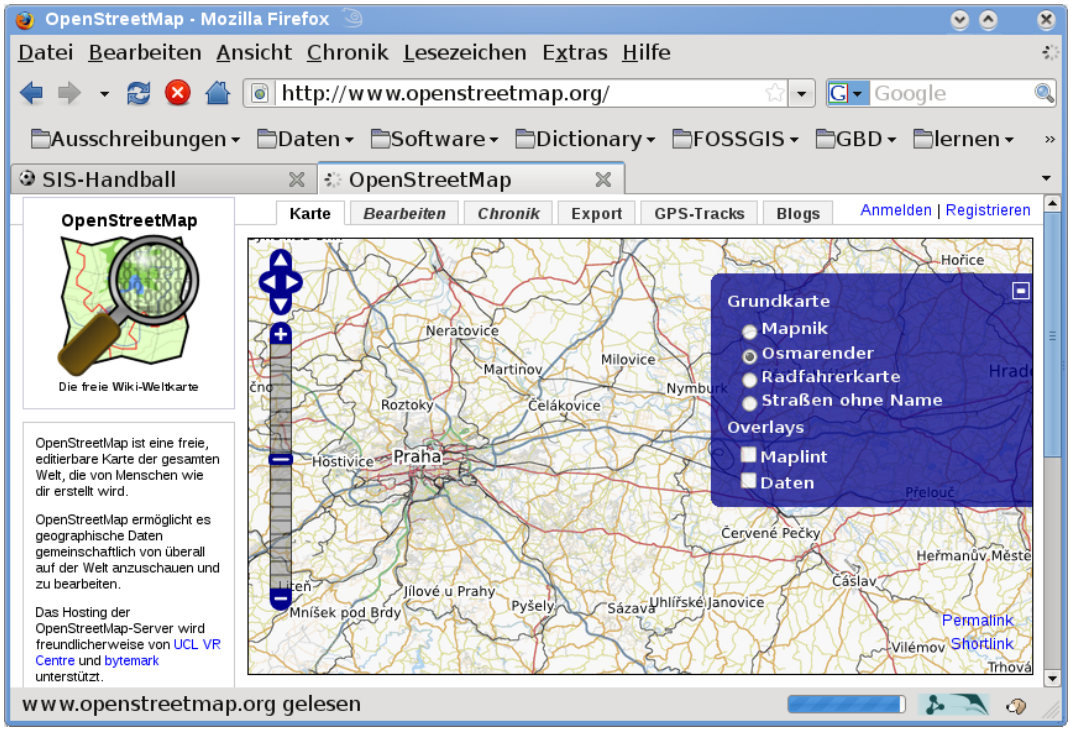


Figure 16.1: OpenStreetMap data in the web

16.2 QGIS-OSM の接続

このセクションの最初のパートでは, OSM プリミティブが QGIS のベクタレイヤでどのように表示されるかを説明します. 上記のように, OSM データはノード, ウェイ, リレーションで構成されています. QGIS では, ポイントレイヤ, ラインレイヤ, ポリゴンレイヤの 3 種類の異なるレイヤタイプで表示されます. これらのレイヤはどれも必要ですし, さらに別のレイヤが加わることもありません.

- **ポイント（Point）レイヤ**は, 単独のノードタイプの地物を表示します. ウェイに属していないノードはすべてポイントレイヤに属することになります.
- **ライン（Line）レイヤ**は, 閉じていないウェイタイプの OSM 地物を表示します. 閉じていないとは, ウェイの始点と終点が異なるノードであるということです.
- **ポリゴン（Polygon）レイヤ**は, ラインレイヤに含まれないすべてのウェイを表示します.

上記の 3 つに加え、オープンストリートマップはもう 1 つのプリミティブを持っています。これをリレーションと呼びます。リレーションを示すためのベクタレイヤーは意図的には用意されていません。リレーションは任意の数のデータ・プリミティブを接続するために定義されます。ポイント、ライン、ポリゴンが地図上で特定された後、プラグインは、すべてのリレーションのリストを表示します。

これは、OSM のデータと標準的な QGIS の編集ツールとの関係をデザインすることを試みていました。どのような地物タイプであるかにかかわらず、これらのツールは一度に 1 つのベクタレイヤーを編集します。これは、OSM データがプラグインを通して QGIS にロードされる場合、（理論的には）個別にこれらのツールを使って、ポイントレイヤー、ラインレイヤー、ポリゴンレイヤーを編集できることを意味します。

ラインレイヤーは、ウェイトノードという異なる 2 つのタイプの OSM フィーチャで構成されています。OSM フォーマットでは、ウェイはノードで構成されます。もしあなたがラインの形状を変えるためにラインレイヤーの編集を開始するなら、あなたのアクションは OSM のウェイだけでなく、その一部である OSM のノードだけにも影響します。

QGIS 標準の編集ツールは、OSM のプロバイダー、およびどのラインがどのように変更されたかを見分けることはできません。これは、どのラインが新しいジオメトリかということを見分けるだけで、OSM データベースに対する変更を正しく伝えるには十分ではありません。ラインレイヤーはラインメンバーの識別子を知りません。同様の問題は、あなたがポリゴンレイヤーを編集しようとする際にも発生します。

この理由として、OSM プラグインは OSM データを編集するための、それ自身のツールが必要です。それを使用すると、OSM レイヤは正しく変更されます。編集ツールのプラグインは、ポイント、ライン、ポリゴン、そしてリレーションの作図や削除、移動をするためのツールで構成されます。

ノート: OSM プラグインと標準の編集ツールをリンクするには、QGIS コアコードの変更が必要であろう。

16.3 インストール

OpenStreetMap プラグインは QGIS 内部のコアプラグインです。ref:‘load_core_plugin‘のセクションで記載されている通り、その ‘OpenStreetMap’ プラグインは 、プラグインマネージャで選択出来ます。

16.4 基本的なユーザインタフェース

The first time the OSM plugin is started (and after the first data are loaded), several new OSM plugin icons appear in the QGIS toolbar menu together with new dock windows as shown in figure_OpenStreetMap_2.

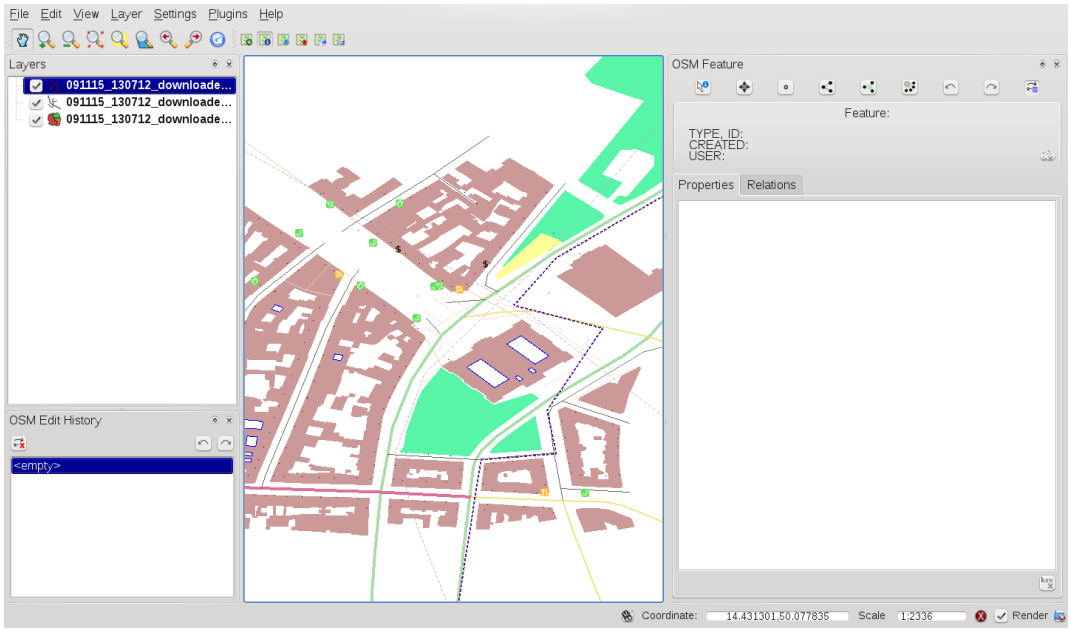


Figure 16.2: OSM plugin user interface

16.4.1 OSM フィーチャーウィジェット

OSM フィーチャーウィジェットは OSM の地物を識別するのに役立ちます。誰によっていつ地物が変更されたかの情報だけでなく、フィーチャータイプや識別子の基礎情報を表示します。OSM フィーチャーウィジェットは、すべての編集ツールを（それの上の部分で）用意されています。これらのツールの詳細については、以下のセクションで見つけることができます。ウィジェットは最初は無効になっています。OSM データのロードに成功した後、ウィジェットは有効になります。

16.4.2 OSM Undo/Redo ウィジェット

この Undo/Redo ウィジェットは編集行為を元に戻す処理と繰り返す処理を行うために使われます。これは典型的な Undo と Redo のボタンのみで構成されているのではなく、行った編集処理の簡潔な説明もリスト

表示します。OSM Undo/Redo ウィジェットは初期設定では非表示ですが、OSM フィーチャーウィジェットボタンを使うことで表示できます。

16.4.3 ツールバーのメニューアイコン

:sup:‘Load OSM from file‘は特定の Ope n StreetMap XML からデータをロードするために使われます。

Show/Hide OSM Feature Manager は OSM フィーチャーウィジェットの表示・非表示を切り替えるために使用されます。OSM フィーチャーウィジェットは OSM の地物の特定や OSM のデータ編集を補助するためのパネルです。

Download OSM data は Ope n StreetMap サーバーよりデータをダウンロードする際に使用されます。

:sup:‘Upload OSM data‘は（現状のデータでの）変更をアップロードする際に使用されます。

Import data from a layer はベクタレイヤーからデータをインポートする際に使用されます。少なくとも 1 つのベクタレイヤーがロードされ、現状の OSM データが選択されます。

Save OSM to file は OSM データを XML ファイルに戻してから保存する際に使用されます。

すべてのウィジェット、ボタン、ダイアログの詳細については、これらの機能（編集、識別など）に応じて、このプラグインの適切なセクションで見つけることができます。

16.5 OSM データの読み込み

OSM プラグインの開始後にされるべき最初のアクションとしては、OSM ファイルからデータを開くことです。OSM データは Shape ファイルとしてインポートされるか、OpenStreetMap サーバーから直接ダウンロードします。ここでは、前者の方法に焦点を当てます。

To load data from a file use the Load OSM from file icon. If there is no such button, maybe someone disabled OpenStreetMap toolbar in your QGIS installation. You can enable it again selecting *Settings* → *Toolbars* → *OpenStreetMap*.

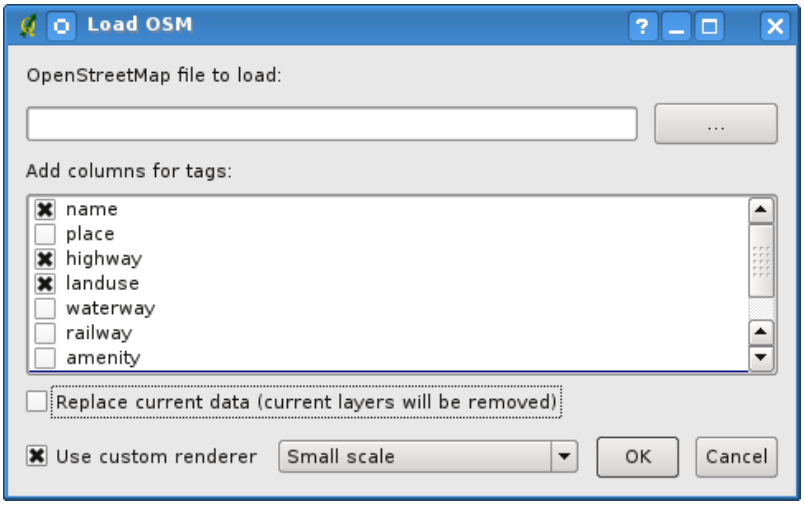


Figure 16.3: Load OSM data dialog

その要素の目的について説明します。

OpenStreetMap file to load: Click on the ... button to select the file:.*osm* file you want to load data from.

Add columns for tags: このオプションは OSM と QGIS データの接続を決定します。OSM データの書く要素はいくつかのタグ（キーと値の組み合わせ）を持っていて、地物の属性を定義しています。QGIS ベクターレイヤーの各地物もまた、その属性（キーと値）を持っています。このオプションで、QGIS の地物の詳細情報をいつ表示し、OSM オブジェクトのどの属性を表示するかを定義することができます。

Replace current data: このオプションのチェックは、新しいデータと、ユーザが作業した現状のデータを置き換えるかを意味します。現状データのレイヤーは削除され、新しいデータがロードされます。最初に OSM データをロードする際は置き換え対象がないため、このオプションはアクティブではありません。

Use custom renderer: This option determines how many details of the map will be used. There are three predefined OSM styles for map displaying. Use 'Small scale' if you want to view OSM data at low level, to see all details and to edit something. If not you can use 'Medium scale' or 'Large scale'. QGIS 1.8.0 doesn't support changing the renderer style dynamically.

データを読み込むには**[OK]**をクリックします。初めて OSM ファイルがロードされる場合は、プラグインは初めてデータベースを解析するに違いありません。これには数秒か数分かかると思いますが、それはロードするデータ量に依ります。

16.6 OSM データの表示

OSM データをロードした後、適切なツールを使ってマップの地物を特定することができます。OSM フィーチャーウィジェットの左上にあるlosm_identify| Identify feature ボタンを使用します。このツールを使うと、すべてのマップオブジェクトを簡単に調べることができます。マウスカーソルをオブジェクト上に配置すると、OSM フィーチャーウィジェットで直接、そのオブジェクトすべての情報を表示できます。マップ上には動的なラバーバンドが表示されるため、ユーザは、どの地物が現在識別されているかを決定することができます。

ウィジェットの guilabel:'Properties'タブでは、地物のタグすべてが含まれています。guilabel:'Relation'タブでは特定の地物を接続するリレーションのリストが表示されます。

そのプロパティとリレーションを読み込むためにしばらくの間機能を停止するには、同時にマウスカーソルを移動して、地物上で左クリックします。特定プロセスは、次に左クリックするまでの間停止します。

左クリックが行われた時、その地点に複数のちぶつがある場合がある。これは特に、交差点をクリックした　場合やマップを十分にズームしないで行った場合に起こる。この状況では１つの地物のみが識別される（ラバーバンドが付けられる）。しかし、プラグインはそれらすべてを記憶している。その後（一時停止モード）は、右クリックで、識別された地物を循環閲覧できる。

16.7 基礎的な OSM データの編集

'Basic data' in this context means non-relational OSM features - nodes and ways. If you prefer to examine how to perform relational editing, skip this section and move on to the next one.

基礎データの編集は OSM プラグインの重要な部分です。プロパティや、いかなる基礎の地物の位置や形状を変更することができます。地物の削除または追加ができます。ノードとウェイに対するすべての変更内容は、Undo/Redo によって記憶され、すべての変更は OpenStreetMap サーバにすぐにアップロードされます。

16.7.1 地物のタグの変更

OSM 地物のプロパティ/タグの変更はテーブルの地物タグで直接行うことができます。基本的な地物のタグテーブルは OSM フィーチャーウィジェットで見つけることができます。最初に地物を特定することを忘れないでください。

If you want to change a tag value, just double-click in the appropriate row of column 'Value' and type, or select a new value. If you want to remove a tag, click in the relevant row, then use the button key Remove selected tags on the right bottom under the table.

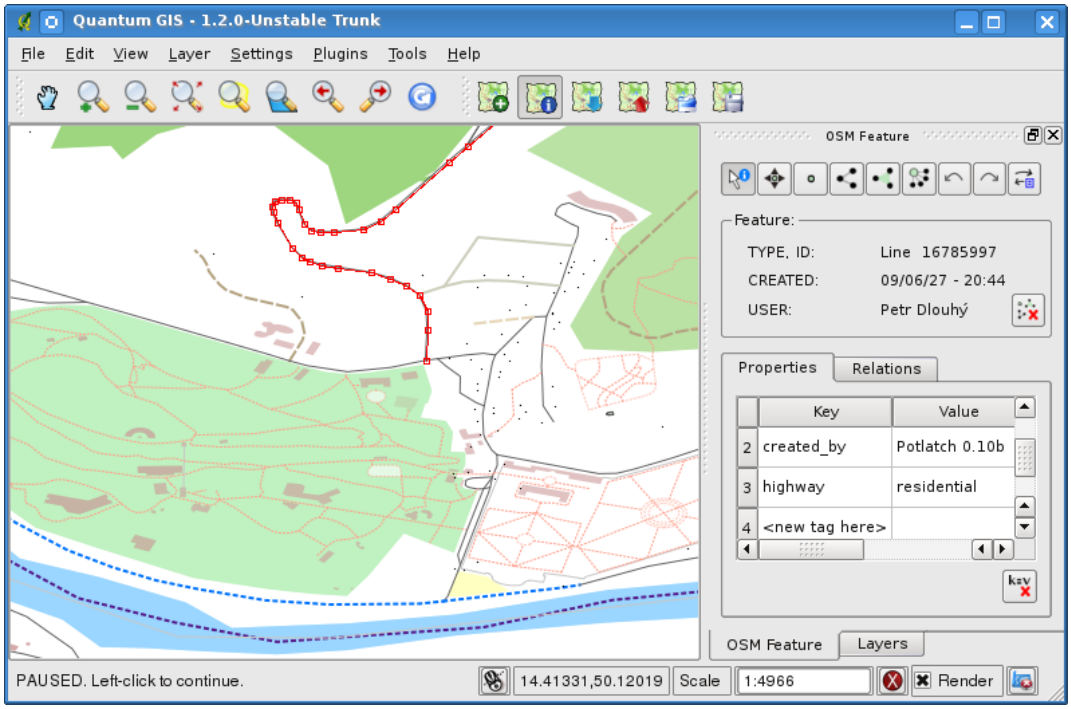


Figure 16.4: Changing an OSM feature tag

新しいタグを追加するには、‘<next tag value>’ と書かれたテーブルの最終行にキーと値をタイプします。存在しているタグのペアのキーを編集できないことに注意してください。便利なことに、すべての既存のタグキーと典型的な値のコンボボックスがあります。

16.7.2 点の作図

ポイントを作図するには、OSM フィーチャーウィジェット上にあるlosm_createPointl :sup:‘点の作成 ‘ボタンを使用します。いくつかのポイントを作図するには、そのボタンをクリックし、マップ上のクリックを開始します。いくつかの地図の地物にマウスカーソルを配置すると、その地物が直ちにマーク/識別されます。ラインまたはポリゴンがマークされ地図上をクリックすると、そのラインまたはポリゴンに、それらの新規メンバーとして、直接的に新しいポイントが作成されます。このような場合、OSM プラグインは、次のメッセージを表示します：

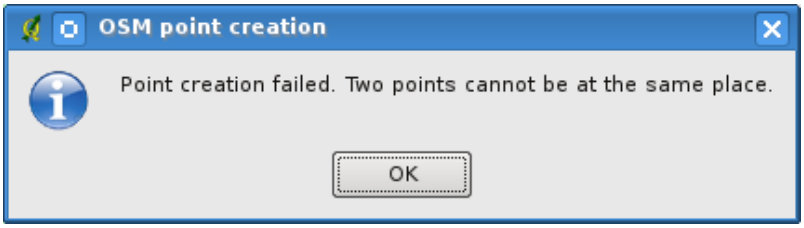


Figure 16.5: OSM point creation message

ラインまたはポリゴンをヒットするためにユーザーを助ける仕組みはスナップと呼ばれ、デフォルトで有効となってます。ラインの非常に近く（ただしライン上ではない）に点を作成したい場合は、最初に kbd:‘Ctrl‘キーを押すことでスナップを無効にしなければいけません。

16.7.3 ラインの作図

ラインを作図するには、OSM フィーチャーウィジェットの  :sup:‘線の作成 ‘ボタンを使用します。ラインを作成するためそのボタンをクリックし、マップ上の左クリックを開始します。それぞれの左クリックは新しいラインの頂点として記憶されています。初めて右クリックするとラインの作図が終了します。新しいラインは直ちにマップ上に表示されます。

ノート: A Line with less than two members cannot be created. In such case the operation is ignored.

スナップは地図上のすべての頂点-ポイントベクターレイヤ由来のポイントとすべてのラインおよびポリゴンのメンバーに対して実行されます。スナップは、kbd:‘Ctrl‘キーを押すことで無効にすることができます。

16.7.4 ポリゴンの作図

ポリゴンを作成するには 、OSM フィーチャーウィジェット上のlosm_createPolygonl
Create polygon‘ボタンを使用します。ポリゴンを作成するためにこのボタンをボタンをクリックし、マップ上で左クリックを開始します。それぞれの左クリックが、新しいポ
キーを押すことで無効にできます。

16.7.5 マップ上の地物の移動

もし（種類に関係なく）地物を異動したい場合は、OSM 地物ウィジェットメニューのlosm_movel Move feature ボタンを使用してください。それからマップ（あなたがそれを繰り返し行うとき、地物が動的に特定される）を表示することができ、移動したい地物をクリックすることができます。適切な地物が特定されるまで、右クリックを繰り返してください。選択が完了しカーソルを移動すると、何を移動するかを変更することはできません。移動を確認するには、マウスの左ボタンをクリックしてください。移動をキャンセルするには、別のマウスボタンをクリックします。

別の地物に接続している地物を移動する場合、これらの接続が損傷することはありません。他の地物は、移動した地物の新しい位置に適応するのみです。

スナップはこの操作においてもサポートされています。これは以下を意味します。

- 単体のポイント（ライン/ポリゴンの一部でないもの）を移動する場合、マップのセグメントと頂点すべてに対するスナップが行われる。
- ライン/ポリゴンのメンバーであるポイントを移動する場合、ポイントの親の頂点は除くすべてのマップセグメントと頂点に対してスナップが行われる。
- ライン/ポリゴンを移動する場合、すべてのマップの頂点に対してスナップが行われます。OSM プラグインは、移動したライン/ポリゴンの持つカーソルに近接した３つの頂点に対してのみスナップを試みる点にご注意ください。そうでないと動作が非常に遅くなります。操作中に kbd:*Ctrl* キーを押すことでスナップを無効にすることができます。

16.7.6 マップの地物の移動

地物を削除したい場合は、まずそれを特定する必要があります。特定した地物を削除するには OSM 地物ウィジェットのlosm_removeFeatl :sup:‘この地物の削除 ‘ボタンを使用します。ライン/ポリゴンを削除すると、それ自身のメンバーであって、他のライン/ポリゴンに属していないポイントもすべて削除されます。

ライン/ポリゴンのメンバーであるポイントを削除すると、ポイントが削除され、親であるライン/ポリゴンの形状は変更されます。新しい親の形状は、古いものよりも頂点が少なくなっています。

もし親地物が３つの頂点を持つポリゴンであれば、その新しい形状は、２つの頂点しか持ちません。２つの頂点しか持たないポリゴンは存在し得ないため前述のとおり、その地物タイプは自動的にラインに変更されます。

もし親地物が２つの頂点を持つラインであれば、新しい形状は１つの頂点しか持ちません。１つのみの頂点で構成されたラインは存在し得ないため、地物タイプが自動的にポイントに変更されます。

16.8 リレーションの編集

OSM リレーションが存在するおかげで、グループに OSM の地物を結合し、それらに共通のプロパティを付与することができます。そのような方法で、地域の境界（ウェイやポイントのグループとして）、バスルート等など、私たちは任意のマップオブジェクトをモデル化することができます。リレーションの各メンバーはそれ特有のロールを持ちます。我々のプラグインでは、OSM リレーションに取ってかなり良いサポートがあります。それらをどのように分析し、作成し、更新または削除するか見てみましょう。

16.8.1 リレーションの分析

もしリレーションの属性を参照したいなら、メンバーの１つを特定しましょう。それから、OSM 地物ウィジェットの guilabel:‘リレーション ‘タブを表示します。 タブの上部で、特定された地物を含むすべてのリレーションがリスト表示されます。分析したい１つを選択すると、その情報が下に表示されます。１つ目のテーブルは’ リレーションタグ’ と呼ばれ、選択したリレーションの属性を見つけることができます。１つのメンバーをクリックすると、プラグインは、地図上にラバーバンドを作成します。

16.8.2 リレーションの作成

リレーションの作成方法は２つあります：

1. OSM 地物ウィジェットのlosm_createRelationl:sup:‘リレーションの作成 ‘ボタンを使用することができます。
2. OSM 地物ウィジェットの guilabel:‘リレーション ‘タブにあるlosm_addRelationl:sup:‘リレーションの追加 ‘ボタンを使用することで、リレーションを作成することができます。

どちらの場合も、ダイアログが表示されます。第二のケースでは、現在特定された地物が自動的に最初のリレーションメンバーと見なされ、ダイアログでは少々事前入力がなされます。リレーションを作成する際、そのタイプを選択してください。定義済のリレーションの種類または独自のタイプを記載することができます。それからリレーションタグを埋めたりメンバーを選択します。

すでにリレーションのタイプを選択した場合は、  タグの作成 ‘ボタンを使用してください。それにより、リレーションのタイプにとって典型的なタグを
ツールを使用してマップ場をクリックすることにより可能です。

タイプ、タグ、メンバーを選択したら、ダイアログの内容を確定できるようになります。その場合、プラグインは新しいリレーションを作成します。

16.8.3 リレーションの変更

既存のリレーションを辺既往するには、まずそれを選択します（上記の ref:‘examining_relation‘のセクションに記載されたステップにしたがってください）。その後losm_editRelationl :sup:‘リレーションの編集 ‘ボタンをクリックします。 それは、OSM 地物ウィジェット上にあります。ダイアログが表示されると、 ‘リレーションの作成’ とほぼ同様でしょう。そのダイアログでは、与えられたリレーションの情報があらかじめ入力されています。あなたはリレーション、メンバーとそのタイプのタグを変更できます。ダイアログの内容を確定すると、変更内容がコミットされます。

16.9 OSM データのダウンロード

To download data from OpenStreetMap server click on the  Download OSM data button. If there is no such button, the OSM toolbar may be disabled in your QGIS instalation. You can enable it again at *Settings* → *Toolbars* → *OpenStreetMap* . After clicking the button a dialog occurs and provides following functionalities:

範囲：緯度と経度度の間隔からデータをダウンロードする領域を指定します。OpenStreetMap のサーバー上でダウンロード可能なデータ量の制限があるため、間隔を広げすぎてはいけません。領域の仕様におけるより詳細な情報は、右側のlosm_questionMarkl :sup:‘ヘルプ ‘ボタンをクリックした後に表示されます。

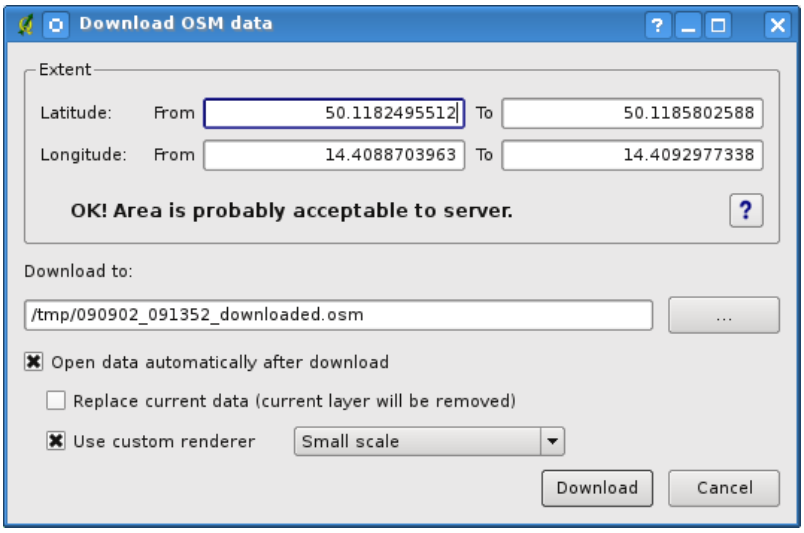


Figure 16.6: OSM download dialog

ダウンロード先：ここでは、データが格納されるファイルのパスを記述することが期待されています。あなたのディスクの構造を思い出せない場合は、パニックにならないでください。参照ボタンl browsebuttonl があなたを助けるでしょう。

ダウンロード後に自動的にデータを開く：ダウンロードプロセス後にデータのロード処理をを行うかどうかを決定します。データをロードしたくない場合は、 :sup:‘Load OSM from file‘ボタンを使用して、後からロードします。

カレントデータの置き換え：このオプションはlradiobuttononl :guilabel:‘ダウンロード後自動的にデータを開く‘にチェックが入っている場合のみ有効です。 このオプションにチェックを入れるとダウンロードデータが、現在作業しているデータと置き換えられます。現在のデータのレイヤは削除され、新しいものがロードされます。QGIS を起動して初めて OSM データをダウンロードする場合、置き換え対象がないため、このオプションは非アクティブです。

Use custom renderer: This option is active only if the *Open data automatically after download* checkbox is checked. It determines how many details will be in the map. There are three predefined OSM styles for map displaying. Use ‘Small scale’ if you want to view OSM data at low level, to see all details and to edit something. If not you can use ‘Medium scale’ or ‘Large scale’. QGIS 1.8.0 does not support changing the renderer style dynamically.

ダウンロード処理を開始するには **[Download]**ボタンをクリックします。

プログレスダイアログが、すでにダウンロードされたデータがどれくらいあるかを継続的に知らせます。ダウンロードプロセス中にエラーが発生した場合、ダイアログが原因を知らせます。アクションが正常に終了すると、プログレスダイアログとダウンロードダイアログの両方が閉じられます。

16.10 OSM データのアップロード

Note that the upload is always done on current OSM data. Before opening the OSM Upload dialog, please be sure that you really have the right active layer with OSM data.

To upload current data to the OSM server click on the Upload OSM data button. If there is no such button, OSM toolbar in your QGIS installation is disabled. You can enable it again in *Settings* → *Toolbars* → *OpenStreetMap* . After clicking the **[Upload]** button a new dialog will appear.

