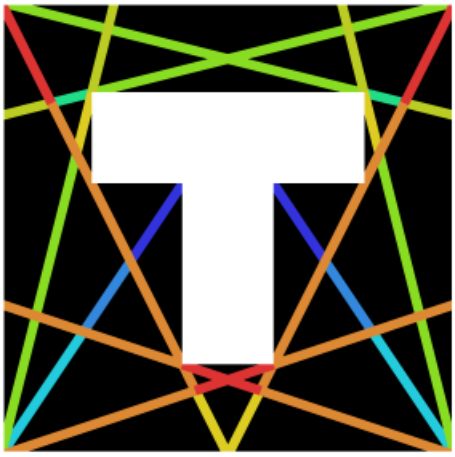
Space Syntax Toolkit for QGIS

Version 0.1.0

05/07/2015



User Guide

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Overview

The "Space Syntax Toolkit" (SST) is a QGIS plug-in for spatial network and statistical analysis. It provides a front-end for the depthmapX[1] software within QGIS, offering user-friendly space syntax analysis in a GIS environment. It is primarily aimed at supporting the standard space syntax methodology, and enhancing its workflows with standard GIS data, analysis and visualisation features. However, the added functionality can be of general benefit to QGIS users by introducing tools for exploratory spatial data analysis. Currently the SST consists of two modules: "Graph Analysis" and "Attributes Explorer".

The SST plug-in is an open source project, being developed at the Space Syntax Laboratory, The Bartlett School of Architecture, UCL. Additional information about the SST project is available from its Github repository (https://github.com/SpaceGroupUCL/qgisSpaceSyntaxToolkit), namely:

- Articles and presentations, under 'documents';
- Sample data sets, under 'data';
- Issue tracking and features wish list, under 'Issues';
- Latest source code, under 'esstoolkit';
- Previous releases, under 'releases'.

This "User Guide" describes the installation, functionality and basic usage of the SST. It does not explain the theory and methods of space syntax, nor the standard features and operation of QGIS or depthmapX. Please refer to the respective literature and documentation for information on these essential aspects.

[1] Varoudis T., 2012, 'depthmapX Multi-Platform Spatial Network Analysis Software', Version 0.30 OpenSource, http://varoudis.github.io/depthmapX/

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Installation

The SST plug-in is available via the QGIS "Plugins manager" (Fig. 1), found under menu 'Plugins > Manage and Install plugins…'. Selecting the "All" or "Not installed" tabs, scroll down to find the "Space Syntax Toolkit" entry, or type its name in the "Search" box. Select and click the "Install plugin" button, making sure the check box next to it is active before closing the "Plugins manager" window. This activates the plug-in and it remains available for future sessions.

Using the "Plugins manager" you can also uninstall and upgrade the plug-in. If there are updates available, it will be listed in the "Upgradable" tab, and a notification is shown in the QGIS main window status bar.

Figure 1 – "Plugins manager", with the "Space Syntax Toolkit" selected.

After installing the plug-in there will be a "Space Syntax Toolkit" menu entry in the "Vector" menu, and a new toolbar with two buttons (Fig. 2). These menus and buttons start the different modules. The toolbar can be switched on/off in the 'View > Toolbars' menu.

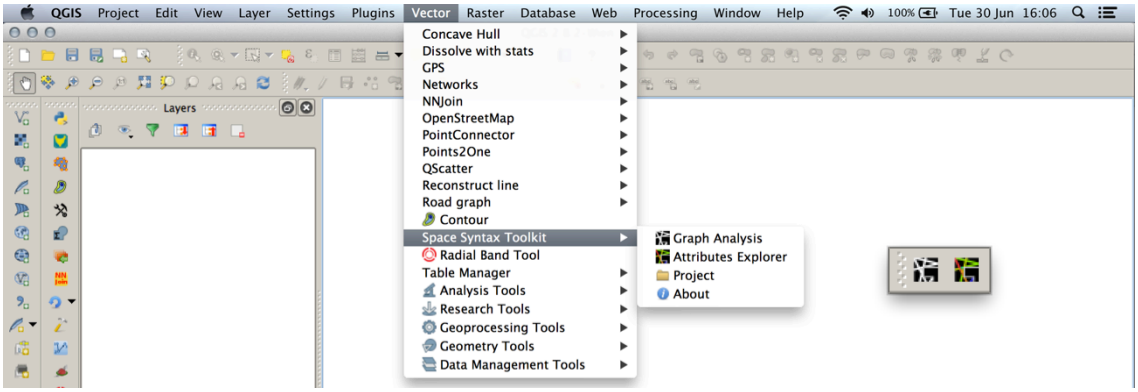


Figure 2 – Vector menu with the "Space Syntax Toolkit", and toolbar.

Additional requisites

One of the main features of the SST is the integration of depthmapX for space syntax axial and segment graph analysis. In order to run these analyses, the depthmapXnet version of the software must be installed (Fig. 3). This package can be downloaded from: http://archtech.gr/varoudis/depthmapX/?dir=depthmapXnet

Make sure you download the correct version for your computer system. If you don't install depthmapXnet you will still be able to use the SST plug-in, but you won't be able to use the "depthmapX remote" tool.

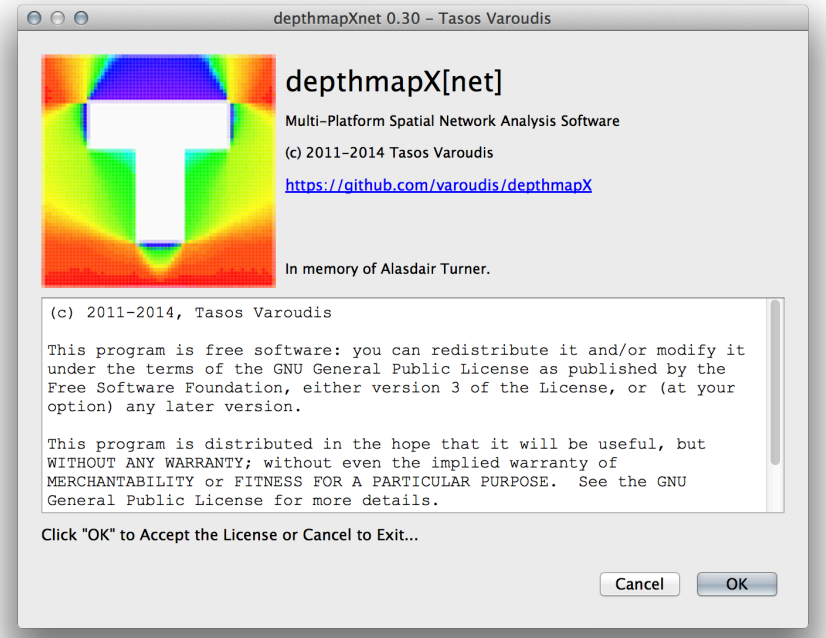


Figure 3 – DepthmapXnet welcome screen.

Sample data

The SST repository hosts a sample data set, which can be downloaded to try the tools straight away and test all of the toolkit's features. This data set is used throughout the User Guide. Included with the sample data are also *.qgs* project files to load the different tables as layers in QGIS.

The sample data comes in three data formats: a folder with Shape files, a Spatialite personal geodatabase file, and a PostGIS data dump. You can use either format, or even try all three, because the SST performance is affected by the data format being used. The PostGIS data is for users that have access to a local or remote installation of a PostgreSQL server, and needs to be restored into a schema named "data".

General notes on data formats

The SST has been developed to work with all vector data formats available in QGIS. It can use as input any vector layer loaded in the layers panel, and supports writing to the native data formats of QGIS, namely shape files, spatialite personal geodatabases, PostGIS databases, and memory layers. Each of these data formats has features that might be more appropriate for different users, and the SST takes advantage of each format's unique characteristics to optimize performance in various operations. Every user should become familiar with the pros and cons of each data format, and choose the most suitable for their project.

Shape file

Shape file is the most common file based GIS format. It consists of a collection of files, storing the geometry, attribute data, metadata, coordinate system, spatial index, etc. A lot of existing data sets are distributed and shared in this format.

- Pros: uses the standard file and folder approach for storage that every user is familiar with.
- Cons: easy to lose components of the "file" when moving things around; limited to 10 characters in attribute names; limited to 2GB in the dbf (attributes) file; leads to huge folders with many files; depends fully on the QGIS API for querying and analysis.
- For more info: https://en.wikipedia.org/wiki/Shapefile

Spatialite

Spatialite is a spatial extension to the SQLite personal database, i.e. a self-contained database in a single file on disk. The Spatialite drivers are installed with QGIS and it supports it natively. Has similar functionality to PostGIS, with embedded SQL, many spatial analysis functions and spatial indices. The toolkit makes use of these embedded functions whenever possible.

- Pros: all the data is stored in a single file, the easiest to store, backup and share; the embedded SQL and functions allow powerful data queries and analysis; the embedded functions are many times faster than QGIS equivalents; has no restrictions to table and attribute names.
- Cons: requires some familiarity with database principles to manage the stored information, although QGIS offers user-friendly data manager interfaces; the database can quickly grow to have many tables; the SQLite SQL standard has some limitations; only supports vector data.
- For more info: https://en.wikipedia.org/wiki/SpatiaLite

PostGIS

PostGIS is a spatial extension to PostgreSQL, the most robust and powerful open source relational database system. It is a server-based system, widely used in enterprise and web scenarios, allowing remote and concurrent access by multiple users. It can also be installed locally for personal use.

