Converting point clouds to 3D object maps

Part of iTransit

2016-05-10

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AstaZero Researchers' day

Agenda

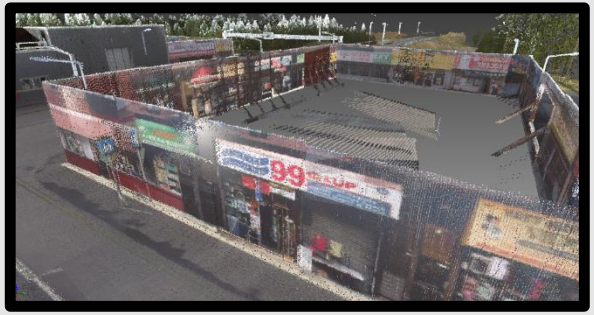
- Short background
- Overview of algorithm
- Description: Point cloud to 3D object map
- Final words

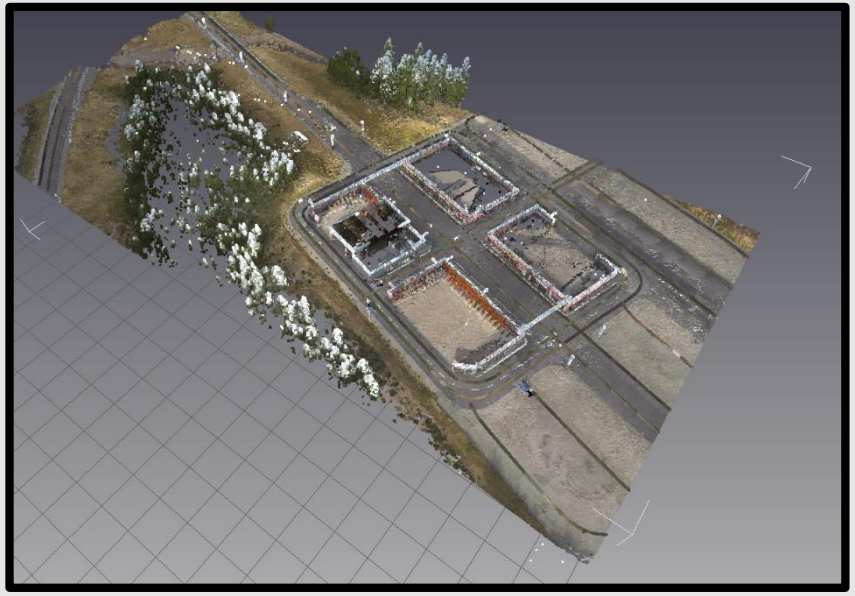
Background

Background

Why should we process point clouds?