正しいデータをアップロードする場合は、ダイアログの上部でチェックすることができます。現在のデータベースの短い名前があります。テーブルでは、どのくらいの変更がアップロードされるかの情報を見つけます。統計情報は、各地物の種類ごとに個別に表示されます。

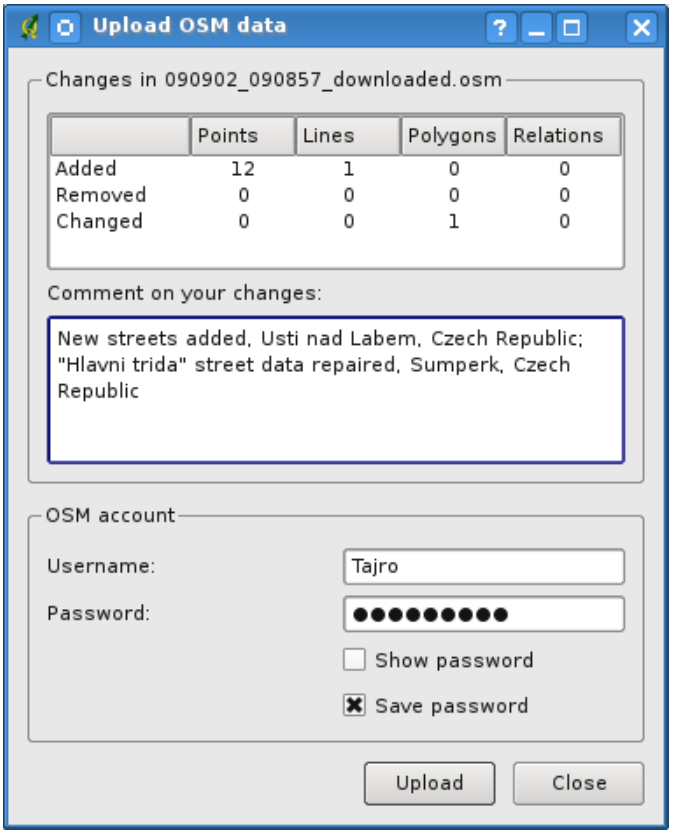


Figure 16.7: OSM upload dialog

‘あなたの変更についてのコメント’ ボックスには、アップロード操作の意味について簡単な情報を書き込むことができます。ちょっと手短に言えば、データに何の変更を行ったかを書くか、ボックスを空にしておいてください。サーバがあなたを認証できるように’OSM アカウント’ の列を埋めてください。もし OSM サーバーにアカウントを持っていない場合、 http://www.openstreetmap.org で作成するのには最高の時です。最終的に**[アップロード]**を使用してアップロード操作を開始します。

16.11 OSM データの保存

To save data from a current map extent to an XML file click on the  Save OSM to file button. If there is no such button, the OSM toolbar in your QuantumGIS installation is probably disabled. You can enable it again in *Settings* → *Toolbars* → *OpenStreetMap*. After clicking on the button a new dialog appears.

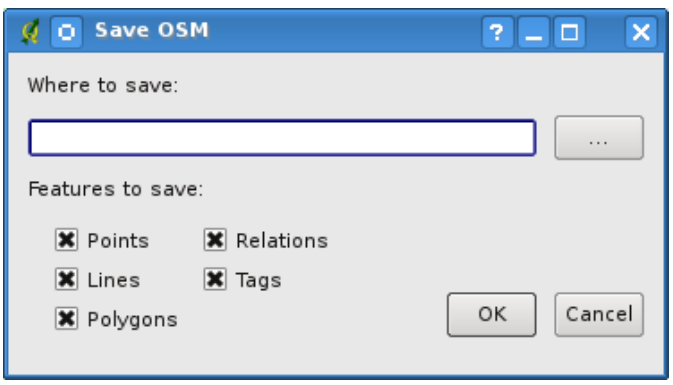


Figure 16.8: OSM saving dialog

XML ファイルとファイル自体に保存したい地物を選択します。 **[OK]**ボタンを使用して操作を開始します。そのプロセスで、カレントのマップ領域で表現された OSM データを XML ファイルとして作成します。出力ファイルの OSM バージョンは 0.6 です。OSM データの要素 (<node>, <way>, <relation>) は、その変更セットと uid の情報を含みません。この情報はまだ必須のものではなく、OSM XML バージョン 0.6 の DTD を参照してください。出力ファイルでは OSM の要素が順序付けされていません。

現在の範囲外のデータも保存されていることに注意してください。それらのほんの一部が現在の範囲に表示されている場合でも、それら全体のポリゴンや線が出力ファイルに保存されます。保存されたライン/ポリゴンとそのメンバーであるノードすべても同様に保存されます。

16.12 OSM データのインポート

To import OSM data from an opened non-OSM vector layer follow this instructions. Choose current OSM data by clicking on one of their layers. Click on the  Import data from a layer button. If there is no such button, someone has probably disabled the OpenStreetMap toolbar in your QGIS installation. You can enable it again in *Settings → Toolbars → OpenStreetMap*.

そのボタンをクリック後に、以下のメッセージが表示されるでしょう：

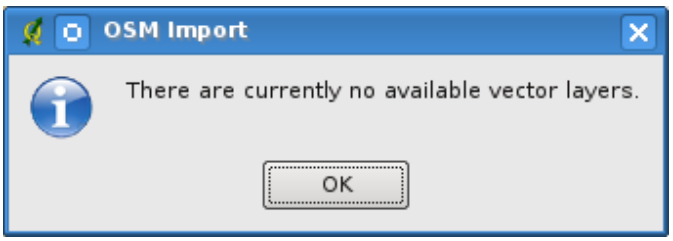


Figure 16.9: OSM import message dialog

In such case there is no vector layer currently loaded. The import must be done from a loaded layer - please load a vector layer from which you want to import data. After a layer is opened, your second try should give you a better result (don't forget to mark the current OSM layer again):

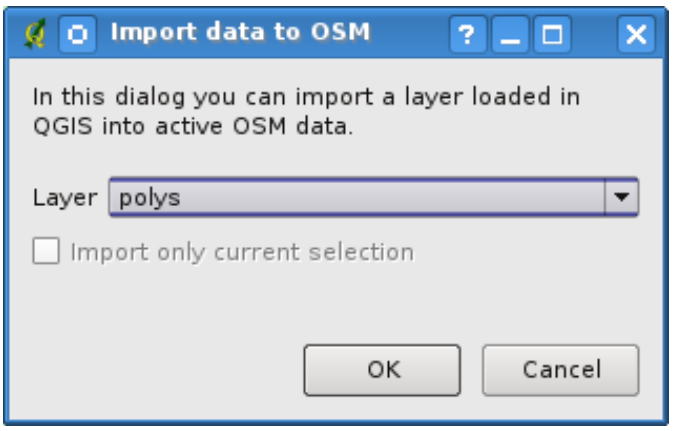


Figure 16.10: Import data to OSM dialog

OSM データのインポート処理を開始するにはサブミットダイアログを使用します。あなたが何かをインポートしたいかわからない場合、それを拒否します。

Chapter 17

SEXTANTE

17.1 はじめに

この章では、QGIS において強力な地理的分析のフレームワークである SEXTANTE について紹介します。SEXTANTE は QGIS からネイティブかつサードパーティのアルゴリズムを呼び出すために使われるジオプロセシング環境です。それにより、空間分析がより生産的に、簡単に達成できるようにします。

次のセクションでは、 SEXTANTE のグラフィカルな要素を使用し、それらの各々を最大限に活用する方法についてレビューします。

17.1.1 Basic elements of the SEXTANTE GUI

There are four basic elements in the SEXTANTE GUI, which are used to run SEXTANTE 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 *SEXTANTE* 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).

- SEXTANTE ツールボックス。SEXTANTE GUI の主な要素は、単一のアルゴリズムを実行するか、そのアルゴリズムに基づいてバッチプロセスを実行するために使用される。

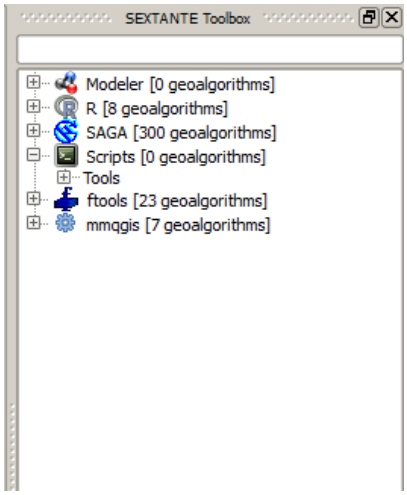


Figure 17.1: SEXTANTE Toolbox

- SEXTANTE graphical modeler。いくつかのアルゴリズムをグラフィカルサブプロセスのいくつかを伴う単一のプロセスを作成し、ワークフローを定義するために、modeler を使用して組み合わせることができます。

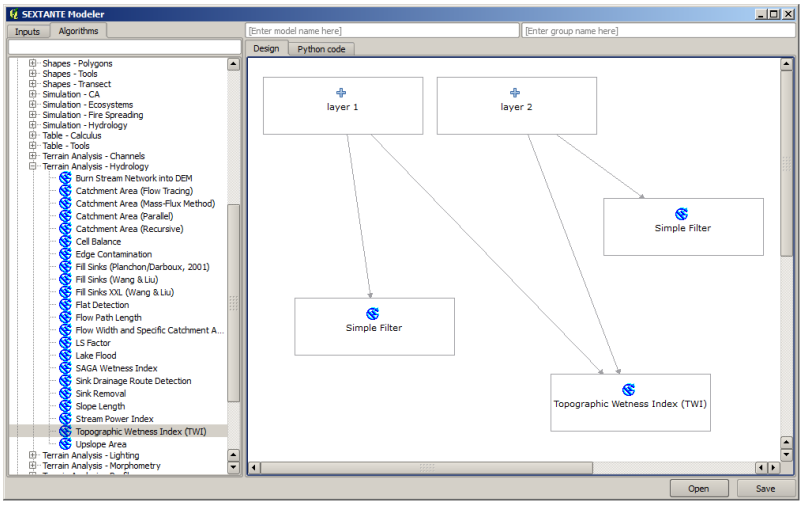


Figure 17.2: SEXTANTE Models

- SEXTANTE 履歴マネージャ。前述の要素のいずれかを用いて実行されたすべてのアクションが履歴ファイルに保存され、後で簡単に履歴マネージャを使用して再生することができる。

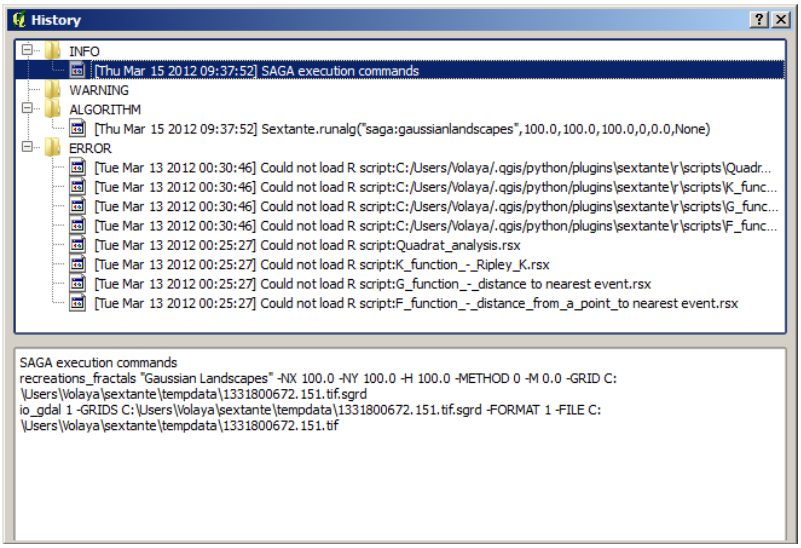


Figure 17.3: SEXTANTE History

- SEXTANTE バッチプロセシングインタフェースマネージャ。このインタフェースを使用すると、バッチ処理を実行し、複数のデータセットに対し単一のアルゴリズムの実行を自動化することができます。

次のセクションに沿って我々は詳細に、この要素のそれぞれをレビューします。

17.2 SEXTANTE toolbox

17.2.1 イントロダクション

Toolbox は SEXTANTE GUI の主な要素であり、最も日常業務で使用できそうなものの１つです。それは異なったブロックにグループ化されたすべての使用可能なアルゴリズムのリストを示しており、単一のプロセスとして、または入力の異なるセットで同じアルゴリズムのいくつかの実行を伴うバッチ処理のようにするかどうか、それらを実行するためのアクセスポイントです。

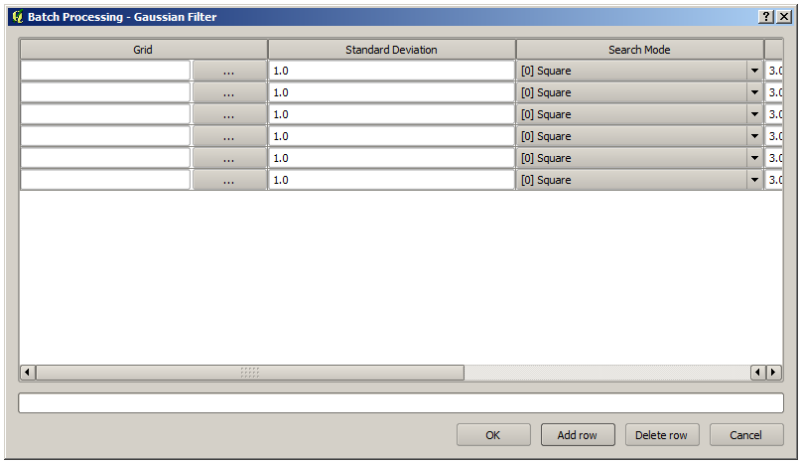


Figure 17.4: SEXTANTE Batch Processing

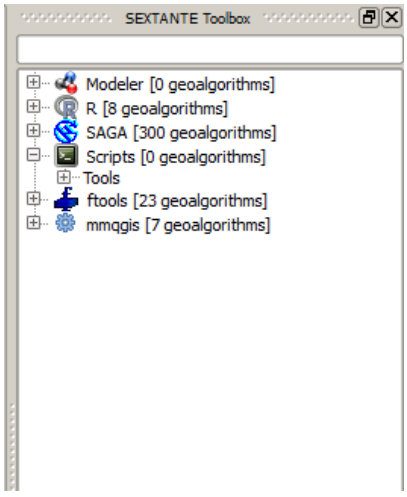


Figure 17.5: SEXTANTE Toolbox

The toolbox contains all the algorithms available, divided into groups. 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 this groups represent algorithms from one of such third-party applications (like SAGA, GRASS or R), while other contain algorithms directly coded along with SEXTANTE elements, not relying on any additional software. Currently, these providers all reuse code from already existing QGIS plugins (more specifically, from the fTools vector library shiped along with QGIS and the contributed mmqgis plugin that you can install using the Plugin Manager), making them more useful, since they can be executed from elements such as the modeler or the batch processing interface, which we will soon describe.

Additionally, two more providers can be found, namely 'Models' and 'Scripts'. This providers include user-created algorithms, and 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 can 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 which contain the text you have entered in their names.

To execute an algorithm, just double-click on its name in the toolbox.

17.2.2 The algorithm dialog

Once you double-click on the name of the algorithm that you want to execute, a dialog similar to the next one is shown (in this case, the dialog corresponds to the SAGA 'Convergence index' algorithm).

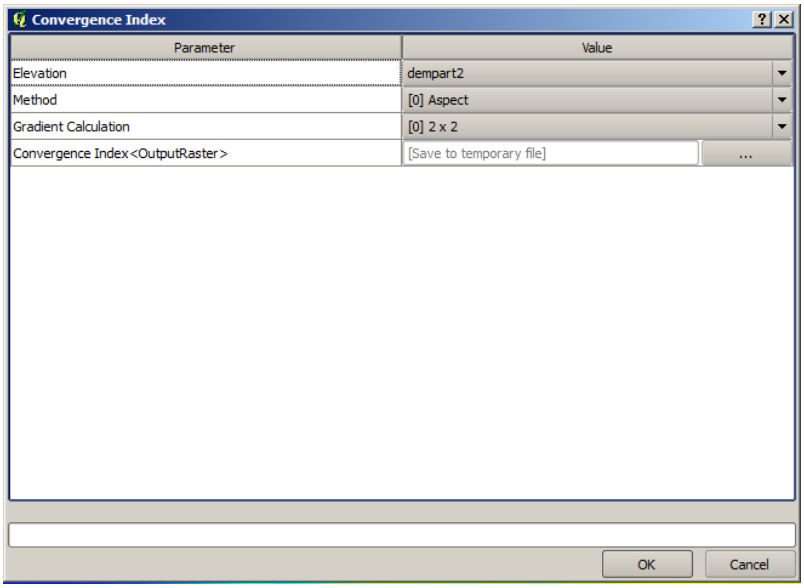


Figure 17.6: Parameters Dialog

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 on the table can be of one of the following types.

- A raster layer, to select from a list of all the ones 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 the ones available in the 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.

You will see a button by each vector layer selector. 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. We will see more about this kind of execution at the end of this section.

- A table, to select from a list of all the ones 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 a SEXTANTE algorithm that needs one of them is restricted to tables coming from files in DBase (`.dbf`) or Comma-Separated Values (`.csv`) formats.
- An option, to choose from a selection list of possible options.
- 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 this variables such as the cellsize of a layer or the northern most coordinate of another one.

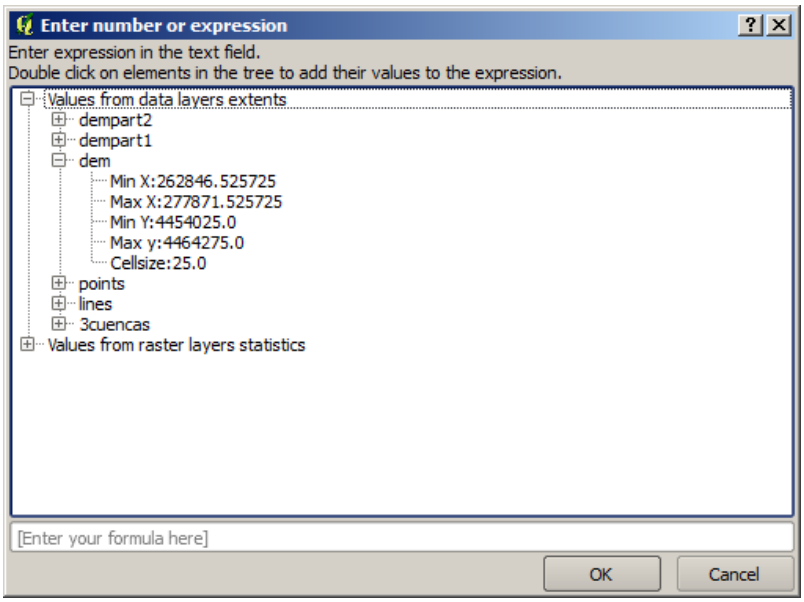


Figure 17.7: Number Selector

- A range, with min and max values to be introduced in two text boxes.
- A text string, to be introduced in a text box.
- A field, to choose from the attributes table of a vector layer or a single table selected in another parameter.
- A Coordinate Reference System (CRS). You can type the EPSG code directly in the text box, or select it from the CRS selection dialog that appear when you click on the button on the right-hand size
- A extent, to be entered by four number 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 option: to select the value from a layer or the current canvas extent, or to define it by dragging directly onto the map canvas.

  If you select the first option, you will see a window like the next one.

  If you select the second one, the parameters window will hide itself, so you can click and drag onto the canvas. Once you have defined the selected rectangle, the dialog will reappear, containing the values in the extent text box.

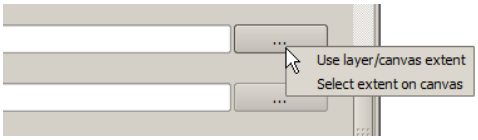


Figure 17.8: SEXTANTE Extent

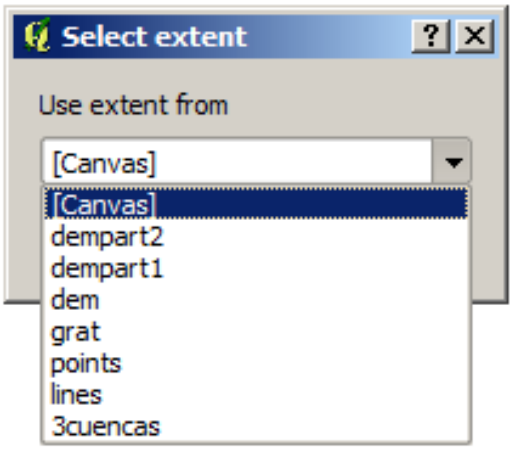


Figure 17.9: SEXTANTE Extent List

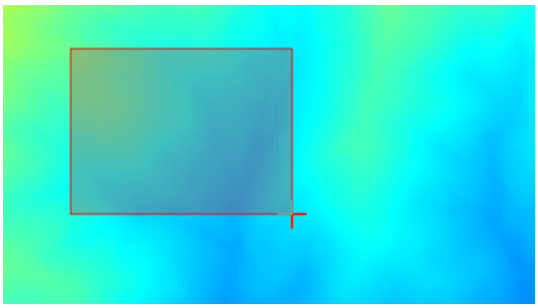


Figure 17.10: Extent Drag

- A list of elements (whether raster layers, vector ones or tables), to select from the list of the ones available in QGIS. To make the selection, click on the small button on the left side of the corresponding row to see a dialog like the following one.

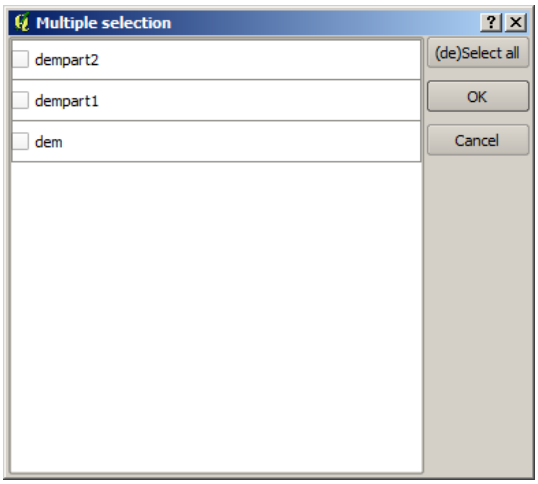


Figure 17.11: Multiple Selection

- A small table to be edited by the user. These are used to define parameters like lookup tables or convolution kernels, among others.

  Click on the button on the right side to see the table and edit its values.

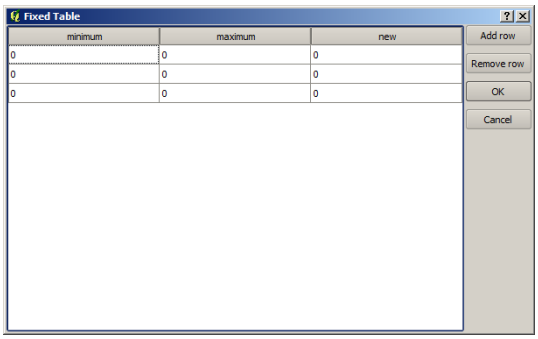


Figure 17.12: Fixed Table

  Depending on the algorithm, the number of rows can be modified or not, using the buttons on the right side of the window.

You will find a **[Help]** button in the lower part of the parameters dialog. If a help file is available, it will be shown, giving you more information about the algorithms 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.

A note on projections

SEXTANTE — and also most of the external applications whose algorithms are available from SEXTANTE — does not perform any reprojection on input layers and assumes 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 coor-

dinate system. That reprojection should be done manually and then use the resulting files as input to SEXTANTE. Also note that the reprojection process can be performed with SEXTANTE, which incorporates tools to do so.

17.2.3 Data objects generated by SEXTANTE algorithms

Data objects generated by SEXTANTE can be of any of the following types:

- A raster layer
- A vector layer
- A table
- An HTML file (used for text and graphical outputs)

They are all saved to disk (there are no in-memory results), 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 of SEXTANTE 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, SEXTANTE 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 filepath. 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 the ones supported by the algorithm itself. To select a format, just select the corresponding file extension (or add it if you are directly typing the filepath instead). If the extension of the filepath you entered does not match any of the supported ones, a default extension (usually `.dbf` for tables, `.tif` for raster layers and `.shp` for vector ones) will be appended to the filepath 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 and in the corresponding default file format, and 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 *SEXTANTE* 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.

Apart from raster layers and tables, SEXTANTE also generates graphics and texts 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 SEXTANTE during the current session, and can be shown at any time by selecting in menu *SEXTANTE* → *SEXTANTE results viewer*.

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 outut files will not be processed by QGIS (opened or included into the current QGIS project), since most of the times 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 outputs, you will find a check box that you can use to tell SEXTANTE not whether to load the file once it is generated by the algorithm or not. By default, all files are opened.

SEXTANTE does not support optional outputs, so all outputs are created, but you can uncheck the corresponding check box if you are not interested in a given output, which virtually makes it behave like an optional output (although 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)

17.2.4 Configuring SEXTANTE

As it has been mentioned, the configuration menu gives access to a new dialog where you can configure how SEXTANTE works. Configuration parameters are structured in separate blocks that you can select on the left-hand side of the dialog.

Along with the aforementioned *Output folder* entry, the *General* block contains parameters for setting the default rendering style for SEXTANTE layers (that is, layers generated by using algorithms from any of the SEXTANTE components). Just create the style you want using QGIS, save it to a file, and then enter the path to that file in the settings so SEXTANTE can use it. Whenever a layer is loaded by SEXTANTE and added to the QGIS canvas, it will be rendered with that style.

Rendering stlyes can be configured individually for each algorithm and each one of its outputs. Just right-click on the name of the algorithm in the toolbox and select *Edit rendering styles*. You will see a dialog like the one shown next.

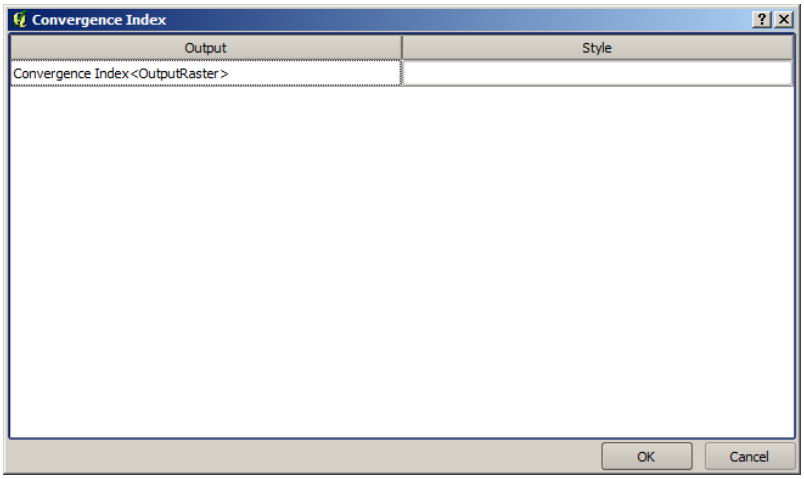


Figure 17.13: Rendering Styles

Select the style file (`.qml`) that you want for each output and press **[OK]**.

Other configuration parameters in the *General* group are explained below:

- **Use filename as layer name**. The name of each resulting layer created by SEXTANTE is defined by the algorithm generating it. In some cases, a fixed name might be used, that meaning that the same 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 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 of them will be used.

Apart from the *General* block in the settings dialog, you will also find one for each algorithm provider. They contain 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, that we will explain later when covering particular algorithm providers.

17.3 SEXTANTE 図形モデラー

17.3.1 はじめに

*図形モデラー*で、シンプルで使いやすいインタフェースを使って複合的なモデルを作成することができます。GIS で操作する際、たいていの解析操作は孤立しておらず、一連の操作の連鎖の一部です。図形モデラーを使用すると、プロセスのチェーンは単一のプロセスにラップすることができ、異なる設定を入力して単一のプロセスを行うよりもより簡単で便利です。どんなに多くのステップと、それに伴い異なるアルゴリズムがあろうと、モデルは単一のアルゴリズムとして実行され、大規模なモデルでは特に、時間と労力を節約できます。

The modeler can be opened from the *SEXTANTE* menu, but also from the toolbox. In the *Modeler* branch of the algorithms tree you will find a group named *Tools*, which contains an entry called *Create new model*.

The modeler has a working canvas where the structure of the model and the workflow it represents are shown. On the left part of the window, a panel with two tabs can be used to add new elements to the model.

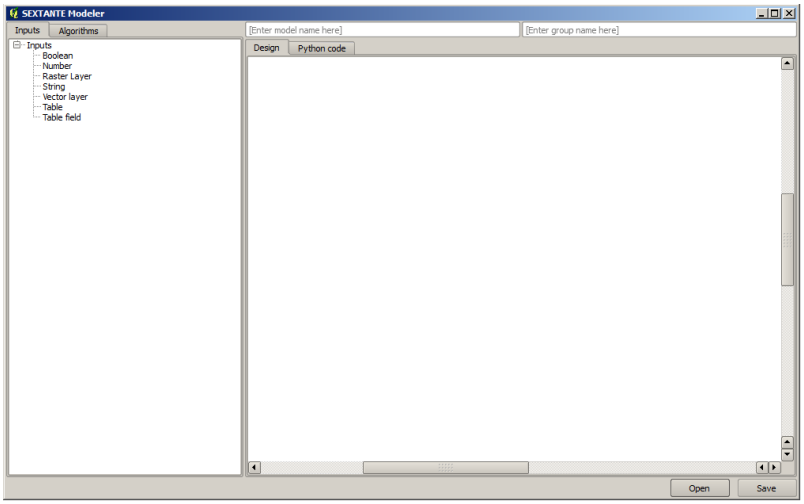


Figure 17.14: Modeler

Creating a model involves two steps:

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 a SEXTANTE algorithm, so the parameters window is generated automatically as it happens with all the algorithms included in SEXTANTE.
2. Definition of the workflow. Using the input data of the model, the workflow is defined adding algorithms and selecting how they use those inputs or the outputs generated by other algorithms already in the model.

17.3.2 Definition of inputs

The first step to create a model is to define the inputs it needs. The following elements are found in the *Inputs* tabs on the left side of the modeler window:

- Raster layer
- Vector layer
- String
- Table field
- Table
- Numerical value
- Boolean value

Double-clicking on any of them, a dialog is shown to define its characteristics. Depending on the parameter itself, the dialog will contain just one basic element (the description, which is what the user will see when executing the

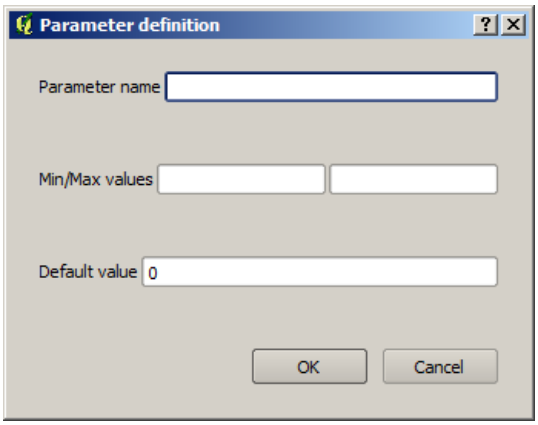


Figure 17.15: Model Parameters

model) or more of them. For instance, when adding a numerical value, as it 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.

