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TerraScan New Features

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Cloud Type

- You should specify cloud type whenever you use **Read points** menu command
- You can change the cloud type later on using File / Cloud type menu command
- Project definition has cloud type – **Open block** knows the type

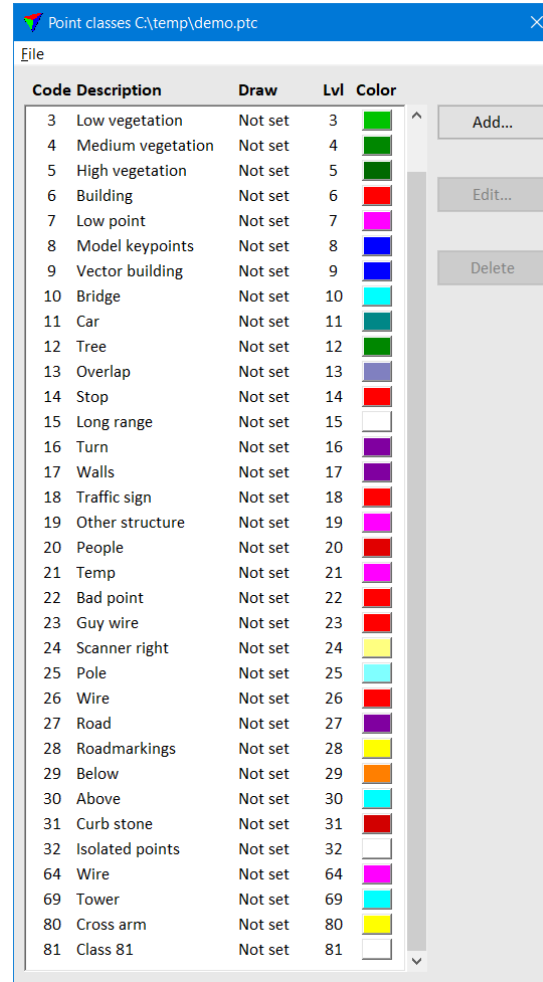
- This setting affects speed optimization logic in some routines
- Not critical to set but you are better off when the setting is right

The screenshot shows a dialog box titled "Read points - hippos.fbi" with the following settings:

- Cloud type: Airborne photo
- Format: Fast binary
- Points: 125 561 048
- WGS84: Do not apply
- Transform: None
- Fit view: 1
- Only every: 10 th point
- Only class: 2 - Ground
- Inside fence only:
- Checked options: Xyz, Color, Distance, Group
- Unchecked options: Time, Intensity, Scanner, Angle, Normal vector, Echo length, Echo normality, Echo position, Image number, Reflectance, Deviation, Class
- Buttons: All on, All off
- Bottom buttons: OK, Cancel

Resizable Windows

- TerraScan Main Window
- Manage Trajectories
- View Positions
- Define Classes
- Check Tunnel Sections
- Check Building Models
- Inspect Groups
- Define Macro



Point classes C:\temp\demo.ptc

File

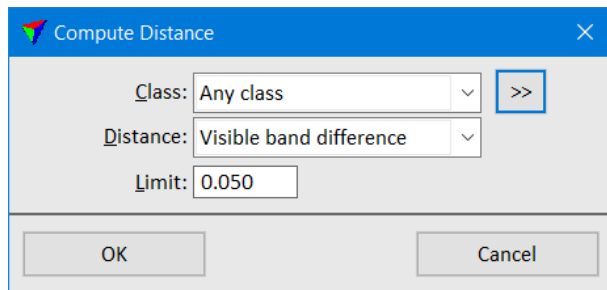
Code	Description	Draw	Lvl	Color
3	Low vegetation	Not set	3	Green
4	Medium vegetation	Not set	4	Green
5	High vegetation	Not set	5	Green
6	Building	Not set	6	Red
7	Low point	Not set	7	Magenta
8	Model keypoints	Not set	8	Blue
9	Vector building	Not set	9	Blue
10	Bridge	Not set	10	Cyan
11	Car	Not set	11	Teal
12	Tree	Not set	12	Green
13	Overlap	Not set	13	Grey
14	Stop	Not set	14	Red
15	Long range	Not set	15	White
16	Turn	Not set	16	Purple
17	Walls	Not set	17	Purple
18	Traffic sign	Not set	18	Red
19	Other structure	Not set	19	Magenta
20	People	Not set	20	Red
21	Temp	Not set	21	Magenta
22	Bad point	Not set	22	Red
23	Guy wire	Not set	23	Red
24	Scanner right	Not set	24	Yellow
25	Pole	Not set	25	Cyan
26	Wire	Not set	26	Red
27	Road	Not set	27	Purple
28	Roadmarkings	Not set	28	Yellow
29	Below	Not set	29	Orange
30	Above	Not set	30	Cyan
31	Curb stone	Not set	31	Red
32	Isolated points	Not set	32	White
64	Wire	Not set	64	Magenta
69	Tower	Not set	69	Cyan
80	Cross arm	Not set	80	Yellow
81	Class 81	Not set	81	White

Buttons: Add..., Edit..., Delete



Vegetation Index in Ground Classification

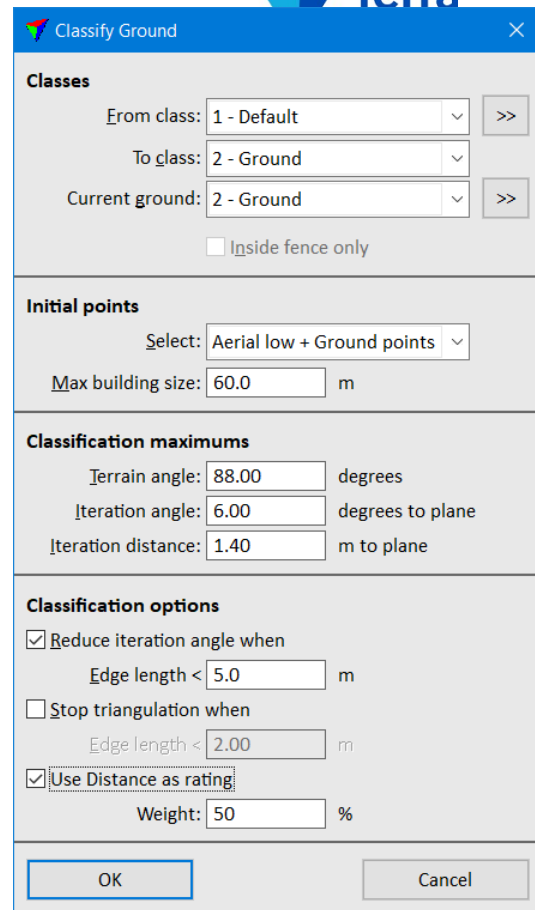
- Ground classification can make use of vegetation index as a probability factor for how likely a point is to be ground
- Improves result with a photogrammetric point cloud
- Steps:
 - Use **Compute distance** to store vegetation index as distance value
 - Use **Smoothen points** to smoothen distance values
 - Run ground classification with **Use Distance as rating** on



The 'Compute Distance' dialog box is shown with the following settings:

- Class: Any class
- Distance: Visible band difference
- Limit: 0.050

Buttons: OK, Cancel



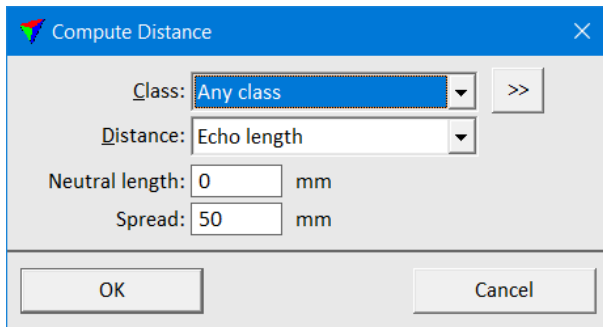
The 'Classify Ground' dialog box is shown with the following settings:

- From class: 1 - Default
- To class: 2 - Ground
- Current ground: 2 - Ground
- Inside fence only
- Initial points: Select: Aerial low + Ground points
- Max building size: 60.0 m
- Classification maximums:
 - Terrain angle: 88.00 degrees
 - Iteration angle: 6.00 degrees to plane
 - Iteration distance: 1.40 m to plane
- Classification options:
 - Reduce iteration angle when
 - Edge length < 5.0 m
 - Stop triangulation when
 - Edge length < 2.00 m
 - Use Distance as rating
 - Weight: 50 %

Buttons: OK, Cancel

Echo Length in Ground Classification

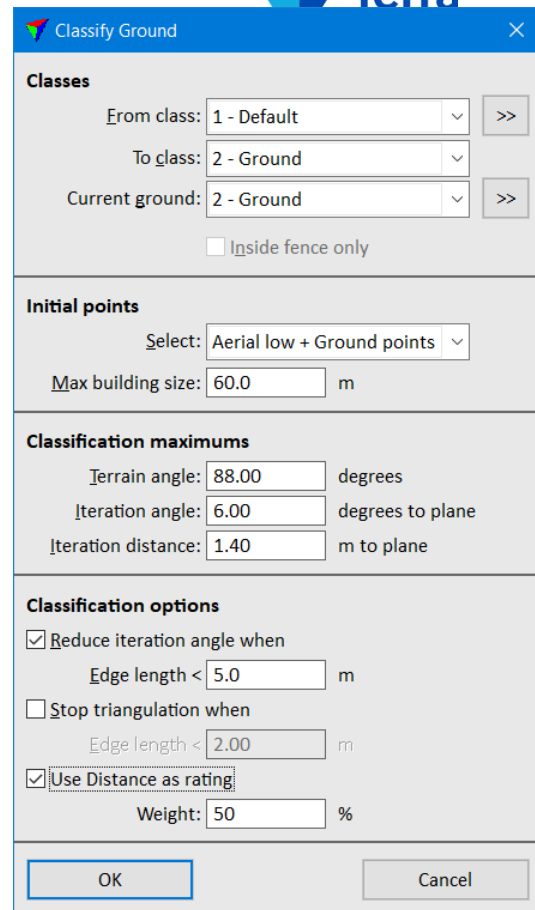
- Ground classification can make use of echo length as a probability factor for how likely a point is to be ground
- Can help in avoiding vegetation to become ground
- Steps:
 - Use **Compute distance** to translate echo length into a distance value
 - Use **Smoothen points** to smoothen distance values
 - Run ground classification with **Use Distance as rating** on



The 'Compute Distance' dialog box has a blue title bar with the Terra logo and a close button. It contains the following fields:

- Class:** A dropdown menu set to 'Any class' with a right-pointing arrow button.
- Distance:** A dropdown menu set to 'Echo length'.
- Neutral length:** A text input field with '0' and 'mm'.
- Spread:** A text input field with '50' and 'mm'.

At the bottom, there are 'OK' and 'Cancel' buttons.



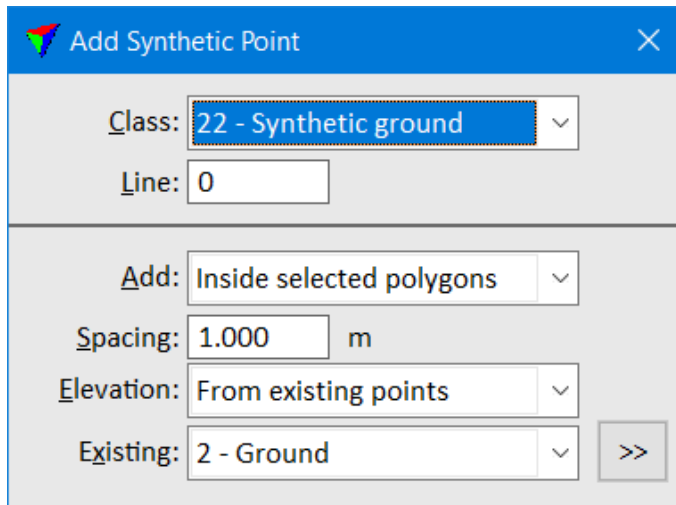
The 'Classify Ground' dialog box has a blue title bar with the Terra logo and a close button. It is divided into several sections:

- Classes:** Contains three dropdown menus: 'From class' (set to '1 - Default'), 'To class' (set to '2 - Ground'), and 'Current ground' (set to '2 - Ground'). Each has a right-pointing arrow button. Below them is a checkbox for 'Inside fence only' which is unchecked.
- Initial points:** Contains a 'Select:' dropdown menu set to 'Aerial low + Ground points' and a 'Max building size:' text input field with '60.0' and 'm'.
- Classification maximums:** Contains three text input fields: 'Terrain angle' (88.00 degrees), 'Iteration angle' (6.00 degrees to plane), and 'Iteration distance' (1.40 m to plane).
- Classification options:** Contains three checkboxes: 'Reduce iteration angle when' (checked), 'Stop triangulation when' (unchecked), and 'Use Distance as rating' (checked). Below 'Use Distance as rating' is a 'Weight:' text input field with '50' and '%'. The 'Reduce iteration angle when' checkbox has an 'Edge length <' text input field with '5.0' and 'm'. The 'Stop triangulation when' checkbox has an 'Edge length <' text input field with '2.00' and 'm'.

At the bottom, there are 'OK' and 'Cancel' buttons.

Improvements in Add Synthetic Points

- **Add Synthetic Point** can add multiple points in operation
- **Along selected vectors** adds points along selected 3D vectors at given spacing
- **Inside selected polygons** adds points in a grid pattern inside selected polygons



The screenshot shows a software dialog box titled "Add Synthetic Point" with a close button (X) in the top right corner. The dialog is divided into two main sections. The top section contains a "Class:" dropdown menu with "22 - Synthetic ground" selected, and a "Line:" text input field containing the number "0". The bottom section contains an "Add:" dropdown menu with "Inside selected polygons" selected, a "Spacing:" text input field with "1.000" and a unit "m" to its right, an "Elevation:" dropdown menu with "From existing points" selected, and an "Existing:" dropdown menu with "2 - Ground" selected. A double right arrow button ">>" is located to the right of the "Existing:" dropdown.

Faster Mobile Project Creation



- **Cut turnarounds** has new logic which works better for mobile trajectories
- **Create along trajectories** draws block boundaries based on trajectory information alone
- Workflow:
 - Import trajectories
 - Run **Cut turnarounds**
 - Run **Create along trajectories** to draw block boundaries into design file
 - (Optional) Modify block boundaries if needed
 - Use **File / New project** to enter project information
 - Use **Block / Add by boundaries** to add block boundaries to project
 - Save project definition
 - Import points into project

A screenshot of the "Cut Turnarounds" dialog box. It has a blue title bar with the Terra solid logo and a close button. The main area is light gray and contains the following controls: "Apply to:" with a dropdown menu set to "All trajectories"; "Keep length:" with a text input field containing "200.0" and "m" to its right; "Line separation:" with a text input field containing "25.0" and "m" to its right; and a checked checkbox labeled "Sort and renumber". At the bottom are "OK" and "Cancel" buttons.