- Pros: no data size limit; full SQL support; rich analysis functions; extremely fast operations; supports vector and raster data; has "schemes" that help keep the database organised; possible to have multiple users collaborating on same database.
- Cons: requires installation of server and/or client platform; for personal use it requires knowledge of database systems and management; data sharing easiest using shape files, when others don't have access to the server.
- For more info: https://en.wikipedia.org/wiki/PostGIS

Memory layer

Memory layers are temporary vector data layers that are not saved on disk, nor saved with the project, and the data disappears once the QGIS session is closed. They can be used to dump analysis results or can be created by the user to store draft information. Their contents can be saved to any permanent vector data format by the user.

- Pros: no need to specify a data store or save path; keep information if something goes wrong.
- Cons: very volatile and data disappears; must be saved as soon as possible into a data store format; does not allow adding or removing attributes.
- For more info:
- http://docs.qgis.org/testing/en/docs/pyqgis_developer_cookbook/vector.html - memory-provider

Other vector formats

Several other vector data formats can be loaded as QGIS layers, and used by the SST, for example MapInfo TAB and MIF, or AutoCAD DXF and DWG. However, none of these formats are editable, therefore they can only be visualised, or used as input for a new layer in one of the previously listed native data formats.

Graph Analysis

The "Graph Analysis" module is a side panel that supports the verification and analysis of the space syntax network model (Fig. 4). This model consists of an axial map layer, representing the open spaces network as lines, and an "unlinks" layer, indicating bridges and tunnels where there is no level crossing between lines that intersect in the map. The "Graph Analysis" module has a verification tool to check the geometric and topological integrity of each of these layers, helping the user correct problems before running the analysis. The "depthmapX remote" tool controls the axial and segment analysis performed in depthmapXnet, via a direct link from QGIS, which sends the model and analysis parameters, and receives back the results once the calculations are completed.

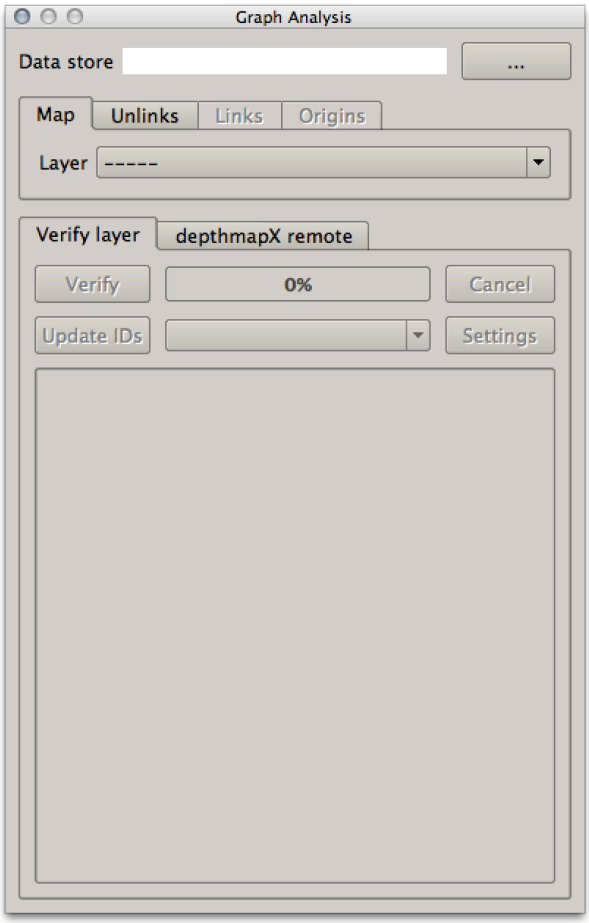


Figure 4 – "Graph Analysis" module tools panel.

Model set-up

The first step in setting up the space syntax model is to indicate in the "Map" and "Unlinks" tabs which of the existing vector layers should be used in the analysis (Fig. 5). The map layer must be a lines layer, while the unlinks layer can be any type of feature, i.e. points, lines or polygons. If there are no valid layers in the QGIS "Layers" panel the drop list will be empty. You can either open an existing QGIS project, add a new layer to the QGIS session, or create a new layer and draw the axial map/unlinks on it. The "OpenLayers" plugin can be very useful for creating new axial models because it loads layers with cartography and aerial imagery from OpenStreetMap, Google, Bing and other providers onto the QGIS canvas. Please refer to the QGIS documentation for details on these operations.

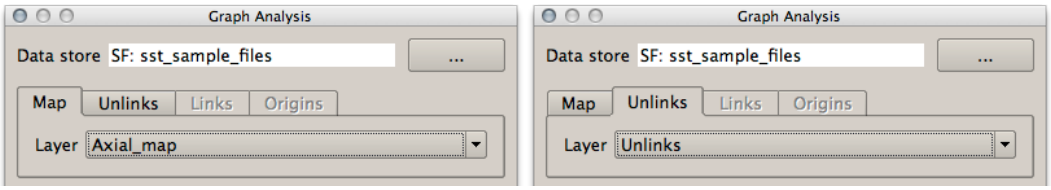


Figure 5 – "Graph analysis" model set-up fields.

Data Store

The "Data Store" field at the top (Fig. 5) indicates the data format and location where the analysis results and other auxiliary files are saved:

- SF: [folder name] – Shape files folder;
- SL: [database name] – Spatialite geodatabase;
- PG: [database name | schema name] – PostGIS geodatabase.

This is by default the same location as the map layer's data format, when first selected. It can also be set or changed to another data format and storage location at any stage, using the "Project Settings" dialog (Fig. 6), accessed from the SST menu or the "…" button next to the data store field. In this window the user can choose existing folders or database connections for the different formats. In the case of shape files and spatialite files, the user can also create a new data store location, or open an existing one. In the case of PostGIS databases, the user can select the schema where the data is stored, but she cannot create a new database or open an existing one. For that the user must use the QGIS dialog for creating PostGIS connections.

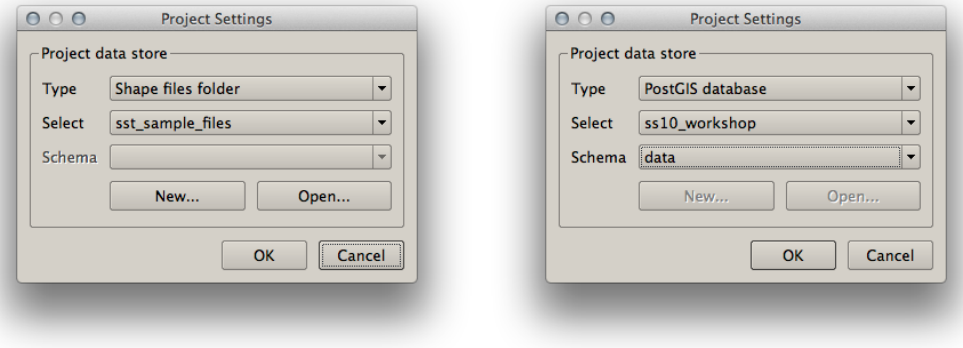


Figure 6 – "Project Settings" window to select the data store.

The data store setting is saved with the QGIS project, and is recovered when the project is opened, if the data store is still available. Refer to the section "General notes on data formats" to decide which data format to use.

Verifying the axial map

The verification of the axial map checks for possible geometry and topology problems with the model (Fig. 7). These may include:

- Small line – lines with a length below the minimum (default: > 1 m)
- Polylines – lines made up of more than two nodes
- Coinciding points – lines with two points coinciding
- Duplicate geometry – two lines with identical geometry
- Short line – line whose endpoint is close to another line without intersecting it (default: > 1 m)
- Orphans – lines that are not intersecting any other lines

