SCANTRA
Beyond Clouds

Release 2.4

Release Notes

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SCANTRA 2.4.4.160

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1   The Network Analyser

The content of the result window has been extended considerably. So far *s0* values were visualized by line thickness and redundancy components binary by the colours blue and/or orange.

With the new network analyser, different parameters of the adjustment result can now be visualized by colour and/or symbol size. The parameters for the observations are:

s0 - The test value for blunder detection

EV - The partial redundancy respectively the reliability of an observation

vt - The residual of the translational part of an observation

Furthermore, the absolute translation accuracy of the stations (*sigma t*) can be visualized in the same way.

The *Lower Limit* and *Upper Limit* values are used to control the colour display. In the case of the values *s0* and *vt* all observations with a value above the upper limit are displayed in red and all with a value below the lower limit in green. With all values between these limits the colour gradient takes place continuously, thus red-orange-yellow-green.

When *EV* is displayed, small values are displayed in red and large values in green.
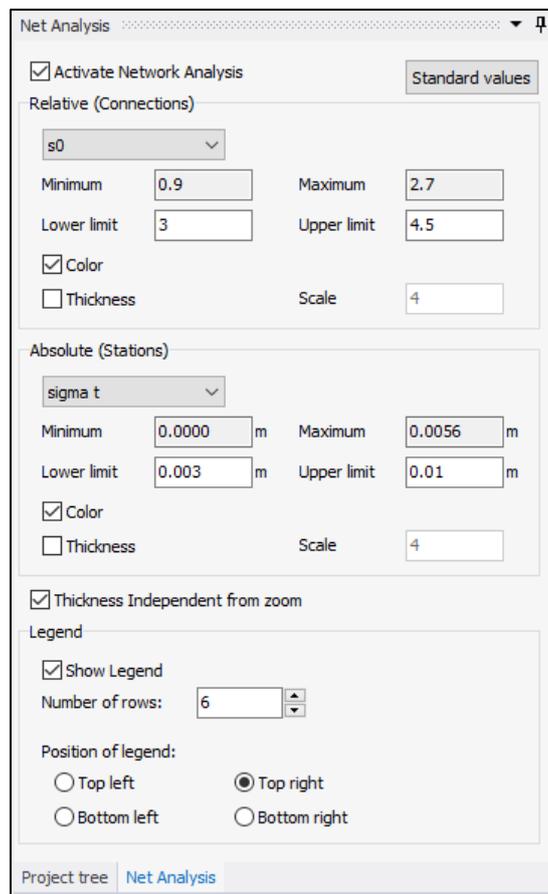
Figure 1: Input mask network analyser

Figure 2 illustrates a network where the residuals after the block adjustment were colour-coded. Information like this can be used for internal QA procedures as well as graphical proofs for a client.
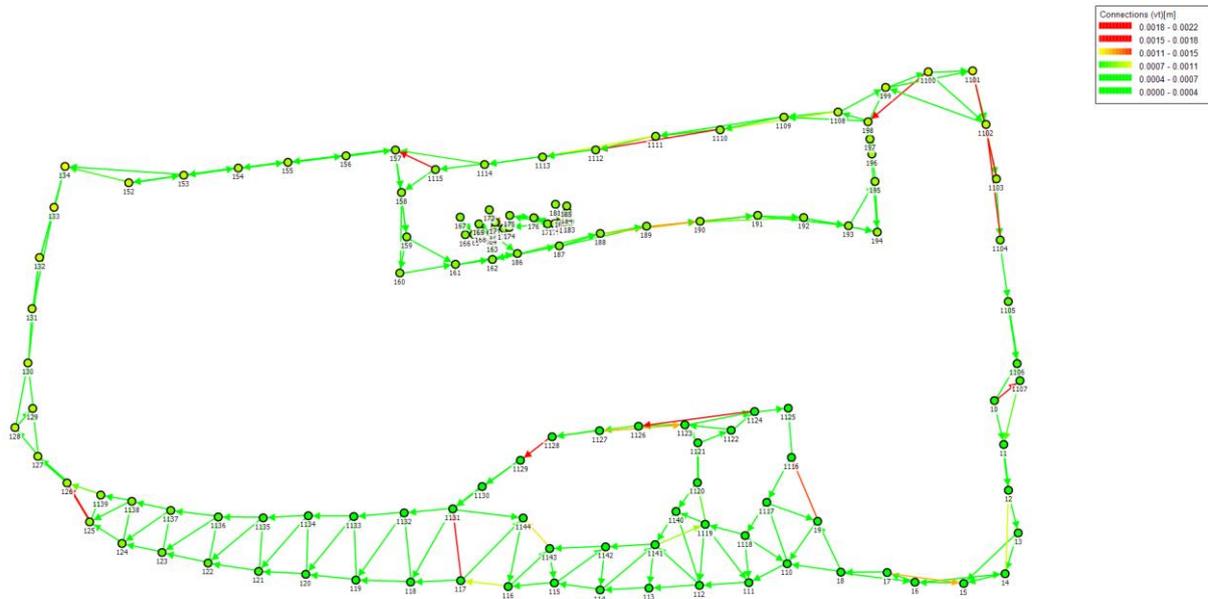
Figure 2: Colour residuals in the Network Analyser (data courtesy of BIMm Services GmbH)

