

Airborne Lidar Processing Software

Our first product survey on Airborne Lidar Processing Software appeared exactly three years ago (see *GIM International*, February 2007). Half the companies listed in the 2007 survey were based in Germany and the other half in the US; none came from other countries.

Remarkably, half the respondents in the present survey too hail from Germany, given that Trimble's contribution actually refers to a product from Inpho GmbH, headquartered in Stuttgart. None of the four US companies listed in the 2007 survey responded to the present questionnaire; the only US firm listed, Virtual Geomatics, based in Austin, Texas, is new to our records. Another company new to our survey is Tiltan of Israel, listed with TLiD, software developed for creating 3D maps and GIS data from Lidar point-clouds in a highly automated manner.

Since the turn of the millennium airborne Lidar has become an essential data-acquisition technology for detailed and accurate digital elevation models (DEM) and the creation of 3D models of objects such as buildings, power-lines, trees and stands of forest. Most systems listed can process raw Lidar data stemming from a wide diversity of acquisition systems. However, Geocode and GeocodeWF from GeoLas Consulting are specifically dedicated to automatically geocoding raw Lidar data acquired by respectively the Riegl LMS-Q120/240/280 series and LMS-Q560. Apart from processing the point-cloud data to produce geocoded DEMs, high-resolution Lidar data enables automated feature extraction when appropriate software modules are applied. The strength of any Lidar processing software can be judged by its ability to extract features from raw point-clouds. Which particular features can be extracted by the diverse software systems can be examined in the section 'Analysis'.

All providers listed provide training support and all systems use Windows as operating systems, up to XP, Vista or Windows 7.

For a brief overview of typical operations performed by ALPS on Lidar data, see this month's Endpoint (page 57).

N/A = Not Applicable □ = No information received	
MANUFACTURER	GEOLAS CONSULTING
• Type/name of software	Geocode, GeocodeWF
• Names of modules[1]	□
• Year of Introduction	2004/2005
General	
• Main type of users (max. 5)	Lidar system operators, data processing service providers
• Design philosophy[2]	□
• Geo-referencing of raw data (y/n)[3]	Y
Platform	
• Platform Requirements[4]	512GB RAM, 250GB HD
• Min. size of display (pixels)	1024 x 768
• Additions to standard hardware[5]	-
• Standalone (y/n(parent package))[6]	Y
Point Cloud	
• Max. # points to be processed	unlimited
• TIN creation [y/n]	N
DEM Editing	
• Interactive removal/insertion of (groups of) points (y/n)[7]	n/a
• Automatic point thinning (y/n)	n/a
• Automatic filtering (y/n)[8]	n/a
Analysis	
• Contour lines generation (y/n)	n/a
• Cross-sections generation (y/n)	n/a
• Break line detection (y/n)	n/a
• Extraction of individual trees (y/n)	n/a
• Extraction of forest canopy	n/a
• Automatic bare ground detection (y/n)	n/a
• Feature extraction[9]	□
• Line of sight (y/n)	□
• Slope analysis (y/n)	□
• Volume analysis (y/n)	□
• Simulations[10]	□
Visualisation	
• Reflected signal intensity (y/n)	n/a
• Altitude colouration (y/n)	n/a
• Diffuse lightening (y/n)	n/a
• Multi-layering (y/n)	n/a
• Hillshading (y/n)	n/a
• Automatic draping of aerospace imagery (y/n)	n/a
File Formats	
• Airborne Lidar systems[11]	Riegl LMS systems
• Data Import Formats	LPO, POS, SBET, LRD, 2DD, SDF
• Data Export Formats	ASCII, LAS, Tscan Binary
• Remarks	Geocoding software for Riegl systems; full waveform processing and LAS 1.3 output

[1] If your software consists of modules which can be purchased separately, list here the names of the modules.

[2] Use no more than 12 words to explain the background of the design of your software.

[3] Geo-referencing of raw lidar data by using on-board gathered GPS/INS data.