- Islands – groups of lines that are disconnected from the main map

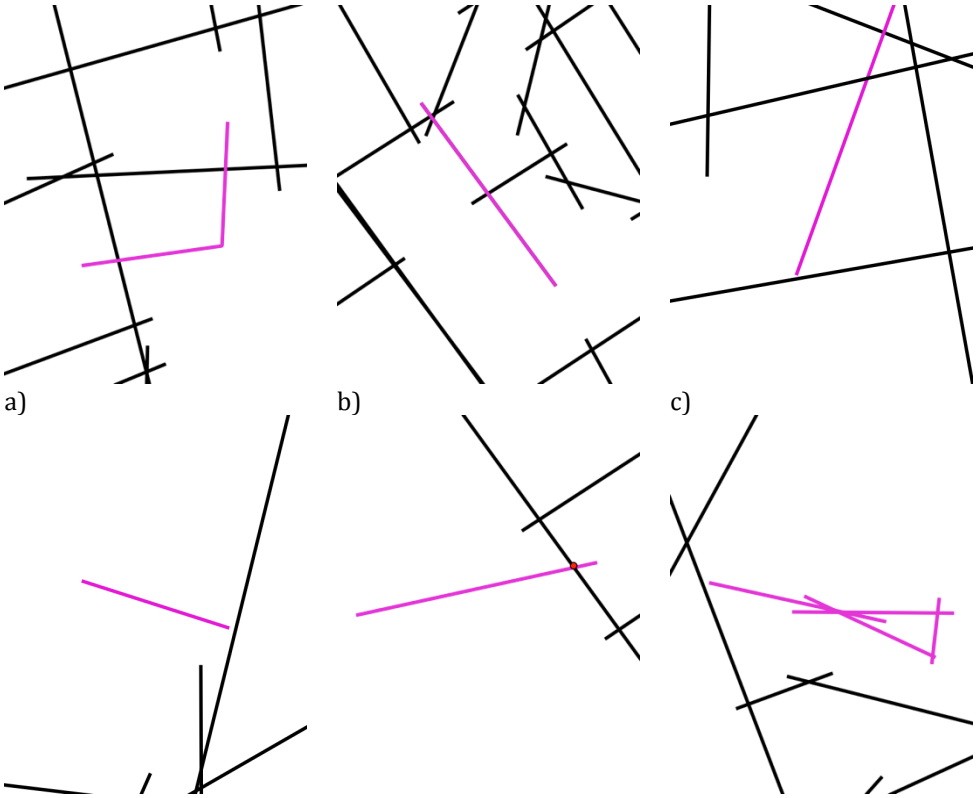


Figure 7 – Examples of the axial line problems being checked, with the problem line highlighted; a) polyline, b) duplicate, c) short, d) orphan, e) unlinked orphan, f) island.

Clicking the "Verify" button in the "Verify layer" tab starts the verification of the selected layer, and when the process concludes, any problems found will be listed in a report (Fig. 8a). The problems listed in the report can be filtered by type of problem in the "All problems" drop-down menu. The number in brackets indicates the total number of occurrences of a problem (Fig. 8b).

When verifying the axial map, if an unlinks layer is selected, the unlinks are taken into account and can reveal topological problems due to unlink disconnections (Fig. 7e). This unlinks layer must also be verified and fixed for the axial map verification results to be completely correct. (See next section).

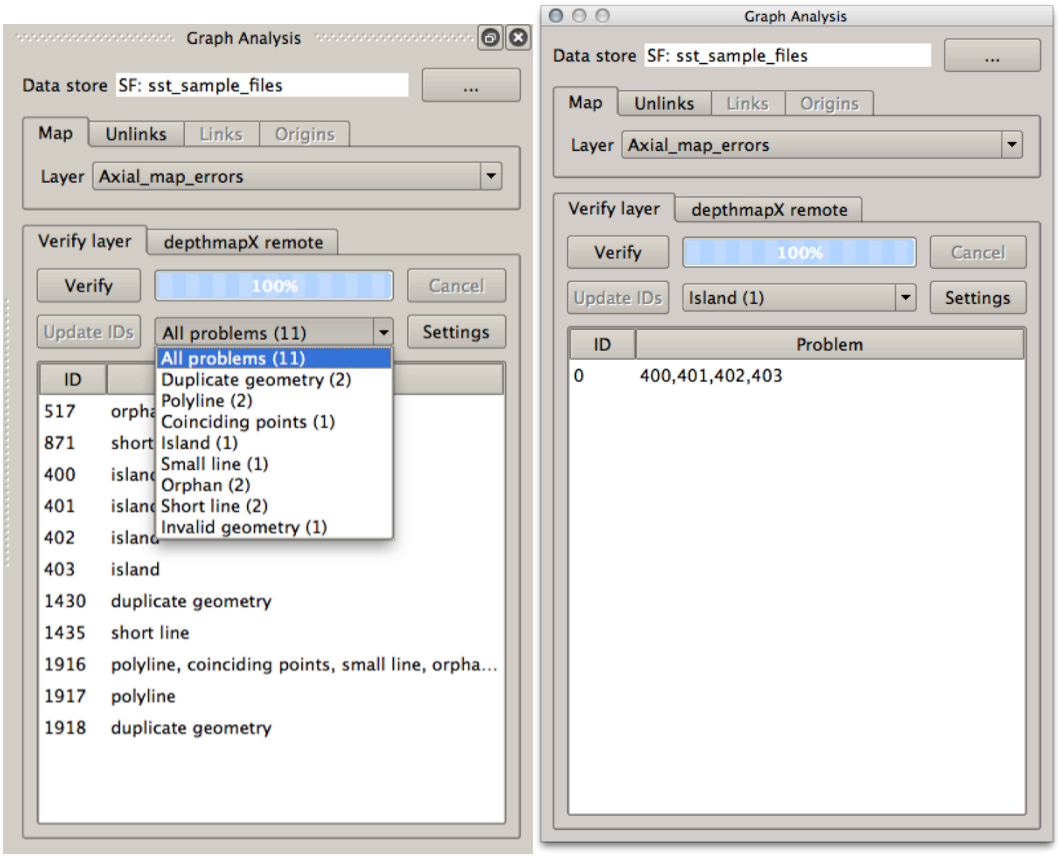


Figure 8– Axial map verification report; a) full report, b) filter to list islands only.

The "Settings" button gives access to the distance thresholds used in the verification process (Fig. 9). The "Axial crossing threshold" value is used to identify short lines (default = 1m). The "Minimum axial length" value is used to identify small lines (default = 1m). These values can be changed to increase or reduce the verification tolerance to suit the level of accuracy of the model.

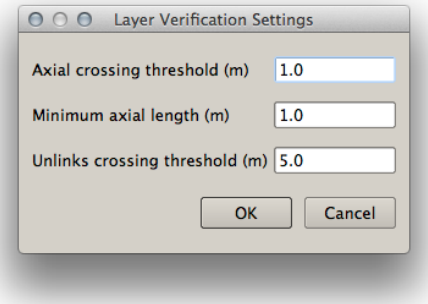


Figure 9 – Layer verification settings, with default values.

Selecting an entry in the problems report automatically selects and zooms into the corresponding line or group of lines. Once located, the user can use the editing mode and modify or remove the line(s) (Fig. 10). The lines are identified by their unique ID, which is the primary key of a geodatabase layer, an existing layer attribute called "ref", "id", "pk", "pkid", "sid", "uid" or "fid", or the internal QGIS feature id when none of the previous is available or valid.

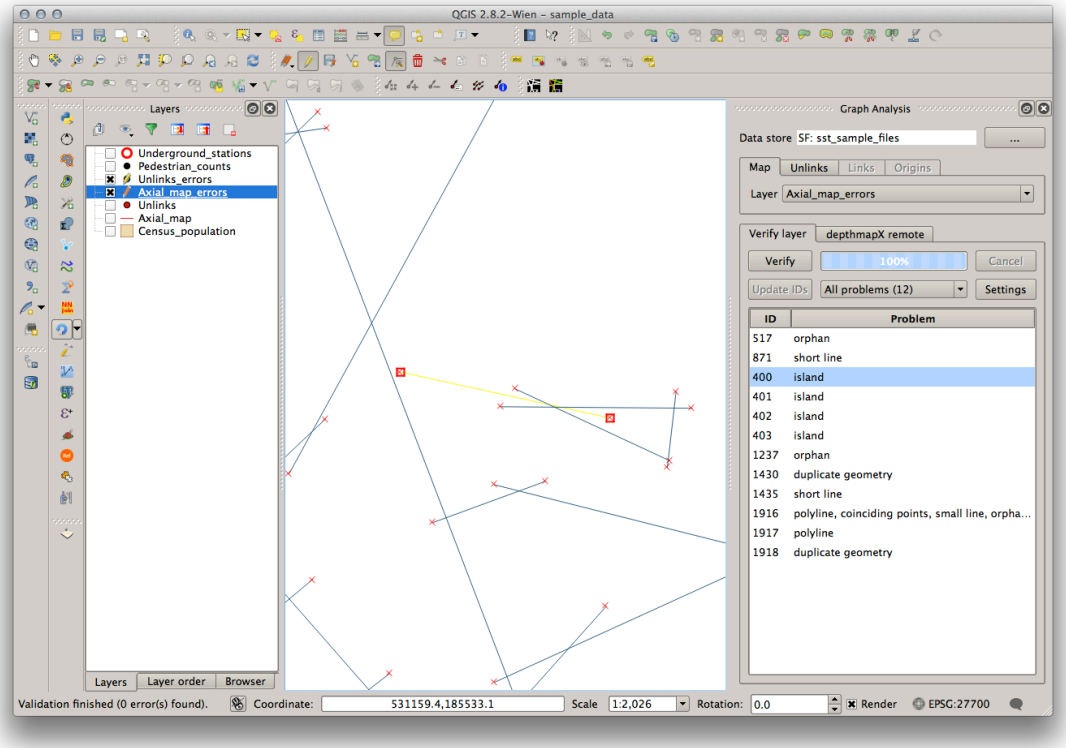


Figure 10 – Selecting a problem in the report, and editing the feature to fix it.

