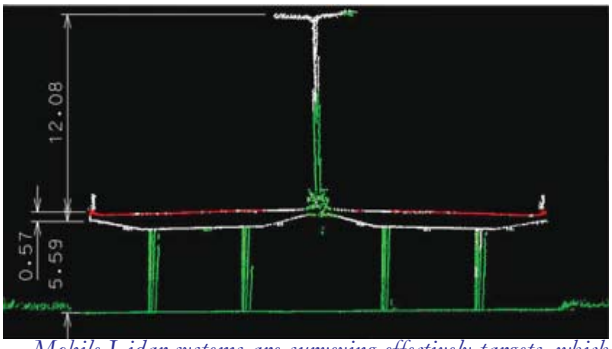
Terrasolid Software Suite for
Mobile Lidar Data Processing

By extracting colours from oblique mobile images to laser points, 3D-views are photo-realistic what ever you are looking at.



Mobile Lidar systems are surveying effectively targets, which are difficult or impossible to survey by another means. Classified point clouds can be used directly for design, quality control and maintenance.

In a typical mobile Lidar system scanners, cameras and IMU/GPS are mounted on vehicle roof.

Mobile Lidar data offers new possibilities to survey details like walls, traffic signs and other objects, which are not visible in airborne Lidar data. Much higher point density of data allows better possibilities for software packages to automatically vectorize objects than before. Moreover mobile Lidar let you create surface models, where the surface accuracy is even better than 1cm. High-accuracy surface models are a fast and cheap method for periodic quality control of roads and streets during their total life cycle.

In spite of different origin of Lidar points and images, Terrasolid software suite for Lidar airborne mapping suits as well for mobile data processing. The major differences between the two acquisition platforms related to data processing are as follows:

- Much shorter survey distance in mobile than in airborne scanning.
- Selected IMU system may be poorer in mobile system than airborne
- Airborne scanning has continuous, good GPS access, while in mobile scanning GPS visibility may be poor especially in urban (shadow) areas.
- Mobile data requires more control measurements to ensure consistent accuracy.

With TerraPhoto you can bring oblique images from mobile mapping systems like *Lynx* and *StreetMapper*, collect tie points in the images and solve camera calibration parameters. By extracting colours from images to laser points makes your design environment visually 3D.

Terrasolid

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Identify error sources of positioning in project strategy

Typical operation workflow is as follows:

- Execute LIDAR / image survey by driving every place twice.
- Check system calibration.
- Find bad positioning, e.g. by displaying trajectories coloured by RMS values and comparing drive passes visually.
- Collect control measurements (GPS, total stations) at bad locations.
- Adjust xyz of drive passes together and to control measurements with a fluctuating correction. Apply correction curve, which changes over time
- Remove less accurate data, e.g. long range measurements if you have short range data from same object.

Mobile scanner system owner should perform a dedicated calibration drive periodically to check and solve misalignment angles. If this is done well, misalignment angles should not become a significant error source in project data as the measurement range is short in many applications. During the project one shall just roughly control that system calibration is valid.

The magnitude of different error sources is as follows:

- System calibration – small if system is well calibrated
- Range measurements – 1 cm level
- Trajectory xyz – dominant error source, which varies due to varying satellite visibility.
- Trajectory orientation (hrp) – small in short distance

System calibration

System calibration is based on tie lines, which TerraMatch searches automatically from loaded laser points. In second phase TerraMatch calculates correction values for all or only a part of misalignment angles. Finally TerraMatch applies correction values to laser points. You can control the effects by viewing output reports before and after misalignment corrections.

Manual tie line check and editing capabilities let you view, search, edit and remove poor tie lines. Visual 3D-control of the effects in section views is a part of the calibration process. Removing the worst tie lines and then repeating the iteration may improve misalignment angles.

Point classification

The density of mobile data decreases with longer measuring distance. In addition, the errors in misalignment angles reduce xy-accuracy of points with increasing range. With TerraScan macros one can filter out those points by scanner number and given maximum distance. On places where car has stopped and turned the point density is higher than desired. Also such points can be filtered and removed by TerraScan macros.

Focus on drive path positioning

To improve the drive path positioning a substantial number of control measurements is required. Control points should be collected close to the drive patch of the system where the density of the laser data is high and where angular error source do not affect the positioning much.

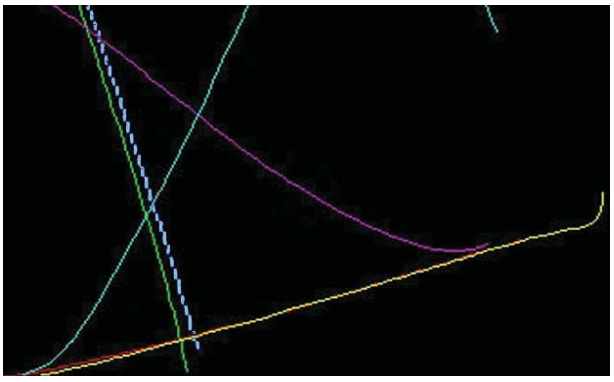
In some cases one may use control points extracted from orthophotos. This can provide fairly good positioning control with minimal effort.

TerraScan supports smrmsg.out , which is an output file from Applanix POSPac software for trajectory correction. By displaying trajectories coloured by their accuracy control measurements can be guided to areas, where the location of trajectories is probably bad.

By viewing trajectory position information of adjacent lines gives good hints to guide control measurements, too.

Range	Xyz effect	Hrp effect
5 m	0.15 m	0.003 m
10 m	0.15 m	0.005 m
20 m	0.15 m	0.010 m
50 m	0.15 m	0.026 m

Total position error is a sum of Xyz error of drive path and misalignment angle error. In short range survey major focus is on a good drive path positioning.



Correct drive pattern is a prerequisite of successful data processing.