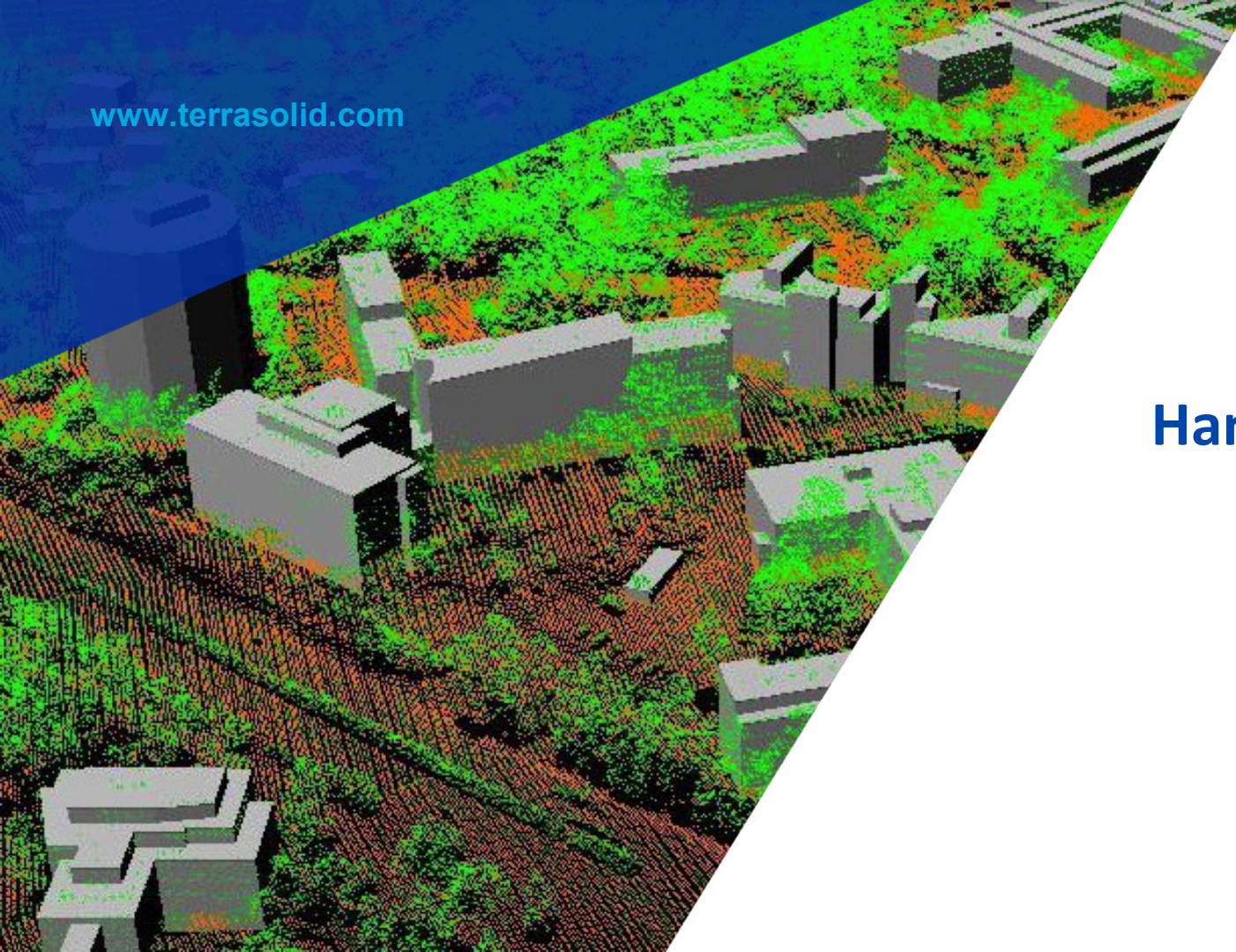


www.terrasolid.com



Handheld Scanner Processing

Arttu Soinen 13.10.2020



Demo 1 : Georefencing ZebRevo Data

Demo 2 : Processing ZebRevo Point Cloud and Images

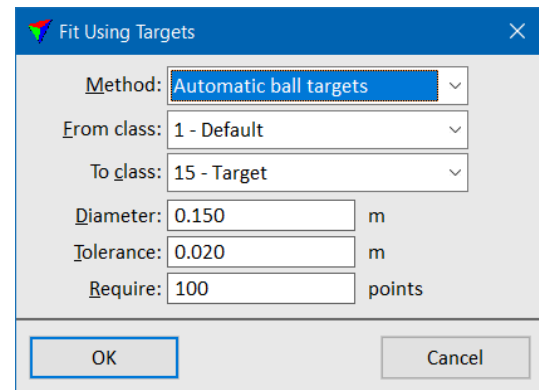
ZEB Scanners & SLAM Positioning

- Handheld scanner measures points from different directions
- Trajectory solution is based on:
 - Data from IMU
 - Matching point cloud surfaces measured multiple times
- No GPS
- Resulting point cloud:
 - Close to 0,0,0 coordinates
 - Matches itself internally
 - Has some drift