For each added input, a new element is added to the modeler canvas.

Figure 17.16: Model Parameters

17.3.3 Definition of the workflow

Once the inputs have been defined, it is time to define the algorithms to apply on them. Algorithms can be found in the *Algorithms* tab, grouped much in the same way as they are in the toolbox.

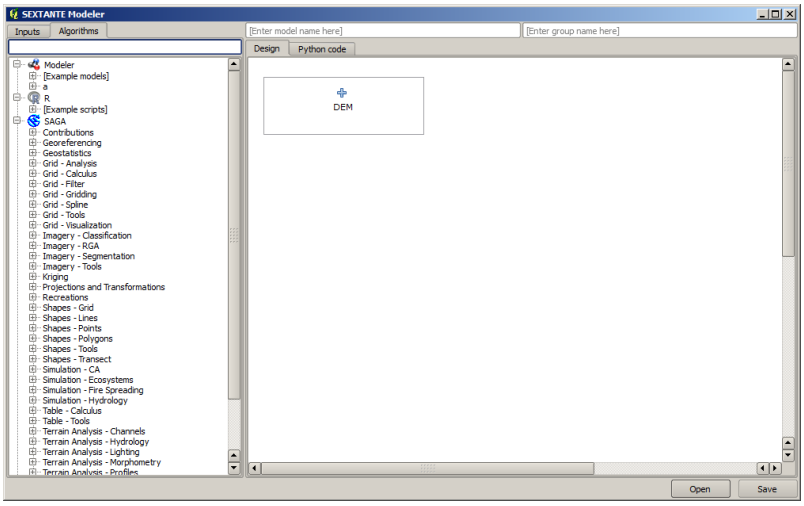


Figure 17.17: Model Parameters

To add an algorithm, double-click on its name. An execution dialog will appear, with a content similar to the one found in the execution panel that SEXTANTE shows when executing the algorithm from the toolbox. the one shown next correspond to the SAGA 'Convergence index' algorithm, the same one we saw in the section dedicated to the SEXTANTE toolbox.

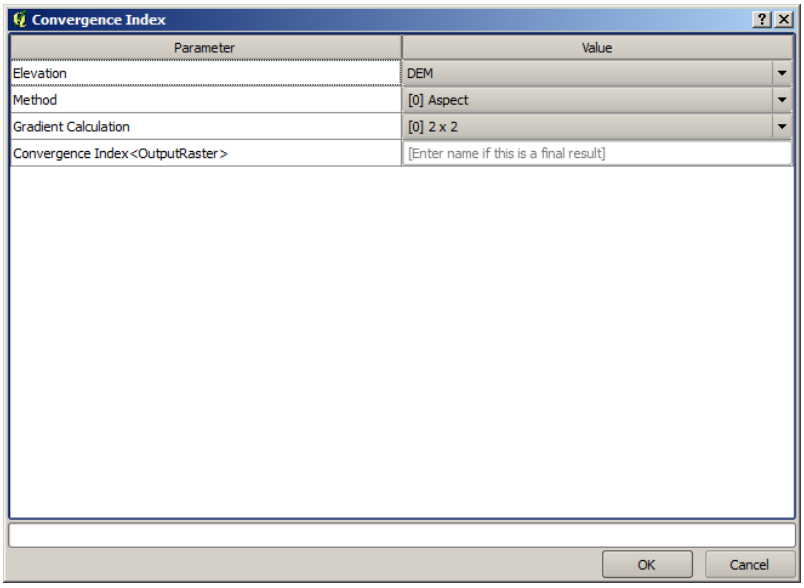


Figure 17.18: Model Parameters

As you can see, some differences exist. Instead of the file output box that was used to set the filepath for output layers and tables, a simple text box is. If the layer generated by the algorithm is 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 textbox. Typing anything on it means that the result is a final one, and the text that you supply will be the description for the output, which will be the one the user will see when executing the model.

Selecting the value of each parameter is also a bit different, since there are importante differences between the context of the modeler and the toolbox one. Let's see how to introduce the values for each type of parameter.

- Layers (raster and vector) and tables. They 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 on the textbox. But this textbox 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. Like 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 of 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 textbox, or use the list to select a table field input already added to the model. The validity of the selected field will be checked by SEXTANTE at run-time.

Once all the parameter 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, which 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 update automatically.

You can run your algorithm anytime clicking on the **[Run]** button. However, in order to use it from the toolbox, it has to be saved and the modeler dialog closed, to allow the toolbox to refresh its contents.

17.3.4 Saving and loading models

Use the **[Save]** button to save the current model and the **[Open]** one to open any model previously saved. Model 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, and it will be used.

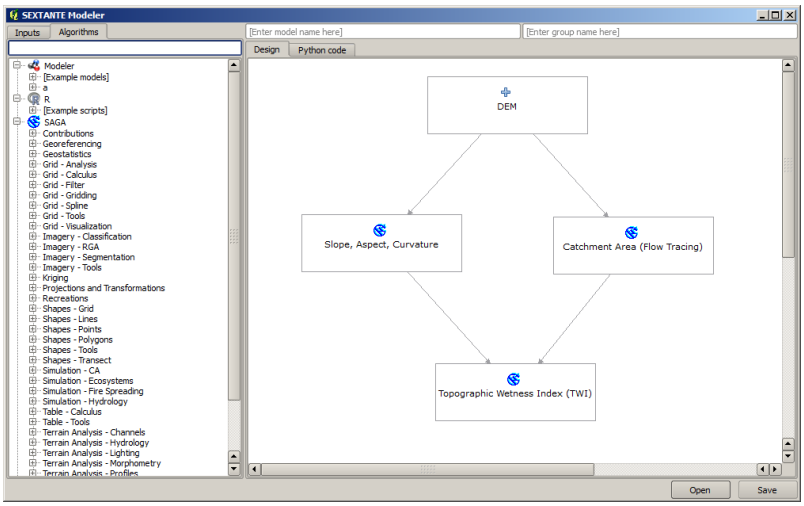


Figure 17.19: Model Parameters

Before saving a model, you have to enter a name and a group for it, using the text boxes in the upper part of the window.

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, SEXTANTE searches the `models` folder for files with `.model` extension and loads the models they contain. Since a model is itself a SEXTANTE algorithm, it can be added to the toolbox just like any other algorithm.

The models folder can be set from the SEXTANTE configuration dialog, under the *Modeler* group.

Models loaded from the models folder appear not only in the toolbox, but also in the algorithms tree in the *Algorithms* tab of the modeler window. That means that you can incorporate a model as a part of a bigger model, just as you add any other algorithm.

In some cases, SEXTANTE might not be able to load a model because it cannot find all the algorithms included in its workflow. If you have used a given algorithm as part of your model, it should be available (that is, it should appear on the toolbox) in order to load that model. Deactivating an algorithm provider in the SEXTANTE 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.

17.3.5 Editing a model

You can edit the model you are currently creating, redefining the workflow and the relationships between the algorithms and inputs that define the model itself.

If you right-click on an algorithm in the canvas representing the model, you will see a context menu like the one shown next:

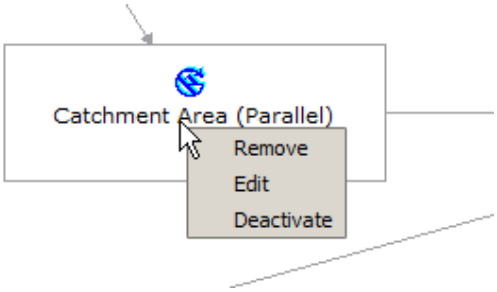


Figure 17.20: Modeler Right Click

Selecting the *Remove* option will cause the selected algorithm to be removed. An algorithm can be removed only if there are no other algorithms dependind on it. That is, if no output from the algorithm is used in a different one as input. If you try to remove an algorithm that has others depending on it, SEXTANTE will show you a warning message like the one you can see below:

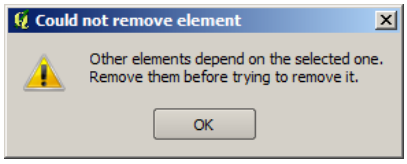


Figure 17.21: Cannot Delete ALG

Selecting the *Edit* option or simply double-clicking on the algorithm icon will show the parameters dialog of the algorithm, so you can change the inputs and parameter values. Not all input elements available in the model will appear in this case as available inputs. Layers or values generated at a more advanced step in the workflow defined by the model will not be available if they cause circular dependencies.

Select the new values and then click on the **[OK]** button as usual. The connections between the model elements will change accordingly in the modeler canvas.

17.3.6 Activating and deactivating algorithms

Algorithms can be deactivated in the modeler, so they will not be executed once the model is run. This can be used to test just a given part of the model, or when you do not need all the outputs it generates.

To deactivate an algorithm, right-click on its icon in the model canvas and select the *Deactivate* option. You will see that the algorithm is represented now with a red label under its name indicating that is not active.

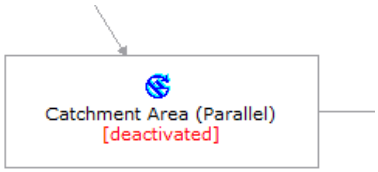


Figure 17.22: Deactivate

All algorithms depending (directly or undirectly) on that algorithm will also appear as inactive, since they cannot be executed now.

To activate an algorithm, just right–click on its icon and select the *Activate* option.

17.3.7 Editing model help files and meta-information

You can document your models from SEXTANTE. Just click on the **[Edit model help]** button and a dialog like the one shown next will appear.

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 those 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 the write its description in the texbox below.

Model help is saved in a file in the same folder as the model itself. You do not have to worry about saving it, since it is done automatically.

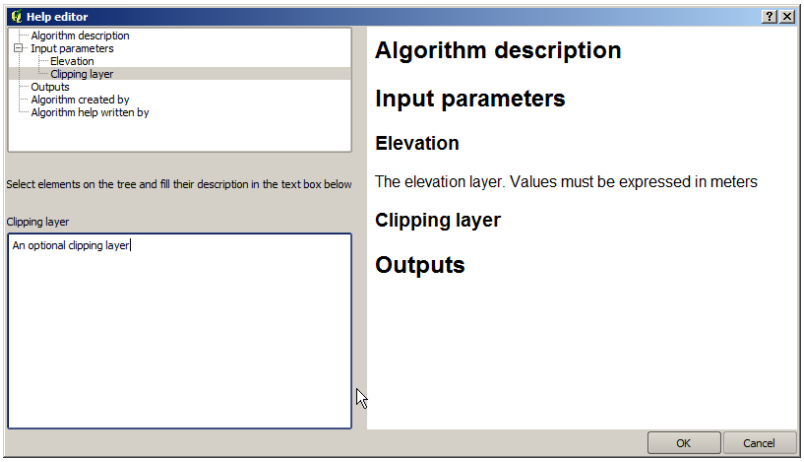


Figure 17.23: Help Edition

17.3.8 About available algorithms

You might notice that some algorithms that can be be executed from the toolbox do not appear in the list of available ones when you are designing a model. To be included in a model, and algorithm must have a correct semantic, so as to be properly linked to other in the workflow. If an algorithm does not have such well-defined semantic (for instance, if the number of output layers cannot be know in advance), then it is not possible to use it within a model, and thus does not appear in the list of them that you can find in the modeler dialog.

Additionaly, you will see some algorithms in the modeler that are not found in the toolbox. This 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 tools is really useful within a model, but outside of that context, it doesn't make too much sense.

17.3.9 SEXTANTE models as Python code

This feature is temporarily unavailable

Along with the tab that contains the graphical design of the model, you will find another one containing a Python script which performs the same task as the model itself. Using that code, you can create a console script (we will explain them later in this same manual) and modify it to incorporate actions and methods not available in the graphical modeler, such as loops or conditional sentences.

This feature is also a very practical way of learning how to use SEXTANTE from the console and how to create SEXTANTE algorithms using Python code, so you can use it as a learning tool when you start creating your own SEXTANTE scripts.

You will find a button below the text field containing the Python code. Click on it to directly create a new script from that code, without having to copy and paste it in the SEXTANTE script editor.

17.4 SEXTANTE バッチプロセシングインタフェース

17.4.1 はじめに

SEXTANTE アルゴリズム（モデルを含む）はバッチプロセスとして実行することができます。すなわち、それらは単一の入力のセットではなく、それらのいくつかを使用して実行でき、必要に応じて何度でもアルゴリズムを実行できます。大量のデータを処理する際には、ツールボックスからアルゴリズムを何回も起動する必要がないので、これは有用です。

To execute an algorithm as a batch process, right-click on its name in the toolbox and select the *Execute as batch process* option in the pop-up menu that will appear.

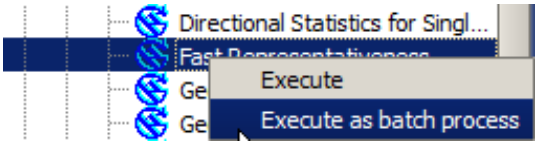


Figure 17.24: Batch Processing Right Click

17.4.2 パラメータテーブル

バッチプロセスの実行は、アルゴリズムの単純な実行と類似しています。パラメータ値を定義しなければならないが、この場合は、各パラメータに単一の値を設定する必要はありません。値は次に示すようなテーブルを使って紹介しています。

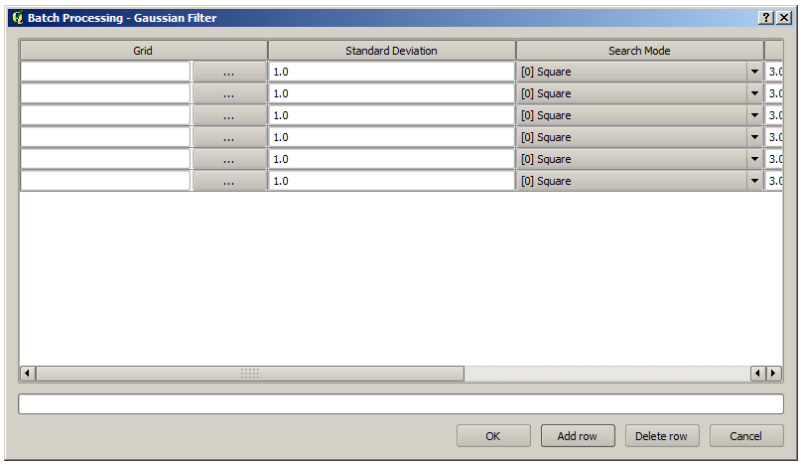


Figure 17.25: Batch Processing

このテーブルの各行はアルゴリズム単一の実行を表し、各セルはパラメータの１つを含みます。これはツールボックスからアルゴリズムを実行する際に表示されるパラメータダイアログと類似しており、配列が異なっています。

デフォるどではテーブルｈは２行のみ含んでいます。ウィンドウの下部にあるボタンを使って、行の追加や削除ができます。

Once the size of the table has been set, it has to be filled with the desired values.

17.4.3 パラメータテーブルの入力

たいていのパラメータで、その値を設定するのは些細なことです。値を直接入力するか、パラメータタイプに応じて、利用可能なオプションのリストから選択するだけです。

主な違いはレイヤやテーブルで代表されるパラメータ、および出力ファイルに対して見られます。入力レイヤとテーブルについて、アルゴリズムがバッチプロセスの一部として実行された時、入力データオブジェクトは、QGIS ですでに開かれたファイルのセットからでなくファイルから直接取得されます。その理由として、任意のアルゴリズムがすでに開かれたデータのないオブジェクトに対してバッチプロセスを実行して、アルゴリズムをツールボックスから実行できません。

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 it represents a multiple input, all the selected files will be added to a single cell, separated by semicolons (;).

ツールボックスからアルゴリズムを実行する時と異なり、出力データオブジェクトは常にファイルとして保存され、一時的にそれを保存することは許可されていません。名称を直接入力するか、添付のボタンをクリックして表示されるファイル選択ダイアログを使用します。

いったんファイルを選択すると、新しいダイアログが同じ列（同じパラメータ）内の他のセルの自動補完を行うために表示されます。

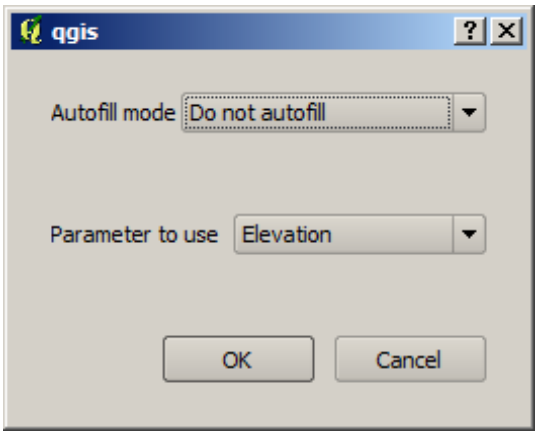


Figure 17.26: Batch Processing Save

If the default value ('Do not autocomplete') is selected, SEXTANTE will just put the selected filename in the selected cell from the parameters table. If any of the other options is selected, all the cells below the selected one will be automatically filled based on a defined criteria. This way, it is much easier to fill the table, and the batch process can be defined with less effort.

自動入力は、単に選択したファイルパスに相関的な番号をを追加するか、同じ行で別のフィールドの値を追加して行うことができます。これは、入力されたものに応じて出力データオブジェクトを命名するのに特に役立ちます。

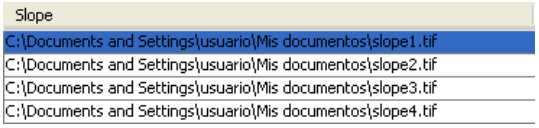


Figure 17.27: Batch Processing File Path

17.4.4 バッチプロセスの実行

To execute the batch process once you have introduced all the necessary values, just click on **[OK]**. SEXTANTE will show the progress of the global batch process in the progress bar in the lower part of the dialog.

17.5 Using SEXTANTE from the console

17.5.1 はじめに

The console allows advanced users to increase their productivity and perform complex operations that cannot be performed using any of the other elements of the SEXTANTE GUI. 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 SEXTANTE console in QGIS, but all SEXTANTE commands are available instead from QGIS built-in Python console. That means that you can incorporate those command to your console work and connect SEXTANTE algorithms to all the other features (including methods from the QGIS API) available from there.

The code that you can execute from the Python console, even if it does call any SEXTANTE method, can be converted into a new SEXTANTE algorithm that you can later call from the toolbox, the graphical modeler or any other SEXTANTE component, just like you do with any other SEXTANTE algorithm. In fact, some algorithms that you can find in the toolbox, like all the ones in the *mmqgis* group, are simple scripts.

In this chapter we will see how to use SEXTANTE from the QGIS Python console, and also how to write your own algorithms using Python.

17.5.2 Calling SEXTANTE from the Python console

The first thing you have to do is to import the SEXTANTE functions with the following line:

```
>>> import sextante
```

Now, there is basically just one (interesting) thing you can do with SEXTANTE from the console: to 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 parameter 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 commandline name. To find the right name for your algorithm, you can use the `algslist()` method. Type the following line in you console:

```
>>> sextante.alglist()
```

You will see something like this.

```
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
...
```

That's a list of all the available algorithms, alphabetically ordered, along with their corresponding command-line names.

You can use a string as a parameter for this method. Instead of returning the full list of algorithm, 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]
```

This result might change depending on the algorithms you have available.

It is easier now to find the algorithm you are looking for and its command-line name, in this case `saga:slopeaspectcurvature`.

Once you know the command-line name of the algorithm, the next thing to do is to know 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. SEXTANTE has a method to describe an algorithm in detail, which can be used to get a list of the parameters that an algorithms require and the outputs that it will generate. To do it, 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.

```
>>> sextante.alghelp("saga:slopeaspectcurvature")
ALGORITHM: Slope, Aspect, Curvature
   ELEVATION <ParameterRaster>
   METHOD <ParameterSelection>
   SLOPE <OutputRaster>
   ASPECT <OutputRaster>
   CURV <OutputRaster>
   HCURV <OutputRaster>
   VCURV <OutputRaster>
```

Now you have everything you need to run any algorithm. As we have already mentioned, there is only one single command to execute algorithms: `runalg()`. Its syntax is as follows:

```
>>> sextante.runalg{name_of_the_algorithm, param1, param2, ..., paramN,
        Output1, Output2, ..., OutputN)
```

The list of parameters and outputs to add depends on the algorithm you want to run, and is exactly the list that the `alghelp()` method gives you, in the same order as shown.

Depending on the type of parameter, values are introduced differently. The next one is 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`.
- Selection. If an algorithm has a selection parameter, the value of that parameter should be entered using an integer value. To know the available options, you can use the `algoptions` command, as shown in the following example:

  ```
  >>> sextante.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 of such such parameters, with 7 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 filepath.
- Table Field from XXX. Use a string with the name of the field to use. This parameter is case-sensitive.
- 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 2D array of value representing the table.

- CRS. Enter the EPSG code number of the desired CRS.
- Extent. You must use a string with `xmin`, `xmax`, `ymin` and `ymax` values separated by commas.

Boolean, file, string and numerical parameters do not need any additional explanations.

Input parameters such as strings booleans or numerical values have default values. To use them, use `None` in the corresponding parameter entry.

For output data objects, type the filepath 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 included in the ones supported by the algorithm, the default file format for that output type will be used, and its corresponding extension appended to the given filepath.

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 it, 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 by SEXTANTE for such task.

The `runalg()` method returns a dictionary with the output names (the ones shown in the algorithm description) as keys and the filepaths of those outputs as values. To add all the outputs generated by an algorithm, pass that dictionary to the `loadFromAlg()` method. You can also load an individual layer passing its filepath to the `load()` method.

17.5.3 Creating scripts and running them from the toolbox

You can create your own algorithms by writing the corresponding Python code and adding a few extra lines to supply additional information needed by SEXTANTE. You can find a *Create new script* 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
ret_slope = sextante.runalg("saga:slopeaspectcurvature", dem, 0, None,
                None, None, None, None)
ret_area = sextante.runalg("saga:catchmentarea(mass-fluxmethod)", dem,
                0, False, False, False, False, None, None, None, None, None)
sextante.runalg("saga:topographicwetnessindex(twi), 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 de 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 sections in this chapter. The first lines, however, need some additional explanation. They provide SEXTANTE the information it needs to turn your code into an algorithm that can be run from any of its 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 SEXTANTE supports in its 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`. 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

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, SEXTANTE will edit it to improve its appearance, replacing low hyphens with blankspaces. 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 `sextante.getObjectFromUri()` function. Multiple inputs also have a string value, which contains the filepaths to all selected object, 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`

The value assigned to the output variables is always a string with a filepath. It will correspond to a temporary filepath in case the use has not entered any output filename.

When you declare an output, SEXTANTE will try to add it to QGIS once the algorithm 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
```

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.

If you 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.

Several examples are provided with SEXTANTE. Please, check them to see real examples of how to create algorithms using this feature of SEXTANTE. You can right-click on any script algorithm and select *Edit script* to edit its code or just to see it.

17.5.4 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.

17.6 The SEXTANTE history manager

17.6.1 SEXTANTE history

SEXTENTE アルゴリズムを実行するたびに、プロセスに関する情報が SEXTENTE history manager の中に保存されます。使用されるパラメータと共に、実行した日時も保存されます。

この方法では、追跡し、SEXTANTE を使用して開発されたすべての作業を制御することが容易であり、簡単に再現することができます。

SEXTANTE history manager は 実行日時にしたがってグルーピングされたレジストリ入力のセットであり、任意の特定の時点で実行されるアルゴリズムの情報を見つけることを容易にします。

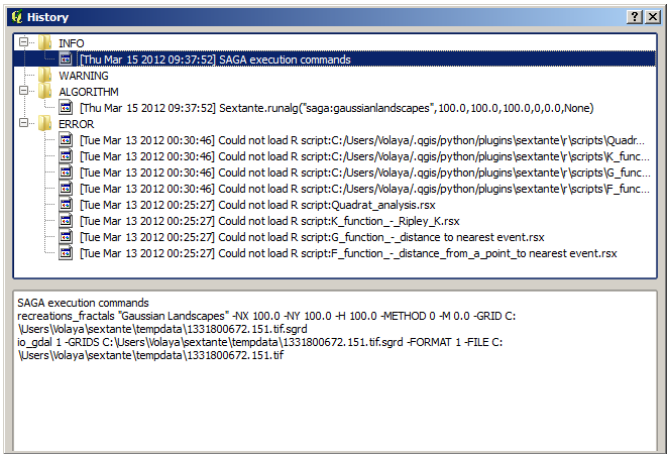


Figure 17.28: History

プロセス情報は、アルゴリズムをツールボックスから起動された場合でも、コマンドライン式として保持されます。ツールボックスを使用してアルゴリズムを呼び出し、それからヒストリーマネージャでコマンドラインから呼び出したアルゴリズムを確認するため、それはコマンドラインインタフェースを使い方を学習するのにも役立ちます。

レジストリ内のエントリは別として、対応するエントリを単にダブルクリックすることで、プロセスを再実行することができます。

Along with algorithm executions, SEXTANTE communicates with the user using 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 SEXTANTE developer to report a bug or error, the information in that group will be very useful for him to find out what is going wrong.

When executing third party algorithms, this is usually done calling their command-line interfaces, which communicate with the user using 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 name '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 *Warning* in case they detect potential problems from that data, in order to warn you about them. Make sure you check those messages in case you are having unexpected results.

17.7 外部アプリケーションの設定

17.7.1 はじめに

SEXTANTE は SEXTANTE 内からそれらを呼び出して、追加のアプリケーションを使用して拡張することができます。現在、SAGA、GRASS、OTB（Orfeo Toolbox）と R は、空間データ分析機能を提供するいくつかの他のコマンドラインアプリケーションと一緒に、サポートされています。外部アプリケーションに依存するアルゴリズムは、独自のアルゴリズムプロバイダによって管理されます。

この章では、これらの追加アプリケーションを含めるための SEXTANTE の設定方法を示し、これらにモドづいたアルゴリズムのいくつかの特定の特徴を説明します。いったんシステムを正しく構成すると、あなたが他の SEXTANTE の geoalgorithm で行うと同じように、toolbox または graphical modeler のような SEXTANTE コンポーネントから外部のアルゴリズムを実行することができるようになります。

By default, all algorithms that rely on an external appplication not shipped with QGIS are not enabled. You can enable them in the SEXTANTE configuration dialog. Make sure that the corresponding application is already installed in your system. Enabling an algorithm provider without installing the application it needs will cause the algorithms to appear in the toolbox, but an error will be thrown when you try to execute them.

This is because the algorithm descriptions (needed to create the parameters dialog and give SEXTANTE the information it needs about the algorithm) are not included with each appllication, but with SEXTANTE instead. That is,they are part of SEXTANTE, 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.

A note on file formats

When using an external software, opening a file in QGIS does not mean that it can be opened and processed as well on that other software. In most cases, it can read what you have opened in QGIS, but in some cases, that might not be the case. When using databases or uncommon file formats, whether for raster of vector layers, problems might arise. If that happens, try to use well known file formats that you are sure that are understood by both programs, and check to console output (in the history and log dialog) for knowing more about what is going wrong.

Using GRASS raster layers is, for instance, one case in which you might have trouble and not be able to complete your work if you call an external algorithm using such a layer as input. For this reason, these layers will not appear as available to SEXTANTE algorithms (we are currently working on solving this, and expect to have it ready soon).

You should, however, find no problems at all with vector layers, since SEXTANTE automatically converts from the original file format to one accepted by the external application before passing the layer to it. This adds an extra processing time, which might be significant if the layer has a large size, so do not be surprised if it takes more to process a layer from a DB connection that one of a similar size stored in a shapefile.

Providers not using external applications can process any layer that you can open in QGIS, since they open it for analysis trough QGIS.

Regarding output formats, raster layers can be saved as TIFF (`.tif`) files, while vector layers are saved as shapefiles (`.shp`). These have been chosen as the 'lingua franca' between supported third party applications and QGIS. If the output filename that you select is not one of the above, it will be modified, adding the corresponding suffix, and the default file format will be used.

In the case of GDAL, the number of supported output formats is larger. When you open the file selection dialog, you will see that you have more formats (and their corresponding extensions available). For more information about which formats are supported, check the GDAL documentation.

A note on vector layer selections

By default, when an external algorithm takes a vector layer, it will use all its features, even if a selection exist in QGIS. You can make an external algorithm aware of that selection by checking the *Use selected features in external applications* item in the *General* settings group. When you do so, each time you execute an external algorithm that uses a vector layer, the selected features of that layer will be exported to a new layer, and the algorithm will work with that new layer instead.

Notice that if you select this option, a layer with no selection will behave like a layer with all its features selected, not like an empty layer.

17.7.2 SAGA

SAGA algorithms can be run from SEXTANTE if you have SAGA installed in your system and you configure SEXTANTE properly so it can find SAGA executables. In particular, the SAGA command-line executable is needed to run SAGA algorithms. SAGA binaries are not included with SEXTANTE, so you have to download and install the software yourself. Please check the SAGA website at for more information. SAGA 2.0.8 is needed.

Once SAGA is installed, and if you are running Windows, open the SEXTANTE 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 SEXTANTE.

In case you are using Linux, there is no need to configure that, 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 found where SAGA binaries are located.

About SAGA grid system limitations

Most of SAGA algorithms that require several input raster layers, require them to have the same grid system. That is, to cover the same geographic area and have the same cellsize, so their corresponding grids match. When calling SAGA algorithms from SEXTANTE, you can use any layer, regardless of its cellsize and extent. When multiple raster layers are used as input for a SAGA algorithm, SEXTANTE 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 setting window to do so. There are two ways of setting the target grid system:

- Setting it manually. You define the extent setting the values of the following parameters:
  - Resampling min X
  - Resampling max X
  - Resampling min Y
  - Resampling max Y
  - Resampling cellsize

  Notice that SEXTANTE will resample input layers to that extent, even if they do not overlap with it.

- 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 cellsize of the target layer is the maximum of all cellsizes of the input layers.

For algorithms that do not use multiple raster layers, or for those that do not need a unique input grid system, no resampling is performed before calling SAGA, and those parameters are not used.

Limitations for multi-band layers

Unlike QGIS, SAGA has no support for multiband layers. If you want to use a multiband layer (such as an RGB or multispectral image), you first have to split it into singlebanded images. To do so, you can use the 'SAGA/Grid - Tools/Split RGB image' algorithm (which creates 3 images from an RGB image) or the 'SAGA/Grid - Tools/Extract band' algorithm (to extract a single band).

Limitations in cellsize

SAGA assumes that raster layers have the same cellsize in the X and Y axis. If you are working with a layer with different values for its horizontal and vertical cellsizes, you might get unexcepted results. In this case, a warning will be added to the SEXTANTE log, indicating that an input layer might not be suitable to be processed by SAGA.

Logging

When SEXTANTE calls SAGA, it does it using its command-line interface, thus passing a set of commands to perform all the required operation. SAGA show its progress by writing information to the console, which includes the percentage of processing already done, along with additional content. This output is filtered by SEXTANTE and used to update the progress bar while the algorithm is running.

Both the commands sent by SEXTANTE and the additional information printed by SAGA can be logged along with other SEXTANTE log messages, and you might find them useful to track in detailed what is going on when SEXTANTE runs a SAGA algorithm. You will find two settings, namely *Log console output* and *Log execution commands* to activate that logging mechanism.

Most other providers that use an external application and call it through the command-line have similar options, so you will find them as well in other places in the SEXTANTE settings list.

17.7.3 R and R scripts

R integration in SEXTANTE 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 chapter dedicated to SEXTANTE scripts. This chapter shows you the syntax to use to call those R commands from SEXTANTE and how to use SEXTANTE objects (layers, tables) in them.

The first thing you have to do, as we saw in the case of SAGA, is to tell SEXTANTE where you R binaries are located. You can do so using the *R folder* entry in the SEXTANTE configuration dialog. Once you have set that parameter, you can start creating your own R scripts and executing them.

Once again, this is different in Linux, and you just have to make sure that the R folder is included in the PATH environment variable. If you can start R just typing `R` in a console, then you are ready to go.

To add a new algorithm that calls an R function (or a more complex R script that you have developed and you would like to have available from SEXTANTE), you have to create a script file that tells SEXTANTE how to perform that operation and the corresponding R commands to do so.

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 SEXTANTE settings dialog), just like you do with the folder for regular SEXTANTE scripts.

Let 's have a look at a very simple file 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 belong to the `maptools` package. Since almost all the algorithms that you might like to incorporate into SEXTANTE will use or generate spatial data, knowledge of spatial packages like `maptools` and, specially, `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 SEXTANTE the inputs of the algorithm described in the file and the outputs that it will generate. They work exactly with the same syntax as the SEXTANTE scripts that we have already seen, so they will not be described here again. Check the corresponding section for more information.

When you declare an input parameter, SEXTANTE 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 be later used as input for R commands.

In the above example, we are declaring an input of type `vector` named `polyg`. When executing the algorithm, SEXTANTE 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 `readGDAL()` commands (you do not have to worry about adding those commands to your description file, SEXTANTE will do it) and 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 in R.

Knowing that, we can now understand the first line of our example script (the first line not starting with a Python comment).