2 Generation of Adjacencies

2.1 Generation of Adjacencies using Delaunay triangulation

Since version 2.3 adjacencies can be generated automatically based on station positions. This process is controlled by two parameters: firstly, by the maximum horizontal distance between two stations and secondly by their vertical distance. In the worst case, however, numerous unnecessary adjacencies could occur, notably slowing down the processing. The function *Tools > Triangulate adjacencies from Positions...* now only generates adjacencies that correspond to a Delaunay triangulation.
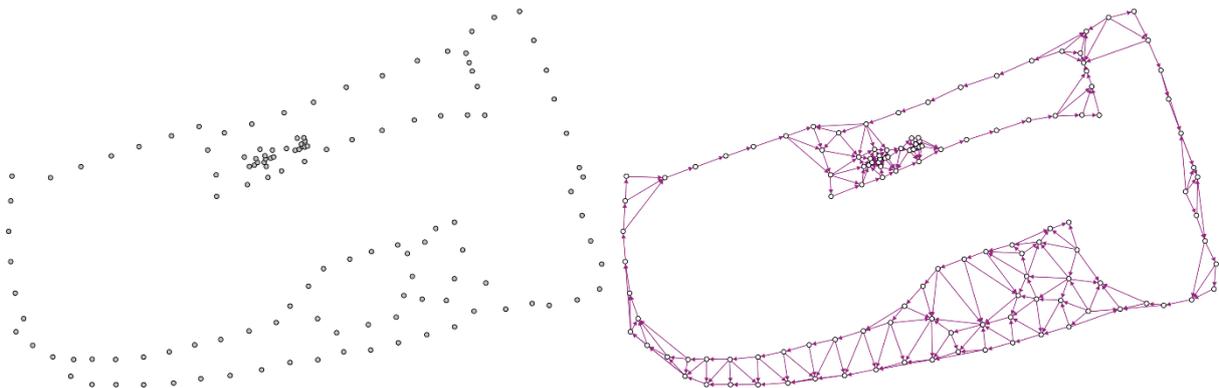
Figure 3: Pre-oriented scans as imported (left) and triangulated network (right)

2.2 Generation of Adjacencies from Station Datum

SCANTRA is now able to import the time stamp that is associated to a scan. Based on this information scans adjacencies can be generated in their temporal order. This is particular helpful if the naming of scans is not incremental.