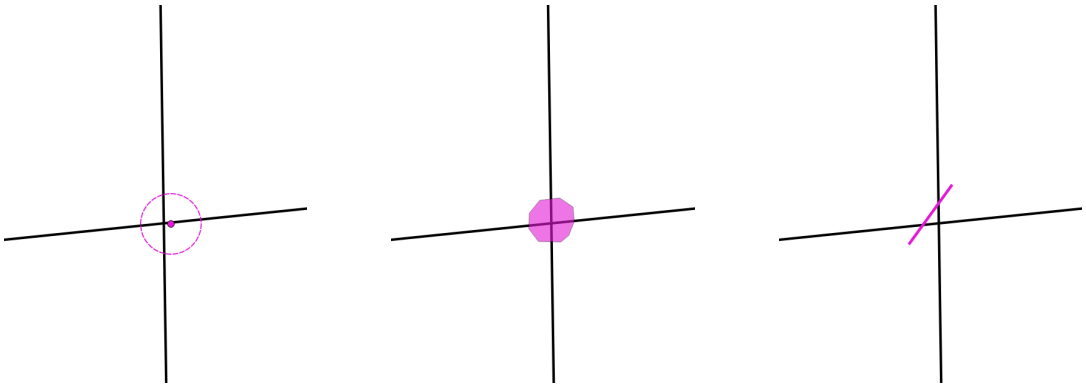
Notes:

The verification process is faster if the data is in a geodatabase because it makes use of optimised SQL queries. This can be important when working with very large maps.

The verification process is meant for axial maps only. It does not identify any possible problems in segment maps or road centre line maps, for example.

Verifying the unlinks

An unlink can be any feature that identifies an intersection between two axial lines, that are to be disconnected. It can be a point near the intersection, or a line or polygon intersecting the two relevant axial lines (Fig. 11).



a) b) c)

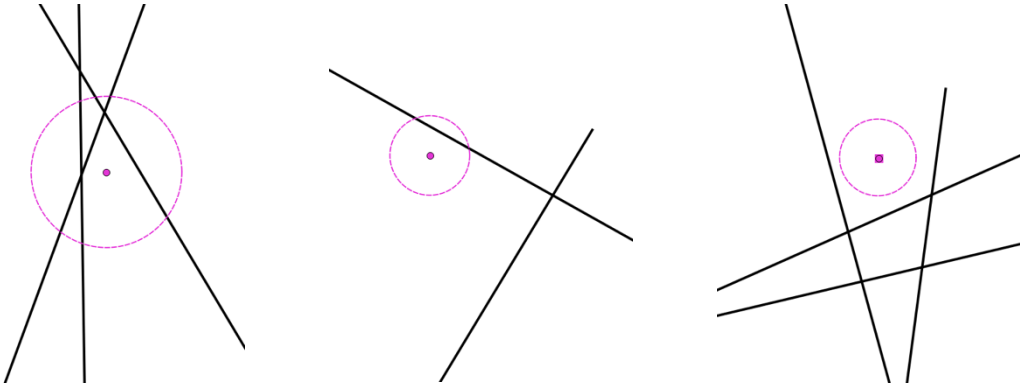
Figure 11 – Types of unlinks geometry: a) point (with verification threshold), b) polygon or c) line.

The ids of the unlinked lines are stored in attributes called “line1” and “line2”. The first time unlinks verification runs, it checks if the “line1” and “line2” attributes are present. If these attributes are missing the user is asked to use the “Update IDs” tool to assign the id of the lines at the intersection

identified by each unlink. In the case of points, a buffer is used to identify the intersection (Fig. 11 a). The unlink threshold distance (default = 5m) can be changed in the "Layer verification settings" window (Fig. 9). To have greater control over the intersection of each individual unlink, the user can opt for polygon or line unlinks.

The verification of unlinks requires that an axial map layer is selected in the "Map" tab (Fig. 5), and both layers must have the same data format and be in the same database (if using Spatialite or PostGIS). The verification checks for topological and line id problems in relation to the axial lines layer (Fig. 12):

- Multiple lines – unlinks near or intersecting more than two axial lines;
- Single line – unlinks near or intersecting only one axial line;
- No lines – unlinks not intersecting any lines, or further than the unlinks threshold (Fig. 9);
- Same id – unlinks with duplicate line id on both attributes;
- Unmatched id – unlinks with no line id attribute (NULL), or the id not matching the currently intersected axial lines.



a) b) c)

Figure 12 – Examples of unlinks problems being checked: a) multiple lines, b) single line, c) no lines.

If there are problems with the unlinks, a report is created with a list of unlinks and line ids (Fig. 13). The unlinks' problem selection, filtering and editing process is identical to that of axial maps, described in the previous section.

Line id problems can occur when the unlinks or the lines are edited and/or moved and the intersection ids do not match the "line1" and "line2" attributes. If there are line id problems reported, the user should first confirm if the line id is wrong or if the unlink is in the wrong place. In this case it should be relocated to the correct intersection. Only then should the user run the "Update IDs" tool to update the line id attributes.

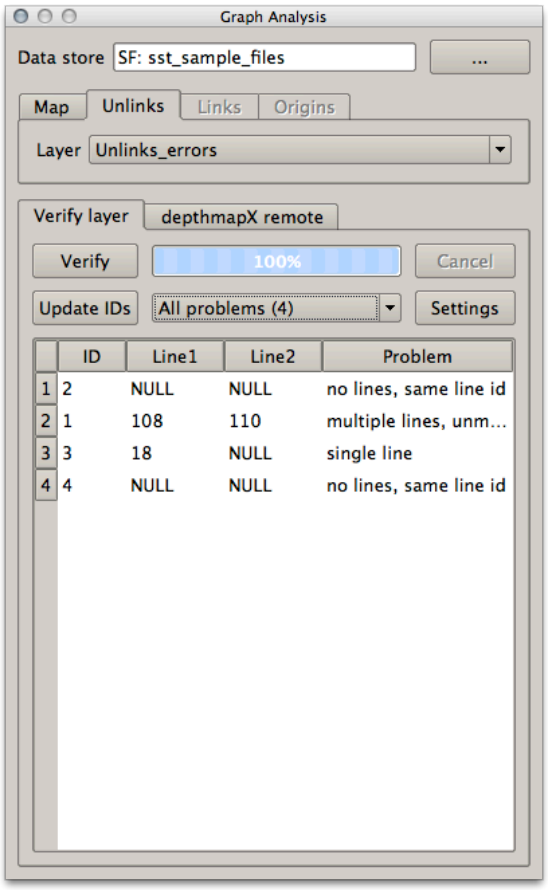


Figure 13 – Unlinks verification report

DepthmapX remote analysis

Once both map and unlinks layers have been verified, and no problems are reported, the user can use this axial model to run a space syntax analysis using depthmapX. Instead of manually exporting the layers and importing them into depthmapX, the SST offers a "depthmapX remote" tool that takes care of the entire process without leaving QGIS.

Note:

DepthmapXnet must be installed and running before starting an analysis (see page4 for details).

The "depthmapX remote" tab controls the analysis in depthmapXnet of the model consisting of the selected map and unlinks layers. The analysis settings in this panel emulate what one would find in depthmapX, but in a more compact layout (Fig. 14). One can choose between axial (topological) and segment (angular) analysis.

The radius distance is "n" or "0" by default, meaning a full global analysis without radius restriction. The field accepts a list of comma-separated values for different radii, which are by default topological steps in the case of axial analysis, and metric distance in the case of segment analysis. The topological steps respect the way depthmapX works, where radius 1 corresponds to connectivity, and radius 2 corresponds to the most local analysis, referred to as R3 in most literature.

In this panel the user can also choose to run weighted analysis, and select the attribute to use as weight. In the case of axial analysis, a "Line Length" attribute is added by default, and in the case of segment analysis, a "Segment Length" attribute is added. Again, this corresponds to the weighted analysis feature of depthmapX. This is a weight of the origin and destination nodes in the analysis, and is not related to the topological and angular distance of the route between nodes.