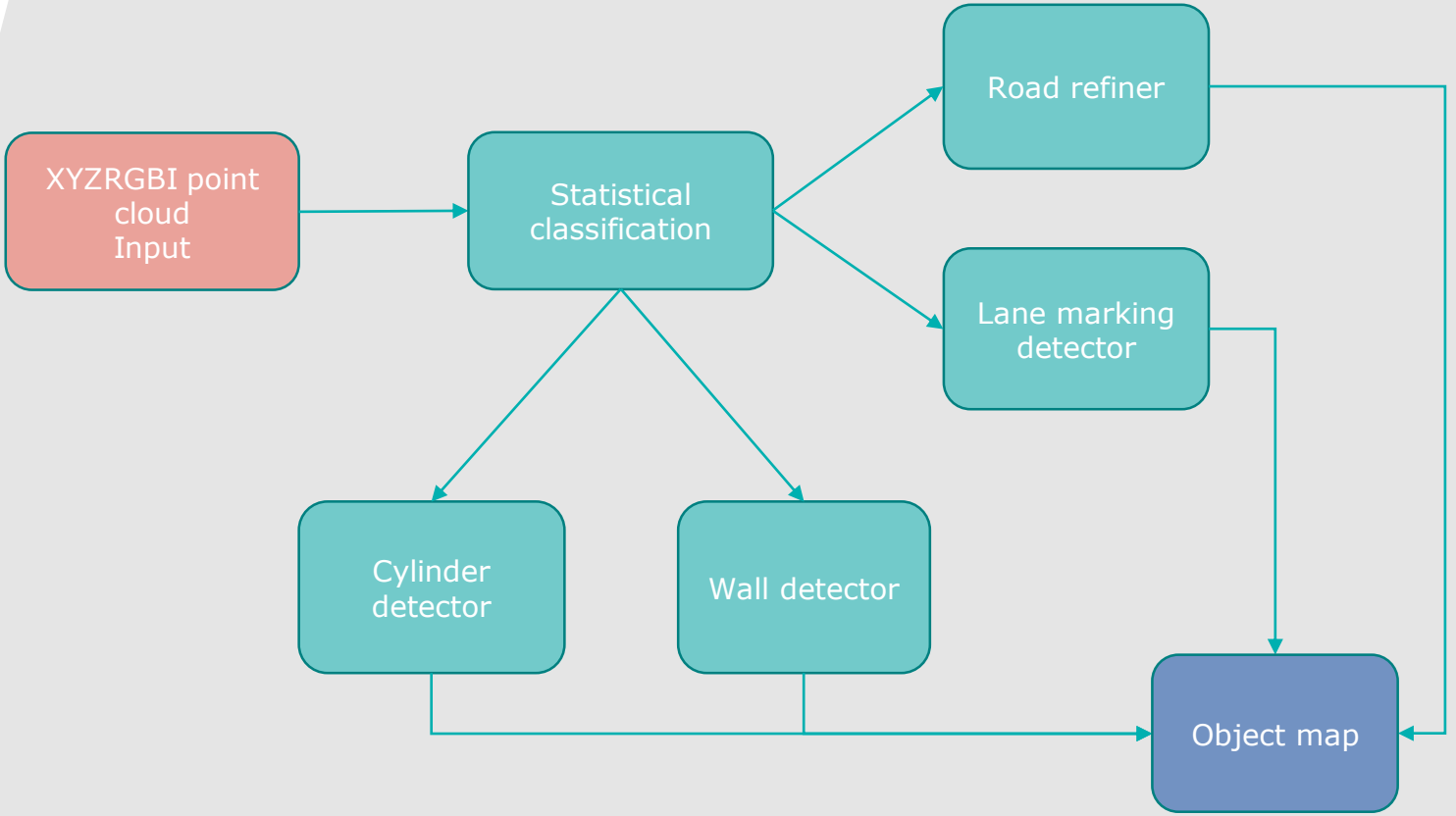
- ~ 80 000 000 points.
- ~2 GB
- Real-time navigation and positioning => need efficient solution.