3   The Hatchet

Finding errors by using the inspector tool is relatively easy but if the adjustment does not converge, e.g. due to a high degree of contamination by outliers', other options need to be considered. For this sake, the Hatchet tool was developed which allows to identify outliers even in large heterogeneous datasets. The algorithm behind the Hatchet transforms a non-linear adjustment, which may not converge, to a linear problem, which always finds a solution. A prerequisite for the Hatchet is information about the vertical orientation of the scans. This could be established by introducing real vertical axes or by deploying pseudo-vertical axes. After applying the Hatchet, an inspector window pops up showing suspicious observations, as depicted in Figure 4.
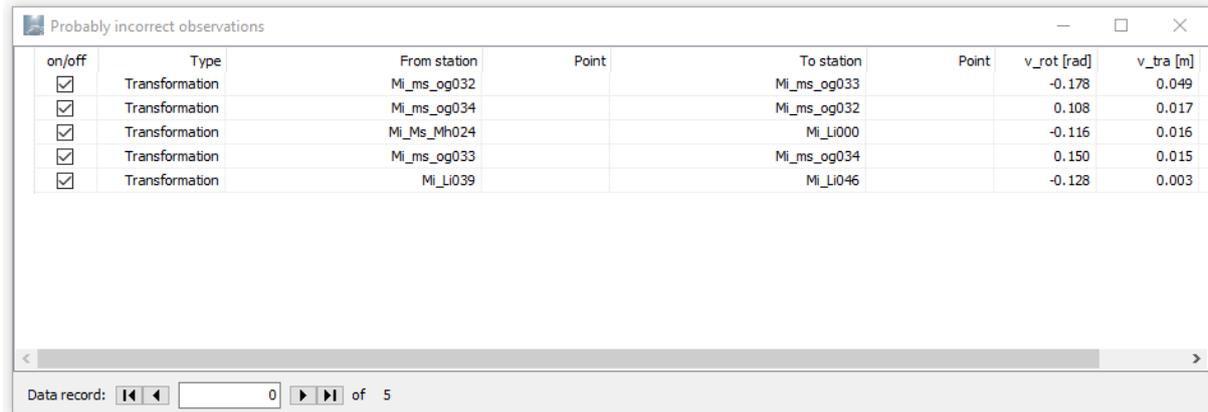
on/off	Type	From station	Point	To station	Point	v_rot [rad]	v_tra [m]
☑	Transformation	Mi_ms_og032		Mi_ms_og033		-0.178	0.049
☑	Transformation	Mi_ms_og034		Mi_ms_og032		0.108	0.017
☑	Transformation	Mi_Ms_Mh024		Mi_Li000		-0.116	0.016
☑	Transformation	Mi_ms_og033		Mi_ms_og034		0.150	0.015
☑	Transformation	Mi_Li039		Mi_Li046		-0.128	0.003

Data record: |◀ ◀   0   ▶ ▶| of 5

Figure 4: Inspector window after using the Hatchet

The observations listed in the inspector window can be switched off or the context menu can be used to focus on the observation in question.