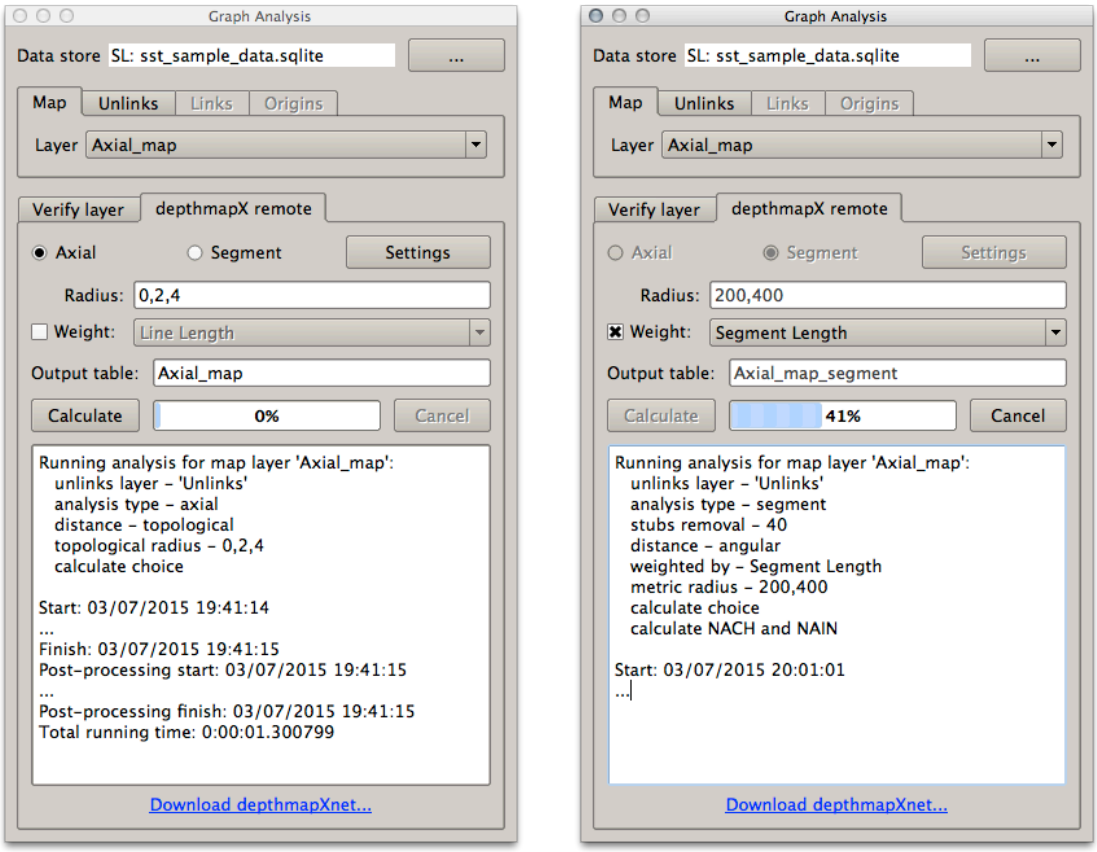


Figure 14 – "depthmapX remote" control panel, for running axial and segment analyses.

Additional "Advanced settings" are available via the "Settings" button. Here the user can choose to calculate a full set of graph measures[2] that are not used very often (unchecked by default), and to include choice measures in the analysis (checked by default). In the case of segment analysis, there are additional parameters: the type of radius distance (metric by default) can be metric, angular or topological; and the stubs removal percentage used when converting an axial map into segment map (40% by default).

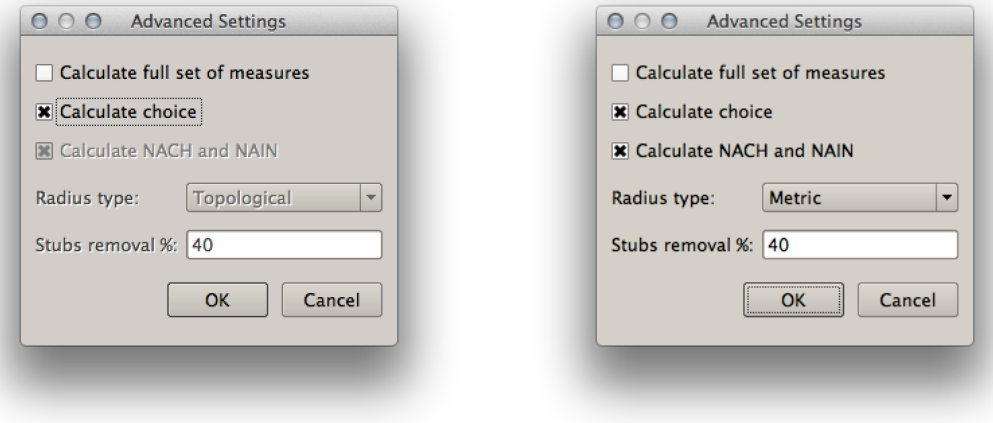


Figure 15 – "Advanced Settings" for axial analysis (left) and segment analysis (right).

The "depthmapX remote" tool (Fig. 14) automatically suggests an output table name for the analysis results, which can be edited by the user. By default, the axial analysis results output is the

[2] Please refer to the depthmapX documentation for a list of the full set of measures.

same as the axial map layer, and they are added to the layer. If a different name is given in the "Output table" field, a new table is created. The segment analysis results always create a new layer, with the "_segment" suffix. These new tables are stored in the current data store location, and the user should confirm that it is the desired location. When a new table is created, the tool checks for an existing table with the same name, and if a duplicate name is found it asks the user if she wishes to overwrite it.

Once all the settings are correct, clicking "Calculate" sends the model data and analysis parameters to depthmapXnet for analysis. depthmapXnet must be already running in the background, or a warning is given. A summary of the analysis settings is written in the report window for verification (Fig. 14). If there is a problem with the map layer, the analysis stops with an error. If there is a problem with the unlinks layer, a warning is given and the analysis continues without unlinks. In either case the user should run the layer verification steps on both layers.

While the analysis is running, both QGIS and depthmapXnet must be kept open throughout, otherwise the connection is broken and the analysis results lost. The analysis can be cancelled midway through using the "Cancel" button. When the progress bar reaches 100%, the analysis is complete and the report displays the analysis running time (Fig. 14).

The post-processing stage takes place on the QGIS side. The results are filtered to include only the standard attributes (i.e. ref, connectivity, choice, integration, node count, total depth, line length) or include the full set. In segment analysis NACH and NAIN is calculated. Finally the attributes are renamed to be compatible with the selected data store format. Shape files in particular are very restrictive when it comes to attribute names, being limited to 10 alphanumeric characters, therefore the names are shortened as much as possible using a predefined conversion table (Table 1) to avoid duplicate unintelligible names (e.g. Choice1, Choice2, Choice3, etc.). Spatialite and PostGIS tables do not have an attribute name size restriction, but having capital letters, special characters such as square brackets, or spaces in the names requires the use of double quotes when creating SQL queries, which should be avoided.

Table 1 – Attributes names conversion table, indicating the full depthmapX name or word, and the equivalent short name for Shape files.

Full name	**Short code**	**Full name**	**Short code**
Choice	CH	[norm]	norm
Connectivity	CONN	Harmonic	har
Controllability	CONTR	[hh]	hh
Entropy	ENT	[p-value]	pv
Mean Depth	MD	[tekl]	tk
Integration	INT	Harmonic	har
Node Count	NC	Relativised	rel
Line		angular	ang
Segment	seg	axial	ax
Length	LEN	metric	m
Intensity	INTEN	T1024	
Total Depth	TD	[wgt]	

The results layer is added to the layers panel of QGIS. The attributes with the results can be seen in the attributes table of the results layer. However, the best way to explore the analysis results is using the "Attributes Explorer" tool (next section).

Attributes Explorer

The "Attributes Explorer" module supports the visual and statistical exploration of a layer's numeric attributes' values, and in particular the space syntax analysis results. The aim is to emulate the interactive nature of depthmapX when looking at results via an attributes list. This module supports the quick analysis of individual attributes of a selected layer, displaying the values on the map using simplified symbology, providing essential descriptive statistics, and plotting basic interactive charts (histogram and scatter plot). To start this exploration, the user just needs to select a layer from the panel's drop-down menu at the top, and click on one of the attributes in the list (Fig. 16).

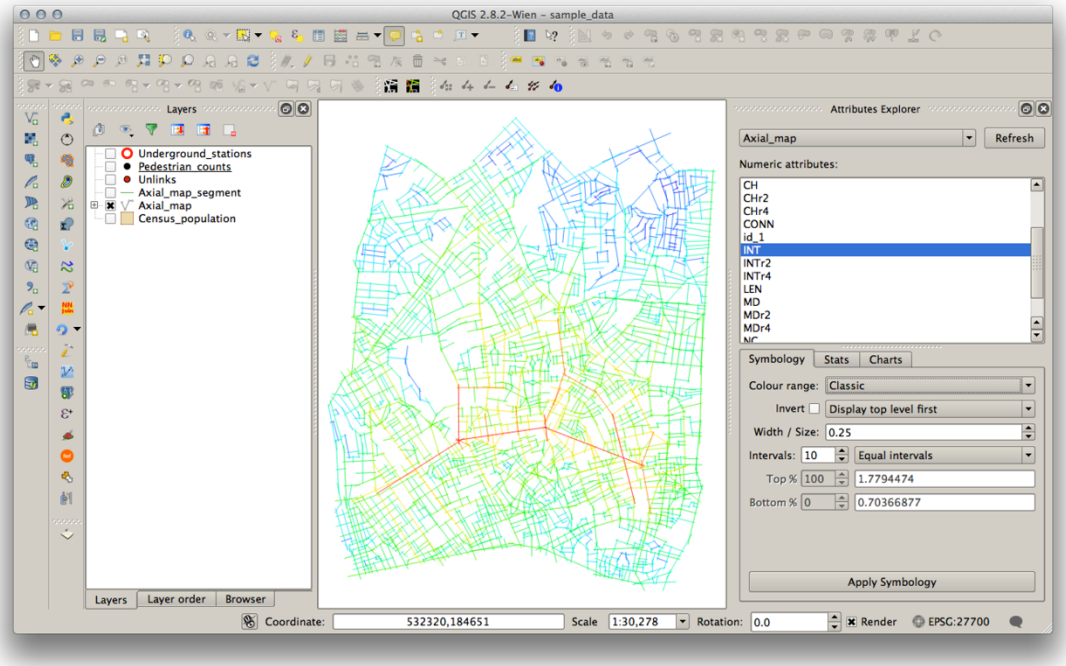


Figure 16 – QGIS window with the "Attributes Explorer" panel docked on the right side.

