Geocode

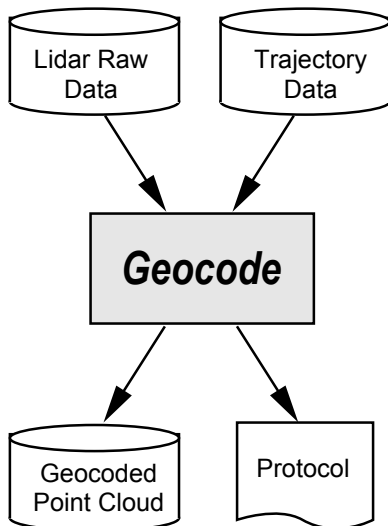*Geocode*^{TM} is the software tool for processing the raw waveform data collected by *ELMAP* laser-scanner systems and converting it into geocoded point clouds in a map-projected coordinate system.

Geocode is a stand-alone application for Microsoft Windows that interfaces smoothly with *TerraScan* and other lidar post-processing tools*. Geocode* imports native lidar waveform data, and pre-processed trajectory and attitude data*,* to calculate 3-D point coordinates in the selected geographical reference frame. Output is generated in the stan-dardized *LAS* format for lidar data, the native bi-nary format of the *TerraScan* lidar data post-processing software for rapid data transfer, or the *Normalized Waveform* file format that combines geocoding information and indexed waveform data for subse-quent processing.

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┌─────────────┐   ┌─────────────┐
│ Lidar Raw   │   │ Trajectory  │
│ Data        │   │ Data        │
└─────────────┘   └─────────────┘
       │                 │
       ▼                 ▼
      ┌───────────────────┐
      │     Geocode       │
      └───────────────────┘
       │                 │
       ▼                 ▼
┌─────────────┐   ┌─────────────┐
│ Geocoded    │   │ Protocol    │
│ Point Cloud │   │             │
└─────────────┘   └─────────────┘
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Geocode has been designed for ease-of-use and efficient production. After selection of the input files, processing and output parameters, it does not re-quire further user interaction. All parameter settings may be saved to "flight" savesets for later reference and re-use. Also, a batch mode is available for pro-cessing data based one or several previously defi-ned flight savesets, so that large projects can be processed efficiently over night.

The transformation and projection, and waveform analysis algorithms have been optimized for speed to provide time-efficient processing. Fur-thermore, the user has control over which proc-essing steps are to be executed to minimize proc-essing time during iterative processing segments. *Geocode* also provides the option to limit process-ing to *segments* of large raw data files, so that time-intensive processing can be limited to the relevant sections.

To ensure the accuracy of the geocoding results *Geocode* uses the full calibration information available from the sensor. Installation and flightline offsets may be used to compensate for misalign-ment errors and GPS-effected variations in the trajectory, and to thereby further maximize the geometrical fidelity of the generated data prod-ucts. Environmental parameters (air pressure, temperature) may be taken into account to com-pensate for variations of the speed-ofight and re-fraction due to atmospheric conditions, to enhance measurement accuracy further.

Currently, transversal-mercator-type projected co-ordinate systems (UTM, Gauss-Krueger) are avail-able, whereby the user can select from a number of pre-defined ellipsoids, datums, and projection para-meters, or define his own. Other projection types can be implemented upon request.

Features

- Reads native *EL-MAP* lidar data files and pre-processed trajectory and attitude data files (various formats supported).
- Optionally imports and applies geoid data
- Extracts surface returns from waveform data and determines the accurate location of the return
- Detects and eliminates outliers with a set of user-configurable filters
- Applies sensor specific calibration data and environemntal parameters for improved geo-metrical accuracy
- Provides control over installation-specific boresight offsets.
- Provides true surface reflectance at the laser wavelength by scaling return intensity by range.
- Outputs pulse width for surface slope and roughness analysis and classification.
- Selection of preset and user-defined ellip-soids, datums, and projections available.
- Output of geocoded, map-projected point clouds in several formats (ASCII, TerraScan BIN, LAS)
- Output of geocoded *Normalized Waveforms*
- Generation of processing protocol and output data statistics for quality control.
- Batch processing of multiple survey flights using flight parameter savesets
- Incremental flight parameter sets can be used for modifying only few parameter

File Input

- Single or multiple binary raw data files from EL-MAP laserscanners
- Binary or ASCII lidar trajectory and orientation files (.LPO, .POS, SBET (*.out), .NCOM etc.).
- Lidar sensor description/calibration files (optional)
- Linelist files for automatic filename assignment and line adjustment (optional)
- Geoid file (optional)

File Output

Available output formats:

- ASCII point records (.ASC)
- Terrascan binary format (.BIN)
- LAS1.0, 1.1, and 1.2 binary formats (.LAS)
- *GeocodeL Normalized Waveform* file format (.LGC, .LWF)
- Terrascan binary trajectory format (.TRJ) for geocoded trajectory or segments output

User settings

- Installation offsets for
  - boresight angles,
  - translational offsets,
  - timing offsets
- Environmental conditions
- Geoid file
- Sensitivity of echo detection
- Return selection (first, intermediate, last return of each laser shot)
- Range gate and noise/outlier filters
- Output ellipsoid, datum, map projection
- Definition of custom ellipsoids, datum transforms, and map projections
- Output file type, path for point cloud and trajectory outputs
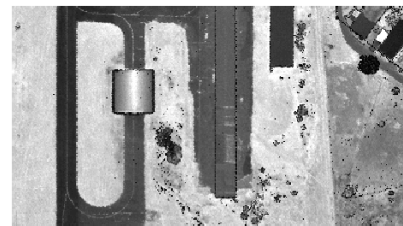
System Requirements

- Hardware:
  - Intel based computer
  - NTFS-formatted harddrive for file sizes larger than 4GB, SSDs recommended for speed
  - 512 MB RAM

- Operating systems:
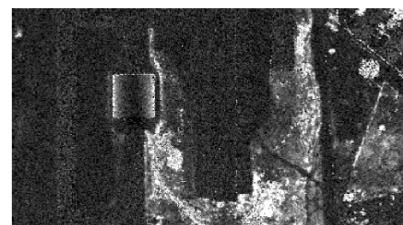 - Windows 10 and above

Maintenance & Support

- 12 months of free maintenance (bug fixes and updates) and e-mail support included.
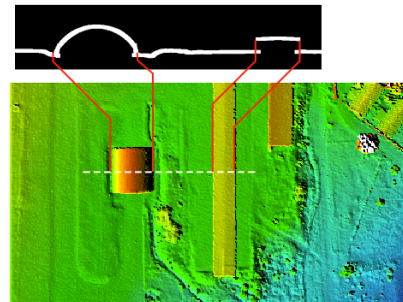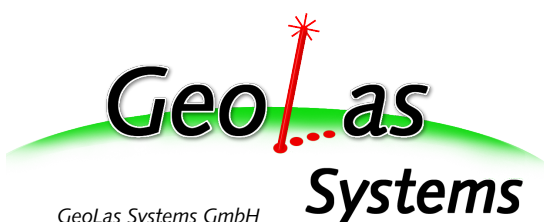

Elevation

Reflectance

Slope / Roughness