4   Displaying the sectional view in the graphics window

Redundancy is the key to sound quality assurance. However, creating redundancy can be quite tedious especially in poorly documented or complex projects. Hence, we've now integrated the horizontal sectional view into the scaled adjacency graph. This allows the user to spot potential lines of sight within registered clusters and additionally provides visual guidance within a project.
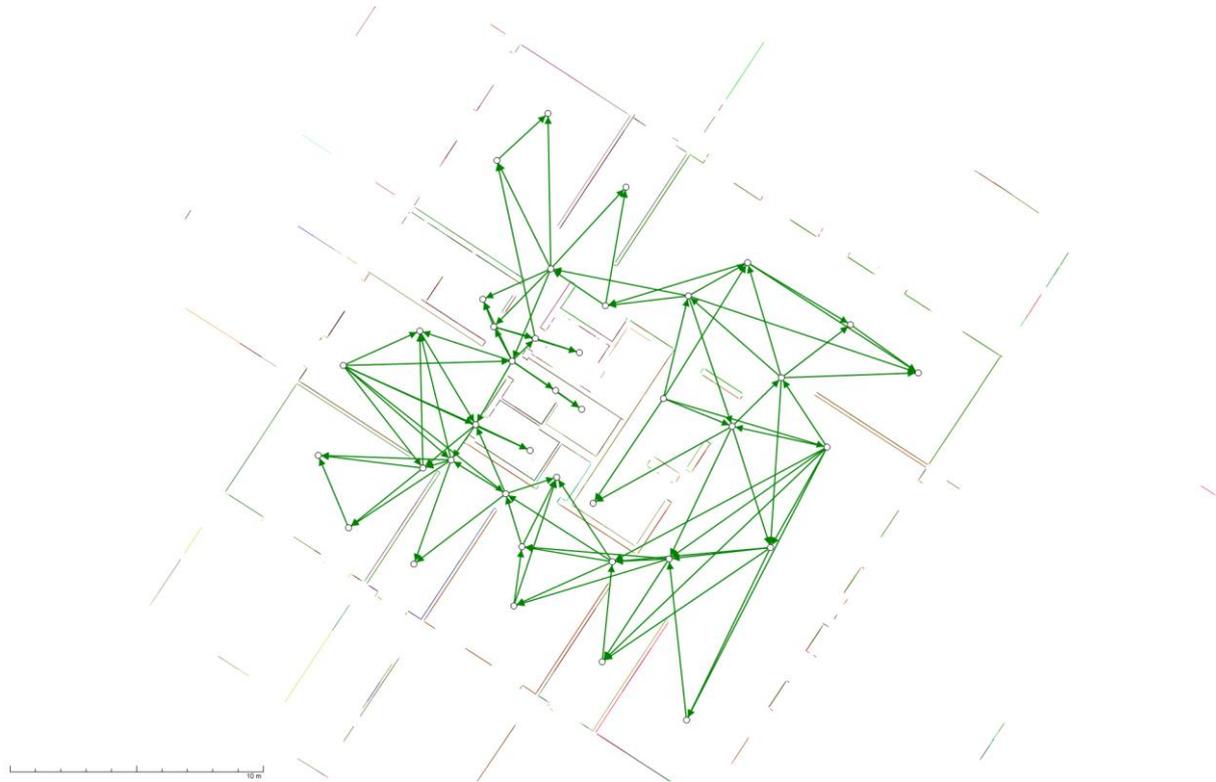
Figure 5: Scaled adjacency graph with sectional view