Georeferencing Handheld Scanner

- Automatic search requires ball targets:
 - User specifies diameter
 - Balls have empty space above or below
 - Scanner sees top or bottom surface of ball
- User can pin point other types of targets manually
- Target coordinates in a text file
- TerraScan links text file coordinates and ball targets in point cloud automatically
- Goes thru all permutations and chooses one with smallest residual
- TerraScan solves and applies a transform in two phases:
 - Systematic xyz shift + 2D rotation
 - (Optional) Rubbersheet fit = triangulated network of xyz shifts



Fit Targets

File Sort

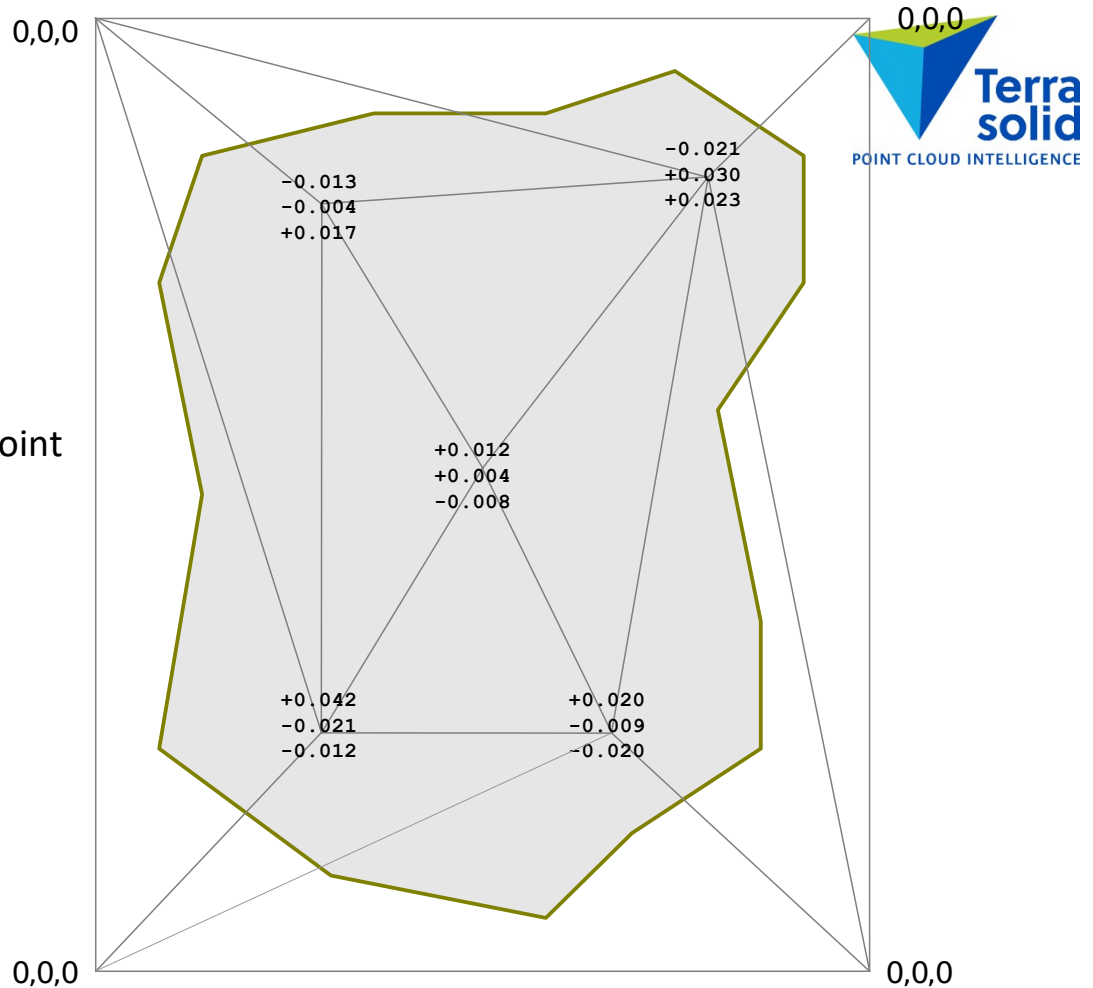
Number	SourceX	SourceY	SourceZ	TargetX	TargetY	TargetZ	Res X	Res Y	Res Z
4	-4.016	-6.974	1.718	457843.245	331767.932	38.162	+0.000	-0.043	+0.002
1	-18.702	-37.731	1.488	457809.139	331767.671	37.932	-0.025	+0.041	+0.001
2	14.668	-36.336	1.532	457825.123	331738.266	37.993	+0.023	-0.012	+0.019
3	20.686	-12.865	1.435	457848.825	331743.216	37.856	+0.001	+0.014	-0.021

Show location Add source Enter target Remove Apply...



