Creating a Digital Twin with UAV-collected Data
Agenda

- Data Requirements
- Data Preparation
- Create high-density 3D point cloud using SfM
- Data thinning
- Identify points for ground classification
- Vertical rectification
- Identify buildings with segmentation classification method
- Extract building features
- Create digital terrain model
Available Data

- Publicly Available Data
  - USGS 3DEP
  - Open Street Maps
- UAV-collected image set
  - Geotagged
  - Overlapping

Images collected by Kelly Bellis
Data Requirements

- Static
- Identifiable Features
- Image Overlap

Optimal conditions for data collection:
- High visibility
- Low wind
Data Preparation

- Evaluate Image overlap
- Image clarity
- Remove erroneous images
  (apply masks if needed)
Pixels to Points Tool

**File**
- Import Images

**Map**
- Ground Control Points

**Input Image Files**
- 130 of 130 Images Checked
  - Filename
  - Latitude
  - Longitude
  - Elevation
  - Relative Alt.

**Ground Control Points**
- Name
- Symbol
- # Points
- Snap
- Latitude
- Longitude
- Elevation

**Outputs**
- Point Cloud
  - Generated Point Cloud
  - C:/Data/My project.gmp
  - Select...
  - Create Point Cloud by Resampling Mesh (3D Model) [Takes Longer but Less Noisy Result]

**Orthoimage**
- Generated Orthoimage
  - C:/Data/My project.gmp
  - Select...

**Options**
- Reduce Image Size (Faster / Less Memory) by Factor of
- Use Relative Altitude Based on Ground Height of
- Harmonize Color
- Enable Clustering
  - Upper Bound
  - Lower Bound

**Analysis Methods**
- Save Work Files to Allow Resuming Canceled Operations
- Use GPU (MCA/MDL)
- Analysis Method
  - Incremental / Sequential (Default) - Typically Best Option
  - Global - Works Well for Large Overlap, May be Much Faster and Provide Better Results in Some Situations

**Quality**
- Normal (Default)
- Camera Type
- Pinhole Radial (Default)

**RUN**

[Image: Global Mapper Pro interface showing import and analysis tools]
Ground Classification

- Segmentation classification
### Feature Measurement Information

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>RMSE</th>
<th>LIDAR_ELEV</th>
<th>ELEV_DIFF</th>
<th>ELEV_DIFF_ABS</th>
<th>ELEVATION</th>
<th>LIDAR_POINT_COUNT</th>
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<td>53.1277 m</td>
<td>97.061 m</td>
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<td>57.0755</td>
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</tbody>
</table>

- **ELEV_DIFF**: 53.128 m
Building Classification

Segmentation non-ground classification
3D Vector Extraction

Building Extraction Settings

- Extract Building Features

Window with settings for building extraction:
- Resolution to Extract Buildings at:
- Height Based on Height
- Minimum Horizontal Threshold:
- Minimum Footprint Area:
- Pitch Plane:
- Side Walls:
- Sharped Edges and Stitch Flanes by Adding Points at Plane Intersections:
- Buildings An Hatch (3D Mode):
- Elevator Vertices By Lidor Intensity:
- Nonreconstruct Surfaces

Tree Extraction Settings
- Extract Tree Features:
- Minimum Tree Height:
- Minimum Tree Spread:
- Maximum Tree Spread:
- Point Type to Use:
- Create Approximate Tree Coverage Polygons

Foliage Extraction Settings
- Extract Foliage Features:
- Maximum Dist From Best PIV Line:
- Minimum Foliage Length to Keep:
- Minimum Foliage Height:
- Minimum Foliage Count:
- Maximum Foliage Spread:
- Mark Top of Pole

Specify Bounds... Filter Points... Restore Defaults

OK Cancel Help
Thank you!

Questions? Comments?

gusc@bluemarblegeo.com
geohelp@bluemarblegeo.com