5   Operating Convenience

5.1   Filtering and Deactivation of Inspector Entries

In SCANTRA 2.3 we've introduced the Inspector that helps to quickly identify statistical outliers within a project. However, the inspector sometimes also contains observations that are statistical outliers - but not critical ones, e.g. a transformation with an s_0 value of 4.3 and a residual of 0.2 mm. For this, filtering options can now be defined by the user in the Options .
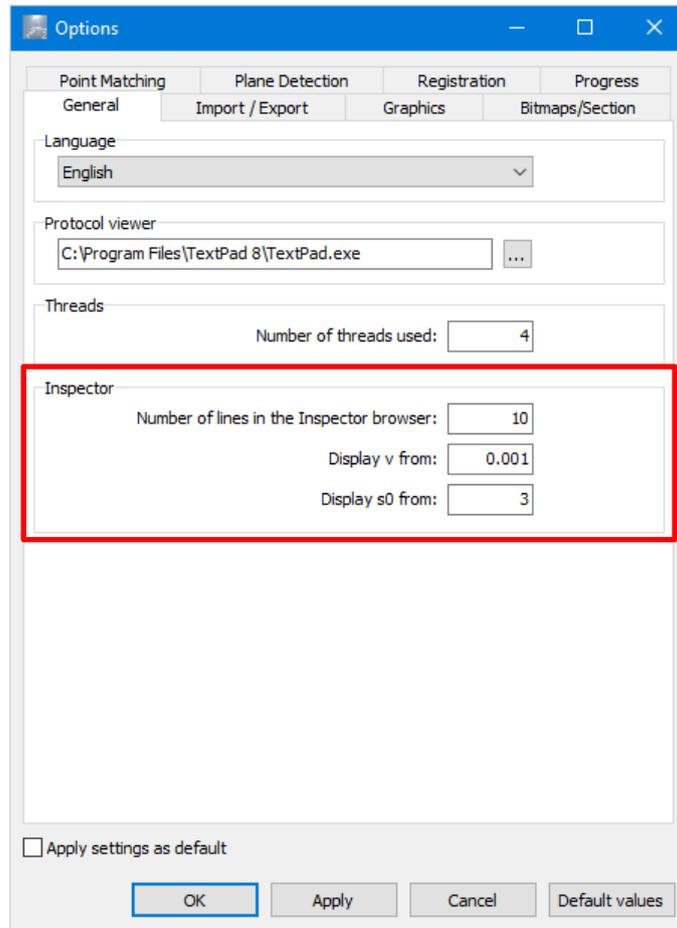
Figure 6: Filter Settings for the Inspector Browser
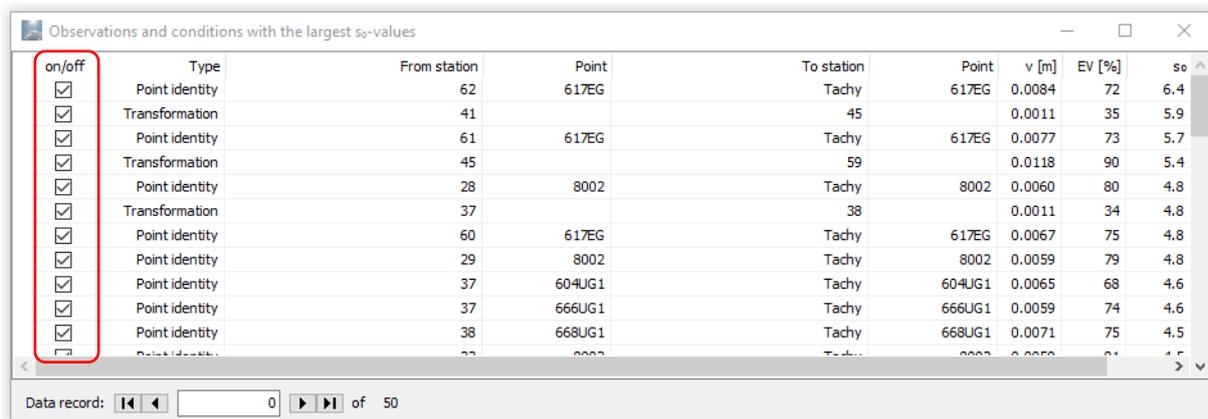
Figure 7: Deactivation ticks for individual observations in the Inspector (right)

5.2 Highlight Unconnected Stations

Stations, that have no relation to another one, are sometimes hard to spot especially when they are located on a relation between two other scans, as depicted in Figure 8. Even though there is a relation between scan 008 and 001 there is none to station 000. Hence, these stations are now emphasised by a grey circle filling. If the option *Highlight unconnected stations* is selected, the size of the station is additionally increased.
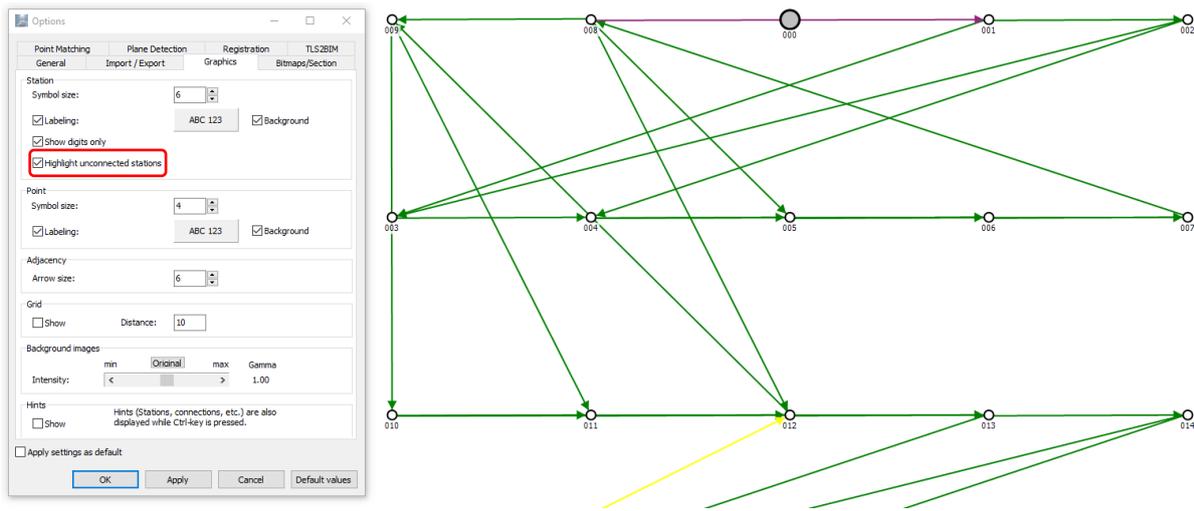
Figure 8: Highlighting unconnected stations within a network