Overview of algorithm

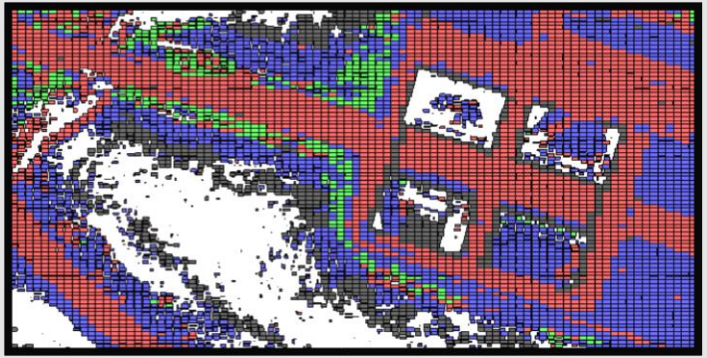
Overview of main algorithm

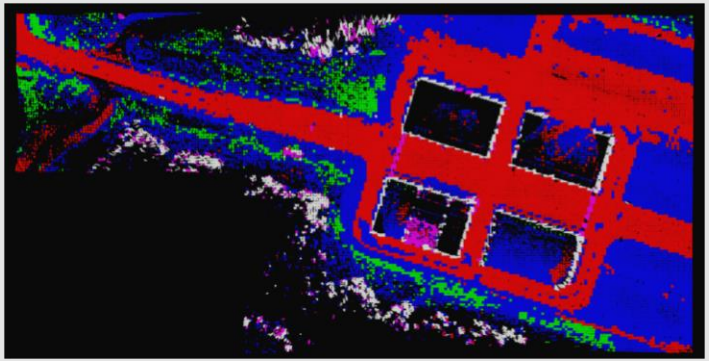


Description: Point cloud to 3D object map

Statistical classification

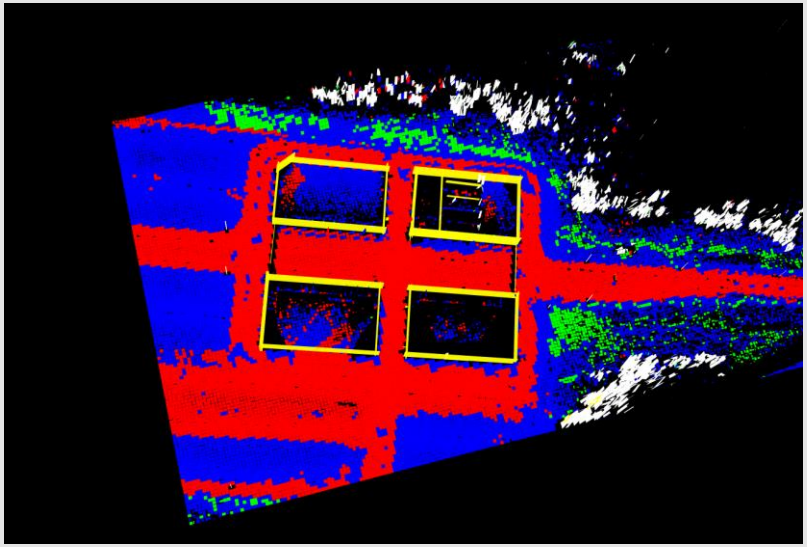
- Divide point cloud into XY grid.
- Fit plane to points in grid.
- Statistical classification:
  - Variance XY plane
  - Variance Patch plane
  - Color





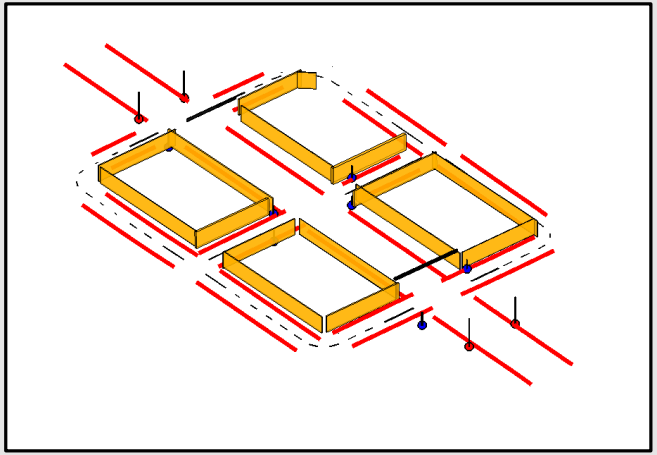
Object detection

- Wall detection:
  - Detect possible ”building clusters”.
  - Find vertical planes in clusters.
  - Find smallest enclosing cube.
- Cylinder detection:
  - Detect poles.
  - Find cylinder parameters.
- Lane marking detection:
  - Detect lane markings
  - Describe lane marking form one or more by cubes.

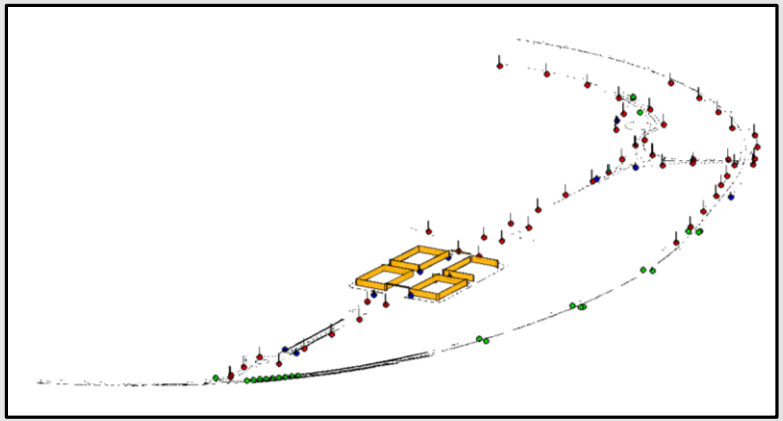


The object Map

- Objects descibed in global coordinates.
- Objects are stored in binary files.
- The map can be visualized in different layers.
  - 9 kB without road surface
  - 442 kB with road surface
  - Compare 2 GB point cloud