The "Attributes Explorer" symbology, stats and charts tabs can be hidden by dragging the separator to the bottom of the panel, leaving only the attributes list visible for attribute selection. This panel can also be docked on the left, as an additional attributes tab next to the "Layers" tab.

To produce maps with a black background, as is typical of deptmapX and other space syntax software, you can change the canvas background colour. Go to "Project > Project Properties…"and in the "General Settings" section of the "General" tab (top) set it to black (Fig. 17). There you can also change the selected feature's colour (yellow by default). These settings are saved with the QGIS project.

Note:

Do not select a layer with a custom symbology that you want to keep, before saving the style. The tool changes the layer's symbology as soon as the layer is selected.

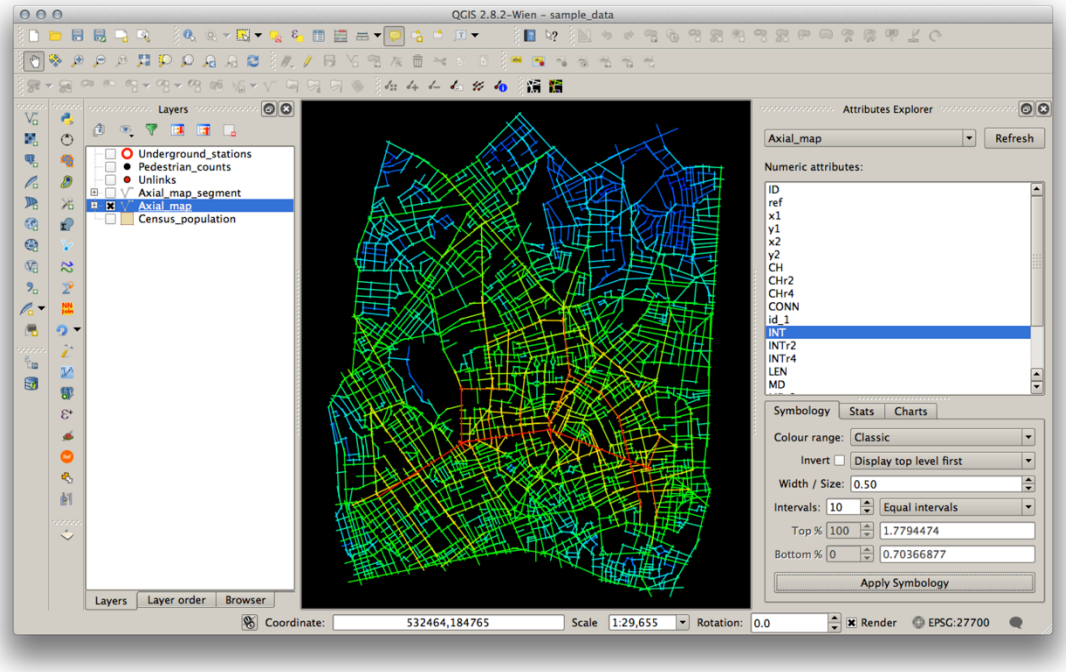


Figure 17 – QGIS window with black background.

Attribute symbology

The attribute symbology tab (Fig. 18) supports the display of maps with the standard settings from depthmapX, plus other settings that are useful for the space syntax community. The default style is applied as soon as an attribute is selected in the "Numeric attributes" list. The user can then change the colour and data range settings to create a custom symbology that is more appropriate to the specific attribute. To see the result of the changed settings, the user needs to click "Apply Symbology". This also stores the new settings with the QGIS project, and they become the style for that attribute. The user can flip between different attributes and they are displayed with their individual custom styles.

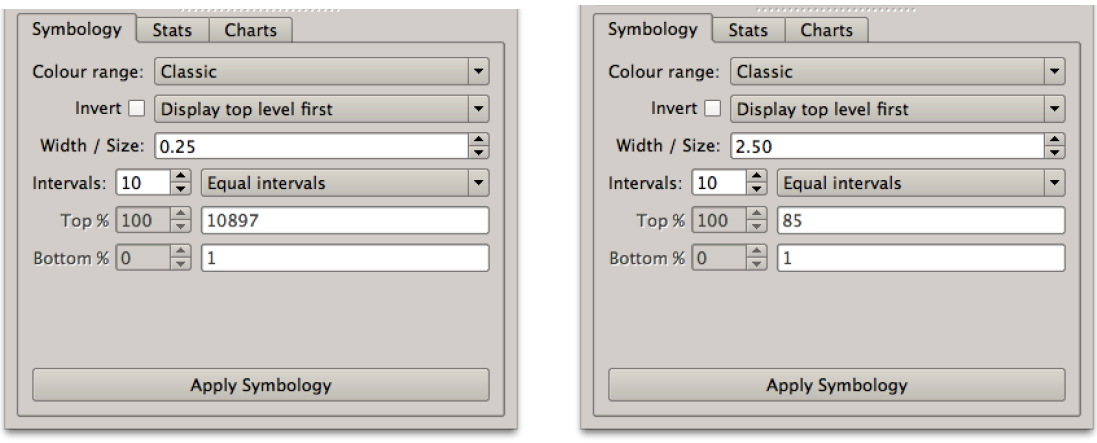


Figure 18 – Attribute symbology settings tab, with default settings for line/polygon layers (left) and point layers (right).

The colour settings include:

- "Colour range" – options for "classic" (default), "red-blue", "greyscale" and "monochrome" display (Fig. 19). The greyscale and monochrome colour ranges automatically use black or white lines depending on the darkness of the background colour;

- Invert – Inverts the range, assigning the top colour to the bottom values;
- Display order – Ensures that the top (default) or bottom values are displayed first in the map, the default being the red lines on top of all the others;
- Width / Size – Sets the line width or point size, which is constant in all styles except monochrome, where this value represents the maximum width/size.

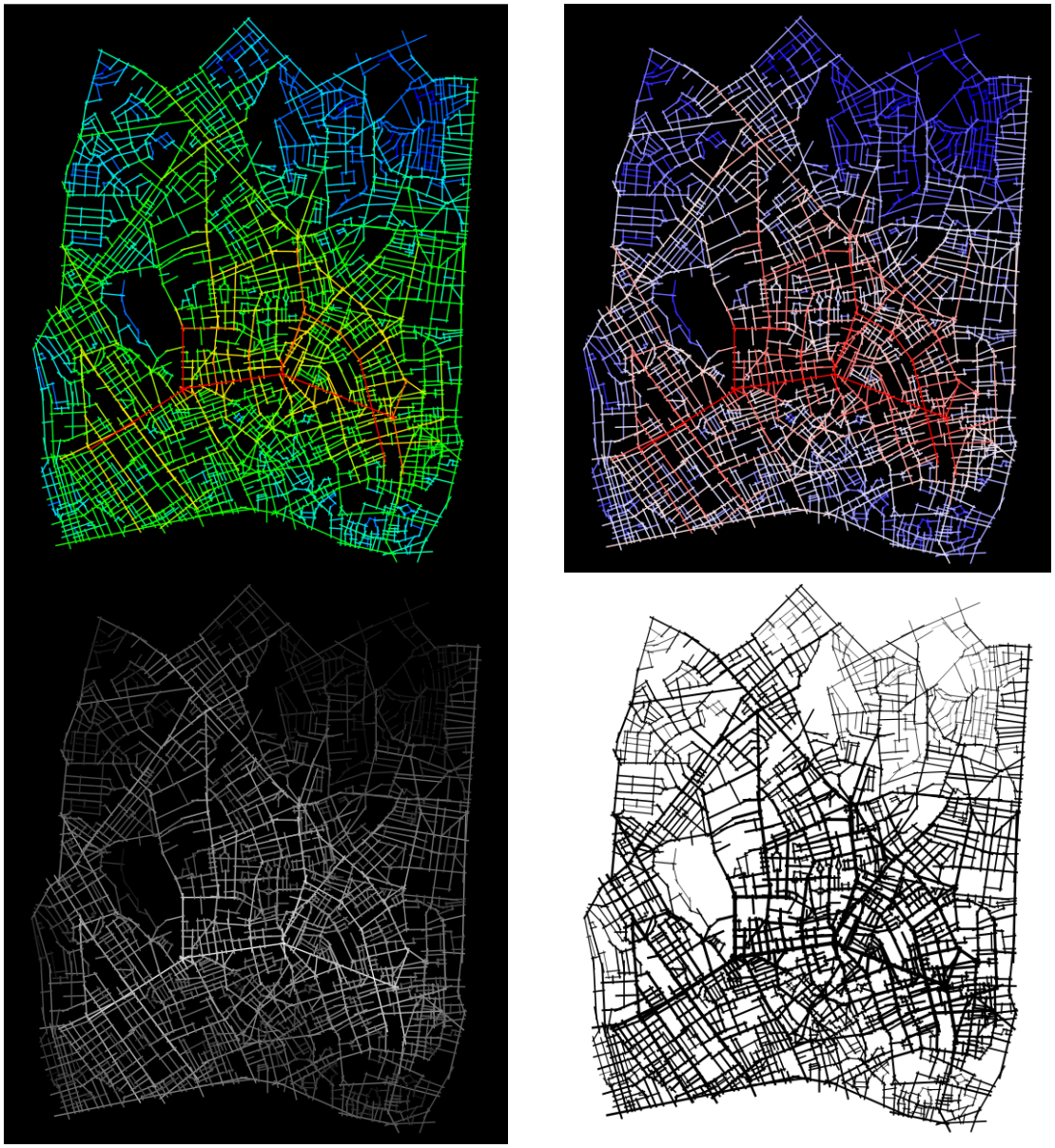


Figure 19 – The different colour range settings: classic (top left), red-blue (top right), greyscale (bottom left) and monochrome (bottom right) with varying line width.