Cut Turnarounds

Apply to: All trajectories

Keep length: 200.0 m

Line separation: 25.0 m

Sort and renumber

OK Cancel

A screenshot of the "Create Blocks Along Trajectories" dialog box. It has a blue title bar with the Terra solid logo and a close button. The main area is light gray and contains the following information: "Trajectories 12962.4 m total length"; "Block length:" with a text input field containing "1500.0" and "m driving" to its right; and "Block width:" with a text input field containing "160.0" and "m" to its right. At the bottom are "OK" and "Cancel" buttons.

Create Blocks Along Trajectories

Trajectories 12962.4 m total length

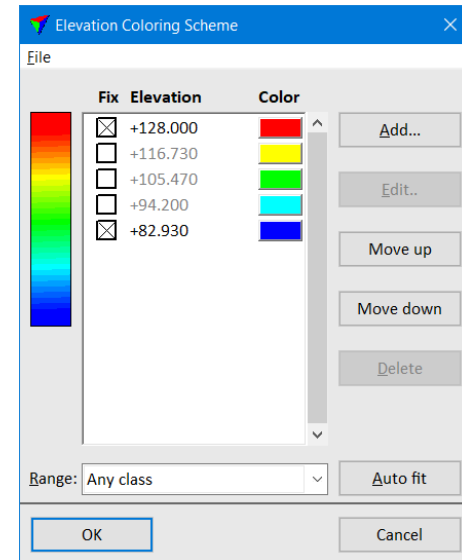
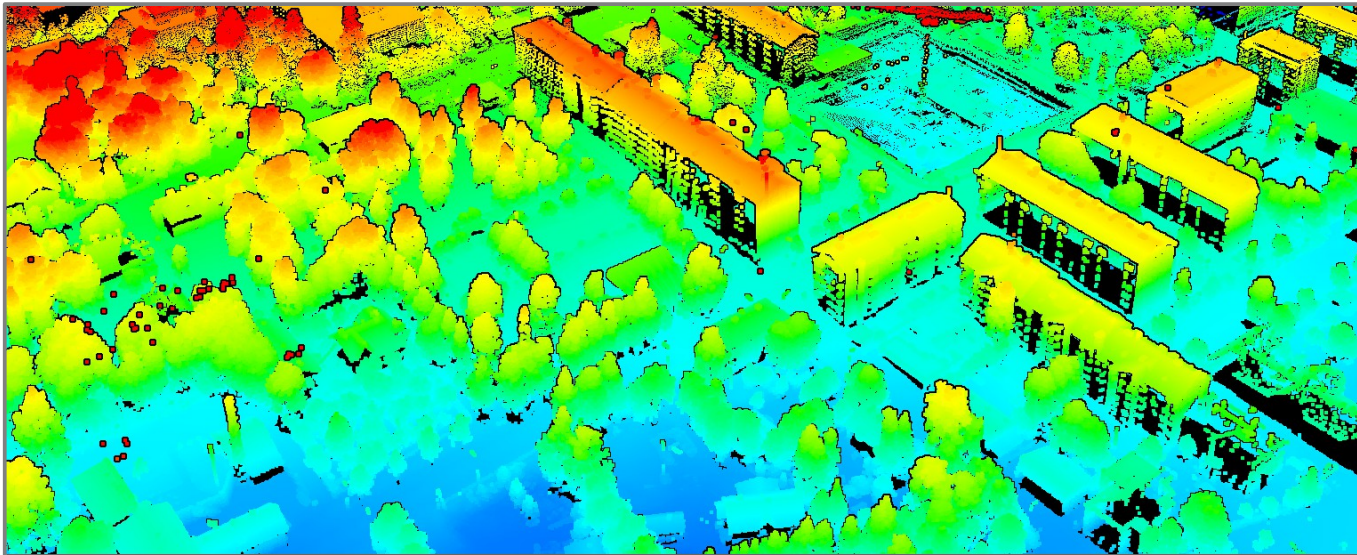
Block length: 1500.0 m driving

Block width: 160.0 m

OK Cancel

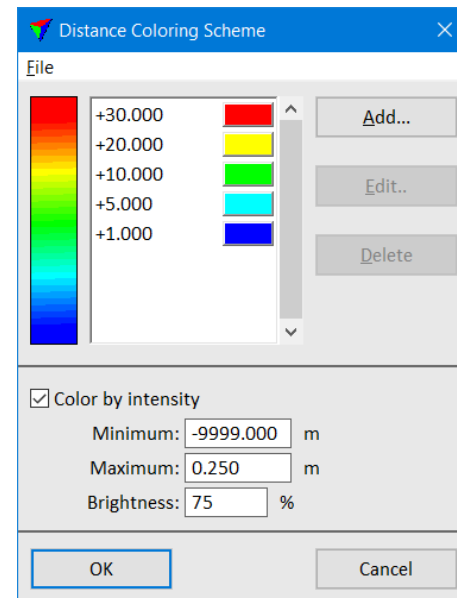
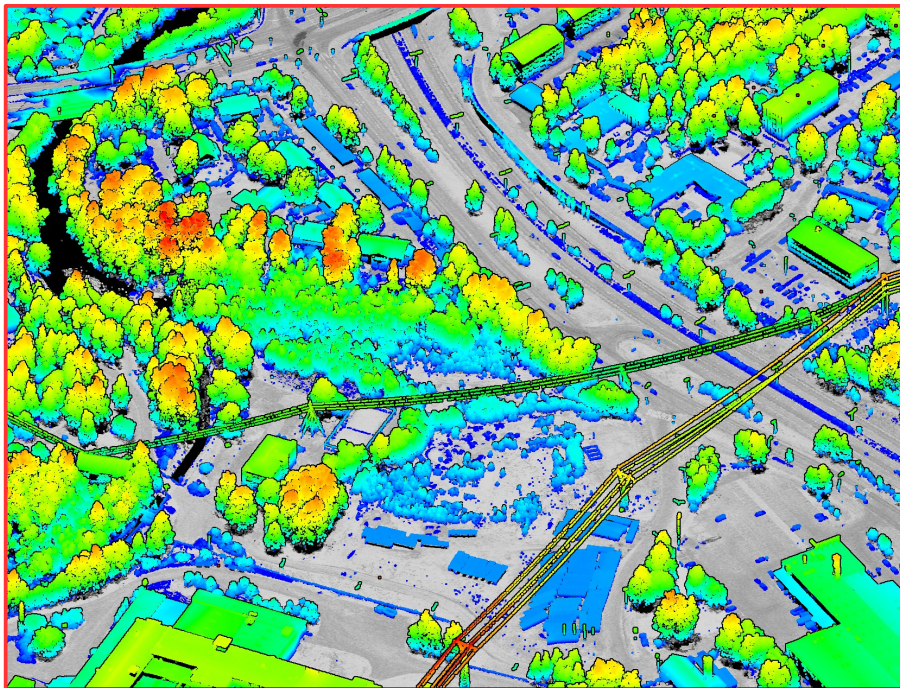
Smooth Elevation Coloring