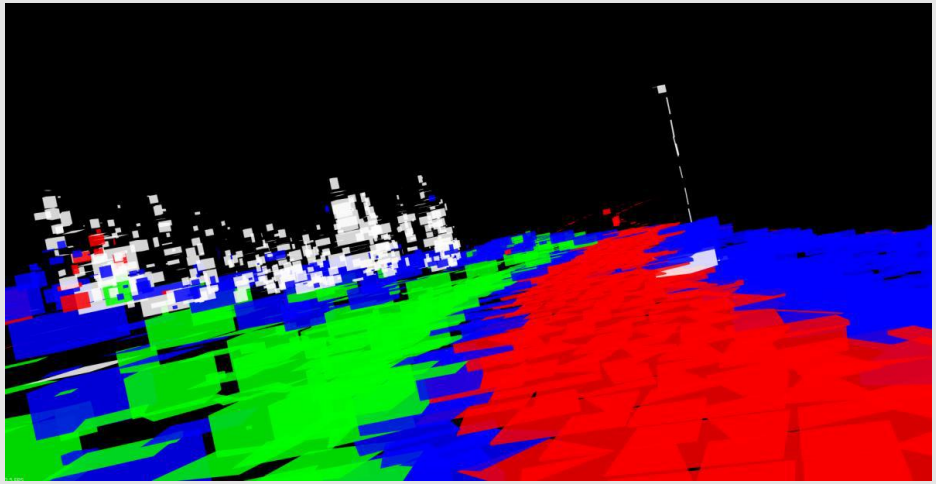


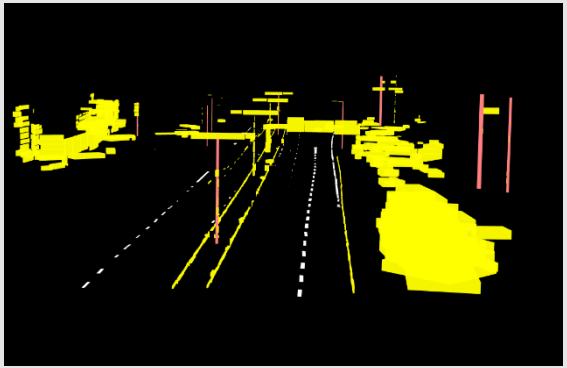
AstaZero city and part of rural road



Describing details

- 3D grid
- Oriented bounding boxes
- Extract main objects first, then describe details





Final words

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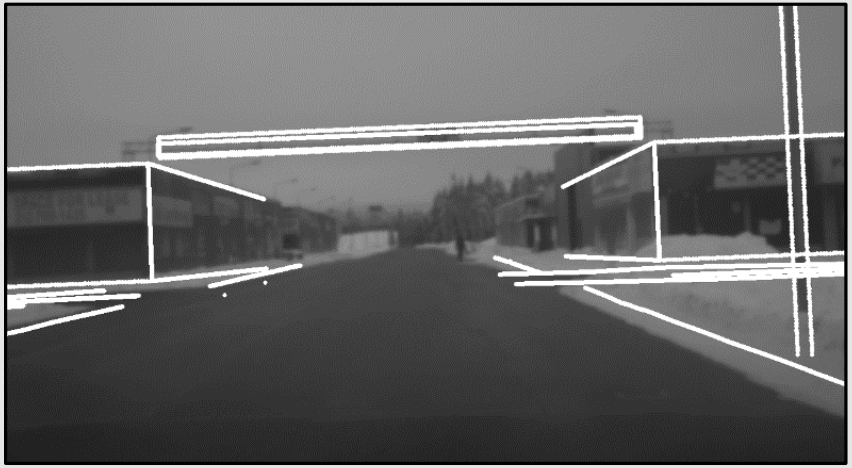
- Accuracy and resolution
- Positioning – LiDAR and camera map matching
- Potential for expansion



Thanks for the attention!