```
pts=spsample(polyg,numpoints,type="random")
```

The variable `polygon` already contains a `SpatialPolygonsDataFrame` object, so it can be used to call the `spsample` method, just like the `numpoints` one, which indicates the number of points to add to the created sample grid.

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 contains a suitable value.

In this case, the result obtained from the `spsample` method has to be converted explicitly into a `SpatialPointsDataFrame` object, since it is itself an object of class `ppp`, which is not a suitable class to be retuned to SEXTANTE.

If you algorithm does not generate any layer, but a text result in the console instead, you have to tell SEXTANTE 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 algorithms 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 ot 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 SEXTANTE).

If your algorithm creates any kind of graphics (using the `plot()` method), add the following line:

```
##showplots
```

This will cause SEXTANTE to redirect all R graphical outputs to a temporary file, which will be later opened once R execution has finished.

Both graphics and console results will be shown in the SEXTANTE results manager.

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 ones.

17.7.4 GRASS

Configuring GRASS is not much different from configuring SAGA. First, the path to the GRASS folder has to be defined, but only if you are running Windows. Additionaly, a shell interpreter (usually `msys.exe`, which can be found in most GRASS for Windows distributions) has to be defined and its path set up as well.

By default, SEXTANTE 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 do it manually. Also, if you want to use a different GRASS version, you can change that setting and point to the folder where that other version is kept. GRASS 6.4 is needed for algorithms to work correctly.

If you are running Linux, you just have to make sure that GRASS is correctly installed, and that it can be run without problem from a console.

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 this is the behaviour you prefer, just check the *Use min covering region* option in the GRASS configuration parameters.

GRASS includes help files describing each algorithm. If you set the *GRASS help folder* parameter, SEXTANTE will open them when you use the **[Show help]** button from the parameters window of the algorithm.

The last parameter that has to be configured is related to the mapset. A mapset is needed to run GRASS, and SEXTANTE creates a temporary one for each execution. You have to tell SEXTANTE if the data you are working with uses geographical (lat/lon) coordinates or projected ones.

17.7.5 GDAL

No additional configuration is needed to run GDAL algorithms, since it is already incorporated to QGIS and SEXTANTE can infere its configuration from it.

17.7.6 Orfeo ToolBox

Orfeo ToolBox (OTB) algorithms can be run from SEXTANTE if you have OTB installed in your system and configured SEXTANTE properly so it can find all necessary files (command-line tools and libraries). Please note that OTB binaries are not included in SEXTANTE, 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 SEXTANTE configuration dialog and configure 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 path to the folder where OTB command-line tools and libraries are installed:

- usually *OTB applications folder* point to `/usr/lib/otb/applications` and *OTB command line tools folder* is `/usr/bin`

- if you use OSGeo4W installer, than 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*

17.7.7 TauDEM

To use this provider you need to install TauDEM command line tools.

Windows

Please visit TauDEM homepage for installation instructions and precompiled binaries for 32bit and 64bit systems. **IMPORTANT**: you need TauDEM 5.0.6 executables, version 5.2 currently not supported.

Linux

There are no packages for most Linux distribution, so you should compile TauDEM by yourself. As TauDEM uses MPICH2, first install it using your favorite package manager. Also TauDEM works fine with OpenMPI, so you can use it instead of MPICH2.

Download TauDEM 5.0.6 source code and extract files in some folder.

Open `linearpart.h` file and add after line

```
#include "mpi.h"
```

add new line with

```
#include <stdint.h>
```

so you'll get

```
#include "mpi.h"
#include <stdlib.h>
```

Save changes and close file. Now open `tiffIO.h`, find line `#include "stdint.h"` and replace quotes (`""`) with <>, so you'll get

```
#include <stdint.h>
```

Save changes and close file. Create build directory and cd into it