- Elevation coloring uses smoothly changing RGB color scheme now



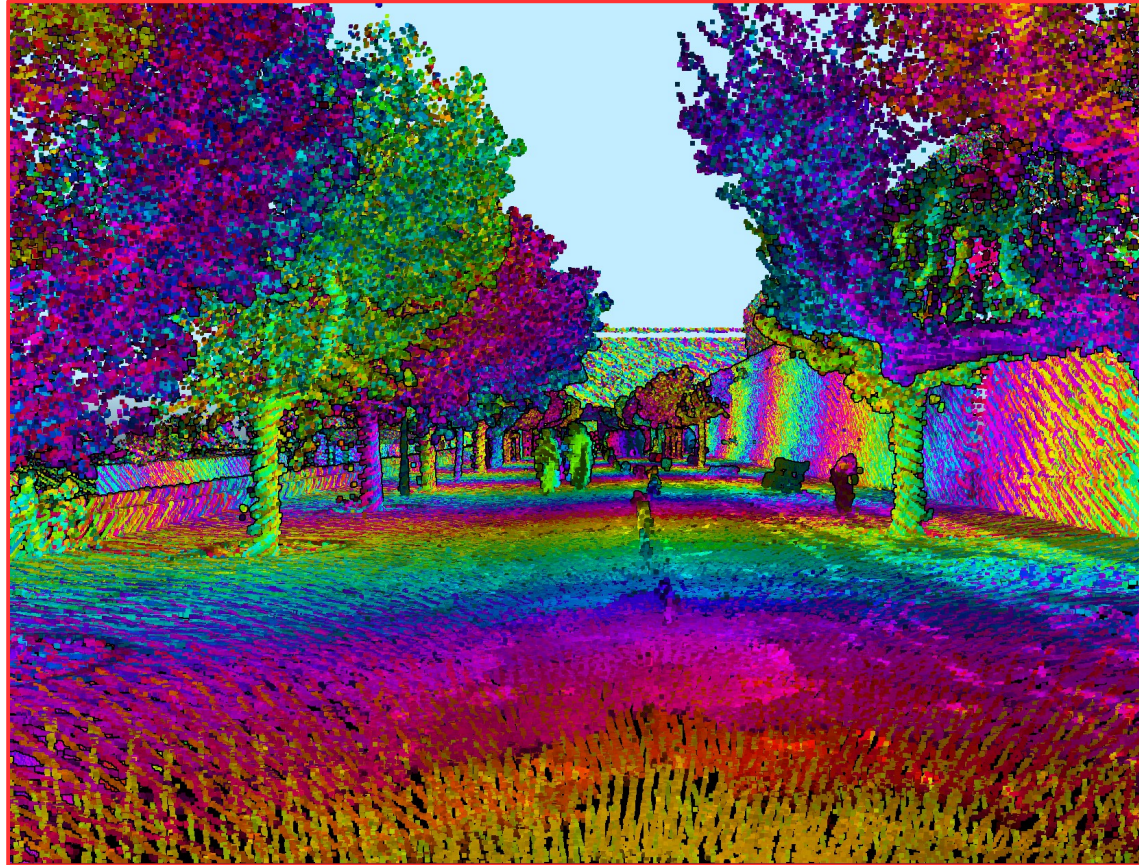
Smooth Distance Coloring

- Distance coloring uses smoothly changing RGB color scheme now
- You can optionally specify a distance range to be displayed by intensity



Coloring by Time

- **Display Mode** has two new color by choices: **Time** and **Time+Intensity**
- Coloring is based on time stamp
- You specify how fast color changes



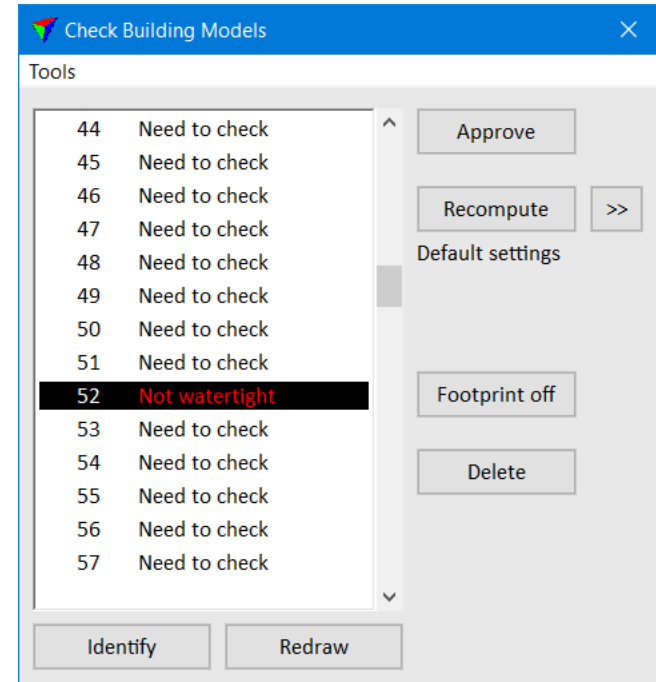
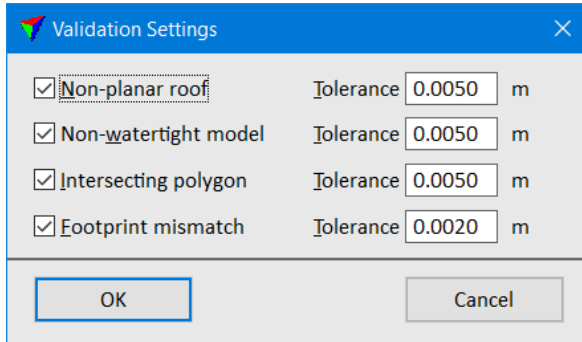
Coloring by Density

- Computes an approximate local point density for each point
- Bright means high density
- Dark means low density



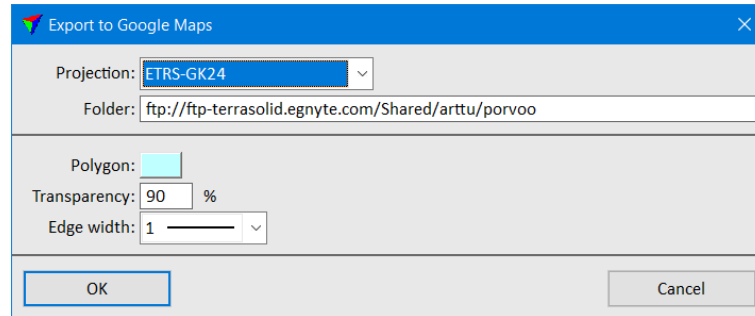
Geometric Improvements in Vectorizing Buildings

- **Vectorize Buildings** tool creates cleaner vector models (=fewer geometric flaws)
- **Check Building Models** checks buildings for two new types of geometric flaws:
 - Non-watertight model
 - Roof polygons crossing each other



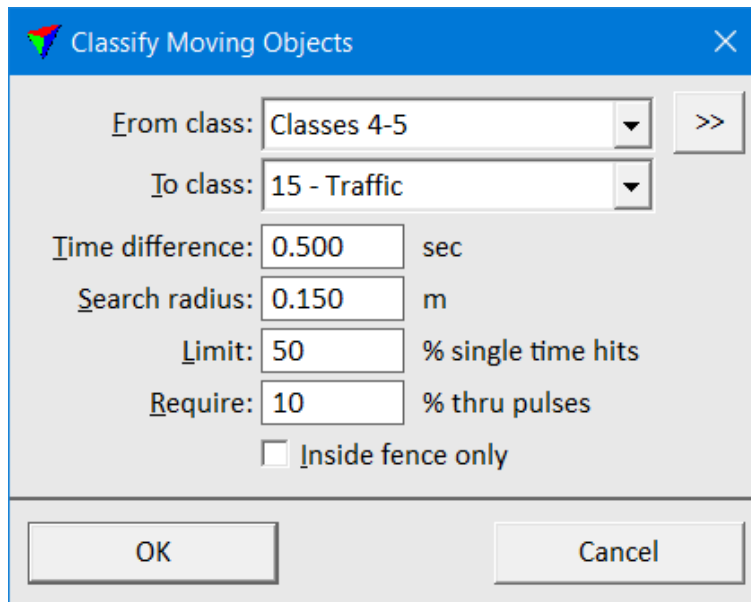
Export to Google Maps

- Menu command in **Define Project**
- Creates one KML file which contains project block polygons with a link to an FTP site
- Provides a simple way to publish point clouds on Google Maps – viewer can download point cloud data thru clicking on a polygon