The layers can have point, line or polygon features, as the colour settings are applied to all types of layers (Fig. 20). The "Width / Size" parameter affects the size of points, the line width of lines, and the outline width of polygons. The size of points is by default 2.5, so that they are clearly visible, while the default line or outline width is 0.25. The outline of polygons is always black. In monochrome range, the polygons show a varying density hatch pattern.

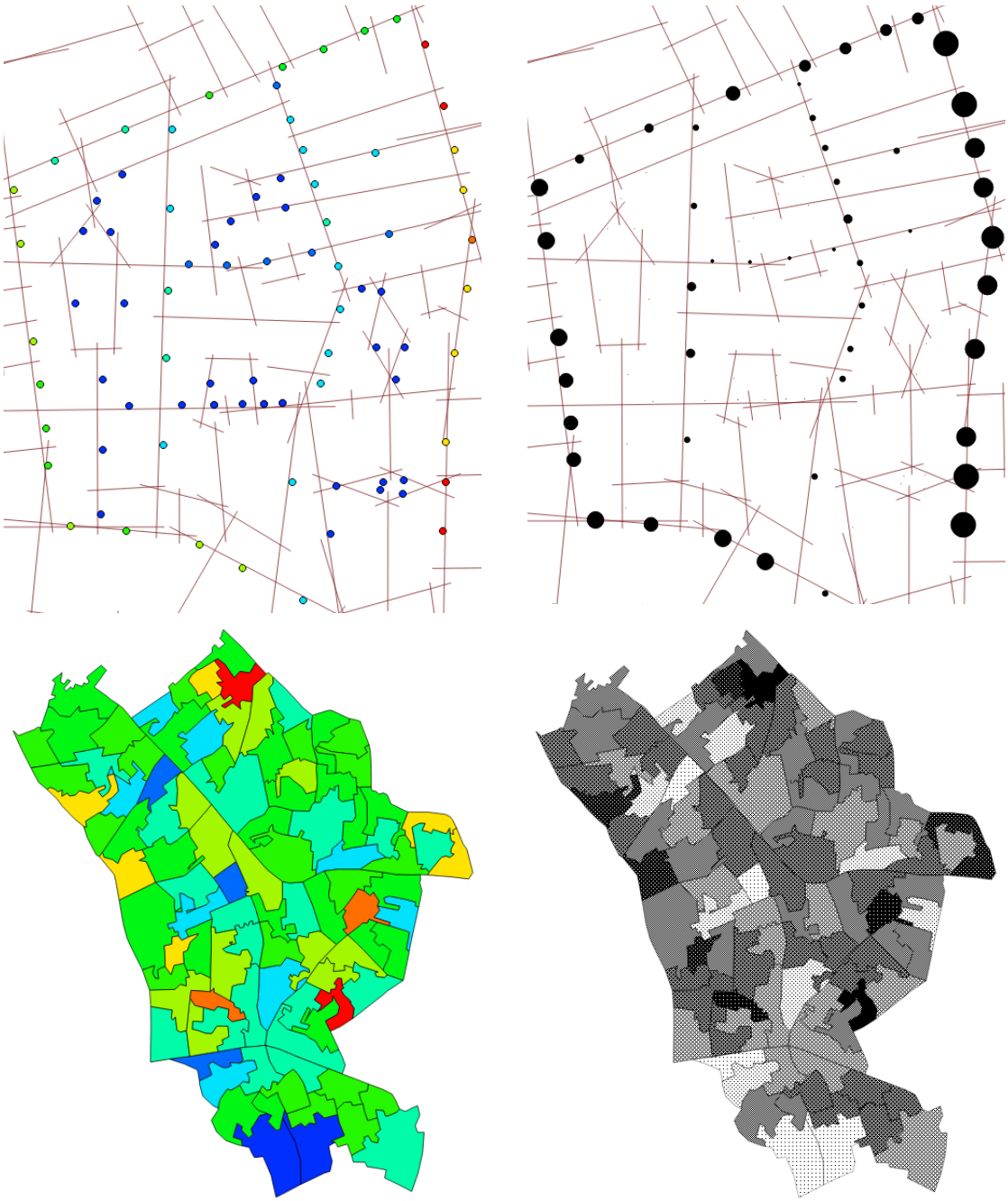


Figure 20 – Classic and monochrome colour ranges applied to point and polygon layers.

The data range settings include:

- Interval number – sets the number of intervals in the colour range (default is 10, maximum is 1024);
- Interval type – selects the colour range interval distribution, with option for “Equal intervals” (default), “Quantiles”, “Natural breaks” (slower) and “Custom (Equal)”. The custom range unlocks the limits controls.
- Custom interval limits – the interval limits are by default the maximum (top) and minimum (bottom) values. With custom intervals the user can change the size of the top and bottom range, using a scale (bottom = 0 to top = 100) or the absolute value of the attribute. The other intervals in between are automatically calculated using equal intervals distribution. This setting is equivalent to the slider controls in the “Colour Range” settings of depthmapX.
-

Note:

The symbology applied to a layer can be further edited in the QGIS symbology dialog. These changes, however, are overridden by the "Attributes Explorer" module. The user should store any final display settings in a QGIS layer style file for later retrieval, or tweak the final display after finishing with this module.

Attribute statistics

The "Stats" tab displays a table with descriptive statistics of the attribute values:

- Number of features;
- Mean, Standard Deviation, Variance;
- Median, 1st Quartile, 3rd Quartile, Inter Quartile Range (IQR);
- Minimum, Maximum, Range;
- Gini coefficient.

The statistics refer to the complete data set and to the current selection of features (Fig. 21). The features can be selected directly on the map or on the "Charts" tab. These statistics give an indication of the overall distribution of values in the data, and can be helpful in deciding the most appropriate symbology settings. The statistics values can also be selected and copied to another application if required.

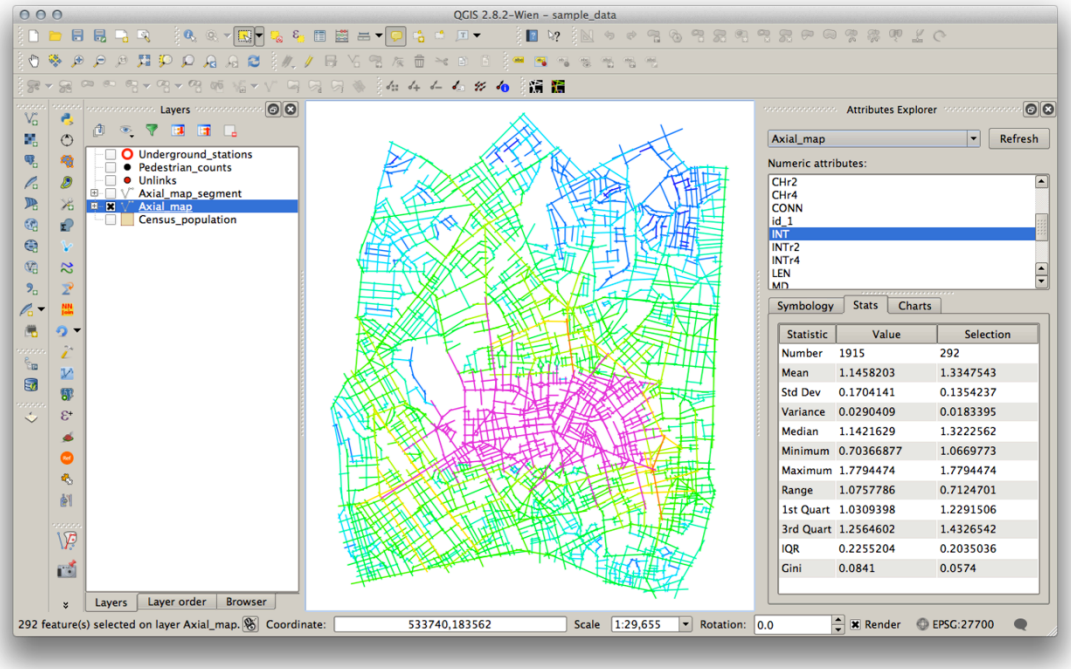


Figure 21 – Descriptive statistics of the attribute values, with the selection of a subset on the map.

Attribute charts

The "Charts" tab displays simple interactive charts (histogram and scatter plot) of the selected attribute, with the data of the currently selected features highlighted in red. The charts can be zoomed in and panned, and the chart re-centred by clicking on the "A" icon on the lower left corner of the chart. The charts also allow the direct selection of values, which is reflected on the map window, on the "Stats" tab, and retained on the chart if another attribute is selected. In the case of the histogram (Fig. 22), two vertical yellow lines are used to set a range of values for selection.