5.3 Background of Labels in the Graphics Window

Station or point labels were sometimes hard to read especially in large projects or if large outliers occurred. In order to improve readability, a white background is plotted above the overlapping graphics element.
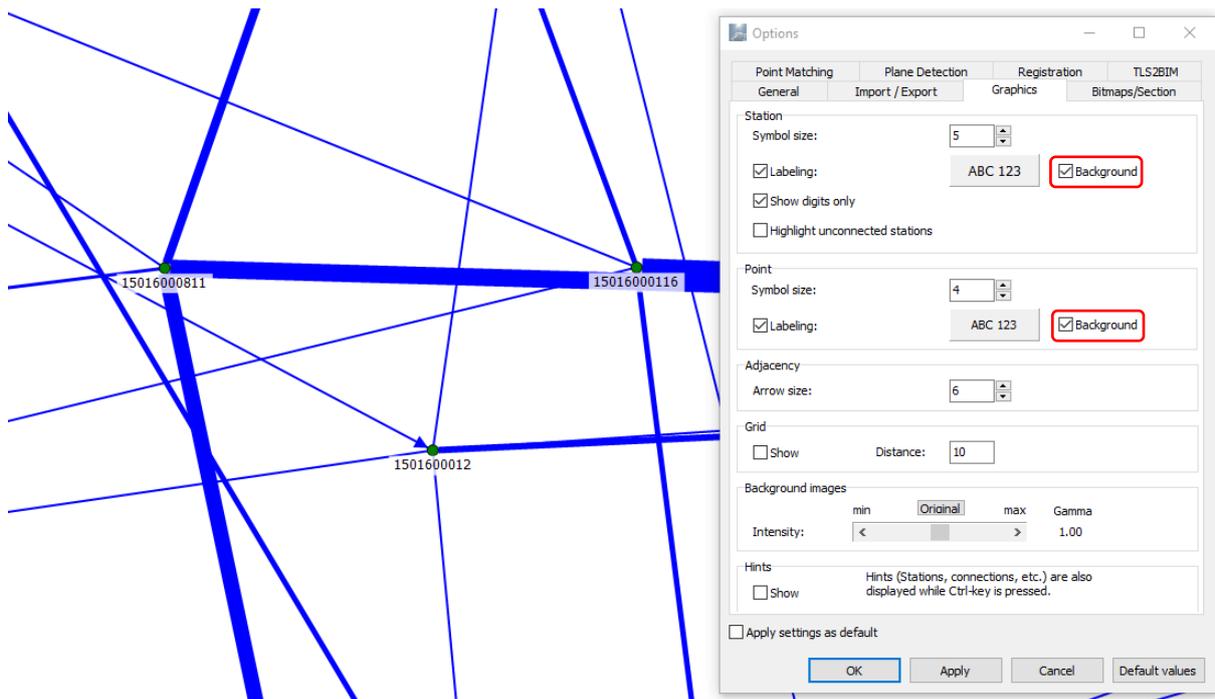
Figure 9: Background labels in the graphics window