More Control in Classifying Moving Objects

- You can specify what percentage of points must be single time hits
- You can specify what percentage of points must have thru pulses closeby



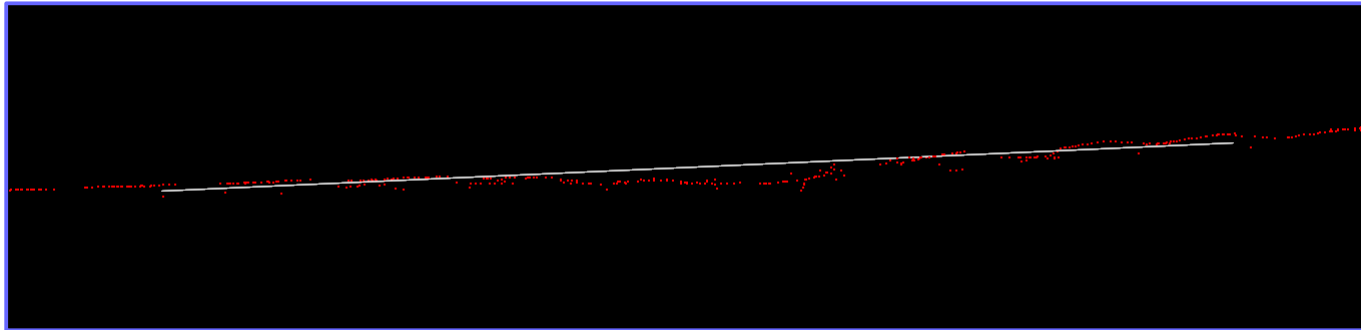
The screenshot shows a dialog box titled "Classify Moving Objects" with a close button (X) in the top right corner. The dialog contains the following fields and options:

- From class:** A dropdown menu showing "Classes 4-5" and a right-pointing arrow button (>>).
- To class:** A dropdown menu showing "15 - Traffic".
- Time difference:** A text input field containing "0.500" followed by the unit "sec".
- Search radius:** A text input field containing "0.150" followed by the unit "m".
- Limit:** A text input field containing "50" followed by the text "% single time hits".
- Require:** A text input field containing "10" followed by the text "% thru pulses".
- Inside fence only:** An unchecked checkbox.

At the bottom of the dialog are two buttons: "OK" on the left and "Cancel" on the right.

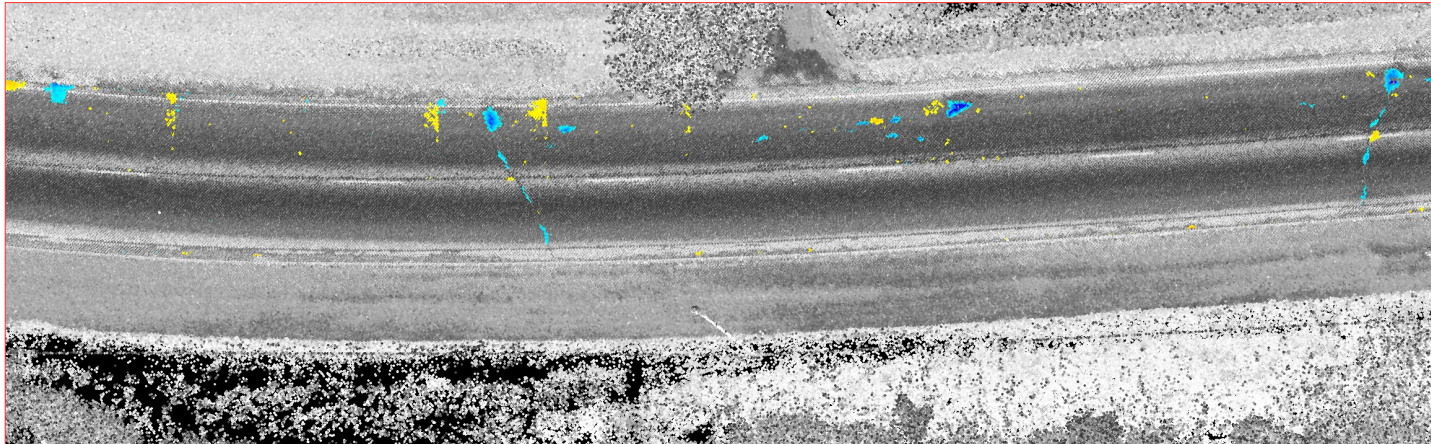
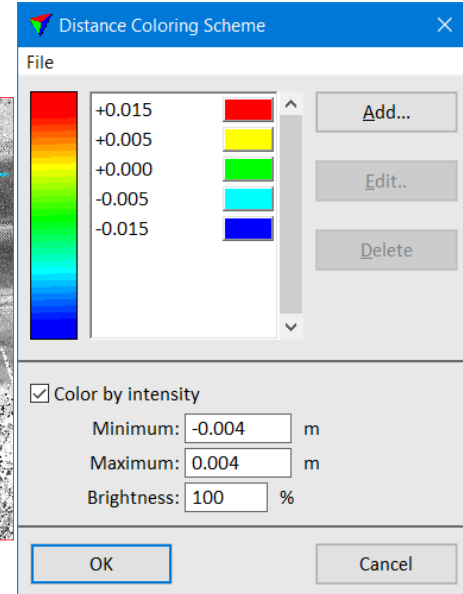
Road Bumps and Potholes

- **Compute distance** tool can compute how much each point on a road surface differs from a line fitted to a narrow longitudinal section along the road
- Bumps get a positive value – point is above fitted line
- Potholes/depressions get a negative value – point is below fitted line
- Computation requires:
 - Hard surface classification is done
 - Height from ground classification is done (to include points very close to the hard surface)



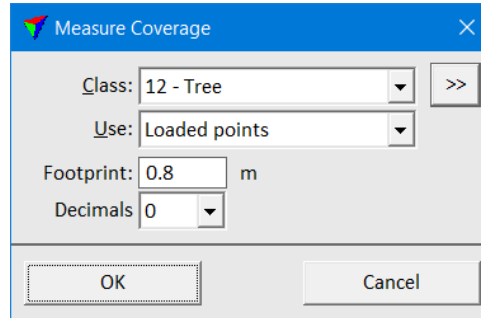
Visualizing Bumps and Potholes

- Coloring by distance gives you an ability to view bumps and potholes
- **Export raster image** from main window and **Export raster images** from project window can produce orthophotos with the same distance coloring



Measure Coverage

- Compute how much a feature type (=class such as tree) covers of selected polygons
- Computation is based on each point covering a circular area with **Footprint** as diameter

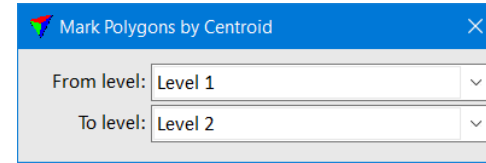


The screenshot shows a dialog box titled "Measure Coverage" with a close button (X) in the top right corner. The dialog contains the following fields and controls:

- Class:** A dropdown menu showing "12 - Tree" and a right-pointing arrow button (>>).
- Use:** A dropdown menu showing "Loaded points".
- Footprint:** A text input field containing "0.8" followed by a unit "m".
- Decimals:** A dropdown menu showing "0".
- At the bottom, there are two buttons: "OK" and "Cancel".