[4] Mention operating system(s), processor, min. required RAM [MB], min. size of hard disk [MB]

[5] E.g. 3-wheel button, second screen, special video card

[6] If your software runs on top of other software systems, indicate

GEOLAS CONSULTING	TILTAN	TRIMBLE	VIRTUAL GEOMATICS (V64D)
LasTools	TLID - Automatic, stand alone, Lidar processing Product	Lidar Box	Lidar Suite
<input type="checkbox"/>	<input type="checkbox"/>	SCOP++, TopPIT, DTMaster	Production Manager, Boresite Viewer, Data Manager
Q3/2010	Feb-08	2003, 2004	1/1/2009
Lidar data processing service providers	Lidar operators, surveying companies, Lidar data processing outfits, power line companies, urban forest mapping companies	Lidar service providers, private and government mapping entities	data producers, defense, government agencies, utilities, hydrology
Integrated point-cloud + raster design full 3D data space	Automatic point classification and GIS layers extraction from Geo-referenced point-cloud	Complete solution or components; automated batch-processing	Low cost end-to-end system (workflow, processing, visualisation, project management & tracking)
N [a]	N	Y	N [b]
512MB RAM, 250GB HD	Pentium 4, 1GB RAM, 150MB HD	Windows	32/64 bit, 2GB RAM, 1GB HD
1024 x 768 / 24 bit	no minimum	1024 x 768	800 x 600
-	video card	Optional: stereo displays for QA/QC	not necessary [c]
N	Y	Y	Y
unlimited	4 billion	unlimited	100 million
Y	Y	Y	Y
N [a]	Y	Y in stereo-, ortho- and side-view	Y
N [a]	Y	Y [d]	Y
N [a]	Y	Y	Y
N [a]	Y	Y	Y
N [a]	Y	Y	Y
N [a]	Y [e]	Y	Y
N [a]	Y	Y	Y
N [a]	Y	Y	Y
N [a]	Y [f] [g]	Y [f]	Y [f] [h]
N	Y [i]	Y	Y
N [a]	Y	Y	Y
N [a]	Y [i]	Y	Y
N [a]	N	Flood	Y
Y	Y	Y	Y
Y	Y	Y	Y
-	-	Y	Y
Y	Y	Y	Y
Y	Y	Y	Y
Y	Y	Y	Y
<input type="checkbox"/> w	All	All	Leica, Optech
ASCII, LAS, Tscan, GeoTiff, ECW...	LAS, TXT, BIN	All common e.g. LAS, DXF, XYZ, Shapefile	LAS, ASCII, PointShape, Bin, GeoTiff (16bit/32bit)
ASCII, LAS, Tscan, GeoTiff, ECW...	LAS, TXT, BIN, GMG, BIL, IMG, ASCII, GeoTIFF, SHP, DXF, CSV, JPG, PNG, BMP, ECW.	All common e.g. LAS, DXF, XYZ, Shapefile, DXF-TIN, SCOP DTM, STL, VRML, VRML-TIN	LAS, ASCII, PointShape, Bin, ASCII Grid, LAS Grid, ESRI ASCII GRID, GeoTiff (16bit/32bit)
Focus of first release on line adjustment; full support of waveform data; flexible integration of Lidar, raster, vector data	For automatic extraction of all building roof surfaces; minimum of 7 points per sq.m recommended	Able to combine Lidar data processing with photogrammetry; does not require a CAD or GIS system.	Raw (and ortho) image fusion, intuitive workflow, time report generation, custom classifications option, many tools to handle typical Lidar needs.

[7] If yes, mention whether addition facilities are required such as stereoscopic viewing.

[8] I.e. removal of unwanted points, such as points reflected on vegetation

[9] Mention here features which can be detected automatically such as buildings, road networks and power lines

[10] E.g. flood, landslides, erosion

[11] List here the Lidar systems from which data can be imported

[a] future release

[b] With boresite viewer systematic errors can be rectified

[c] but available 3-wheel mouse, dual monitor, multi-processor, etc. are supported

[d] plus automatic gap filling

[e] position, height and radius for each tree

[f] Buildings

[g] trees, power lines / features

[h] vegetation, roads, pervious/impervious surface, powerlines, waterbodies, etc.

[i] with additional tool