```
mkdir build
cd build
```

Configure your build with command

```
CXX=mpicxx cmake -DCMAKE_INSTALL_PREFIX=/usr/local ..
```

and then compile

```
make
```

Finaly, to install TauDEM into `/usr/local/bin`, run

```
sudo make install
```

Chapter 18

プリントコンポーザ

The print composer provides growing layout and printing capabilities. It allows you to add elements such as the QGIS map canvas, legend, scalebar, images, basic shapes, arrows and text labels. 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 individual on your system). You can save the layout as template and load it again in another session. See a list of tools in table_composer_1:

アイコン	目的	アイコン	目的
	テンプレートからロードする		テンプレートとして保存する
	イメージ画像として出力する		PDF 型式で出力する
	SVG として出力する		印刷または Postscript として出力する
	全域表示		拡大
	縮小		再読み込み
	アンドゥ		最後の変更を元に戻す
	QGIS マップキャンバスから新規地図を追加する		印刷構成にイメージ画像を追加
	印刷構成にラベルを追加		印刷構成に新規凡例を追加
	印刷構成に新規スケールバー追加		印刷構成に基本図形を追加
	印刷構成に矢印を追加		印刷構成に属性テーブルを追加
	印刷構成でアイテムを選択/移動する		アイテム内のコンテンツを移動する
	印刷構成内のアイテムをグループ化する		印刷構成内のアイテムグループを解除する
	アイテムを前面に移動		選択アイテムを背面に移動
	選択アイテムを最前面に移動		選択アイテムを最背面に移動
	選択アイテムを左側で整列		選択アイテムを右側で整列
	選択アイテムを中央合わせで整列		選択アイテムを水平方向の中央で整列
	選択アイテムを上側線で整列		選択アイテムを下側線で整列

Table Composer 1: プリントコンポーザツール

すべてのプリントコンポーザツールはメニューから利用でき, かつツールバーのアイコンから利用できます. ツールバーはマウスがツールバーの上にあるときにマウス右ボタンで表示と非表示を切り替えできます.

18.1 新しいプリントコンポーザテンプレートを開く

プリントコンポーザで作業を開始する前にいくつかのラスタまたはベクタレイヤを QGIS マップキャンバスにロードして必要に応じてプロパティを設定しておく必要があります. すべての描画と描画設定が終わったらツールバーの New Print Composer アイコンをクリックするかメニューの *File* → *New Print Composer* を選択して下さい.

18.2 プリントコンポーザを利用する

プリントコンポーザーを開くと、現在の QGIS マップキャンバス、凡例、スケールバー、画像、基本図形、矢印とテキストが追加できる空白のキャンバスを提供します。Figure_composer_1 は、:guilabel:‘グリッドにスナップ ‘モードですが要素が追加される前のプリントコンポーザーの初期ビューを示します。

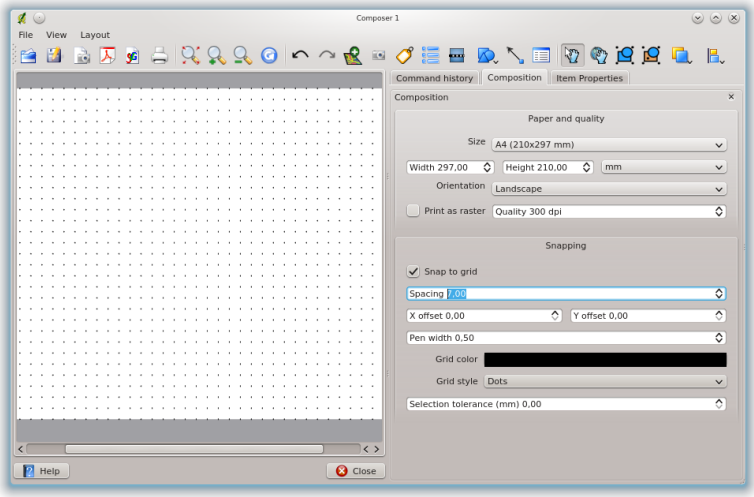


Figure 18.1: Print Composer

プリントコンポーザには 3 個のタブがあります

- The *Composition* tab allows you to set paper size, orientation, the print quality for the output file in dpi and to activate snapping to a grid of a defined resolution. Please note, the *Snap to grid* feature only works, if you define a grid resolution > 0. Furthermore you can also activate the *Print as raster* checkbox. This means all elements will be rastered before printing or saving as Postscript of PDF.
- The *Item Properties* tab displays the properties for the selected map element. Click the Select/Move item icon to select an element (e.g. legend, scalebar or label) on the canvas. Then click the *Item Properties* tab and customize the settings for the selected element.
- 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.

You can add multiple elements to the composer. It is also possible to have more than one map view or legend or scalebar in the print composer canvas. 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.

18.3 カレント QGIS マップキャンバスをプリントコンポーザに追加する

Click on the Add new map toolbar button in the print composer toolbar, to add the QGIS map canvas. Now drag a rectangle on 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:

- **Rectangle** is the default setting. It only displays an empty box with a message 'Map will be printed here'.
- **Cache** renders the map in the current screen resolution. If case you zoom in or out the composer window, the map is not rendered again but the image will be scaled.
- **Render** means, that if you zoom in or out the composer window, the map will be rendered again, but for space reasons, only up to a maximum resolution.

キャッシュ が新規にプリントコンポーザに地図が追加された時のデフォルトプレビューモードです。

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 element frame with the left mouse button. After you found the right place for an element, you can lock the element position within the print composer canvas. Select the map element and click on the right mouse button to Lock the element position and again to unlock the element. You can lock the map element also activating the *Lock layers for map item* checkbox in the *Map* dialog of the *Item Properties* tab.

ノート: QGIS is now able to show labels from the new labeling plugin also in the map composer, but it is not yet scaled correctly. So it might be necessary to switch back to the standard labeling in some cases.

18.3.1 Map item properties tab — Map and Extents dialog

地図ダイアログ

The *Map* dialog of the map *Item Properies* tab provides following functionalities (see figure_composer_2):

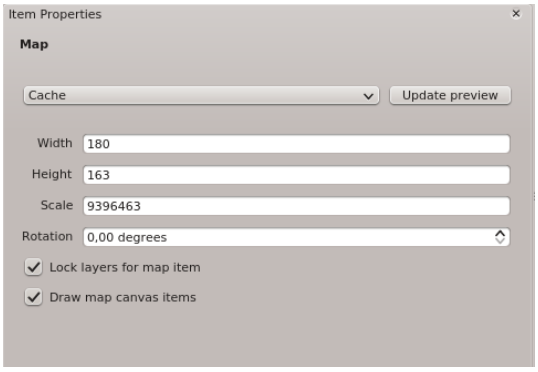


Figure 18.2: Map Dialog

- The **Preview** area allows to define the preview modes 'Rectangle', 'Cache' and 'Render', as described above. Click on the **[Update preview]** button to apply changes to the map view.
- The **Map** area allows to resize the map element specifying the width and height or the scale. The field *Rotation* 1,00 allows to rotate the map element content clockwise in degrees. Note, a coordinate frame can only be added with the default value 0. Furthermore you can enable the checkboxes *Lock layers for map items* and *Draw map canvas items*.

QGIS マップキャンバスにあるビューを拡大縮小やスクロール、ベクタやラスタのプロパティ変更等を行った時に更新したい場合はプリントコンポーザビューで更新したい地図エレメントを選択した後に **[プレビュー更新]** ボタンをクリックして下さい。

領域ダイアログ

The *Extents* dialog of the map item tab provides following functionalities (see Figure figure_composer_3)):

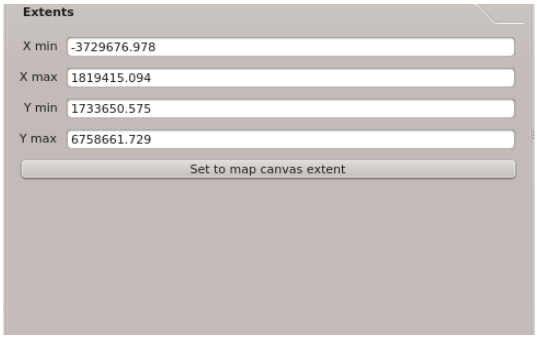


Figure 18.3: Extents Dialog

- The **Map extent** area allow to specify the map extent using Y and X min/max values or clicking the **[Set to map canvas extent]** button.

If you change the view on the QGIS map canvas by zooming or panning or changing vector or raster properties, you can update the print composer view selecting the map element in the print composer and clicking the **[Update preview]** button in the map *Item Properties* tab (see Figure figure_composer_2 a)).

18.3.2 Map item properties tab — Grid and General options dialog

グリッドダイアログ

The *Grid* dialog of the map *Item Properties* tab provides following functionalities (see Figure_composer_4):

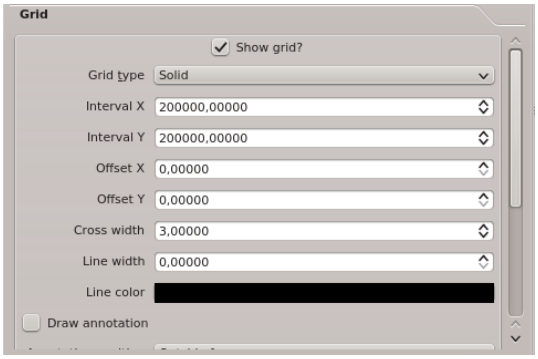


Figure 18.4: Grid Dialog

- **グリッドを表示しますか** チェックボックスでは地図エレメントにオーバーレイするグリッドを有効にします。グリッドタイプとしてソリッドラインと十字を選択できます。 その上 X と Y 方向の間隔、X と Y のオフセット、幅の十字またはライングリッドタイプについて指定できます。
- **注記を描画する** チェックボックスでは地図フレームに座標を追加できます。注記は地図フレームの内側または外側に描画できます。注記の描画方向は水平、垂直、水平と垂直、または外枠の方向が指定できます。 またグリッドの色、注記のフォント、地図フレームから注記への距離、描画する座標の精度を指定できます。

一般情報 オプション ダイアログ

The *General options* dialog of the map *Item Properties* tab provides following functionalities (see Figure_composer_5):

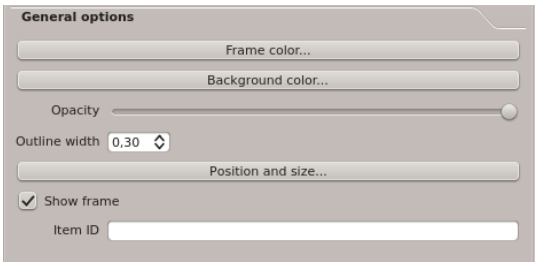


Figure 18.5: General Options Dialog

- Here you can define color and outline width for the element frame, set a background color and opacity for the map canvas. The **[Position and size]** button opens the *Set item position* dialog and allows to set the map canvas position using reference points or coordinates. Furthermore you can select or unselect to display the element frame with the *Show frame* checkbox. With the *Item ID* you can create a relationship to the other print composer items.

18.4 プリントコンポーザに他のエレメントを追加する

プリントコンポーザにカレント QGIS マップキャンバスを追加することに加えて凡例、スケールバー、イメージ、ラベルエレメントについて追加、位置の設定、移動、カスタマイズが可能です。

18.4.1 Label item properties tab - Label and General options dialog

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 their appearance in the label *Item Properties* tab.

ラベルダイアログ

The *Label* dialog of the label item tab provides following functionalities:

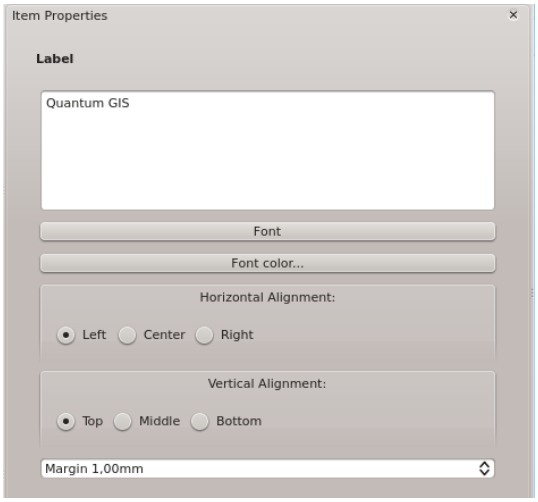


Figure 18.6: Label Options Dialog

- The *Label* dialog offers to add text labels to the composer canvas. You can define the horizontal and vertical alignment, select font and font color for the text and it is possible to define a text margin in mm.

一般情報 オプション ダイアログ

The *General options* dialog of the label *Item Properties* tab provides following functionalities:

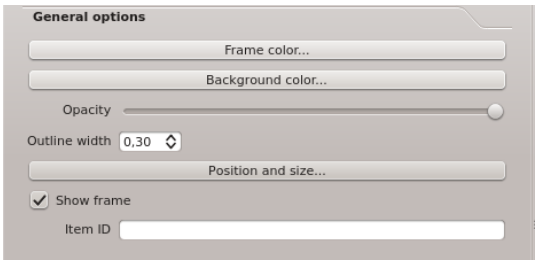


Figure 18.7: General Options Dialog

- Here you can define color and outline width for the element frame, set a background color and opacity for the label. The *Position* button opens the *Set items position* dialog and allows to set the map canvas position using reference points or coordinates. Furthermore you can select or unselect to display the element frame with the *Show frame* checkbox. Use the *Item ID* to create a relationship to other print composer items.

18.4.2 Image item properties tab - Picture options and General options dialog

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 their appearance in the image *Item Properties* tab.

ピクチャオプションダイアログ

The *Picture options* dialog of the image *Item Properties* tab provides following functionalities (see figure_composer_5 a):

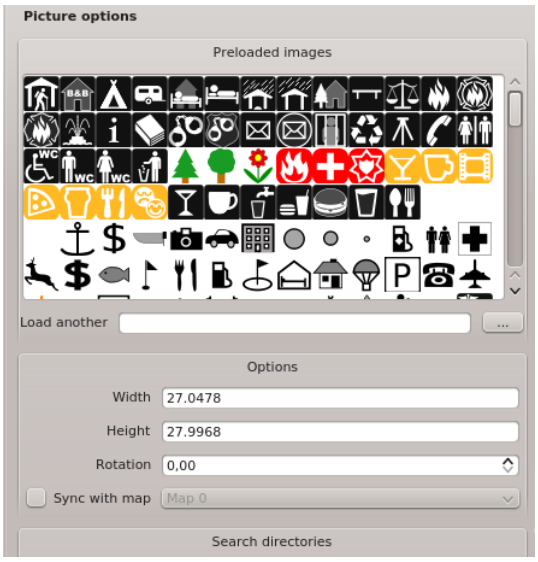


Figure 18.8: Picture Options Dialog Dialog

- The **Preloaded Images** field then shows all pictures stored in the selected directories.
- The **Options** area shows the current selected picture and allows to define width, height and clockwise rotation of the picture. It is also possible to add a user specific SVG path. 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.

- **ディレクトリ検索**エリアでは、ピクチャデータベースの SVG フォーマットのイメージのディレクトリを追加したり削除することができます。

一般情報 オプション ダイアログ

The *General options* dialog of the image *Item Properties* tab provides following functionalities:

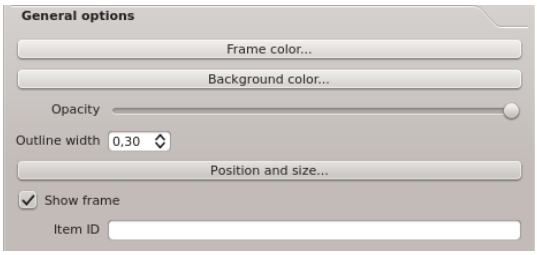


Figure 18.9: General Options Dialog Dialog

- Here you can define color and outline width for the element frame, set a background color and opacity for the picture. The **[Position and size]** button opens the *Set item position* dialog and allows to set the map canvas position using reference points or coordinates. Furthermore you can select or unselect to display the element frame with the *Show frame* checkbox. With the *Item ID* you can create a relationship to other print composer items.

18.4.3 Legend item properties tab - General, Legend items and Item option dialog

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 their appearance in the legend *Item Properties* tab.

一般情報 ダイアログ

The *General* dialog of the legend item tab provides following functionalities (see figure_composer_10):

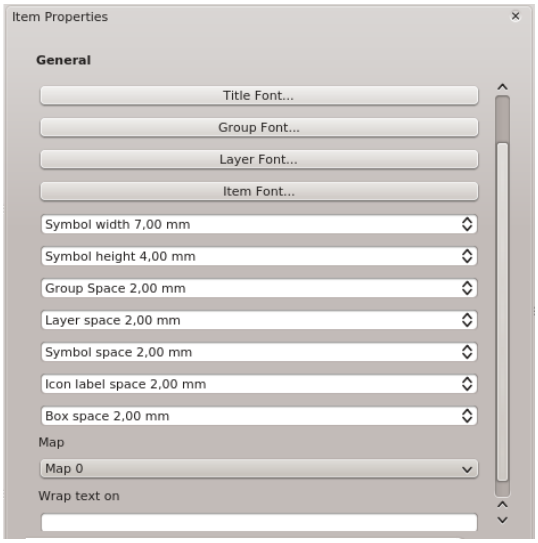


Figure 18.10: General Dialog

- Here you can adapt the legend title. You can change the font of the legend title, layer and item name. You can change width and height of the legend symbol and you can add layer, symbol, icon label and box space. Since QGIS 1.8, you can wrap the text of the legend title to a given character.

凡例アイテムダイアログ

The *Legend items* dialog of the legend *Item Properties* tab provides following functionalities (see figure_composer_11):

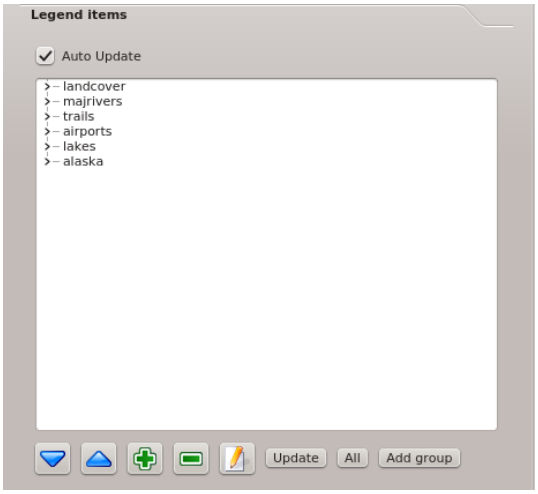


Figure 18.11: Legend Items Dialog

- The legend items window lists all legend items and allows to change item order, edit layer names, remove and restore items of the list. 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. The item order can be changed using the **[Up]** and **[Down]** buttons or with 'drag and drop' functionality.

一般情報 オプション ダイアログ

The *General options* dialog of the legend *Item Properties* tab provides following functionalities (see figure_composer_12):

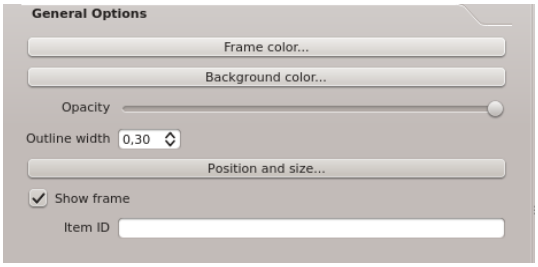


Figure 18.12: General Options Dialog

- Here you can define color and outline width for the element frame, set a background color and opacity for the legend. The **[Position and size]** button opens the *Set item position* dialog and allows to set the map canvas position using reference points or coordinates. Furthermore you can select or unselect to display the element frame with the *Show frame* checkbox. Use the *Item ID* to create a relationship to other print composer items.

18.4.4 Scalebar item properties tab - Scalebar and General options dialog

To add a scalebar, click the Add new scalebar icon, place the element with the left mouse button on the print composer canvas and position and customize their appearance in the scalebar *Item Properties* tab.

スケールバーダイアログ

The *Scalebar* dialog of the scalebar *Item Properties* tab provides following functionalities (see figure_composer_13):

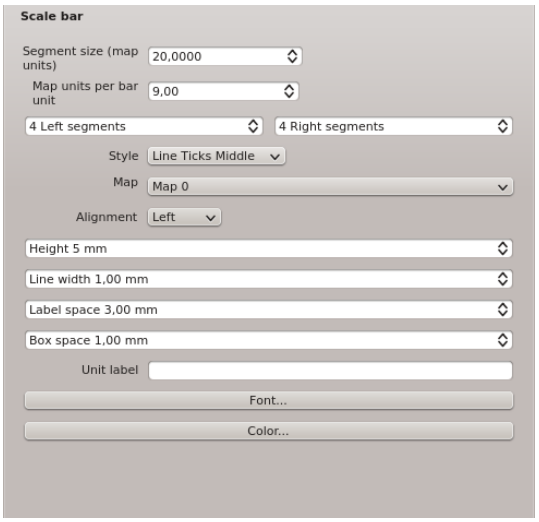


Figure 18.13: Scalebar Options Dialog

- The *Scalebar* dialog allows to define the segment size of the scalebar in map units, the map units used per bar units, and how many left and right segments units from 0 should be used.
- スケールバーのスタイルを指定できます。スタイルとしてはシングルとダブルボックス、ライン目盛を真ん中、上、下に置くかと数字のスタイルの指定ができます。
- Furthermore you can define height, line width, label and box space of the scalebar. Add a unit label and define the scalebar font and color.

一般情報 オプション ダイアログ

The *General options* dialog of the scalebar *Item Properties* tab provides following features (see figure_composer_7 b)):

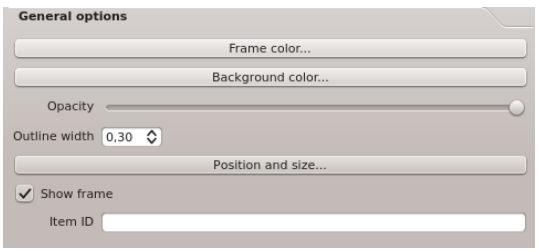


Figure 18.14: General Options Dialog

- Here you can define color and outline width for the element frame, set a background color and opacity for the scalebar. The **[Position and size]** button opens the *Set items position* dialog and allows to set the map canvas position using reference points or coordinates. Furthermore you can select or unselect to display the element frame with the *Show frame* checkbox. With the *Item ID* you can create a relationship to the other print composer items.

18.5 ナブゲーションツール

プリントコンポーザの地図ナビゲーションのためには 4 個のツールが提供されています:

- ズームイン

- ズームアウト
- 全域へズーム
- 表示のリフレッシュ (もしビューの状態が地図と食い違っている場合)

18.6 取り消しと再実行ツール

レイアウト処理中に、変更の取り消しと再実行することが可能である。これは、取り消しと再実行ツールで行うことができます：

- 最後の変更を戻す
- 最後の変更を元に戻す

あるいは :guilabel:‘コマンドヒストリ ‘タブでマウスクリックします (figure_composer_9 を参照)。

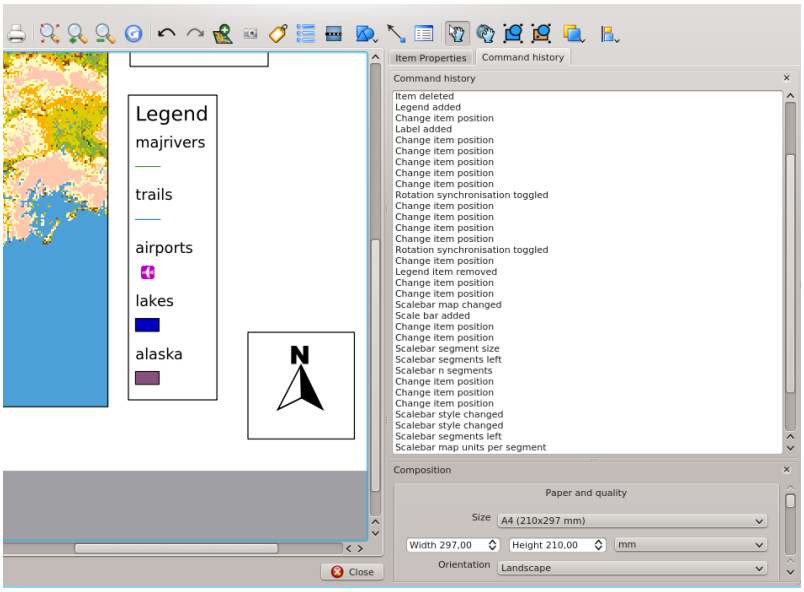


Figure 18.15: Command history in the Print Composer

18.7 基本図形と矢印の追加

プリントコンポーザキャンバスに基本図形 (楕円, 四角形, 三角形) と矢印を追加できます。

The *Shape* dialog allows to draw an ellipse, rectangle, or triangle in the print composer canvas. You can define its outline and fill color, the outline width and a clockwise rotation.

The *Arrow* dialog allows to draw an arrow in the print composer canvas. You can define color, outline and arrow width and it is possible to use a default marker and no marker and a SVG marker. For the SVG marker you can additionally add a SVG start and end marker from a directory on your computer.

18.8 属性テーブル値の追加

ベクタ属性値のテーブルをプリントコンポーザキャンバスに追加することができます。

テーブルダイアログ

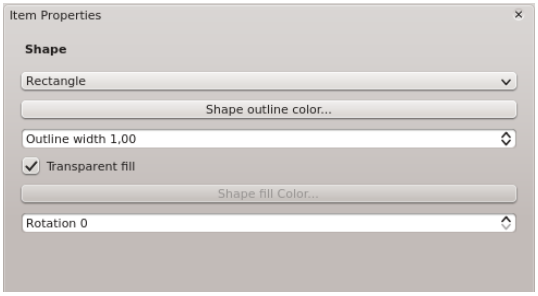


Figure 18.16: Shape Dialog

Figure 18.17: Arrow Dialog

The *Table* dialog of the attribute table item tab provides following functionalities (see figure_composer_20):

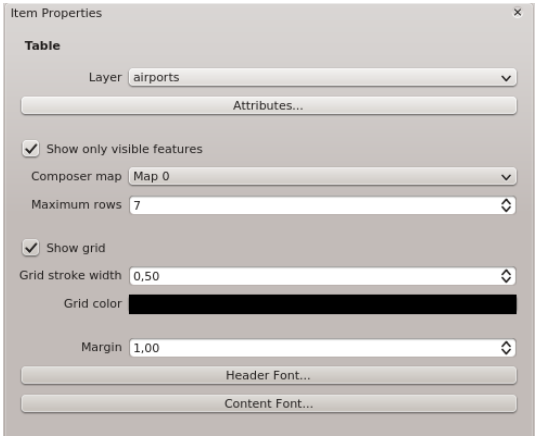


Figure 18.18: Table Dialog

- The *Table* dialog allows to select the vector layer and columns of the attribute table. Attribute columns can be sorted and you can define to show its values ascending or descending.
- 最大表示行数を指定することができます。また現在のコンポーザキャンパスに表示されている地物の属性のみを表示するように指定できます。
- さらにテーブルとヘッダと内容のフォントのようなグリッドの性質を指定することができます。

一般情報 オプション ダイアログ

The *General options* dialog of the attribute table item tab provides following functionalities (see figure_composer_21):

- Here you can define color and outline width for the element frame, set a background color and opacity for the table. The **[Position and size]** button opens the *Set item position* dialog and allows to set the map

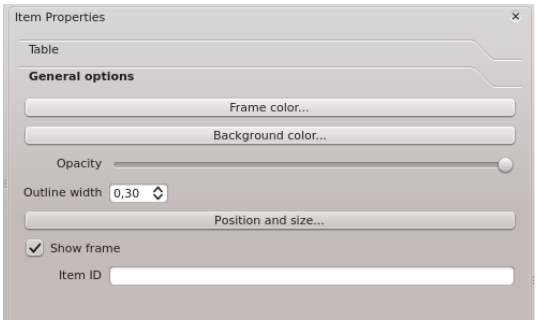


Figure 18.19: General Options Dialog

canvas position using reference points or coordinates. Furthermore you can select or unselect to display the element frame with the *Show frame* checkbox. Use the Item ID to create a relationship to the other print composeritems.

18.9 エレメントの前面移動, 背面移動、整列

エレメントの前面移動または背面移動機能は :sup:‘選択したアイテムを上へ‘プルダウンメニューの中にあります。プリントコンポーザキャンバス内のエレメントを選択して、選択したエレメントと他のエレメントの位置関係を比較して前面移動または背面移動の機能を選択してください (table_composer_1 を参照)。

There are several alignment functionalities available within the Align selected items pulldown 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 will then be aligned within to their common bounding box.

18.10 出力の作成

Figure_composer_22 shows the print composer with an example print layout including each type of map element described in the sections above.

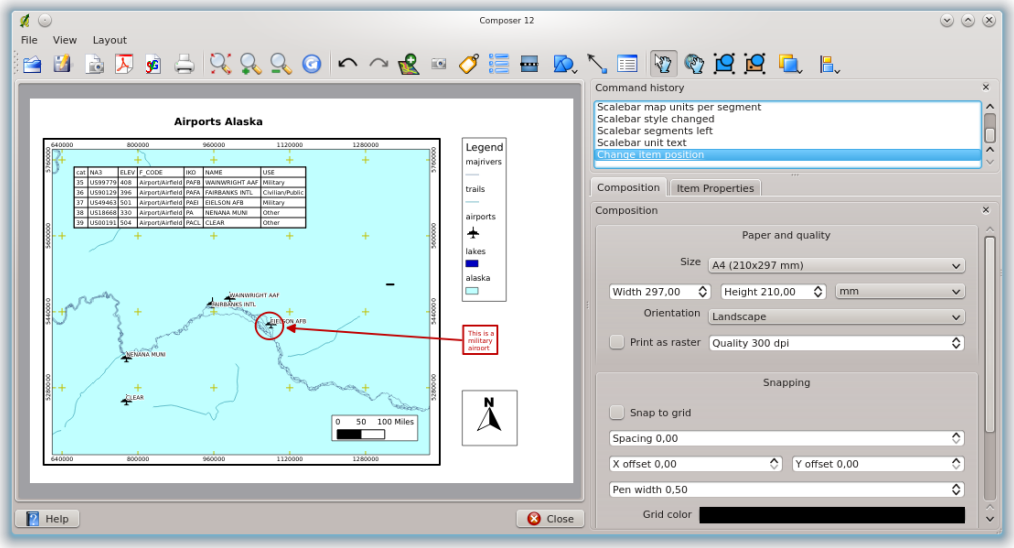


Figure 18.20: Print Composer with map view, legend, scalebar, coordinates and text added

プリントコンポーザでは多彩な種類の出力形式を利用でき、それぞれの解像度（印刷品質）と紙のサイズを指定できます:

- 印刷 アイコンを使うと接続されたプリンタかインストールされているプリンタドライバに依存した Postscript ファイルを出力し、レイアウトを印刷することができます。
- The Export as image icon exports the composer canvas in several image formats such as PNG, BPM, TIF, JPG,...
- :sup:‘PDF として出力 ‘では定義されているプリントコンポーザを PDF に直接出力します。
- :sup:‘SVG として出力 ‘アイコンを使うとプリントコンポーザキャンバスを SVG (Scalable Vector Graphic) として保存できます。

ノート: 現状の SVG 出力は 基本的機能しか実装していません。これは QGIS の問題ではなく,Qt ライブラリが内包する問題です。 この問題が将来のバージョンで整うことを期待しています。

18.11 プリントコンポーザレイアウトの保存とロード

With the Save as template and Load 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 *File* → *Composer Manager* allows to add a new composer template or to manage already existing templates.

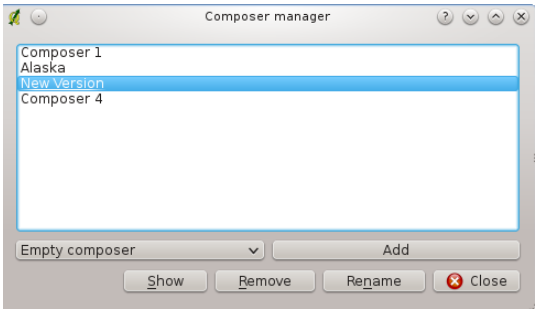


Figure 18.21: The Print Composer Manager

Chapter 19

プラグイン

19.1 QGIS プラグイン

QGIS はプラグインアーキテクチャで設計されています. これによって新しい特徴や機能をアプリケーションに簡単に追加することが可能です. 実際に QGIS の多くの機能は **コア** または**外部プラグイン** によって実装されています.

- **コアプラグイン** は QGIS 開発チームによって保守されていて QGIS のディストリビューションの一部を構成しています. これらは C++ または Python という 2 種類の言語で書かれています. コアプラグインについての詳細な情報はセクション *QGIS* **コアプラグインの利用方法** に記述されています
- **外部プラグイン**は現在のところすべて Python で書かれています. 外部プラグインは, 外部のリポジトリに保存されており, 各製作者によってメンテナンスされています. 外部プラグインは, プラグインインストーラーで QGIS に追加することができます. 外部プラグインについての詳細は, :ref:‘外部プラグインの読み込み ‘セクションを参照してください.

19.1.1 プラグインの管理

プラグインの管理とは:guilabel:**プラグインマネージャ ‘を使ってプラグインを読み込んだり削除したりすることです. 外部プラグインは** *Python* **プラグインインストーラを使ってインストールして有効化でき, またアンインストールできます. 外部プラグインを無効化したり再度有効化するためには***:guilabel:‘***プラグインマネージャ** を再度利用します.

QGIS コアプラグインをロードする

QGIS コアプラグインはメインメニューの:menuselection:‘プラグイン –> プラグインの管理 ‘を起動すると読み込むことができます.

The *Plugin Manager* lists all the available plugins and their status (loaded or unloaded), including all core plugins and all external plugins that have been installed and automatically activated using the *Python Plugin Installer* (see Section *QGIS* **外部プラグインをロードする**). Those plugins that are already loaded have a check mark to the left of their name. Figure_plugins_1 shows the *Plugin Manager* dialog.

特定のプラグインを有効にするには、プラグイン名の左側にあるチェックボックスをクリックし、**[OK]** をクリックします。アプリケーションを終了すると、ロードされたプラグインのリストが保持され、次回 QGIS を実行した場合に、これらのプラグインが自動的にロードされます。

ちなみに: プラグインのクラッシュ

If you find that QGIS crashes on startup, a plugin may be at fault. You can stop all plugins from loading by editing your stored settings file (see *Options* for location). Locate the plugins settings and change all the plugin values to `false` to prevent them from loading.

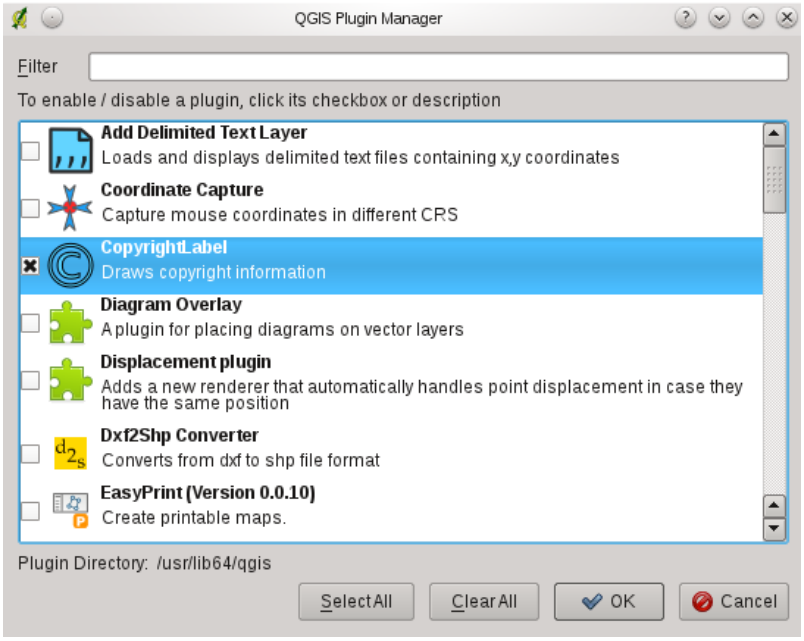


Figure 19.1: Plugin Manager

For example, to prevent the 'Delimited text' plugin from loading, the entry in `$HOME/.config/QuantumGIS/qgis.conf` on Linux should look like this: `Add Delimited Text Layer=false`.

Do this for each plugin in the [Plugins] section. You can then start QGIS and add the plugins one at a time from the *Plugin Manager* to determine which plugin is causing the problem.

QGIS 外部プラグインをロードする

External QGIS plugins are written in Python. They are by default stored in either the 'Official' QGIS Repository, or in various other external repositories maintained by individual authors. The 'Official' QGIS Repository is added by default in *Python Plugin installer*.

Detailed documentation about the usage, minimum QGIS version, homepage, authors, and other important information are provided for the 'Official' QGIS Repository at http://plugins.qgis.org/plugins/. For other external repositories, they might be available with the external plugins themselves. In general it is not included in this manual.

ノート: Updates of core python plugins may be available in this repository as external overlays.

ノート: fTools、 Mapserver Export、プラグインインストーラは Python プラグインであるが、それらは QGIS のソースの一部であり、自動的にロードされ QGIS プラグインマネージャ内で有効です (*QGIS* **外部プラグインをロードする** のセクションを参照すること)。

Currently there are over 150 external plugins available from the 'Official' QGIS Repository. Some of these plugins offer functionality that will be required by many users (for example: providing the user with the ability to view and edit OpenStreetMap data, or to add GoogleMap layers) while others offer very specialized functions (for example: Calculate economic pipe diameters for water supply networks).

しかしながら、提供されたキーワードや名前のリポジトリかつ/またはプラグインの状態（現在システムにインストールされているいない）でフィルタリングすることを用いて、すべての利用可能なプラグインから検索するのは容易なことです。検索とフィルタリングは QGIS Python プラグインインストーラー（ figure_plugins_2 を参照）から行います。

ちなみに: リポジトリを追加する

To add external author repositories, open the Plugin Installer (*Plugins* → *Fetch Python Plugins*), go to the tab *Repositories*, and click **[Add]**. 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.

QGIS に外部プラグインを組み入れるために必要な唯一のステップがあります：

- guilabel:*Python* **プラグインインストーラー** （ ref:‘python_plugin_installer‘を参照) を使用してリポジトリから外部プラグインをダウンロードします。新しい外部プラグインは guilabel:‘プラグインマネージャ‘の利用可能なプラグインのリストに追加され、自動的にロードされます。

QGIS Python プラグインインストーラの利用

In order to download and install an external Python plugin, go to *Plugins* → *Fetch Python Plugins*. The *Plugin Installer* window will appear (figure_plugins_2) with the tab *Plugins*, containing a list of all locally installed Python plugins, as well as plugin available in remote repositories.

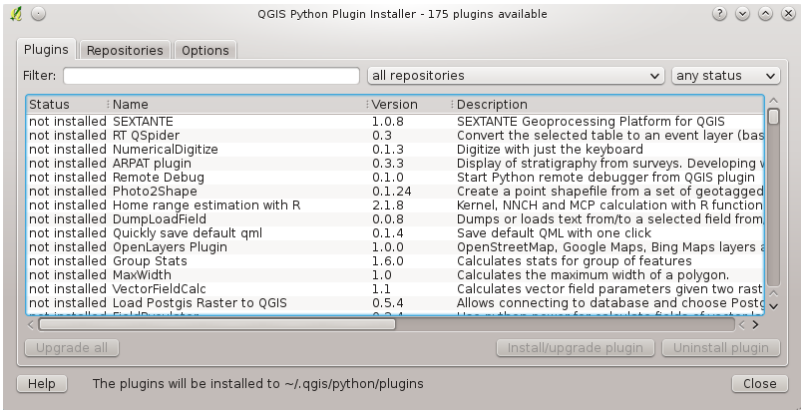


Figure 19.2: Installing external python plugins

各プラグインはいずれかです：

- **未インストール** -これはリポジトリに利用可能なプラグインがあるが、まだインストールされていないことを意味します。それをインストールするにはリストからプラグインを選択して**[Install plugin]**ボタンをクリックします。
- **new** - これは、リポジトリにそのプラグインが新しく利用可能なものとして存在することを意味します。
- **インストール済** -これはそのプラグインがすでにインストールされていることを示します。任意のリポジトリでも利用可能な場合**[プラグインの再インストール]**ボタンが有効になります。利用可能なバージョンがインストールされたもののバージョンよりも古い場合、**[プラグインのダウングレード]**ボタンが代わりに表示されます。
- **アップグレード可** -これはプラグインがインストールされているが、利用可能な最新のバージョンがない ことを意味します。この場合**[プラグインのアップグレード]**と**[すべてアップグレード]**ボタンが使えます。
- **無効** - これはプラグインがインストールされているが、利用できないか壊れていることを示す。その理由はプラグインの説明フィールドで説明されるでしょう。

プラグインタブ

プラグインをインストールするには, リストで選択をした後に**[プラグインをインストール]**ボタンをクリックして下さい. 選択したプラグインが有効になり, 各 OS 毎に定められたディレクトリにインストールされます.

- Linux and other unices
  - `/share/qgis/python/plugins`
  - `$HOME/.qgis/python/plugins`
- Mac OS X
  - `/Contents/MacOS/share/qgis/python/plugins`
  - `/Users/$USERNAME/.qgis/python/plugins`
- Windows
  - `C:\Program Files\QGIS\python\plugins`
  - `C:\Documents and Settings\$USERNAME\.qgis\python\plugins`

インストールが成功した場合, 確認メッセージが表示されます

If the installation fails, the reason for the failure will be displayed in a warning dialog. Most often, errors are the result of connection problems and/or missing Python modules. In the former case you will likely need to wait before trying the install again, in the latter case, you should install the missing modules relevant to your operating system prior to using the plugin. For Linux, most required modules should be available via a package manager. For install instructions in Windows visit the module home page.

If you are using a proxy, you may need to configure it under *Edit* → *Options* (Gnome, OSX) or *Settings* → *Options* (KDE, Windows)‘ on the *Proxy* tab.

[プラグインのアンインストール]ボタンは, 選択されているプラグインがインストールされていてコアプラグインではない場合に利用可能です. ただし, コアプラグインをアップデートしている場合, **[プラグインのアンインストール]**で, アップデートしたプラグインを QGIS のリリース時のバージョンに戻すことができます. QGIS のリリース時のバージョンである場合, コアプラグインはアンインストールできません.

リポジトリタブ

The second tab *Repositories*, contains a list of plugin repositories available for the *Plugin Installer*. By default, only the QGIS Official Repository is enabled. You can add several user-contributed repositories, including the central QGIS Contributed Repository and other external repositories by clicking the **[Add ...]** button. The added repositories contain a large number of useful plugins which are not maintained by the QGIS Development Team. As such, we cannot take any responsibility for them. You can also manage the repository list manually, that is add, remove, and edit the entries. Temporarily disabling a particular repository is possible by clicking the **[Edit ...]** button.

オプションタブ

Options タブでは、 :guilabel:‘プラグインインストーラ ‘の設定を行うことができます。 :guilabel:‘起動時にアップデートをチェックする ‘のチェックで、QGIS はプラグインの更新とニュースを自動的に探します。デフォルドでは、この昨日はすべてのリポジトリリストで有効であり、 :guilabel:‘リポジトリ ‘タブではアップデートをチェックするたびにプログラムが起動します。更新チェックの頻度は、ドロップダウンメニューを使用して調整することができ、1 日に 1 回から 1 日に 1 回まで調節できます新しいプラグインや更新分はインストールプラグインんの 1 つとして利用可能であり、ステータスバーに通知が表示されます。そのチェックボックスが無効の場合、更新とニュースの探知は:guilabel:‘プラグインインストーラ ‘で手動で行った場合のみ実行されます。

プラグインインストーラは 80 とは異なるポートを扱うことができますが、自動的に更新をチェックするのを試みた場合に、インターネットの接続で問題を行う場合があります。これらの場合、*新しいプラグインを探す...*インジケーターが全体の QGIS セッション中にステータスバーで表示されたままになり、終了時にプログラムがクラッシュを引き起こす可能性があります。この場合、チェックボックスを無効にしてください。

それに加えて、 :guilabel:‘Python プラグインインストーラ ‘によって表示されるプラグインのタイプを指定することができます。*許可されたプラグイン*では、あなたが表示したいプラグインを指定できます。

- *Only show plugins from the official repository*
- *Show all plugins except those marked as experimental*

- *Show all plugins, even those marked as experimental*

ちなみに：実験的なプラグインの使用

実験的なプラグインは、制作での利用には一般的に不適当である。これらのプラグインは開発の初期段階にあり' 不完全' または 'コンセプトの証明 'のツールであることを考慮されなければならない。テスト目的のためにそれらを使用する場合を除き、QGIS の開発チームはこれらのプラグインをインストールすることをお勧めしません。

19.1.2 データプロバイダ

Data Providers are 'special' plugins that provides access to a data store. By default, QGIS supports PostGIS layers and disk-based data stores supported by the GDAL/OGR library. A Data Provider plugin extends the ability of QGIS to use other data sources.

データプロバイダプラグインは起動時に QGIS によって自動的に登録されています。これらは、プラグインマネージャで管理されておらず、QGIS でデータタイプがレイヤとして追加される背景で使われます。

19.2 QGIS コアプラグインの利用方法

アイコン	プラグイン	説明	マニュアルの参照
	デリミトッドテキストレイヤの追加	Loads text files containing x,y coordinates	**デリミテッドテキストプラグイン**
	座標取得	マウスで指定した位置の座標を、異なる CRS で取得します	**座標取得プラグイン**
	DB Manager	Manage your databases within QGIS	*DB Manager* **プラグイン**
	Diagram Overlay	Add Diagrams for vectors	*Diagram Overlay Plugin*
	DXF2Shape コンバータ	DXF ファイルを Shapefile に変換します	*Dxf2Shp* **コンバータープラグイン**
	eVis	イベント可視化ツール	*eVis* **プラグイン**
	fTools プラグイン	A suite of vector tools	*fTools* **プラグイン**
	GPS ツール	GPS データをロードやインポートするツール	*GPS* **プラグイン**
	GRASS	GRASS functionality	*GRASS GIS* **の統合**
	GDAL ツール	GDAL raster functionality	*GDAL* **ツールズプラグイン**
	ジオレファレンサ GDAL	Georeference Raster with GDAL	**ジオレファレンサプラグイン**
	Heatmap	Create heatmap raster from input vector points	**ヒートマッププラグイン**
	補間プラグイン	ベクタレイヤの頂点を利用して補間を行います	**データ補間プラグイン**
	MapServer 出力プラグイン	Export a QGIS project file to a MapServer map file	*MapServer Export* **プラグイン**
	オフライン編集	オフラインでの編集とデータベースとの同期	**オフライン編集プラグイン**
	OpenStreetMap	Access OpenStreetMap	**オープンストリートマップ**
	Oracle Spatial Georaster	Oracle Spatial GeoRaster へのアクセス	*Oracle GeoRaster* **プラグイン**
	プラグインインストーラ	Python プラグインのダウンロードとインストール	*QGIS Python* **プラグインインストーラの利用**
	Raster Terrain Analysis	Compute geomorphological features from DEMs	*Raster Terrain Analysis Plugin*
	道路グラグプラグイン	Shortest path analysis	**道路グラフプラグイン**
	SPIT	Shapefile to PostGIS Import Tool	*Importing Data into PostgreSQL*
	SQL Anywhere プラグイン	Access SQL anywhere DB	*SQL Anywhere* **プラグイン**
	空間クエリ	Spatial queries on vectors	

19.3 座標取得プラグイン

座標入力プラグインは使いやすく、選択した 2 つの座標参照系（CRS）について地図上のキャンバスに座標を表示する機能を提供します。

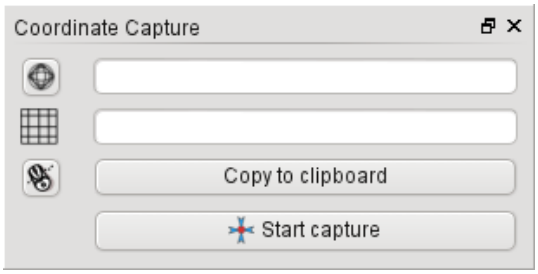


Figure 19.3: Coordinate Capture Plugin

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 statusbar.
2. **オンザフライ** *CRS* **変換を有効にする ‘チェックボックスをクリックし、プロジェクトの座標系を選択します** *(:ref:‘label_projections* も参照すること)。
3. Load the coordinate capture plugin in the Plugin Manager (see *QGIS* **コアプラグインをロードする**) 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.
4. Click on the Click to the select the CRS to use for coordinate display icon and select a different CRS from the one you selected above.
5. 座標入力を開始するには**[入力開始]**をクリックします。それからマップキャンバス上の任意の場所をクリックすると、プラグインは、あなたの選択した CRS の両方の座標を表示します。
6. マウスの座標追跡を可能にするには、:sup:‘マウストラッキング ‘アイコンをクリックします。
7. 選択した座標をクリップボードにコピーすることができます。

19.4 DB Manager プラグイン

The DB Manager Plugin is officially part of QGIS core and intends to replace the SPIT Plugin and the PostGIS Manager 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 to connect to an existing database, to start the SQL-window and to exit the DB Manager Plugin. 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 menu *Table* allows to create and edit tables and to delete tables and views. It is also possible to empty tables and to move tables from one to another schema. Finally you can also run Vacuum Analyze and add Versioning Support to a table.

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.

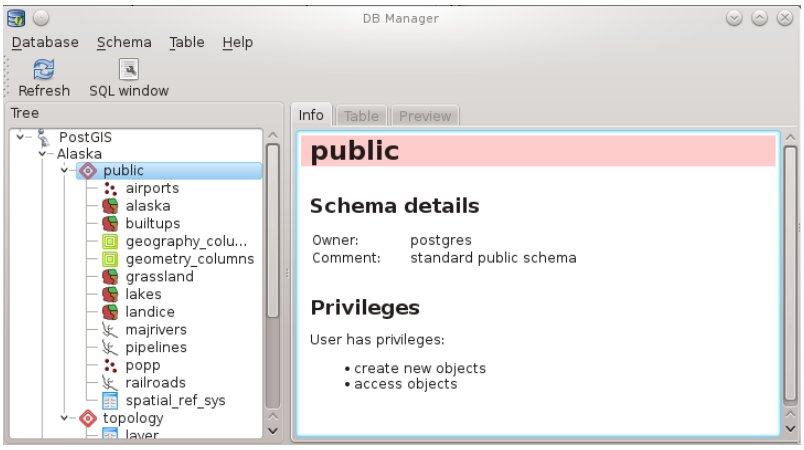


Figure 19.4: DB Manager dialog (KDE)

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 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.

19.5 デリミテッドテキストプラグイン

デリミテッドテキストプラグインはデリミテッドテキストを QGIS のレイヤとして読み込むことができます

19.5.1 Requirements

デリミテッドテキストファイルをレイヤとして表示するためには, テキストファイルが以下の要件を満たす必要があります:

1. 区切り文字で区切られたフィールド名のヘッダ. ヘッダはテキストファイルの先頭行にあることが必要です
2. ヘッダ行には X 座標と Y 座標のフィールドが必要です. フィールド名は任意でかまいません
3. x 座標と y 座標は数値である必要があります. 座標系は重要ではありません.

:file:‘elevp.csv‘は標高ポイントデータをインポートする正しい型式のデリミテッドテキストファイルの例です。elevp.csv は QGIS サンプルデータセットに付属しています。 (:ref:‘サンプルデータ ‘参照):

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

このサンプルテキストファイルについての解説:

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.

19.5.2 Using the Plugin

このプラグインを利用するためには, まずセクション:ref:‘プラグインの管理 ‘に記述されているようにプラグインを有効にして下さい

Click the new toolbar icon Add Delimited Text Layer to open the *Delimited Text* dialog as shown in figure_delimited_text_1.

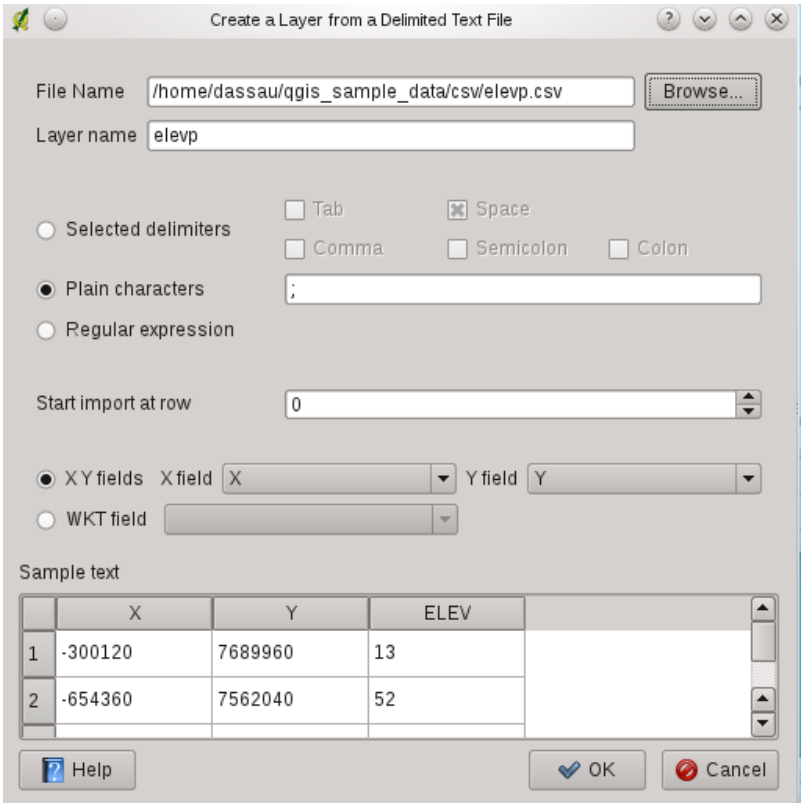


Figure 19.5: Delimited Text Dialog

First select the file (e.g., `qgis_sample_data/csv/elevp.csv`) to import by clicking on the **[Browse]** button. Once the file is selected, the plugin attempts to parse the file using the last used delimiter, in this case a semicolon (`;`). To properly parse the file, it is important to select the correct delimiter. To change the delimiter to tab use `\t` (this is a regular expression for the tab character).

Once the file is parsed, choose the `X` and `Y` fields from the dropdown lists and if available also the WKT field for the CRS information. 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.

19.6 Diagram Overlay Plugin

 The *Diagram Overlay* Plugin allows you to add a graphic overlay to a vector layer (see figure_overlay_1). It provides additional and not yet implemented features to the *Diagrams* tab, described in secion *Diagrams Tab*.

Before starting, the *Diagram Overlay* Plugin needs to be activated using the Plugin Manager (see Section *QGIS コアプラグインをロードする*). It will then appear as *Overlay* tab in the *Layer Properties* dialog next to the *Diagrams* tab.

The *Overlay* tab provides support for Pie charts, Bar charts and proportional SVG symbols.

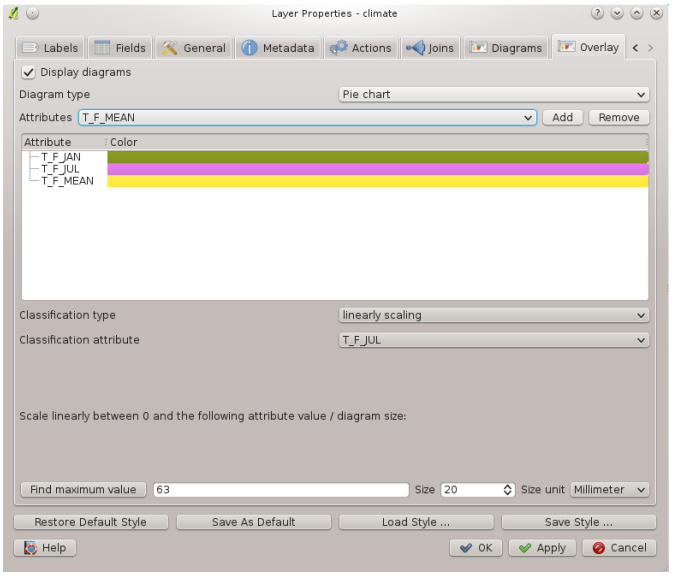


Figure 19.6: Vector properties dialog with overlay tab

Similar to the *Diagrams* tab, we will demonstrate an example and overlay the alaska boundary layer a piechart diagram showing some temperature data from a climate vector layer. Both vector layers are part of the QGIS sample dataset (see Section **サンプルデータ**).

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. Double click the `climate` layer in the map legend to open the *Layer Properties* dialog.
3. Click on the *Overlay* tab, activate *Display diagrams* and select 'Pie Chart' from *Diagram type* combobox.
4. 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 **[Add]** button, then `T_F_JUL` and finally `T_F_MEAN`.
5. Diagram size is based on linear scaling of a classification attribute. We choose `T_F_JUL`, click on **[Find maximum value]** and set size to `20` and *Size unit* to 'Millimeter'.
6. Now click **[Apply]** to display the diagram in the QGIS main window.
7. You can now adapt the chart size, or change the attribute colors double clicking on the color values in the attribute field. Figure_overlay_2 gives an impression.
8. Finally click **[Ok]**.

Additionally in the *Settings* → *Options* dialog, there is a `Overlay` tab where it is possible to select the placement algorithm of the diagrams. The 'Central point' method is a generic one, the others use algorithms of the PAL library. They also consider diagram objects and labels in different layers.

19.7 Dxf2Shp コンバータープラグイン

コンバータープラグインはベクタデータを DXF から Shapefile 形式に変換します。変換を実行する際に以下のパラメータが要求されます:

- **入力 DXF ファイル**: 変換を行う DXF ファイルのパスを入力して下さい
- **出力 Shp file**: 作成される Shapefile の名前を入力して下さい

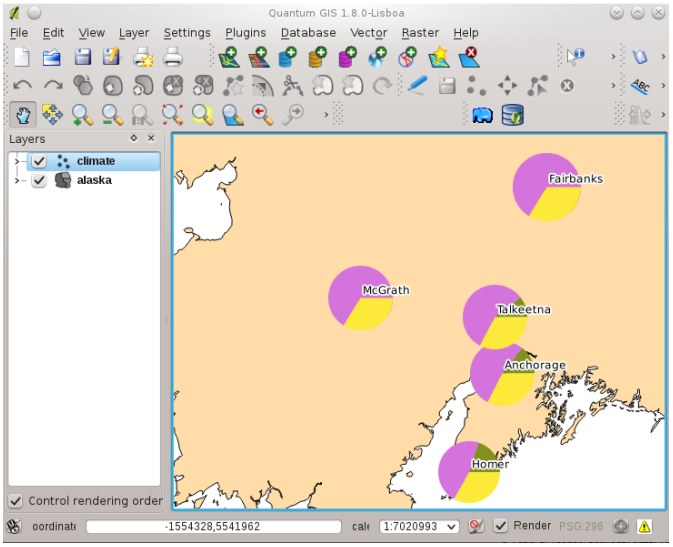


Figure 19.7: Pie chart diagram from temperature data overlayed on a map

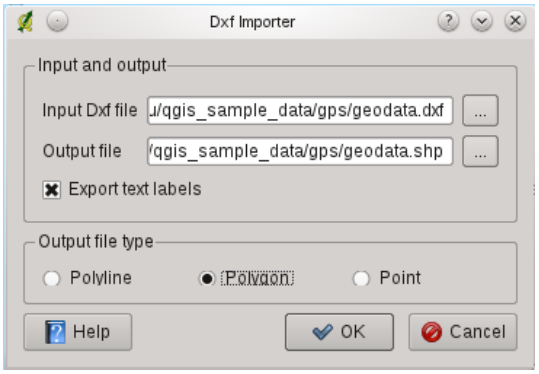


Figure 19.8: Dxf2Shape Converter Plugin

- **出力ファイルタイプ**: 出力 Shapefile のジオメトリタイプを指定して下さい。現在サポートされているタイプはポリライン、ポリゴンとポイントです。
- **テキストラベルをエクスポートする**: このチェックボックスが有効な場合、追加で Shapefile のポイントレイヤが作成されます。 そして関連の dbf テーブルには"TEXT" フィールドに関する情報が含まれ、テキスト文字列そのものもファイルの中にできます。

19.7.1 Using the Plugin

1. QGIS を起動して, ([プラグイン] メニューにある)[プラグインの管理] で Dxf2Shape を有効にして下さい (セクション *QGIS* **コアプラグインをロードする** 参照)。そして QGIS ツールバーメニューにある  :sup:‘Dxf2Shape Converter‘アイコンをクリックして下さい。 Dxf インポーター ダイアログが Figure_dxf2shape_1 のように表示されます。
2. DXF ファイル、出力ファイルの名前、Shapefile のタイプを入力して下さい。
3. レイヤのラベル表示のためのポイントレイヤを追加で作成する場合は、  :guilabel:‘テキストラベルの出力 ‘チェックボックスを有効にして下さい。
4. **[OK]**をクリックします。

19.8 eVis プラグイン

The Biodiversity Informatics Facility at the American Museum of Natural History's (AMNH) Center for Biodiversity and Conservation (CBC) (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.) 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 **プラグインの管理**).

The eVis plugin is made up of three modules: the 'Database Connection tool', 'Event ID tool', and the 'Event Browser'. These work together to allow viewing of geocoded photographs and other documents that are linked to features stored in vector files, databases, or spreadsheets.

19.8.1 Event Browser

The Event Browser module provides the functionality to display geocoded photographs that are linked to vector features displayed in the QGIS map window. Point data, for example, can be from a vector file that can be input using QGIS or it can be from the result of a database query. 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. Your vector layer must be loaded into QGIS before running the Event Browser.

Launch the Event Browser module

To launch the Event browser module either click on the  eVis Event Browser icon or click on *Database* → *eVis* → *eVis Event Browser*. This will open the *Generic Event Browser* window.

The *Generic Event Browser* window has three tabs displayed at the top of the window. The *Display* tab is used to view the photograph and its associated attribute data. The *Options* tab provides a number of settings that can be adjusted to control the behavior of the eVis plugin. Lastly, the *Configure External Applications* tab is used to

maintain a table of file extensions and their associated application to allow eVis to display documents other than images.

Understanding the Display window

To see the *Display* window click on the *Display* tab in the *Generic Event Browser* window. The *Display* window is used to view geocoded photographs and their associated attribute data.

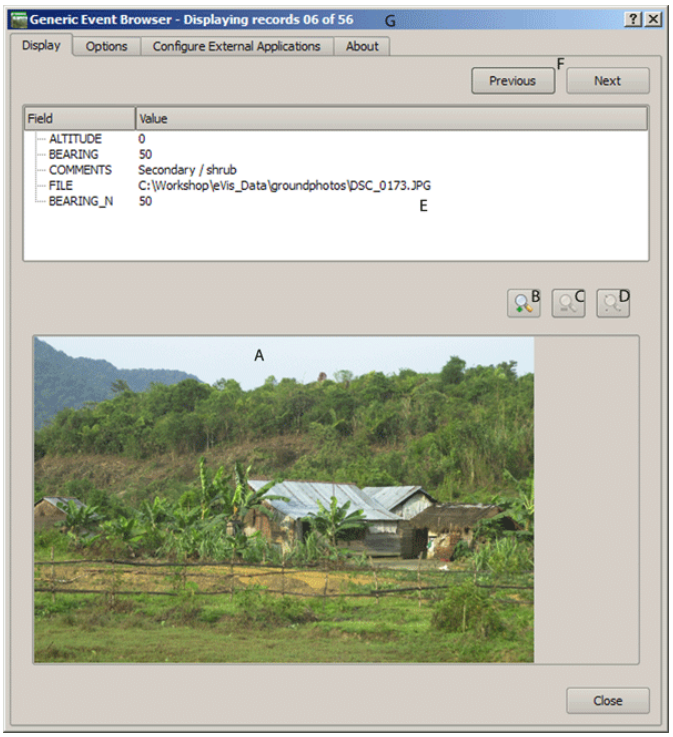


Figure 19.9: The *eVis* display window

1. **Display window**: A window where the photograph will appear.
2. **Zoom in button**: Zoom in to see more detail. If the entire image cannot be displayed in the display window, scroll bars will appear on the left and bottom sides of the window to allow you to pan around the image.
3. **Zoom out button**: Zoom out to see more area.
4. **Zoom to full extent** button: Displays the full extent of the photograph.
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. **Navigation buttons**: Use the Previous and Next buttons to load the previous or next feature when more than one feature is selected.
7. **Feature indicator**: This heading indicates which feature is being displayed and how many features are available for display.

Understanding the Options window

1. **File path**: A dropdown 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

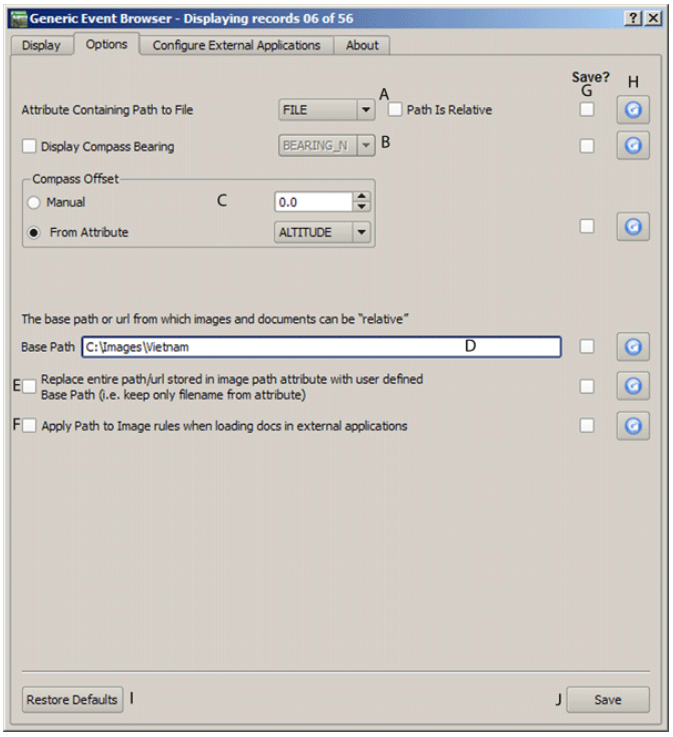


Figure 19.10: The *eVis* Options window

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 *Specifying the location and name of a photograph* below.

2. **Compass bearing display field**: A dropdown 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 to the left of the dropdown menu title.
3. **Compass offset setting**: Compass offsets can be used to compensate for declination (adjust bearings collected using magnetic bearings to true north bearings). Click the *Manual* radiobutton to enter the offset in the text box or click the *From Attribute* radiobutton 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. **Directory base path**: The base path onto which the relative path defined in Figure_eVis_2 (A) will be appended.
5. **Replace path**: If this checkbox is checked, only the file name from the 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. **Save 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. **Reset values**: Resets the values on this line to the default setting.
9. **Restore faults**: This will reset all of the fields to their default settings. It has the same effect as clicking all of the **[Reset]** buttons.
10. **Save**: This will save the settings without closing the *Options* pane.

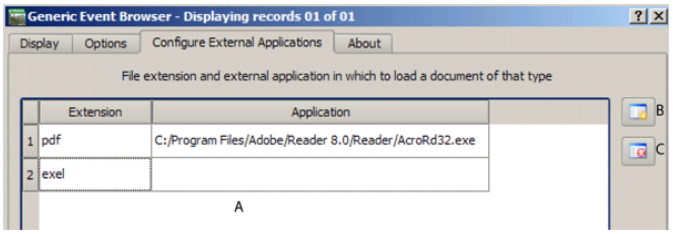


Figure 19.11: The *eVis* External Applications window

Understanding the Configure External Applications window

1. **File reference table**: A table containing file types that can be opened using eVis. Each file type needs a file extension and the path to an application that can open that type of file. This provides the capability of opening a broad range of files such as movies, sound recordings, and text documents instead of only images.
2. **Add new file type**: Add a new file type with a unique extension and the path for the application that can open the file.
3. **Delete current row**: Delete the file type highlighted in the table and defined by a file extension and a path to an associated application.

19.8.2 Specifying the location and name of a photograph

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://biodiversityinform.org/testdata/DSC_0170.JPG  10
780596    1784017   pdf:http://www.test.com/attach.php?attachment_id-12  76
```