5.4 Show Used Planes Within a Scan

In version 2.3 a function was introduced that colours detected planes in dependence to their normal direction. If a user wants to see which planes were used for registration, the function *show used planes* tinted these planes in their complementary colour. In some cases, this led to confusion which is why we have updated this function. Now, only the planes are shown, as depicted in Figure 10, which were used for registration while the other detected planes are displayed in grey scale.
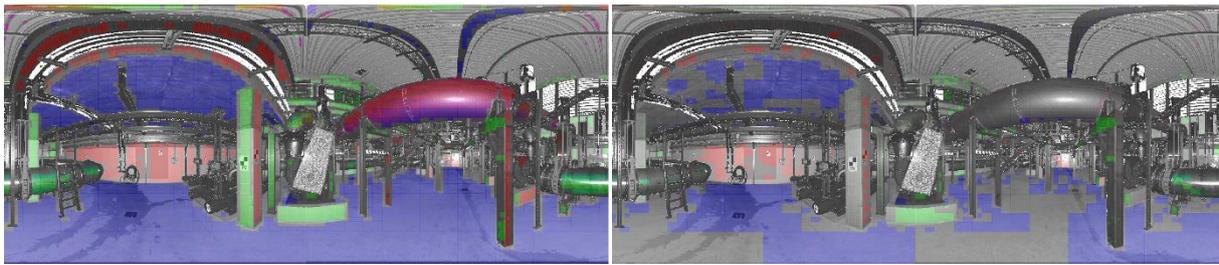
Figure 10: Detected planes in a scene (left) and used planes within a registration (right)

5.5 New Keyboard Shortcuts

The following shortcuts were added in addition to the existing ones:

Ctrl + T: Show bitmap

Ctrl + I: Show sectional view

6 Import / Export

6.1 Trimble RMX Export

Customers who use Trimble's RealWorks software for generating their deliverables but register in SCANTRA can now exchange registration parameters by exporting RMX-files. These files can be imported into RealWorks and apply the registration parameters to the corresponding scans.

6.2 LupoScan Import: Keeping project groups

In LupoScan projects, scans can be grouped arbitrarily. The grouping information is contained in the LupoScan project file, which can be imported from version 2.4 onwards. However, while in LupoScan one and the same scan can be assigned to several groups simultaneously, SCANTRA only allows assignment to one group. For this reason, only the group assignment that first appears in the LupoScan project file is transferred to SCANTRA during import.

7 Bugfixes / Improvements

7.1 Order of Scans After Import

The sequence of the stations after the import was dependent on the sorting setting of the Windows Explorer. If sorted by name, the import was no problem. If, however, other sorting criteria were defined, the sequence of the stations in Scantra also followed this sorting. The import function was adapted so that the stations are always sorted in ascending order by name.

7.2 Import of vertical axes from lps-files

During the import of lps files vertical axes were always imported regardless of the chosen setting. This bug was fixed.

7.3 Shifting the Sectional View in YZ-Direction

The up-button in the sectional (YZ-direction) was erroneous. Instead of shifting upwards, the section was shifted in opposite direction. This bug was fixed.

7.4 Switch of Datum-Independent Matching

SCANTRA can use pre-orientations for plane-matching which usually speeds up this process notably. If the pre-orientations are too poor in terms of quality the user can choose *Registration > Plane Matching > Datum invariant matching after pre-orientation* in the options dialogue so that SCANTRA tries to find a solution on its own. If relations were generated based on entries from the tools section, the relation status was falsely set, so that the aforementioned setting had no effect onto the algorithm. This bug was fixed by updating the status settings.

7.5 The "Hide Points" Tool Button Deactivated Itself After the Block Adjustment

If a network contains point identities, either to a superior coordinate system or among local scans, these correspondences are highlighted by dashed lines between triangles (ground control point) or small circles (local point). This visual information can be hidden by clicking the *Hide Points* Button. After a block adjustment the button was automatically deactivated. This behaviour was updated so that the chosen setting remains.

7.6 Alphanumerical Sorting of Entries in the Registration Dialogue and the Inspector

Numerical entries in the registration dialog and in the inspector have been sorted alphanumerically so far. Now all values are split into a numeric postfix and (if existing) an alphanumeric prefix. Sorting takes place hierarchically by prefix first, then within the prefix by postfix. In this way, the irritating purely lexical sorting of numerical values is avoided.

7.7 Focus function

The focus function was shifting to the correct relation or station, but the selected entity was not highlighted. This bug was fixed by dashing the object in question.