Mark Polygons by Centroid

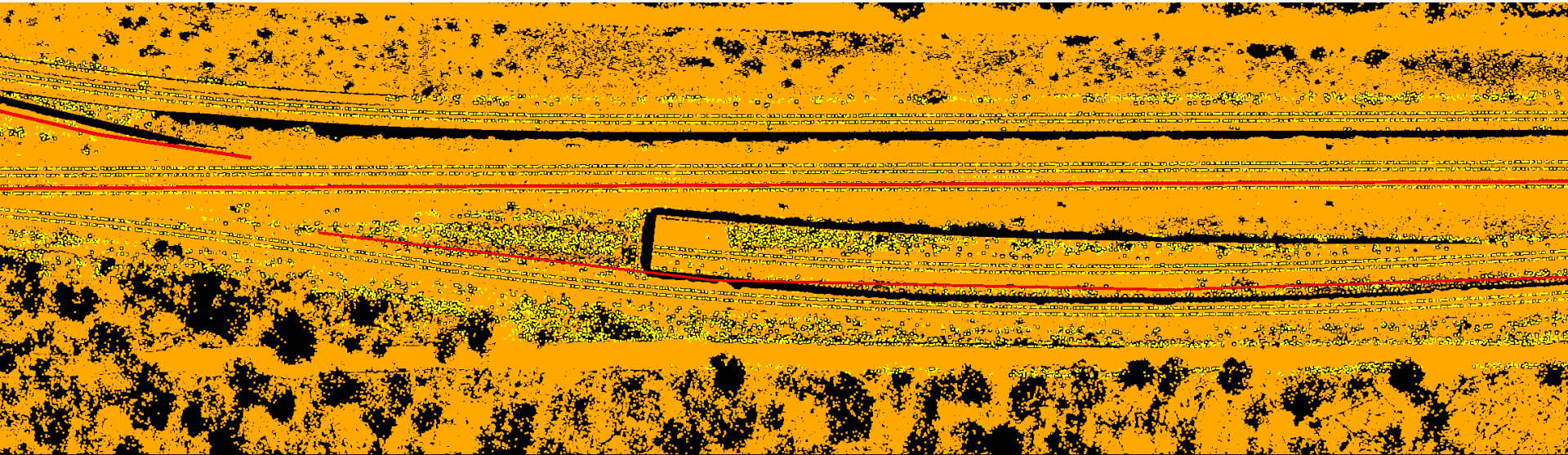
- Marks polygons which have centroid inside selected polygon
- Example use: mark building footprints belonging to a block or larger processing area



Find Rails and Airborne Data



- **Find Rails** can find rail tracks from airborne data
- Example preprocessing steps:
 - Draw line strings running in direction of tracks (red in picture below)
 - Classify by centerline $\pm 20\text{m}$ offset from line strings from **Medium vegetation** to **Temporary**
 - Classify points $0.10 - 0.35\text{m}$ above ground from **Temporary** to **Potential rail**
 - Use **Classify / Closeby points** to exclude points which have another vegetation or ground above it
 - Thin **Potential rail** points keeping **Biggest distance** (=height from ground) point



Find Rails and Airborne Data

- Run **Find Rails** choosing **Rail top hits** in **Find using**
- Use TerraModeler **Smoothen Linear Elements** to smoothen result

Find Rails [X]

From class: 12 - Potential rail [v] >>

Find using: Rail top hits [v]

Track width: 1.507 m

Min length: 20.0 m

Dz: 0.000 m

Remove single rail vectors

Find: Parallel to alignment(s) [v]

Angle tolerance: 15.0 deg

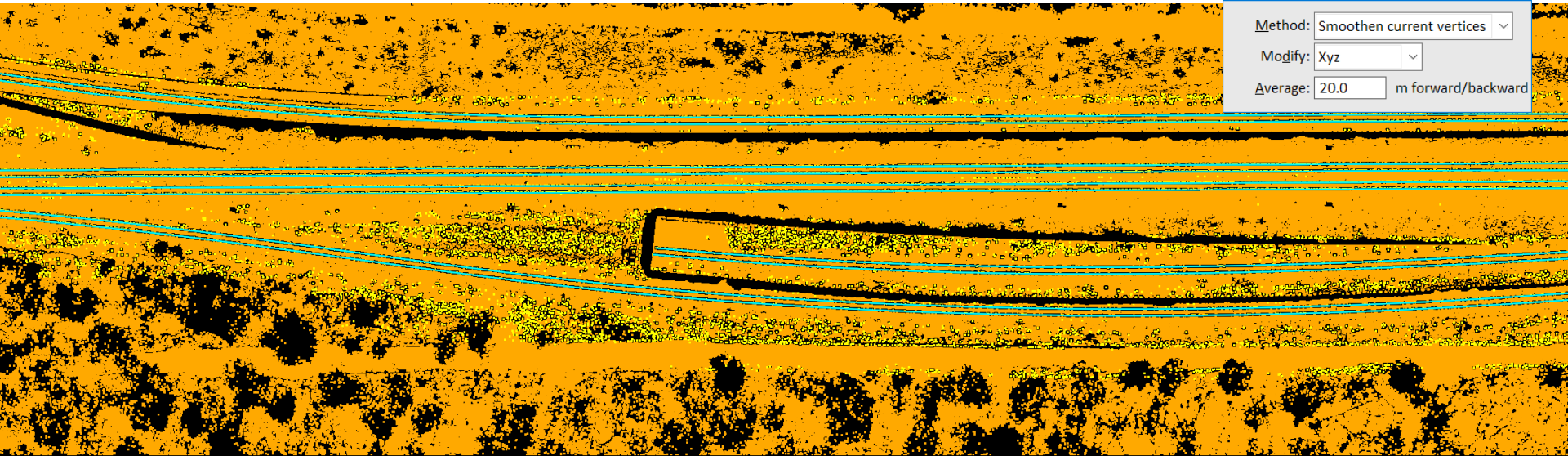
OK Cancel

Smoothen Linear Element [X]

Method: Smoothen current vertices [v]

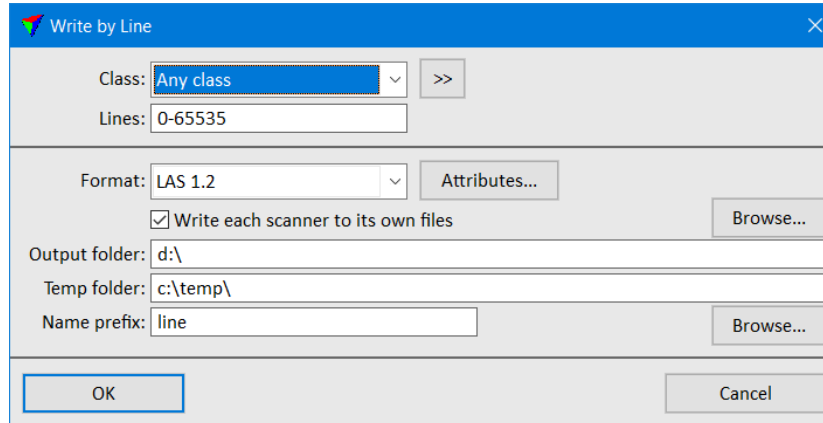
Modify: Xyz [v]

Average: 20.0 m forward/backward



'Tools / Write by line' in Define Project

- Menu command in **Define Project** dialog for writing each line (and optionally each scanner) to its own file sorted by time stamp and echo number
- Output is similar to raw files generated by scanner manufacturer software
- Uses a temporary folder (**Temp folder**) to collect points into temporary files before forming final output (into **Output folder**)