19.8.3 Specifying the location and name of other supporting documents

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, and 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).

19.8.4 Using the Generic Event Browser

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 *Generic Event Browser* window. The arrow will be centered over the point that is associated with the photograph or other document.

To close the *Generic Event Browser* window click on the **[Close]** button from the *Display* window.

19.8.5 Event ID Tool

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.

Launch the Event ID module

To launch the 'Event ID' module either click on the  Event ID icon or click on *Plugins* → *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.

To view the photographs linked to vector features in the active vector layer displayed in the QGIS map window, move the Event ID cursor over the feature and then click the mouse. After clicking on the feature, the *Generic Event Browser* window is opened and the photographs on or near the clicked locality are available for display in the browser. If more than one photograph is available, you can cycle through the different features using the **[Previous]** and **[Next]** buttons. The other controls are described in the ref:*evis_browser* section of this guide.

19.8.6 Database connection

The 'Database Connection' module provides tools to connect to and query a database or other ODBC resource, such as a spreadsheet.

eVis can directly connect to four types of databases: Microsoft Access, PostgreSQL, MySQL, SQLite, and can also read from ODBC connections. 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.

Launch the Database Connection module

To launch the 'Database Connection' module either click on the appropriate icon  eVis Database Connection or click on *Plugins* → *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.

Connect to a database

Click on the *Database Connection* tab to open the database connection interface. Next, use the *Database Type*  combobox 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".

Enter the name of the database in the *Database Name* textbox. If you selected "ODBC" as the database type, you need to enter the data source name.

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.

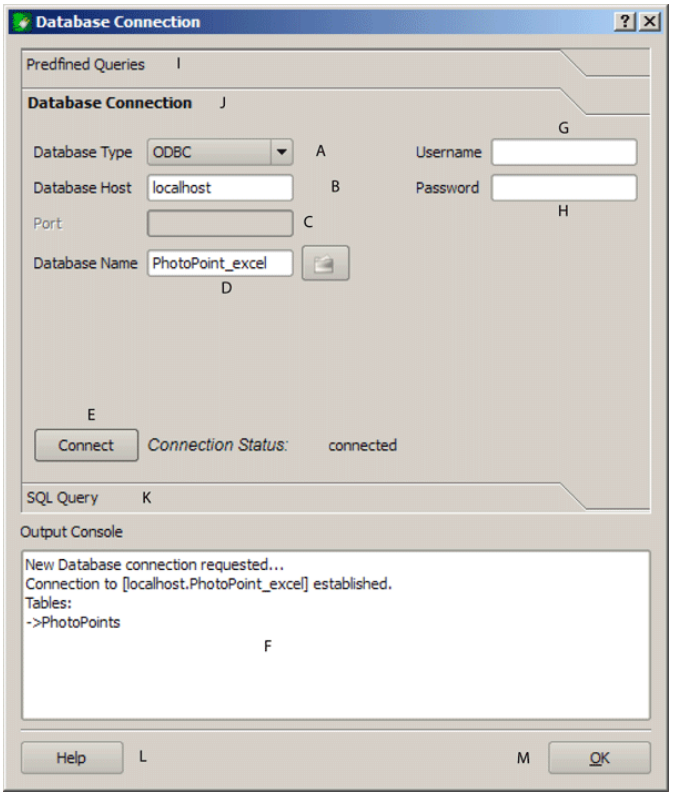


Figure 19.12: The *eVis* Database connection window

1. **Database Type**: A dropdown list to specify the type of database that will be used.
2. **Database Host**: The name of the database host.
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.
6. **Output Console** The console window where messages related to processing are displayed.
7. **Username**: Username for use when a database is password protected.
8. **Password**: Password for use when a database is password protected.
9. **Predefined Queries**: Tab to open the "Predefined Queries" window.
10. **Database Connection**: Tab to open the "Database Connection" window.
11. **SQL Query**: Tab to open the "SQL Query" window.
12. **Help**: Displays the on line help.
13. **OK**: Close the main "Database Connection" window.

Running SQL queries

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.

In the *Database File Selection* window, enter the name of the layer that will be created from the results of the query in the *Name of New Layer* textbox.

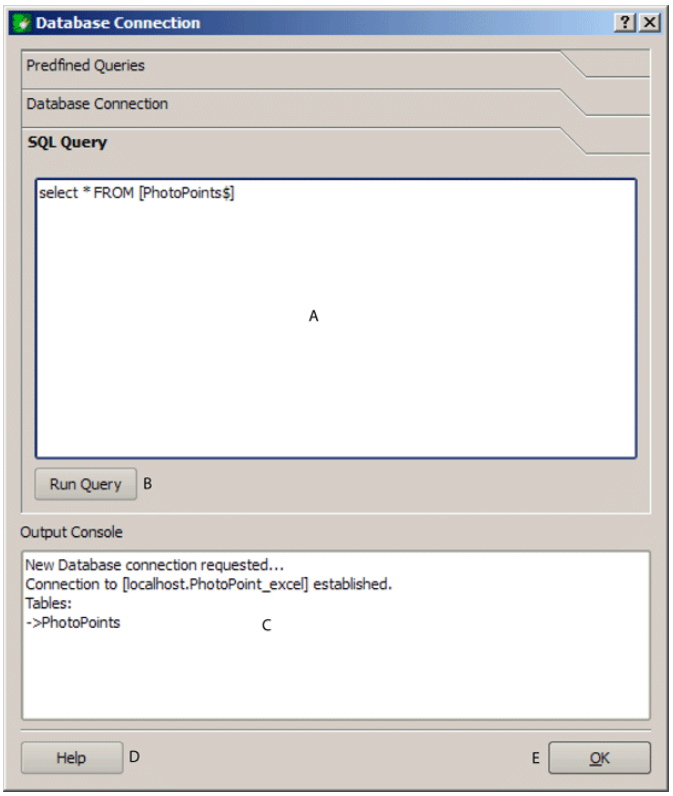


Figure 19.13: The eVis SQL query tab

1. **SQL Query Text Window**: A screen to type SQL queries.
2. **Run Query**: Button to execute the query entered in the *SQL Query Window*.
3. **Console Window**: The console window where messages related to processing are displayed.
4. **Help**: Displays the on line help.
5. **OK**: Closes the main *Database Connection* window.

Use the *X Coordinate*  and *Y Coordinate*  comboboxes to select the field from the database that store 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...'

ちなみに: Creating a vector layer from a Microsoft Excel Worksheet

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 there 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.

Running predefined queries

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 dropdown menu located just below the Open File icon, the full description of the query is displayed in the text window under the dropdown menu.

Select the query you want to run from the dropdown 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.

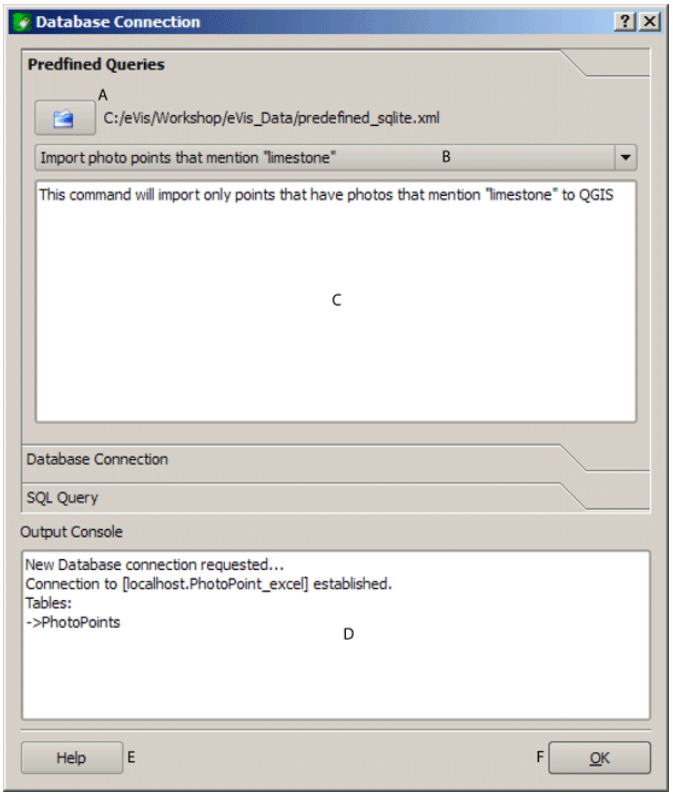


Figure 19.14: The *eVis* Predefined queries tab

1. **Open Query File**: Launches the "Open File" file browser to search for the XML file holding the predefined queries.
2. **Predefined Queries**: A dropdown list with all of the queries defined by the predefined queries XML file.

3. **Query description**: A short description of the query. This description is from the predefined queries XML file.
4. **Console Window**: The console window where messages related to processing are displayed.
5. **Help**: Displays the on line help.
6. **OK**: Closes the main "Database Connection" window.

XML format for eVis predefined queries

The XML tags read by eVis

Tag	Description
query	Defines the beginning and end of a query statement.
shortdescription	A short description of the query that appears in the eVis dropdown menu.
description	A more detailed description of the query displayed in the Predefined Query text window.
databasetype	The database type as defined in the Database Type dropdown menu in the Database Connection tab.
databaseport	The port as defined in the Port textbox in the Database Connection tab.
databasename	The database name as defined in the Database Name textbox in the Database Connection tab.
databaseusername	The database username as defined in the Username textbox in the Database Connection tab.
databasepassword	The database password as defined in the Password textbox in the Database Connection tab.
sqlstatement	The SQL command.
autoconnect	A flag ("true"" or "false") to specify if the above tags should be used to automatically connect to database without running the database connection routine in the Database Connection tab.

A complete sample XML file with three queries is displayed below:

```
<?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>
```

19.9 fTools プラグイン

fTool プラグインの目的は、追加のソフトウェアやライブラリ、複雑な手順を必要とせず、ベクタデータに関する多くの解析や調査、演算を処理することです. そのために必要な、一連の地理空間データの解析や調査機能を提供しています.

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 Section *QGIS* **コアプラグインをロードする**). 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.

19.9.1 Analysis tools

アイコン	ツール	目的
	距離マトリックス	2 つの点レイヤ間の距離を計測し、a) 距離行列、b) 線形距離行列、c) 距離統計行列といった出力が可能です。また、最近傍点（k）の点群のみに限定して計測することも可能です。
	線長の合計	ポリゴンベクタレイヤの各ラインについて、線長の合計値を計算することができます。
	ポリゴン内の点	ベクタレイアに含まれる点の数をカウントすることができます。
	ユニーク値のリスト	ベクタレイア中のユニーク値のリストを抽出することができます。
	基本統計	ベクタレイアの基本的な統計値 (平均値, 標準偏差, 分散, 総数, 総計, 中央値等)
	最小近傍分析	ポイントベクタレイヤにおいて、最小近傍分析を行います。
	平均座標 (群)	ベクタレイヤ全体またはユニーク ID をもつ複数の地物について、平均座標あるいは重み付き平均座標の計算を行います。
	ラインの交差	ラインとラインの交差を特定し, ポイントとして Shapefile 型式で出力します。道路や軌跡の交差の特定に利用できます. 線長が 0 のラインは無視されます.

Table Ftools 1: fTools 解析ツール

19.9.2 Research tools

アイコン	ツール	目的
	ランダム選択	n 個の地物または n %の地物をランダムに選択します
	ランダムセットのランダム選択	ユニークな ID を持つサブセットをランダムに選択します
	ランダム点群	選択レイヤの中からランダムな点群を発生させます
	規則的な点群	選択レイアの中から, 設定した規則的な範囲で点群を発生させ, ポイントの Shapefile を出力します.
	ベクタグリッド	ユーザーが設定した領域内に, ポリゴンまたはラインのグリッドを発生させ,Shapefile として出力します
	場所による選択	地物を指定した場所に基づいて選択します. 指定した場所は, 他のレイヤで新しい選択を行うか, あるいは現在の選択に追加または削除が行えます
	レイア領域のポリゴン	指定したラスタまたはベクタレイヤの領域から, 新たなポリゴンを作成し,Shapefile で出力する

Table Ftools 2: fTools 調査ツール

19.9.3 Geoprocessing tools

アイコン	ツール	目的
	凸包	選択したレイヤまたは入力された ID フィールドに基づいた凸包を作成し,Shapefile として出力します
	バッファ	バッファ距離またはバッファ距離の入ったフィールドを指定し, 入力したベクタにバッファ(群) を発生させ,Shapefile で出力します
	交差	指定したベクタレイヤの交差しているポリゴン, ライン, ポイントを出力し,Shapefile で出力します
	統合	指定したベクタレイヤの交差しているポリゴン, ライン, ポイントを出力し,Shapefile で出力します
	対称差分	指定したベクタレイヤの交差していないポリゴン, ライン, ポイントを出力し、Shapefile で出力します
	クリップ	レイヤをオーバーレイし, クリップレイヤと重なる部分のみを Shapefile として出力します
	差分	レイヤをオーバーレイさせてクリップレイヤと重ならない部分のみを Shapefile として出力します
	融合	Merge features based on input field. All features with identical input values are combined to form one single feature.

Table Ftools 3: fTools ジオミトリツール

19.9.4 Geometry tools

アイコン	ツール	目的
	ジオミトリの整合性をチェック	ポリゴンを交差や穴のクロスをチェックし, ノードの順序を修正します
	ジオミトリカラムの出力/追加	ベクタレイヤのジオメトリ情報に点 (X 座標、Y 座標)、線 (長さ) またはポリゴン (面積、周囲の長さ) を追加します
	ポリゴン重心	ポリゴンから重心を計算し出力します
	ドロネー三角形分割	指定点ベクタレイヤでドロネー三角形分割を行い, 結果を (ポリゴンとして)Shapefile に出力します
	ボロノイ分割	点データからボロノイポリゴンを生成します
	ジオミトリを簡素化する	Douglas-Peucker アルゴリズムでラインまたはポリゴンを間引いて簡素化します
	Densify geometry	Densify lines or polygons by adding vertices
	マルチパートをシングルパートへ	マルチパート地物をシングルパート地物に変換します. シンプルポリゴン群とライン群を作成します
	シングルパートをマルチパートへ	複数の地物をユニーク ID フィールドで結合し, 単一のマルチパート地物に変換します
	ポリゴンをラインに	ポリゴンをラインに変換します. マルチパートポリゴンは複数のシングルパートラインに変換します
	ラインをポリゴンに	ラインをポリゴンに変換します. マルチパートラインは複数のシングルパートポリゴンに変換します
	ノードの展開	ラインまたはポリゴンレイヤからポイントとしてノードを出力します

Table Ftools 4: fTools ジオミトリツール

ノート: Simplify geometry　ツールは、ラインやポリゴンの重複ノードを削除します。単純化の許容値を 0 に設定するだけでその操作を行います。

19.9.5 Data management tools

アイコン	ツール	目的
	投影法の定義	CRS が定義されていない Shapefile の投影法を定義します
	属性の結合	属性をベクタに結合し, 追加します. ベクタレイヤの属性と他の属性テーブルを結合し,Shapefile として出力します
	ベクタレイヤの分割	ベクタレイヤを指定したフィールドに基づいて複数の Shapefile に分割します
	Merge shapefiles to one	Merge several shapefiles within a folder into a new shapefile based on the layer type (point, line, area).
	Create spatial index	Create a spatial index for OGR supported formats.

Table Ftools 5: fTools データマネジメントツール

19.10 GDAL ツールズプラグイン

19.10.1 GDAL ツールプラグインとは？

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.

GDAL ライブラリ

GDAL ライブラリはコマンドラインプログラムのセットで構成されており、それぞれがオプションの大きなリストです。ターミナルからコマンドを実行して満足しているユーザはオプションのフルセットへのアクセスでコマンドラインを好むかもしれません。GDAL ツールズプラグインは最も人気のあるオプションのみ見えるようにし、ツールへの簡単なインターフェースを提供しています。

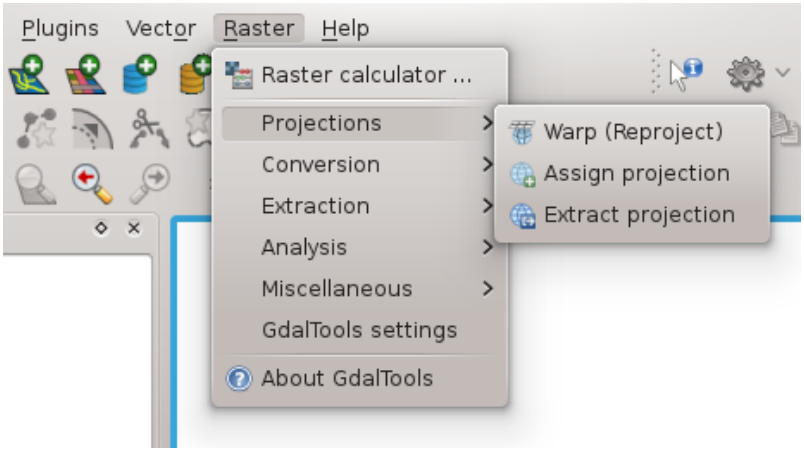


Figure 19.15: The *GDALTools* menu list

19.10.2 List of GDAL tools

Projections

Warp (Reproject)	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
Assign projection	This tool allows to assign projection to rasters that already georeferenced but miss projection information. Also with it help it is possible to alter existing projection definition. Both single file and batch mode are supported. For more information please visit utility page at GDAL site http://www.gdal.org/gdalwarp.html
Extract projection	This utility helps you to extract projection information from an input file. If you want to extract projection from a whole directory you can use the Batch mode. It creates both `.prj` and `.wld` files.