Rubbersheet

- Computed using triangulated model
- Each vertex has its own dx, dy, dz shift
- Surrounding corners have 0,0,0 shift
- Forces point cloud to match target coordinates at location of each target point



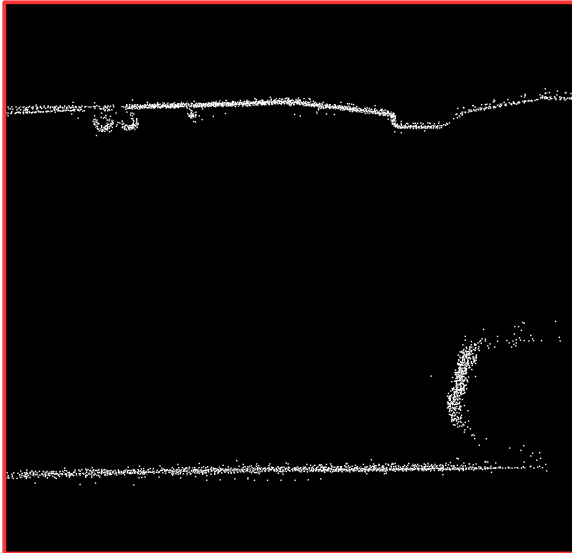
ZebRevo Processing



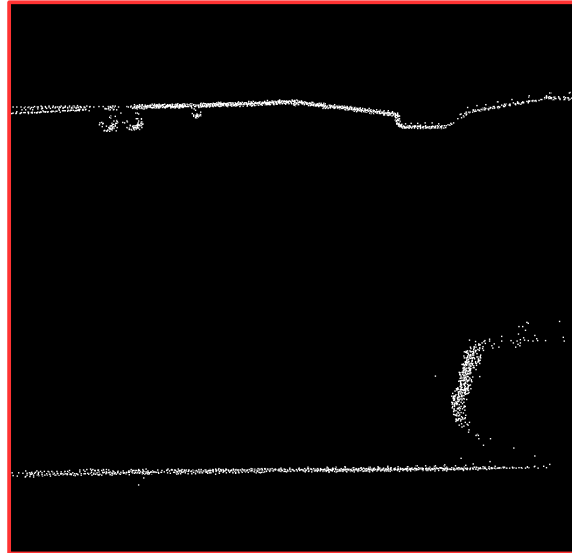
- Import point cloud and trajectory solution
- Run macro to cut long measurements, delete isolated points, apply thinning and compute normal vectors
- Perform georeferencing using targets
- Run macro to classify hard surface
- Run macro to assign groups
- Run macro to classify moving objects
- Cleanup classification manually and classify above ground features
- (Optional) Run smoothing for point cloud xyz
- Import exterior orientation of images and apply georeferencing derived using targets
- Check camera misalignment using tie points
- Extract color to laser points from images

Cut Long and Smoothing

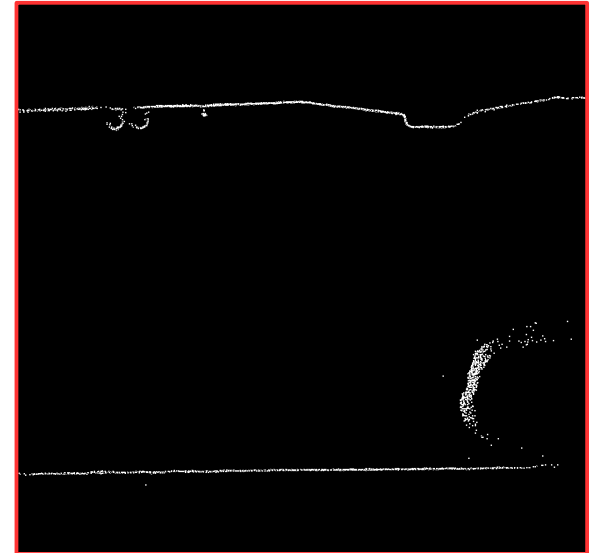
- You can make the point cloud cleaner by:
 - Cutting longer range measurements if there is a shorter measurement closeby
 - Smoothing points (modifies xyz coordinates of points)



All points



Longer measurements removed



Points after smoothing