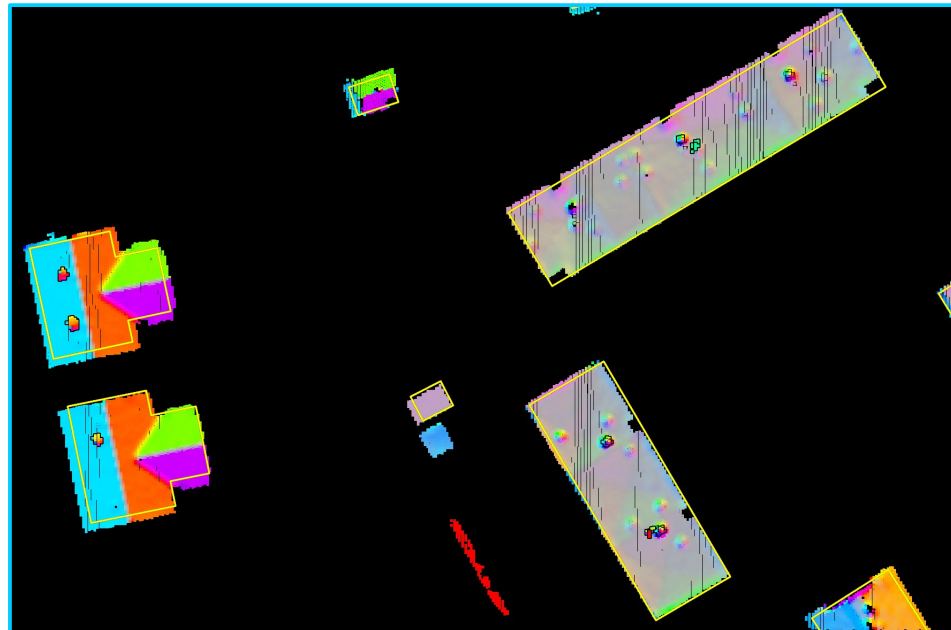
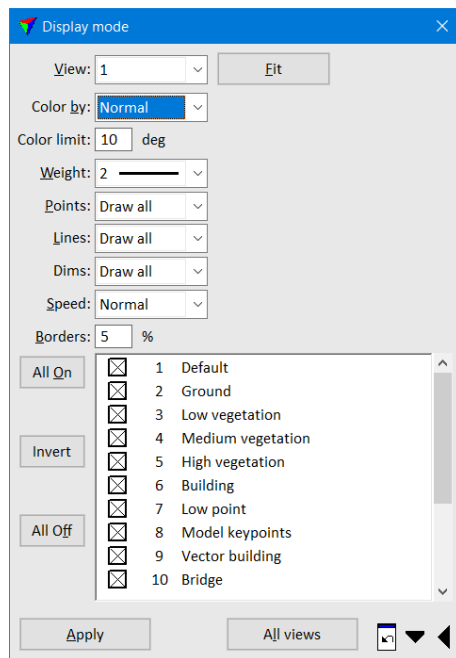


The screenshot shows the 'Write by Line' dialog box with the following settings:

- Class: Any class (dropdown menu)
- Lines: 0-65535 (text input)
- Format: LAS 1.2 (dropdown menu)
- Attributes... (button)
- Write each scanner to its own files (checkbox)
- Browse... (button)
- Output folder: d:\ (text input)
- Temp folder: c:\temp\ (text input)
- Name prefix: line (text input)
- Browse... (button)
- OK (button)
- Cancel (button)

Coloring by Normal

- Nice coloring mode for understanding roof structures
- Based on normal vectors – use **Compute normal vectors** first
- Color of planar dimension points shows direction of sloped surfaces
- Horizontal surfaces are grey – saturation grows to between 0 and given limit (10 deg)



Check Footprint Polygons Improvements



- Tool for checking footprint polygons before using those for 3D building vectorization
- **Check as list** in **Method** gives you a list of footprint polygons
- You can:
 - Exclude polygons which do not have enough laser data
 - Rotate polygons to match laser data better
 - Shift polygons to match laser data better
 - Fix corners to be exact 90 degrees

Check Footprint Polygons

Source classes: 6 - Building >>

Method: Check as list

Search data: 5.0 m around footprint

Radius: 1.000 m

Pixel size: 0.200 m

Top view: 1 Rotate to match footprint

Oblique view: None

OK Cancel

Check Footprint Polygons

View Edit Tools

Area	Cover	Angle	Rating	Shift
206	100%	0.06	90%	0.20
206	97%	2.32	73%	0.85
206	100%	2.07	79%	0.20
206	100%	3.39	59%	0.00
205	100%	3.27	76%	0.89
205	100%	0.05	72%	0.00
205	100%	0.50	53%	0.20
205	100%	0.24	57%	0.00
205	100%	0.21	3%	0.20
205	100%	0.09	66%	0.45
204	100%	2.01	52%	0.20
204	100%	0.55	64%	0.00
204	100%	1.20	7%	0.28
204	100%	0.06	78%	0.00
204	99%	1.27	27%	0.45
204	100%	0.24	91%	0.40
204	100%	1.44	41%	0.20
204	100%	1.25	76%	0.20
204	97%	2.19	55%	0.60
204	98%	1.36	63%	0.28

Auto rotate

Auto shift

Rotate

Shift

Approve

Reject

Show Identify

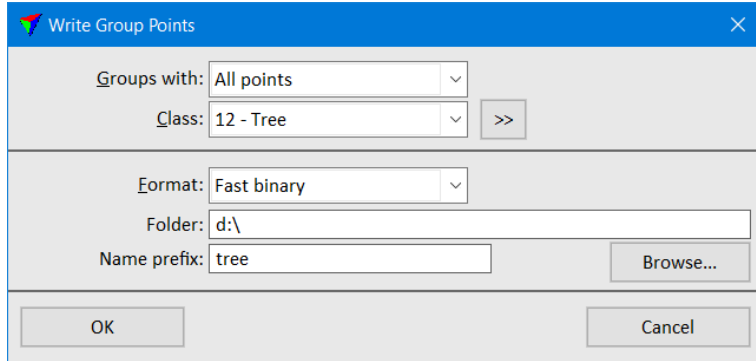
Check Footprint Polygons Improvements

- You can also view footprint polygons against oblique images
- Helps to understand places where roofs extend outside footprint polygon
- Is footprint in right place? Is there a wall that is needed in 3D building vector model?