Conversion

Rasterize	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
Polygonize	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
Translate	This utility can be used to convert raster data between different formats, potentially performing some operations like subsettings, resampling, and rescaling pixels in the process. For more information you can read on http://www.gdal.org/gdal_translate.html
RGB to PCT	This utility will compute an optimal pseudo-color table for a given RGB image using a median cut algorithm on a downsampled RGB histogram. Then it converts the image into a pseudo-colored image using the color table. This conversion utilizes Floyd-Steinberg dithering (error diffusion) to maximize output image visual quality. The utility is also desribed at http://www.gdal.org/rgb2pct.html
PCT to 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

Extraction

Contour	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.
Clipper	This utility allows to clip (extract subset) raster using selected extent or based on mask layer bounds. More information can be found at http://www.gdal.org/gdal_translate.html.

Analysis

Sieve	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 .
Near Black	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 .
Fill nodata	This utility fills selection raster regions (usually nodata areas) by interpolation from valid pixels around the edges of the area. On http://www.gdal.org/gdal_fillnodata.html you can find more information.
Proximity	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 .
Grid	This utility creates regular grid (raster) from the scattered data read from the OGR datasource. Input data will be interpolated to fill grid nodes with values, you can choose from various interpolation methods. The utility is also described on the GDAL website http://www.gdal.org/gdal_grid.html .
DEM terrain models	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 you can read on http://www.gdal.org/gdaldem.html

Miscellaneous

Build Virtual Raster	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 .
Merge	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 on http://www.gdal.org/gdal_merge.html .
Information	This utility lists various information about a GDAL supported raster dataset. On http://www.gdal.org/gdalinfo.html you can find more information.
Build Overviews	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 .
Tile Index	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 .

19.11 ジオレファレンサプラグイン

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 their coordinates.

Features

Icon	Purpose	Icon	Purpose
	Open raster		Start georeferencing
	Generate GDAL Script		Load GCP Points
	Save GCP Points As		Transformation settings
	Add Point		Delete Point
	Move GCP Point		Pan
	Zoom In		Zoom Out
	Zoom To Layer		Zoom Last
	Zoom Next		Link Georeferencer to QGIS
	Link QGIS to Georeferencer		

Table Georeferencer 1: Georeferencer Tools

19.11.1 Usual procedure

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 the projection you want to have your image. In this case you can enter the coordinates by clicking on the reference dataset loaded in QGIS map canvas.

The usual procedure for georeferencing an image involves selecting multiple points on the raster, specifying their coordinates, and choosing a relevant transformation type. Based on the input parameters and data, the plugin will compute the world file parameters. The more coordinates you provide, the better the result will be.

The first step is to start QGIS, load the Georeferencer Plugin (see Section *QGIS* コアプラグインをロードする) and click on the  Georeferencer icon which appears in the QGIS toolbar menu. The Georeferencer Plugin dialog appears as shown in figure_georeferencer_1.

For this example, we are using a topo sheet of South Dakota from SDGS. It can later be visualized together with the data from the GRASS `spearfish60` location. You can download the topo sheet here: http://grass.osgeo.org/sampledata/spearfish_toposheet.tar.gz.

Entering ground control points (GCPs)

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.

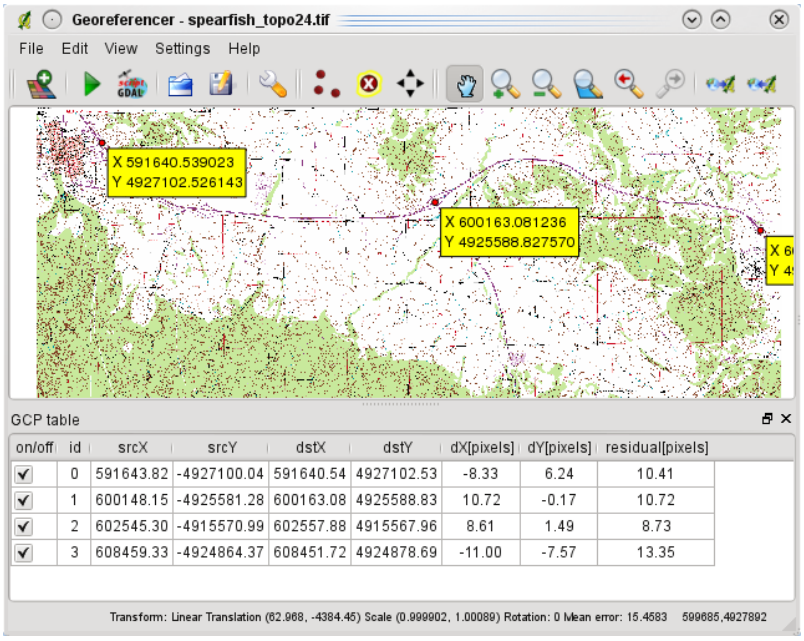


Figure 19.16: Georeferencer Plugin Dialog

2. Using the Add Point button, add points to the main working area and enter their coordinates (see Figure figure_georeferencer_2). For this procedure you have three options:
   - Click on a point in the raster image and enter the X and Y coordinates manually.
   - Click on a point in the raster image and choose the button from map canvas to add the X and Y coordinates with the help of a georeferenced map already loaded in the QGIS map canvas.
   - With the button, you can move the GCPs in both windows, if they are at the wrong place.
3. Continue entering points. You should have at least 4 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.

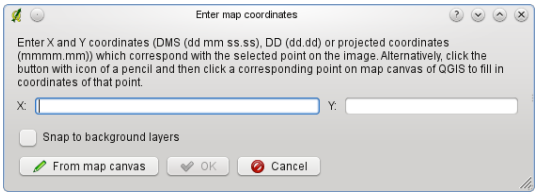


Figure 19.17: Add points to the raster image

The points that are added to the map will be stored in a separate text file (`[filename].points`) usually together with the raster image. This allows us to reopen the Georeferencer plugin at a later date and add new points or delete existing ones to optimize the result. The points file contains values of the form: `mapX, mapY, pixelX, pixelY`. You can use the Load GCP Points and Save GCP Points buttons to manage the files.

Within the GCP table you can click on a column header and therewith enable e.g. numerical sorting. The GCP list is automatically updated.

Defining the transformation settings

After you have added your GCPs to the raster image, you need to define the transformation settings for the georeferencing process.

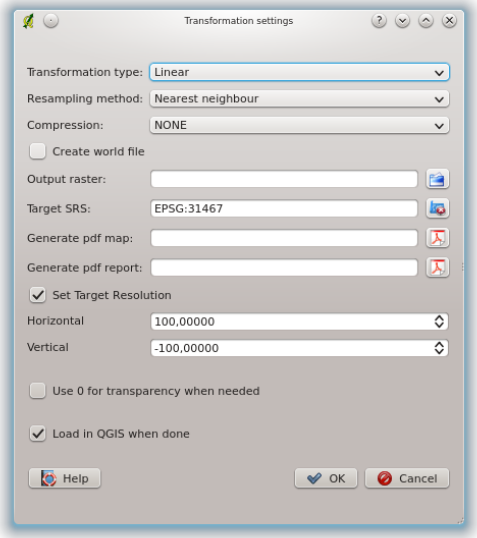


Figure 19.18: Defining the georeferencer transformation settings

Available Transformation algorithms

Depending on how many ground control point 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 final result.

Currently, following algorithms 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.
- The **Helmert transformation** performs simple scaling and rotation transformations.
- The **Polynomial algorithms** 1-3 are among the most widely used algorithms for georeferencing, and each one differs by the degree of distortion 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.
- The **Thin plate spline (TPS) algorithm** is a more modern georeferencing method, which is able to introduce local deformations in the data. This algorithm is useful when very low quality originals are being georeferenced.
- The **Projective transformation** is a linear rotation and translation of coordinates.

Define the Resampling method

The type of resampling you choose will likely depending on your input data and the ultimate objective of the exercise. If you don't want to change statistics of the image, you might want to choose 'Nearest neighbour', whereas a 'Cubic resampling' will likely provide a more smoothed result.

It is prossible to choose between five different resampling methods.

1. Nearest neighbour
2. Linear
3. Cubic

4. Cubic Spline
5. Lanczos

Define the transformation settings

There are several options that need to be defined for the georeferenced output raster.

- The checkbox *Create world file* 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 field *Output raster* is not activated, because only a new world-file will be created.
- For all other transformation type 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 section **投影法の利用方法**).
- 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 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.

Show and adapt raster properties

Clicking on the *Raster properties* dialog in the *Settings* menu opens the raster properties of the layer that you want to georeference.

Configure the georeferencer

- You can define if 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*.

Running the transformation

After all GCPs have been collected and all transformation settings are defined, just press the button Start georeferencing to create the new georeferenced raster.

19.12 データ補間プラグイン

この補間プラグインは、ポイントベクタレイヤの TIN または IDW 補間を生成するために使用されます。これは扱いがとてもシンプルで、内挿されたラスタレイヤを作成するための直感的なグラフィカルユーザ・インタフェースを提供します (Figure_interpolation_1 を参照すること)。プラグインは、実行前に次のパラメータを必要とします。

- **Input vector layer**: 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*  combobox.
- **補間する属性**:補間に使用する属性カラムを選択するか 、格納された Z 値を使用するには|checkbox| :guilabel:‘Z 座標を使用する ‘チェックを有効にします。
- **Interpolation Method**: Select interpolation method. This can be either ‘Triangulated Irregular Network (TIN)’ or ‘Inverse Distance Weighted (IDW)’.
- **カラム/行の数**:出力するラスタファイルの 行またはカラムの数を指定します。
- **出力ファイル**: 出力するラスタファイルの名称を指定します。

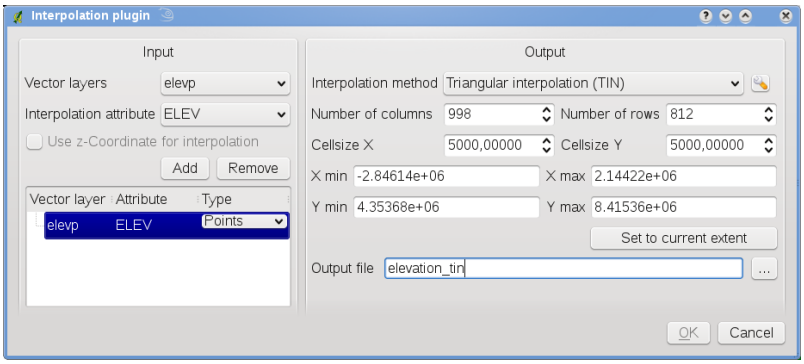


Figure 19.19: Interpolation Plugin 

19.12.1 Using the plugin

1. QGIS を起動し、ポイントベクタレイヤ（e.g., `elevp.csv`）をロードします。
2. Load the Interpolation plugin in the Plugin Manager (see Section *QGIS* **コアプラグインをロードする**) and click on the  Interpolation icon which appears in the QGIS toolbar menu. The Interpolation plugin dialog appears as shown in Figure_interpolation_1.
3. 補間のための入力レイヤ (e.g., *elevp* ) とカラム (e.g., `ELEV`) を選択します。
4. Select an interpolation method (e.g. ‘Triangulated Irregular Network (TIN)’), and specify a cellsize of 5000 as well as the raster output filename (e.g., `elevation_tin`).
5. **[OK]**をクリックします。
6. For the current example, double click `elevation_tin` in the layer list to open the raster *Layer Properties* dialog and select ‘Pseudocolor’ as *Color Map*  in the *Symbology* tab. Or you can define a new color table as described in section *Working with Raster Data*.

19.13 MapServer Export プラグイン

あなたは、レイヤを追加そして調整したり、それらをシンボライズしたり、色をカスタマイズし MapServer としてマップファイルを作成することで、地図を ’compose ’することができます。

ノート: Currently the plugin only works when you use ‘Old Symbology’ in QGIS. ‘New Symbology’ is not yet supported.

19.13.1 プロジェクトファイルの作成

The MapServer Export Plugin operates on a saved QGIS project file and **not** on the current contents of the map canvas and legend. This has been a source of confusion for a number of users. As described below, before you start using the MapServer Export Plugin, you need to arrange the raster and vector layers you want to use in MapServer and save this status in a QGIS project file.

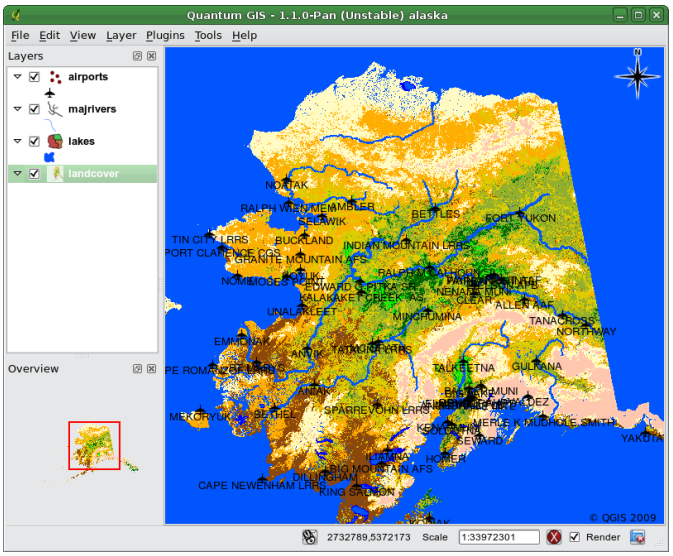


Figure 19.20: Arrange raster and vector layers for QGIS project file

In this example, we demonstrate the four steps required to create a simple project file which can be used to create the MapServer map file. We use raster and vector files from the QGIS sample dataset **サンプルデータ**.

1. Add the raster layer `landcover.tif` clicking on the Add Raster Layer icon.
2. Add the vector Shapefiles `lakes.shp`, `majrivers.shp` and `airports.shp` from the QGIS sample dataset clicking on the Add Vector Layer icon.
3. Change the colors and symbolize the data as you like (for example see figure_mapserver_export_1)
4. Save a new project named `mapserverproject.qgs` using *File* → *Save Project*.

19.13.2 Creating the Map File

To use the Mapserver Export plugin from within QGIS, you need to enable the MapServer Export Plugin first using the Plugin Manager (see *QGIS* **コアプラグインをロードする**).

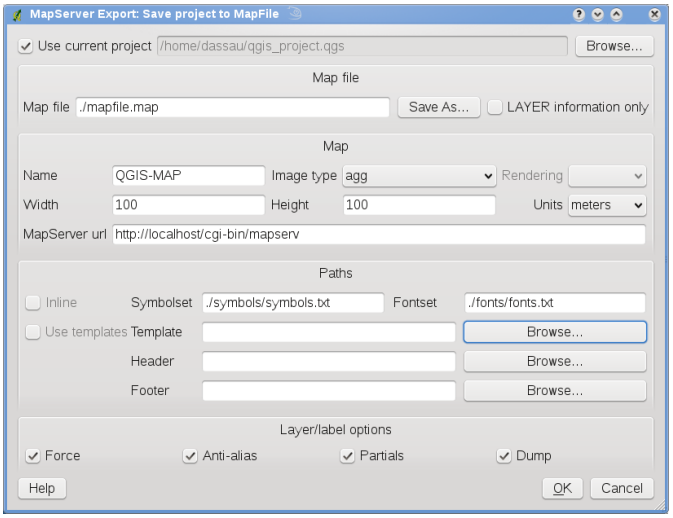


Figure 19.21: Export to MapServer Dialog

Map file	Enter the name for the map file to be created. You can use the button at the right to browse for the directory where you want the map file created.
Qgis project file	Enter the full path to the QGIS project file (.qgs) you want to export. You can use the button at the right to browse for the QGIS project file.
Map Name	A name for the map. This name is prefixed to all images generated by the mapserver.
Map Width	Width of the output image in pixels.
Map Height	Height of the output image in pixels.
Map Units	Units of measure used for output.
Image type	Format for the output image generated by MapServer
Web Template	Full path to the MapServer template file to be used with the map file
Web Header	Full path to the MapServer header file to be used with the map file
Web Footer	Full path to the MapServer footer file to be used with the map file

Only the inputs *Map file* and *QGIS project file* are required to create a map file, however by omitting the other parameters, you may end up creating a non-functional map file, depending on your intended use. Although QGIS is good at creating a map file from your project file, it may require some tweaking to get the results you want. For this example, we will create a map file using the project file `mapserverproject.qgs` we just created (see Figure_mapserver_export_2):

1. Click the  MapServer Export icon in the toolbar menu to start the MapServer dialog (see Figure_mapserver_export_2).
2. Enter the name (e.g., `qgisproject.map`) for your new map file.
3. Browse and find the QGIS project file (e.g., `mapserverproject.qgs`) you previously saved.
4. Enter a name (e.g., `MyMap`) for the map.
5. Enter the width and height (e.g., `600` for the width and `400` for the height) for your output image.
6. For this example, the layers are in meters, so we change the units to meters.

7. Choose *png* for the image type.
8. Click **[OK]** to generate the new map file `qgisproject.map`. QGIS displays the success of your efforts.

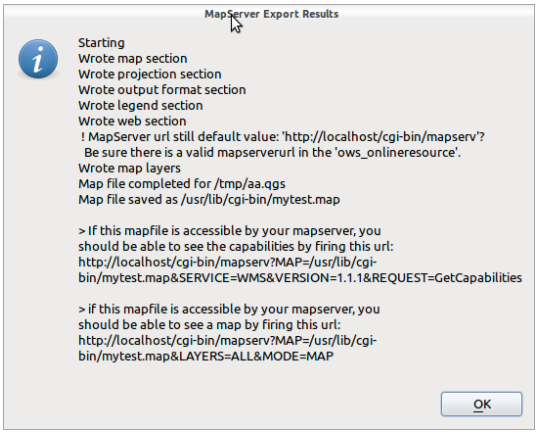


Figure 19.22: Export to MapServer Succesfull Dialog

You can view the map file in any text editor or visualizer. If you take a look, you'll notice that the export tool adds the metadata needed to enable our map file for WMS.

19.13.3 Troubleshooting

If you get error messages from mapserver like:

```
loadSymbolSet(): Unable to access file. (./symbols/symbols.txt)
```

or:

```
msLoadFontset(): Unable to access file. Error opening fontset ./fonts/fonts.txt.
```

This means that that the map file is requesting for fonts or symbol definition files but that Mapserver cannot find those.

Either comment the lines containing those names in the map file (this is possible if you do not have labels or use styles from the `symbols.txt`). Or create those files (see below).

The most simple `fonts.txt` file (because arial is used in the QGIS generated map files) contains the following line

```
# either relative to the map file or a full path:
arial /usr/share/fonts/truetype/msttcorefonts/arial.ttf
```

The most simple `symbols.txt` file contains the definition of a circle symbol (because a circle symbol is used for point layers)

```
SYMBOLSET
    SYMBOL
    NAME "circle"
    TYPE ellipse
    FILLED true
    POINTS
    1 1
    END
    END
END
```

19.13.4 Testing the Map File

We can now test our work.

If the map file is accessible for you mapserver cgi you can use the one of the url's from the success dialog.

Another option is using the **shp2img** tool to create an image from the map file. The **shp2img** utility is part of MapServer and FWTools. To create an image from our map:

- Open a terminal window
- If you didn't save your map file in your home directory, change to the folder where you saved it.
- Run `shp2img -m qgisproject.map -o mapserver\_test.png` and display the image

This creates a PNG with all the layers included in the QGIS project file. In addition, the extent of the PNG will be the same as when we saved the project. As you can see in figure_mapserver_export_4, all information except the airport symbols are included.

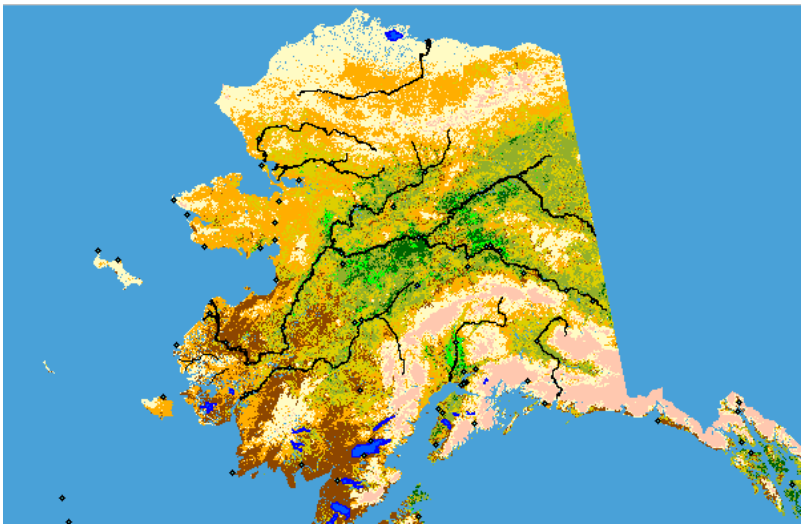


Figure 19.23: Test PNG created by shp2img with all MapServer Export layers

19.13.5 Using Map File

If you plan to use the map file to serve WMS requests, you probably don't have to tweak anything. If you plan to use it with a mapping template or a custom interface, you may have a bit of manual work to do. To see how easy it is to go from QGIS to serving maps on the web, take a look at Christopher Schmidt's 5 minute flash video. He used an older version of QGIS (version 0.8), but the demo applies equally well to newer versions.

19.14 オフライン編集プラグイン

データ収集のために、ノートパソコンやフィールドでオフラインの携帯電話で作業するのは一般的な状況です。ネットワークへの復帰後、変更内容はマスターデータソース（e.g. a PostGIS データベース）と同期する必要があります。複数の人が同じデータセットを同時に作業している場合、それは人々が同じ地物を変更していない場合でも、手作業で編集内容をマージするのは困難です。

The Offline Editing Plugin automates the synchronisation by copying the content of a datasource (usually PostGIS or WFS-T) to a SpatiaLite database and storing the offline edits to dedicated tables. After being connected to the network again, it is possible to apply the offline edits to the master dataset.

19.14.1 Using the plugin

- ベクタレイヤ（e.g. PostGIS or WFS-T データソース 由来）を開きます。
- プロジェクトとして保存します。
- Press the  Convert to offline project icon and select the layers to save. The content of the layers is saved to SpatiaLite tables.
- オフラインでレイヤを編集します。
- After being connected again, upload the changes with the  Synchronize button.

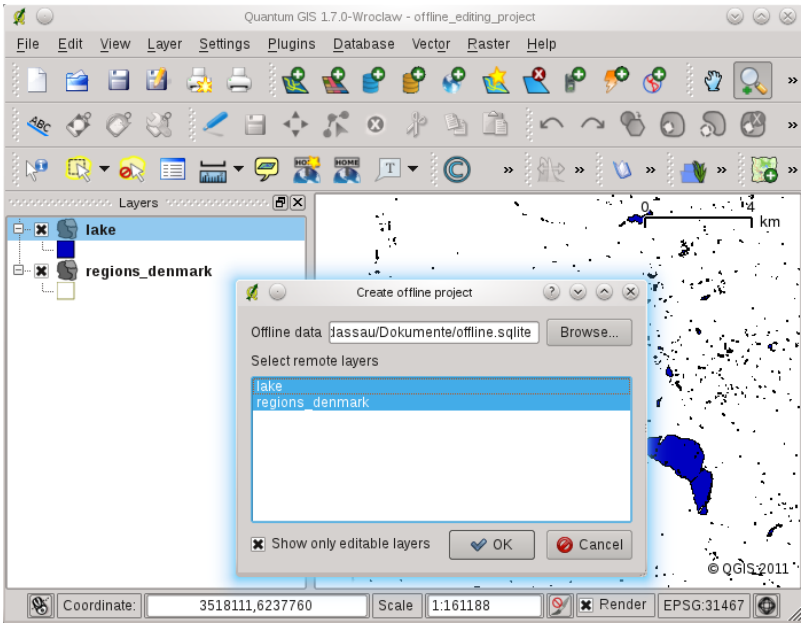


Figure 19.24: Create an offline project from PostGIS or WFS layers

19.15 Oracle GeoRaster プラグイン

In Oracle databases, raster data can be stored in SDO_GEORASTER objects available with the Oracle Spatial extension. In QGIS, the  OracleGeoRasterPlugin 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
```

This will load the raster into the default GDAL_IMPORT table, as a column named `RASTER`.

19.15.1 接続の管理

Firstly, the Oracle GeoRaster Plugin must be enabled using the Plugin Manager (see Section *QGIS* **コアプラグインをロードする**). 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  Select GeoRaster toolbar button, it 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**: The password associated with your username that is required to access the database

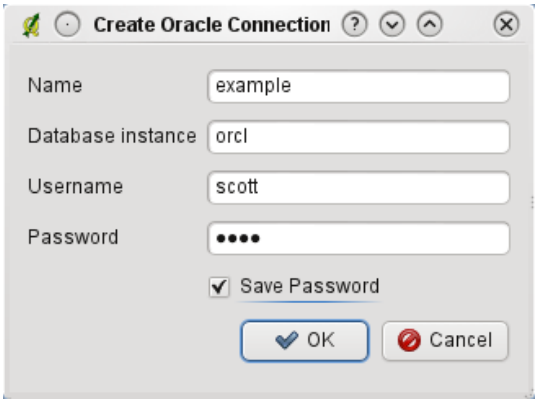


Figure 19.25: Create Oracle connection dialog

Now, back on the main *Oracle Spatial GeoRaster* dialog window (see Figure_oracle_raster_2), use the drop-down list to choose one connection, and use the **[Connect]** button to establish a connection. You may also **[Edit]** the connection by opening the previous dialog and making changes to the connection information, or use the **[Delete]** button to remove the connection from the drop-down list.

19.15.2 Selecting a GeoRaster

いったん接続が確立されると、サブデータセットウィンドウには GDAL サブデータセット名の形式でデータベースに GeoRaster カラムを含むすべてのテーブルの名称が表示されます。

リストアップされたサブデータセットのいずれかをクリックし、 **[選択]**をクリックしてテーブル名を選択します。 今サブデータセットの別のリストは、そのテーブルの GeoRaster 列の名称で表示されています。ほとんどのユーザは同じテーブルに 1 つまたは 2 つ以上の GeoRaster 列を持たないため、これはたいてい短いリストです。

リストアップされたサブデータセットをクリックし、テーブル/列の組み合わせの 1 つを選択するために**[選択]**をクリックします。ダイアログでは GeoRaster を含むすべての行を表示します。サブデータセットリストは Raster Data Table と RasterID のペアが表示される点に注意してください。

いつでも選択エントリは既知の GeoRaster に直接移動するか、最初に戻って、別のテーブル名を選択するために編集することができます。

選択データエントリは、例えば ‘‘geor:scott/tiger@orcl,gdal_import,raster,geoid=‘‘のように識別文字列の末尾に Where 句を入力するために使用することができます。詳細については http://www.gdal.org/frmt_georaster.html を参照してください。

19.15.3 GeoRaster の表示

最終的に、ラスタデータテーブルと RasterID のリストから GeoRaster とを選択することによって、ラスタイメージが QGIS にロードされます。

The *Select Oracle Spatial GeoRaster* dialog can be closed now and next time it opens it will keep the same connection, and will show the same previous list of subdataset making it very easy to open up another image from the same context.

ノート: ピラミッドを含む GeoRaster はより速く表示できますが、ピラミッドは Oracle PL/SQL または gdaladdo を使用して QGIS の外部から生成する必要があります。

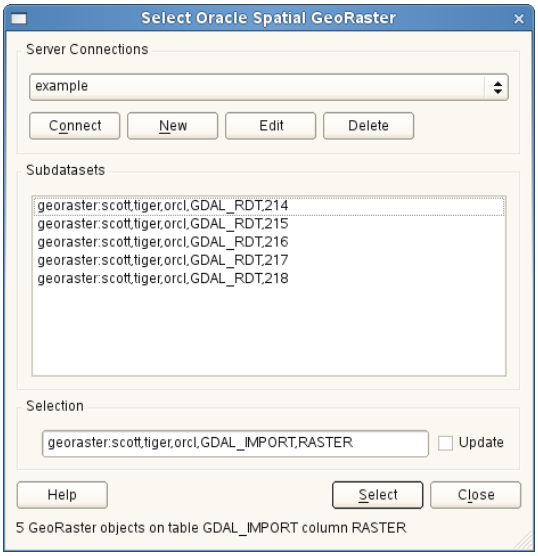


Figure 19.26: Select Oracle GeoRaster dialog

The following is example using `gdaladdo`:

```
gdaladdo georaster:scott/tiger@orcl,georaster\_table,georaster,georid=6 \
-r nearest 2 4 6 8 16 32
```

This is an example using 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;
```

19.16 Raster Terrain Analysis Plugin

 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).

分析の説明：

- **傾斜**：各セルの傾斜角を度単位で計算する（一時導関数の推定に基づく）。
- **傾斜方位**：説明（反時計回りに、北方向は 0 から始まる）。
- **Hillshade**: Create 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**: Creating a shaded relief map from digital elevation data. Implemented is a method to choose the elevation colors analysing the frequency distribution.

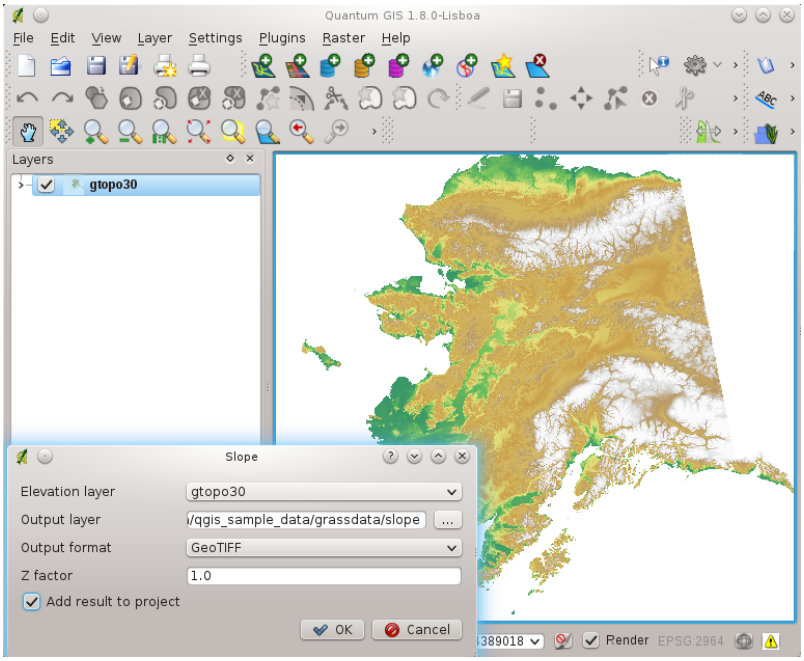


Figure 19.27: Raster Terrain Modelling Plugin (slope calculation)

19.16.1 プラグインの利用

1. Start QGIS and load the `gtopo30` raster layer from the GRASS sample location.
2. Load the Raster Terrain Analysis plugin in the Plugin Manager (see Section *QGIS* **コアプラグインをロードする**)
3. Select an analysis method from menu (e.g. *Raster* → *Terrain Analysis* → *Slope*). The *Slope* dialog appears as shown in Figure_raster_terrain_1.
4. 出力ファイルパスおよび出力ファイルタイプを指定します。
5. **[OK]**をクリックします。

19.17 ヒートマッププラグイン

:sup:‘ヒートマップ‘プラグインはポイントのベクタレイヤからヒートマップを作成することを可能とします。ヒートマップとはポイントに関連した情報の密度や大きさを示すラスタマップです。この結果から“ホットスポット”を用意に特定することができます。

19.17.1 ヒートマッププラグインの有効化

まず、プラグインマネージャ(*QGIS* **コアプラグインをロードする** のセクションを参照) を利用して、このプラグインを有効化する必要があります。すると、有効になったヒートマップアイコンlheatmapl をラスタツールバーで見つけることができます。

Select from menu *View* → *Toolbars* → *Raster* to activate the Raster Toolbar when it is not yet activated.