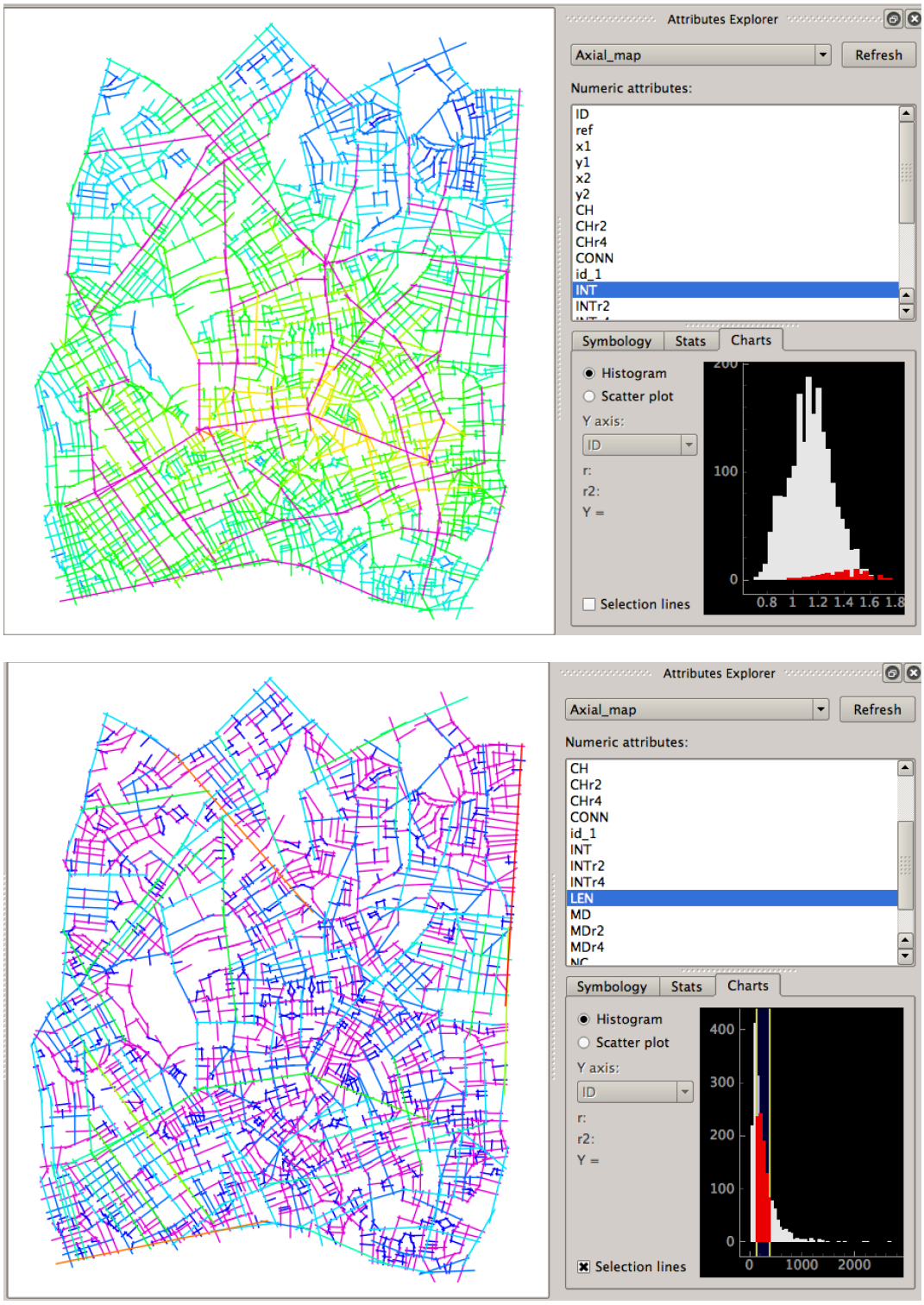


Figure 22 – Histogram highlighting the current selection (top) and setting a selection based using the range selection lines (bottom).

In the case of the scatter plot, the dependent variable is set in the "Y axis" drop down menu that contains all the attributes from the list above (Fig. 23). With the scatterplot the charts tool also calculates the correlation coefficient (r) and the linear regression of the two variables, displaying the R^2 and linear equation. The regression line on the chart can be switched on and off. The points on the scatterplot can be selected by clicking directly on them. The "shift" key is used to add further points to the selection.

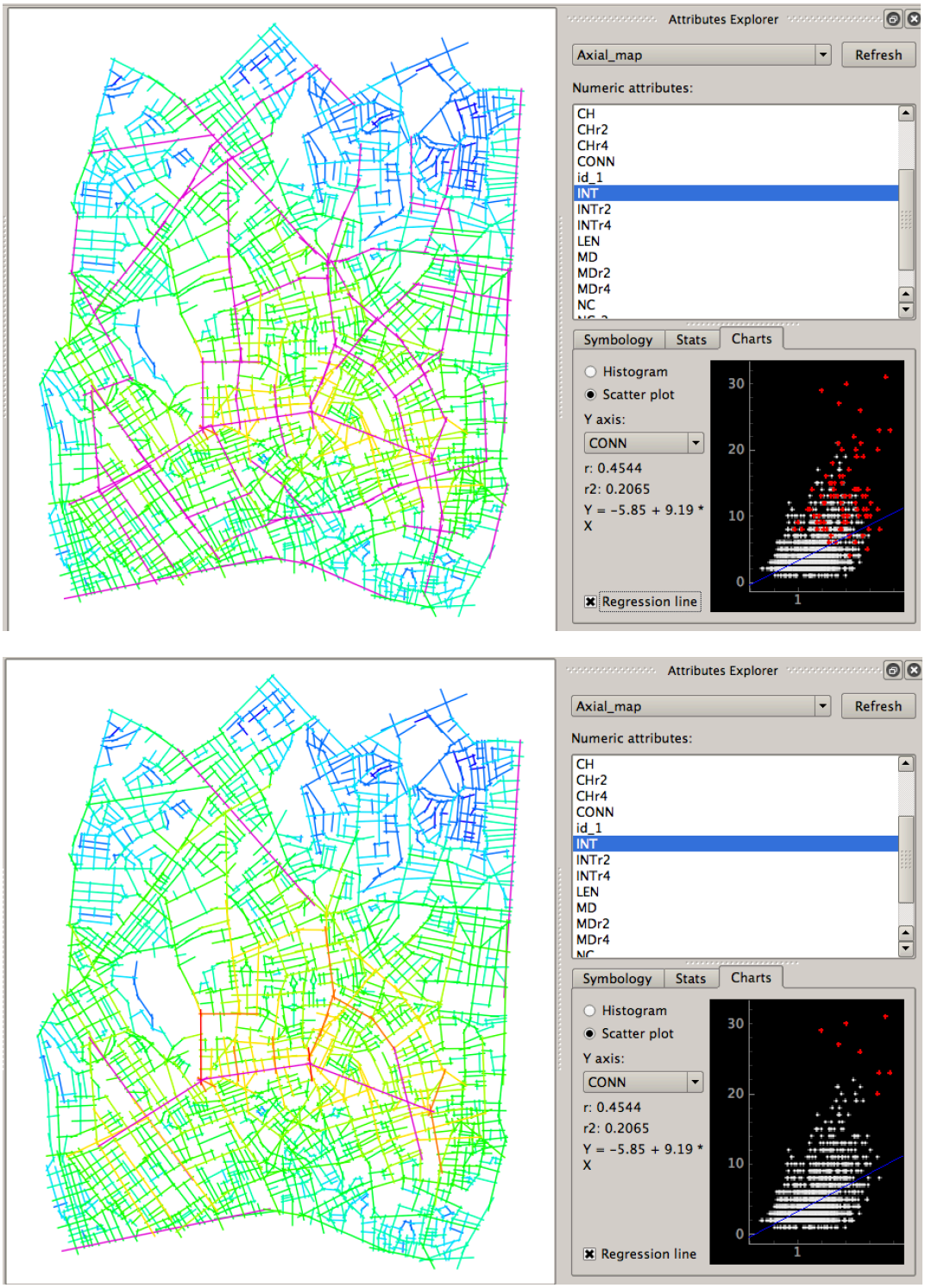


Figure 23 – Scatter plots of selected attribute values. In red are the data points corresponding to the selected features on the map (top) and select on the scatterplot (bottom).

Note:

The charts are provided by the excellent pyqtgraph Python package. Currently there is a rendering bug on Mac OSX that can show the histogram selection lines and the regression lines as very thick lines that obscure the chart. This only occurs with some attribute ranges. There is currently no other solution to the problem than switching the auxiliary lines off.

Support

The SST is an open source project that has its own Github repository: https://github.com/SpaceGroupUCL/qgisSpaceSyntaxToolkit

In case of problems with the SST users can submit an issue in the repository, stating the version of the tool, the problem encountered, and whenever possible include the error message, an image or a sample data set that helps reproduce and fix the problem.

Also in this repository are the latest documents and tutorials related to the SST. If users have produced training material that is useful to the wider community (maybe a translation of the user guide to a different language) and wish to share it, these can be added to the documents folder or linked to from the Wiki pages in the repository.

Finally, in the issues list users can also add suggestions for new features, new tools or simply enhancements of the current tools. Those users with Python programming skills are most welcome to contribute their own fixes and improvements to the SST.