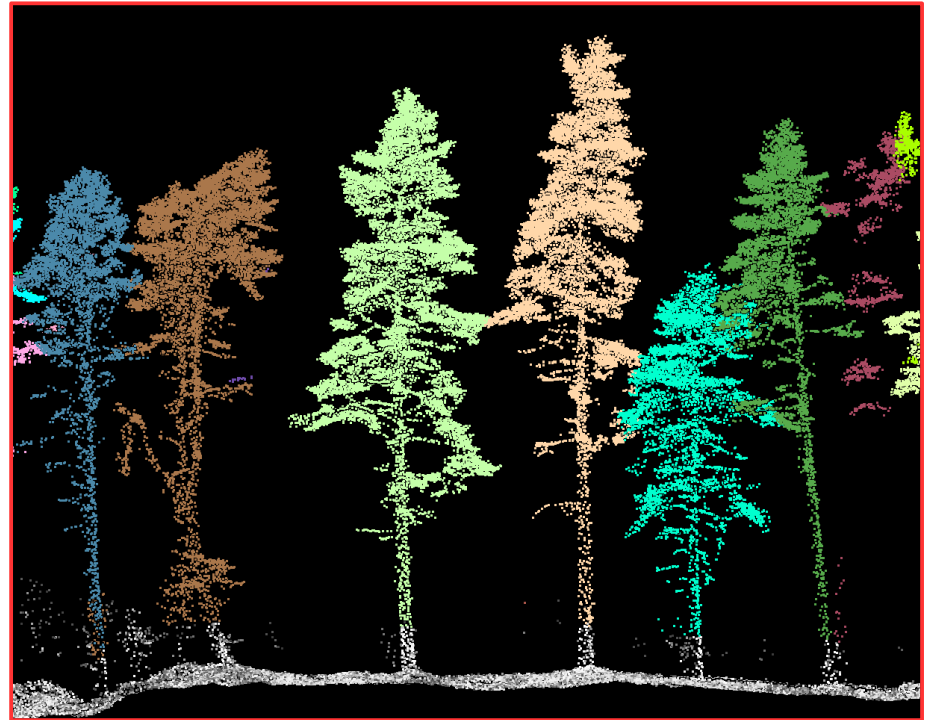
Write Group Points

- Menu command for writing each group into a separate file



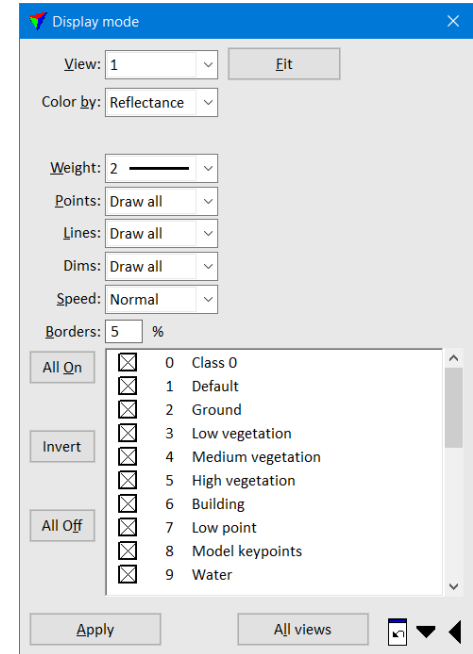
The screenshot shows a dialog box titled "Write Group Points" with a close button (X) in the top right corner. The dialog is divided into several sections:

- Groups with:** A dropdown menu set to "All points".
- Class:** A dropdown menu set to "12 - Tree", followed by a right-pointing arrow button (>>).
- Format:** A dropdown menu set to "Fast binary".
- Folder:** A text input field containing "d:\".
- Name prefix:** A text input field containing "tree", followed by a "Browse..." button.
- Buttons:** "OK" and "Cancel" buttons at the bottom.



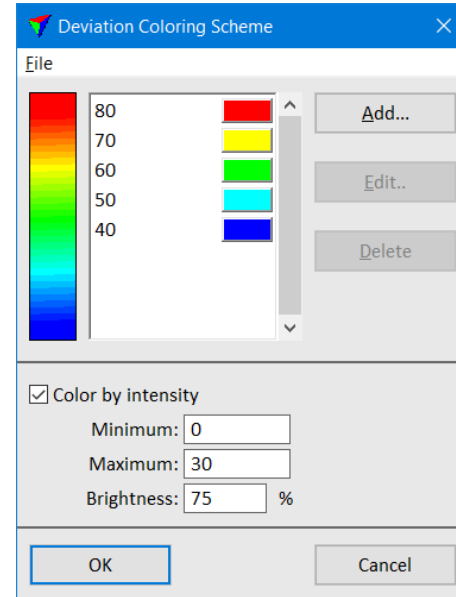
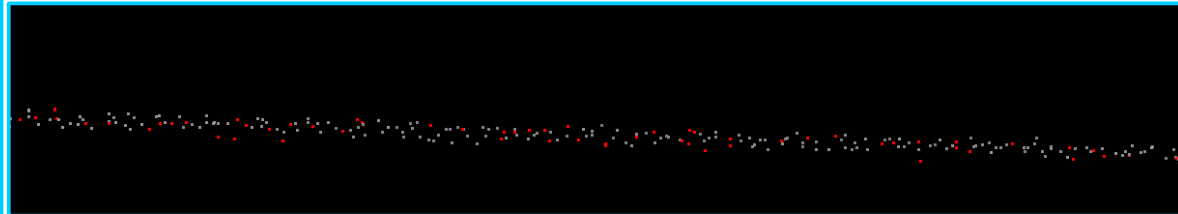
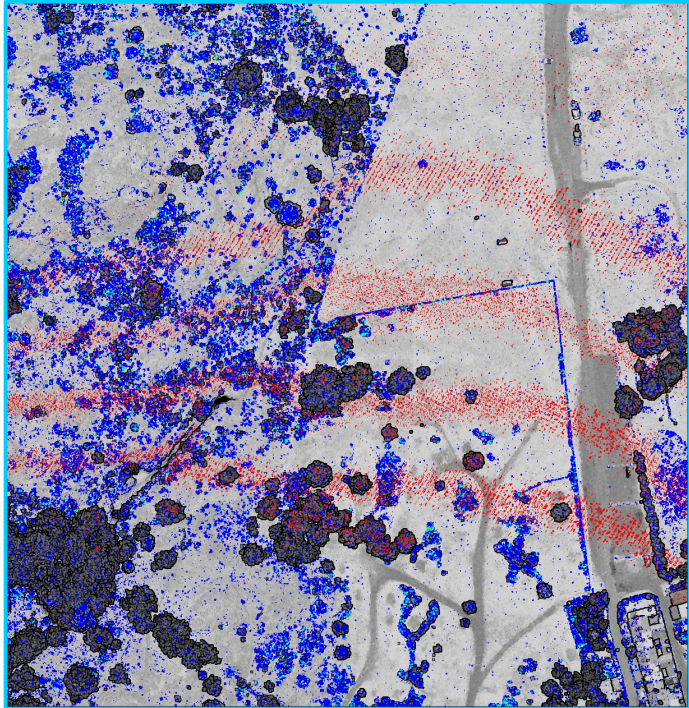
Coloring by Reflectance

- Automatically fitted grey scale coloring similar to **Intensity auto**



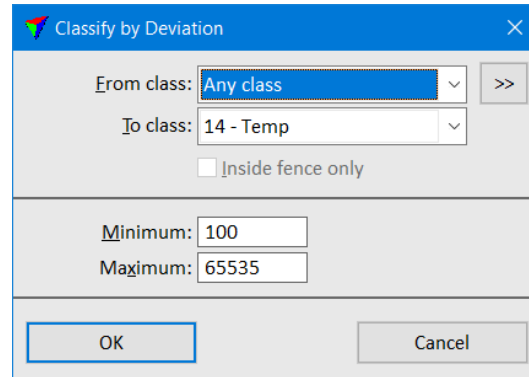
Coloring by Deviation

- Coloring mode based on pulse deviation values
- Small deviation value = normal shape return pulse
- Big deviation value = abnormal shape



Classify by Deviation

- Classifies points based on pulse deviation value
- Can be useful in eliminating potentially noisy points from more reliable points



The screenshot shows a dialog box titled "Classify by Deviation" with a close button (X) in the top right corner. The dialog is divided into several sections:

- From class:** A dropdown menu showing "Any class" with a right-pointing arrow button (>>) to its right.
- To class:** A dropdown menu showing "14 - Temp" with a downward-pointing arrow button (v) to its right.
- Inside fence only:** An unchecked checkbox.
- Minimum:** A text input field containing the value "100".
- Maximum:** A text input field containing the value "65535".
- Buttons:** "OK" and "Cancel" buttons at the bottom.