19.17.2 ヒートマッププラグインの利用

The Heatmap toolbutton starts the dialog of the Heatmap plugin (see figure_heatmap_2).

ダイアログには次のオプションがあります：

- **Input Point Vector** dialog: Provides a selection of loaded point vector maps.
- **Output Raster**: Using the  button you select the folder and the name of the output raster the Heatmap plugin will generate. It is not necessary to give a file extension
- **Output Format**: Selection of the output format. Although all formats supported by GDAL can be choosen, GeoTIFF is most in cases the best format to choose.
- **半径**: メートルまたはマップの単位で半径を与えるために使用できます。選択された半径が小さすぎる場合、あなたは良いヒートマップを得ることはありません。ポイントの周りの多くのサークルがお互いに重なっ場所では明るいホットスポットが発生します！
- **減衰率**: 中心からのヒートが減衰する率を示すのに使用します。
  - When 0 is given (=minimum) the heat will be concentrated in the centre of given radius and be completely extinguished at the edge.
  - 10 が指定された場合（=最大）ヒートがエッジで濃縮し、中央では完全に消滅する。与えられた値が高いと、効果がありません。
  - When 1 is given the heat is spread evenly over the whole circle.
  - 負の減衰率を指定した場合、ヒートマップではなくクールマップを作成できるでしょう！

When the  *Advanced* checkbox is checked it will give acces to additional advanced options.

- **行** と **列** は出力ラスタのピクセルサイズを変更するのに使います。行数と列数を多くすることは、ピクセルサイズを小さくすることを意味し、出力ファイルのサイズはより大きくなり、プロセスがややゆっくり行われます。行数を 2 倍にすると自動的に列のサイズも二倍になり、セルサイズも二分割されます。出力ラスタの領域は同じのままです！
- **セルサイズ X** と **セルサイズ Y** は出力ラスタのピクセルサイズに影響を及ぼし行と列の数を変更します。

点ベクタレイヤはヒートマップを作成するために用いられる属性フィールドを持つかもしれません。

- **半径にフィールド値を使う**:属性フィールドから半径を設定します。
- **重みにフィールド値を使う**:属性フィールドから重み要因を設定します。

出力ラスタを与えたら**[OK]**ボタンを使ってヒートマップを作成することができます。この最初の結果はグレーのサーフェスであり、ヒートマップを作成するための追加の処理が必要です。

警告：ラスタサイズプロパティの変更
ラスタライズプロパティを変更する場合、出力結果も変わります。ホットスポットエリアがより大きくなります。

19.17.3 ヒートマップの作成

次の例では、QGIS サンプルデータセット (**サンプルデータ** を参照) の ‘‘airports‘‘ 点ベクタレイヤを使っています。ヒートマップを作成するためのもう 1 つの優れた QGIS チュートリアルは ‘http://qgis.spatialthoughts.com <http://qgis.spatialthoughts.com/2012/07/tutorial-making-heatmaps-using-qgis-and.html>‘_ で見つけることができます。

Figure_Heatmap_1 ではアラスカの空港が示されてます。

1.  :sup:‘ヒートマップ ‘ツールボタンを押すことで、ヒートマッププラグインのダイアログが表示されます (figure_heatmap_2 を参照) 。
2. In field *Input Point Vector*  select `airpoirt` from the list of point layers loaded in current project.

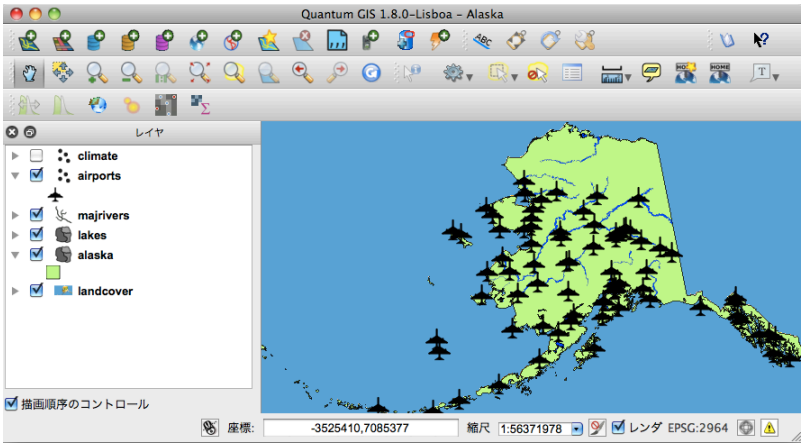


Figure 19.28: Airports of Alaska

3. In field *Output Raster* give the name and location using the ... button of the output raster. Give the output raster file the name `heatmap_airports` to give an file extension is not necessary.
4. :guilabel:‘出力形式 ‘では ‘‘GeoTIFF‘‘を選択します。
5. :guilabel:‘半径 ‘では ‘‘1000000‘‘メートルを設定します。
6. オリジナルの:guilabel:‘減衰率 ‘は ‘‘0.1‘‘が適当でしょう。
7. **[OK]**をクリックし、新しいラスタマップを作成してロードします (Figure_Heatmap_3 を参照)。

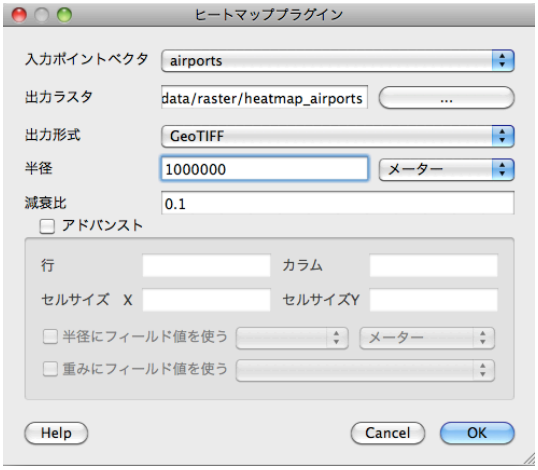


Figure 19.29: The Heatmap Dialog

ヒートマップを読み込んだ後の結果は、おそらく期待していたものと異なるでしょう。これはグレーのサーフェスであり、(色に) バリエーションがありません。最初に、このレイヤのいくつかの追加設定は、ヒートマップが自分自身を表示するために行われる必要があります。

1. Open the properties dialog of layer `heatmap_airports` (select the layer `heatmap_airports`, open context menu with right mouse button and select *Properties*).
2. Select the *Symbology* tab.
3. Change *Color map*  from ‘Grayscale’ to ‘Pseudocolor’.
4. Press the **[Apply]** button.
5. Switch to the *Transparency* tab and set *Global transparency*  to 40%.
6. **[OK]**を選択します。

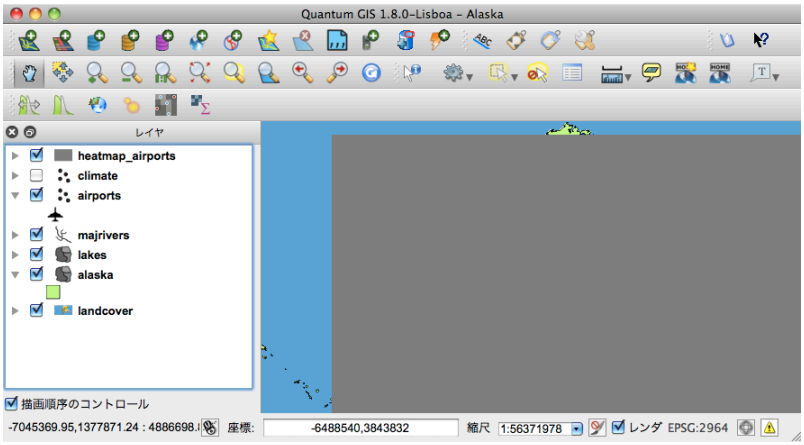


Figure 19.30: The heatmap after loading looks like a grey surface

最終的な結果は Figure_Heatmap_4 に示してあります。

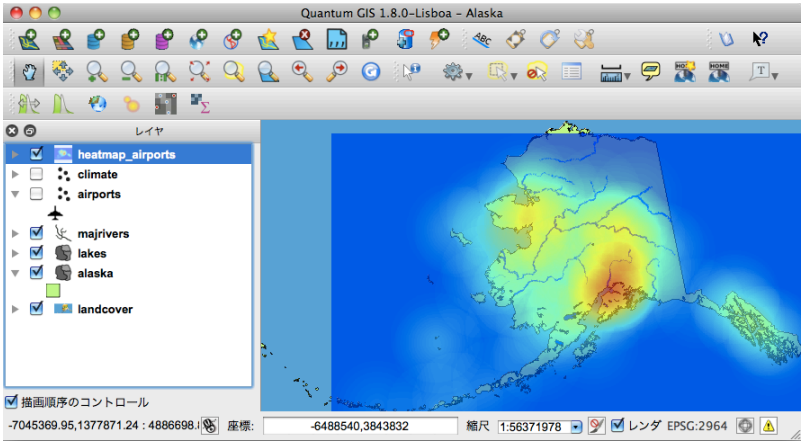


Figure 19.31: Final result of heatmap created of airports of Alaska

19.18 道路グラフプラグイン

道路グラグプラグインは C++で書かれた QGIS 用のプラグインで, ポリライン上の任意の 2 地点間の最短経路を計算し, 道路ネットワーク上にポリラインとプロットを作成し出力します

Main features:

- 経路, 距離, 旅行時間を計算する
- 距離または旅行時間で最適化する
- 経路をベクタレイヤとして出力する
- 道路の方向にハイライトを入れる (動作が遅いため, 主にデバッグや設定確認目的に利用します)

QGIS がサポートしているフォーマットでは、どんなポリラインのベクターレイヤでも道路のレイヤーとして使用することができます。共通のポイントを持つ 2 本のラインは接続していると見なされます。注意点は、道路レイヤーを編集中にレイヤーの CRS をプロジェクトの CRS として使用する必要があります。これは、異なる CRS 間の座標の再計算が、スナップを用いた場合でさえも不連続性をもたらし、エラーを引き起こす事実によるものです。

次に示すレイヤ属性テーブルのフィールドが利用可能です

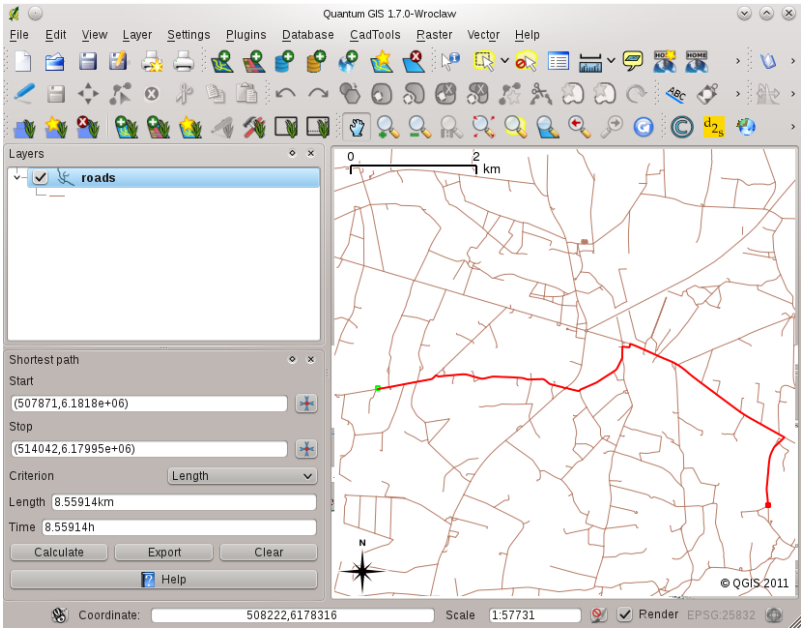


Figure 19.32: Road Graph Plugin

- 道路の速度 — 数値フィールド;
- direction — any type, that can be casted to string. Forward and reverse directions are correspond to the one-way road, both directions — 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 plugin settings dialog.

19.18.1 Using the plugin

After plugin activation you will see an additional panel on the left side of the main QGIS window. Now make some definitions to the *Road graph plugin settings* dialog in the menu *Vector* → *Road Graph*.

道路ネットワークレイヤ上に始点と終点を設定し,**[計算]**をクリックしてください

19.19 空間検索プラグイン

空間検索 プラグインは、他のレイヤを参照して、ターゲットレイヤで空間クエリを作成する（地物を選択する）ことを可能とします。この機能は GEOS ライブラリにもとづいており、選択したソースフィーチャレイヤに依存します。

利用可能な演算子：

- 含む
- 一致する
- 重複する
- 横切る
- 交差する
- 離れている
- 接する
- 範囲内

19.19.1 Using the plugin

例として、我々は空港が含まれているアラスカのデータセット内の領域を見つけたい。次の手順が必要です：

1. QGIS を起動してベクタレイヤ `regions.shp` と `airports.shp` をロードします。
2. Load the Spatial Query plugin in the Plugin Manager (see Section *QGIS* **コアプラグインをロードする**) and click on the Spatial Query icon which appears in the QGIS toolbar menu. The plugin dialog appears.
3. ソースレイヤとして regions を選択し、参照する地物レイヤとして airports を選択します。
4. 地物の場所で ‘範囲内’ を選択し**[Apply]**をクリックします。

Now you get a list of feature IDs from the query and you have several options as shown in figure_spatial_query_1.

- :sup:‘リスト内のアイテムでレイヤを作成する ‘をクリックします。
- リストから ID を選択しlselectcreatelayerl :sup:‘選択からレイヤを作成する ‘をクリックします。
- Select the ‘Remove from current selection’ in the field *And use the result to* .
- さらに :guilabel:‘アイテムにズームする ‘か :guilabel:‘ログメッセージ ‘の表示を利用できます。

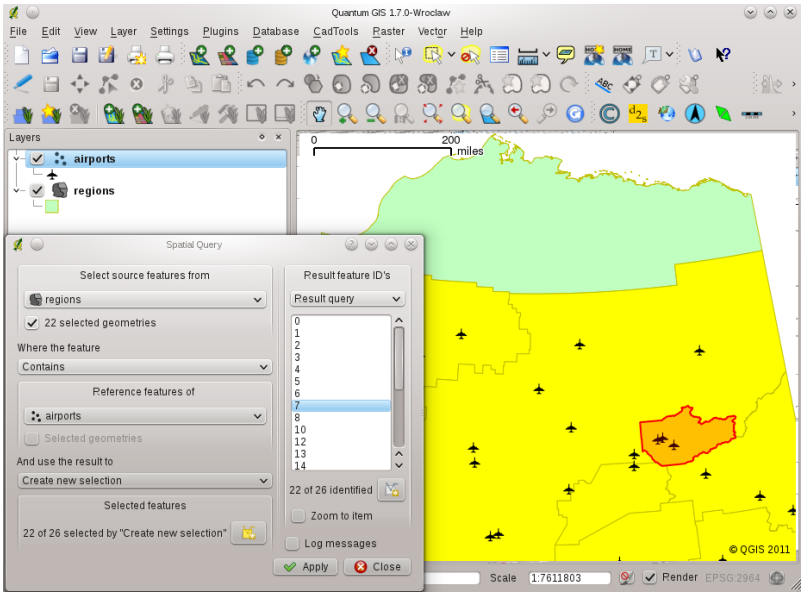


Figure 19.33: Spatial Query analysis - regions contain airports

19.20 SPIT プラグイン

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, check the box next to the *SPIT plugin* and click **[OK]**. The SPIT icon will be added to the plugin toolbar.

To import a shapefile, click on the SPIT tool in the toolbar 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.

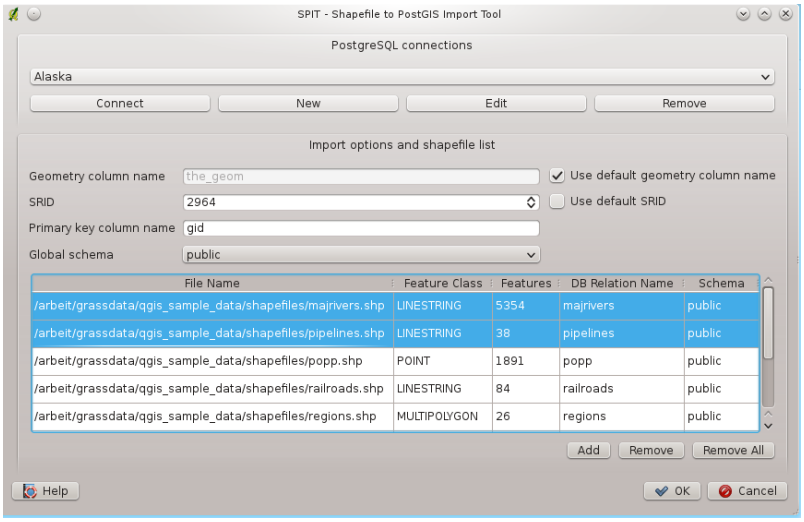


Figure 19.34: Using SPIT Plugin to import Shape files to PostGIS

ちなみに: Importing Shapefiles Containing PostgreSQL Reserved Words

If a shapefile is added to the queue containing fields that are reserved words in the PostgreSQL database a dialog will popup showing the status of each field. You can edit the field names prior to import and change any that are reserved words (or change any other field names as desired). Attempting to import a shapefile with reserved words as field names will likely fail.

19.21 SQL Anywhere プラグイン

SQL Anywhere は、Sybase の独自のリレーショナルデータベース管理システム（RDBMS）です。 SQL Anywhere は、OGC を含め、Shape ファイルなどの空間データをサポートしており、 KML, GML と SVG フォーマットへの出力機能が組み込まれています。

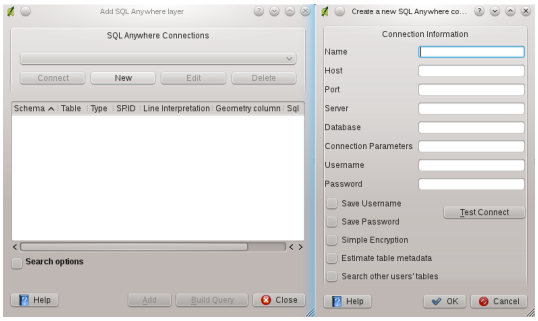


Figure 19.35: SQL Anywhere dialog (KDE)

The SQL Anywhere allows to connect to spatialy enabled SQL Anywhere databases. The *Add SQL Anywhere layer* dialog is similar in functionality to the dialogs for PostGIS and SpatiaLite.

19.22 地域統計プラグイン

With the Zonal Statistics Plugin you can analyze the results of a thematic classification. It allows 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.

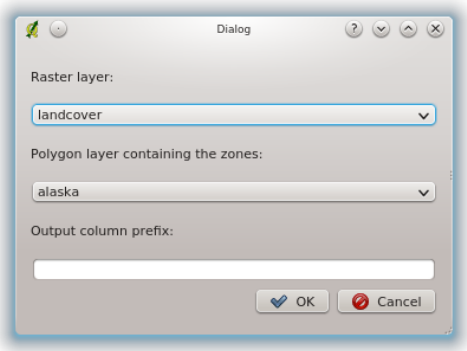


Figure 19.36: Zonal statistics dialog (KDE)

Chapter 20

ヘルプとサポート

20.1 メーリングリスト

QGIS は活発な開発が続けられています。それゆえいつもあなたが期待した通りに動作するとは限りません。 推奨されるヘルプは QGIS ユーザメーリングリストへの加入です。 あなたの質問は多くの人に届けられ、回答は他の人の利益になるでしょう。

20.1.1 qgis-users

このメーリングリストは QGIS 一般について、とりわけインストールや利用方法についての話題が中心になります。 以下の URL から qgis-users メーリングリストに参加できます: http://lists.osgeo.org/mailman/listinfo/qgis-user

20.1.2 fossgis-talk-liste

ドイツ語をしゃべる人のためにはドイツの FOSSGIS e.V. が fossgis-talk-liste メーリングリストを提供しています。このメーリングリストでは QGIS を含むオープンソース GIS 一般について論議されます。fossgis-talk-liste メーリングリストには以下の URL から参加できます: https://lists.fossgis.de/mailman/listinfo/fossgis-talk-liste

20.1.3 qgis-developer

もしあなたが開発者で技術的な問題に直面しているなら 、ここの qgis-developer メーリングリストに参加するといいでしょう :http://lists.osgeo.org/mailman/listinfo/qgis-developer

20.1.4 qgis-commit

QGIS コードレポジトリにコミットが行われるたびにこのリストにメールが送られます。あなたがカレントコードベースを最新の状態にしておきたいならば、ここでこのリストに参加できます:http://lists.osgeo.org/mailman/listinfo/qgis-commit

20.1.5 qgis-trac

このリストはプロジェクト管理に関連した通知を提供します、そこにはバグレポート、タスク、リクエスト機能が含まれます。 ここでリストに参加できます:http://lists.osgeo.org/mailman/listinfo/qgis-trac

20.1.6 qgis-community-team

このリストでは文書、コンテキストヘルプ、ユーザガイド、web サイト、ブログ、メーリングリスト、フォーラムを含むオンラインの情報や翻訳についての話題が交わされます。もしユーザーガイドについてなにかをしたい場合はこのリストがあなたの質問をあつかう適切な場所です。このリストにはここで参加できます:http://lists.osgeo.org/mailman/listinfo/qgis-community-team

20.1.7 qgis-release-team

このリストではリリースプロセス、様々な OS 向けのバイナリのパッケージングの話題と世界に向けての新リリースアナウンスを行います。以下の場所でこのリストに参加できます:http://lists.osgeo.org/mailman/listinfo/qgis-release-team

20.1.8 qgis-tr

このリストでは翻訳作業についての情報を扱います。マニュアルやグラフィカルユーザーインターフェース (GUI) の翻訳作業を行いたい場合、このリストがあなたの質問に適したスタートポイントです。ここからリストに参加出できます： http://lists.osgeo.org/mailman/listinfo/qgis-tr

20.1.9 qgis-edu

このリストは QGIS の教育についての情報を扱います。もし QGIS 教育用マテリアルを作成したい場合はこのリストがあなたの質問に適したスタートポイントです。ここからこのリストに参加できます：http://lists.osgeo.org/mailman/listinfo/qgis-edu

20.1.10 qgis-psc

このリストは運営委員会の討議に利用されます。ここでは Quantum GIS のプロジェクト管理や方針に関するすべてのことが議論されます。このリストには以下の場所で参加できます:http://lists.osgeo.org/mailman/listinfo/qgis-psc

あなたはどのリストに参加しても歓迎されます。質問に回答してあなたの経験を共有することで貢献できることを覚えておいてください。 qgis-commit と qgis-trac は通知専用にデザインされており、ユーザの投稿用ではないことに注意して下さい。

20.2 IRC

私たちは IRC も維持しています - irc.freenode.net の#qgis チャンネルに加わってみてください。 チャンネルに参加している人達は他のことをやっているのであなたの質問にレスポンスがあるまでしばらくお待ちください。 それは他の人があなたの質問に気づくまでの時間です。 QGIS のコマーシャルサポートもあります。詳細については、WEB サイト http://qgis.org/en/commercial-support.html の情報を参照して下さい。

もし IRC に失敗した場合でも問題ありません! 私たちはすべての会話をログにとってあります。ですからあなたは簡単に追いつくことができます。それにはここにいってみて http://logs.qgis.org 、 IRC-logs を読んで下さい。

20.3 BugTracker

メーリングリストは一般的に ’QGIS で xyz はどうやるのか ’というような質問のためには便利であるとともに、あなたは QGIS 内のバグを通知したいと思うでしょう。 はなたは QGIS のバグレポートを https://trac.osgeo.org/qgis/のトラッカーで登録することができます。 新しいバグのチケットを作成した時は追加情報をリクエストできるように email アドレスを提供して下さい。

あなたの報告したバグがあなたの望む優先順位で処理されないことがあることを、どうか気になさらないでください (そのバグの重大性に依存します)。 いくつかのバグは開発者に対して多大な労力かけるのでいつもそのようにできるわけではありません。

将来実装してほしい要望についてもバグと同じようにチケットで登録できます。 ‘‘Feature‘‘というタイプのチケットを選択して下さい。

もしあなたがバグを発見してご自身で修正した場合はパッチも登録することができます。 再度ですが、愛らしいトラックチケットシステムは https://trac.osgeo.org/qgis/ で利用できます。 patch をタイプメニューで選択して下さい。開発者の誰かがそれをレビューして QGIS に適用するはずです。 あなたのパッチがすぐに適用されないようなことを心配しないでください — 開発者は他のコミットメントで手が離せないのでしょう。

20.4 Blog

QGIS-community はウェッブログ (ブログ) を http://blog.qgis.org で運営しています。ここではユーザや開発者にとって 興味深い記事が掲載されています。 あなたは登録するとブログへの記事投稿に招待されます！

20.5 Plugins

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’.

20.6 Wiki

私たちは WIKI ウェッブサイトを http://www.qgis.org/wiki で運営しています。ここでは QGIS 開発、リリース計画、ダウンロードサイトへのリンク、 メッセージ翻訳のためのヒント等多彩な有用情報があります。ここを調べると中にはすばらしいものがありますよ！

Chapter 21

付録

21.1 GNU General Public License

Version 2, June 1991

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software–to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow. TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

   Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

   You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

   (a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

   (b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

   (c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

   These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

   Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

   In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

   (a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

   (b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

(c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

   If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

   It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

   This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Quantum GIS Qt exception for GPL

In addition, as a special exception, the QGIS Development Team gives permission to link the code of this program with the Qt library, including but not limited to the following versions (both free and commercial): Qt/Non-commerical Windows, Qt/Windows, Qt/X11, Qt/Mac, and Qt/Embedded (or with modified versions of Qt that use the same license as Qt), and distribute linked combinations including the two. You must obey the GNU General Public License in all respects for all of the code used other than Qt. If you modify this file, you may extend this exception to your version of the file, but you are not obligated to do so. If you do not wish to do so, delete this exception statement from your version.

21.2 GNU Free Documentation License

Version 1.3, 3 November 2008

Copyright 2000, 2001, 2002, 2007, 2008 Free Software Foundation, Inc

<http://fsf.org/>

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The purpose of this License is to make a manual, textbook, or other functional and useful document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondarily, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The **Document**, below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "**you**". You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A "**Modified Version**" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A "**Secondary Section**" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The "**Invariant Sections**" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none.

The "**Cover Texts**" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A "**Transparent**" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not "Transparent" is called **Opaque**.

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The "**Title Page**" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

The "**publisher**" means any person or entity that distributes copies of the Document to the public.

A section "**Entitled XYZ**" means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as "**Acknowledgements**", "**Dedications**", "**Endorsements**", or "**History**".)

To "**Preserve the Title**" of such a section when you modify the Document means that it remains a section "Entitled XYZ" according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

1. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
2. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.
3. State on the Title page the name of the publisher of the Modified Version, as the publisher.
4. Preserve all the copyright notices of the Document.
5. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
6. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.

7. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
8. Include an unaltered copy of this License.
9. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.
10. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.
11. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.
12. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.
13. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.
14. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.
15. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties—for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections Entitled "Endorsements".

6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the copyright resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document's Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, or distribute it is void, and will automatically terminate your rights under this License.

However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally, unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, receipt of a copy of some or all of the same material does not give you any rights to use it.

10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See http://www.gnu.org/copyleft/.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation. If the Document specifies that a

proxy can decide which future versions of this License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version for the Document.

11. RELICENSING

"Massive Multiauthor Collaboration Site" (or "MMC Site") means any World Wide Web server that publishes copyrightable works and also provides prominent facilities for anybody to edit those works. A public wiki that anybody can edit is an example of such a server. A "Massive Multiauthor Collaboration" (or "MMC") contained in the site means any set of copyrightable works thus published on the MMC site.

"CC-BY-SA" means the Creative Commons Attribution-Share Alike 3.0 license published by Creative Commons Corporation, a not-for-profit corporation with a principal place of business in San Francisco, California, as well as future copyleft versions of that license published by that same organization.

"Incorporate" means to publish or republish a Document, in whole or in part, as part of another Document.

An MMC is "eligible for relicensing" if it is licensed under this License, and if all works that were first published under this License somewhere other than this MMC, and subsequently incorporated in whole or in part into the MMC, (1) had no cover texts or invariant sections, and (2) were thus incorporated prior to November 1, 2008.

The operator of an MMC Site may republish an MMC contained in the site under CC-BY-SA on the same site at any time before August 1, 2009, provided the MMC is eligible for relicensing.

ADDENDUM: How to use this License for your documents

To use this License in a document you have written, include a copy of the License in the document and put the following copyright and license notices just after the title page:

> Copyright YEAR YOUR NAME. Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the "with ... Texts." line with this:

> with the Invariant Sections being LIST THEIR TITLES, with the Front-Cover Texts being LIST, and with the Back-Cover Texts being LIST.

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.

Chapter 22

文献とWeb参照

GDAL-SOFTWARE-SUITE. Geospatial data abstraction library. http://www.gdal.org, 2012.

GRASS-PROJECT. Geographic ressource analysis support system. http://grass.osgeo.org , 2012.

MITCHELL, T. Web mapping illustrated, 2005.

NETELER, M., AND MITASOVA, H. Open source gis: A grass gis approach, 2008.

OGR-SOFTWARE-SUITE. Geospatial data abstraction library. http://www.gdal.org/ogr , 2012.

OPEN-GEOSPATIAL-CONSORTIUM. Web map service (1.1.1) implementation specification. http://portal.opengeospatial.org, 2002.

OPEN-GEOSPATIAL-CONSORTIUM. Web map service (1.3.0) implementation specification. http://portal.opengeospatial.org, 2004.

POSTGIS-PROJECT. Spatial support for postgresql. http://postgis.refractions.net/ , 2012.