XIII Congreso de Ingeniería del Transporte

(CIT 2018)

Suitability Testing of LiDAR Processing Software aimed at 3-D Sight Distance Estimations

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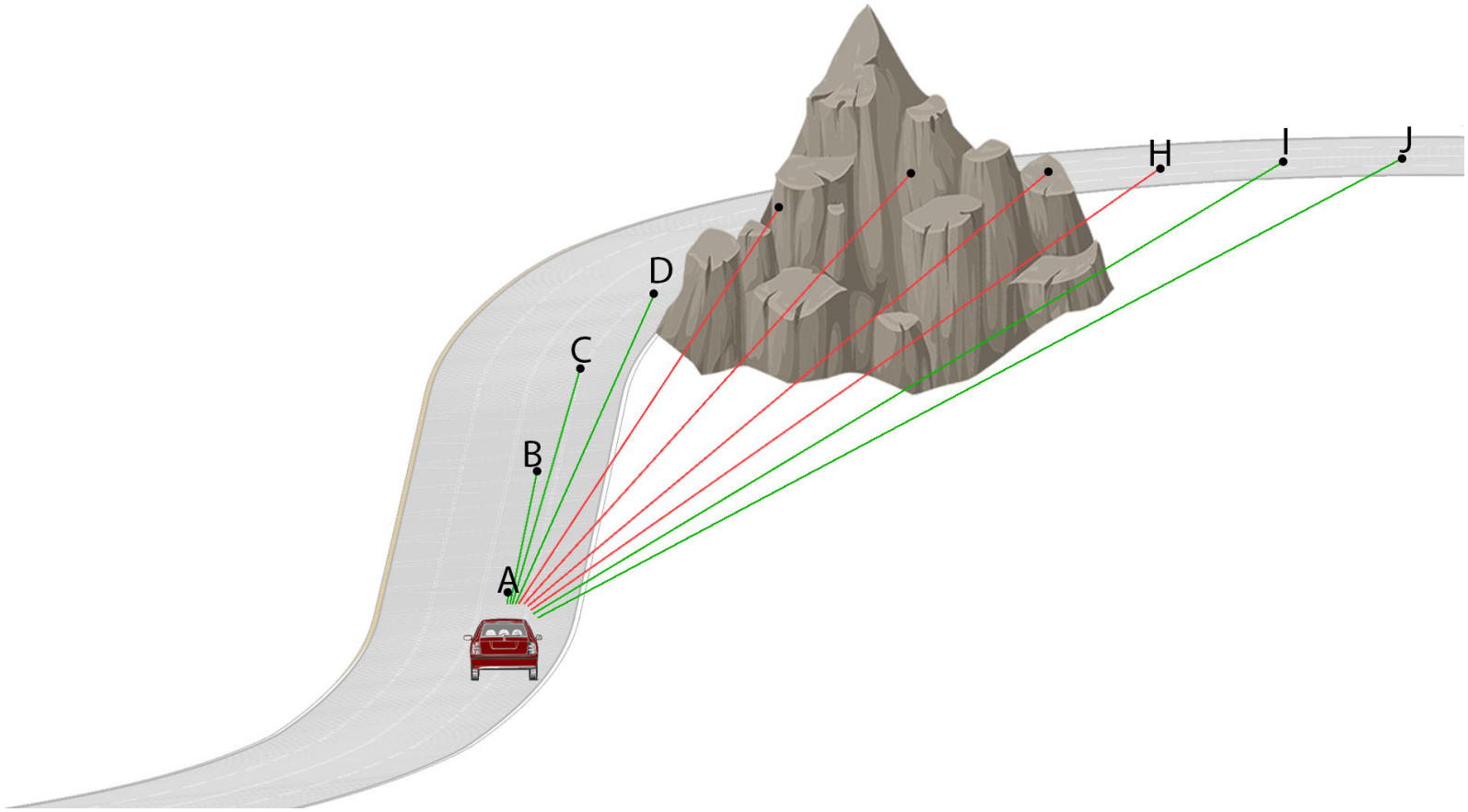
Introduction

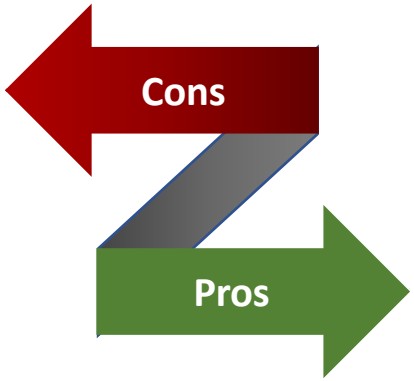
- Sight distance estimations operational roads



Introduction

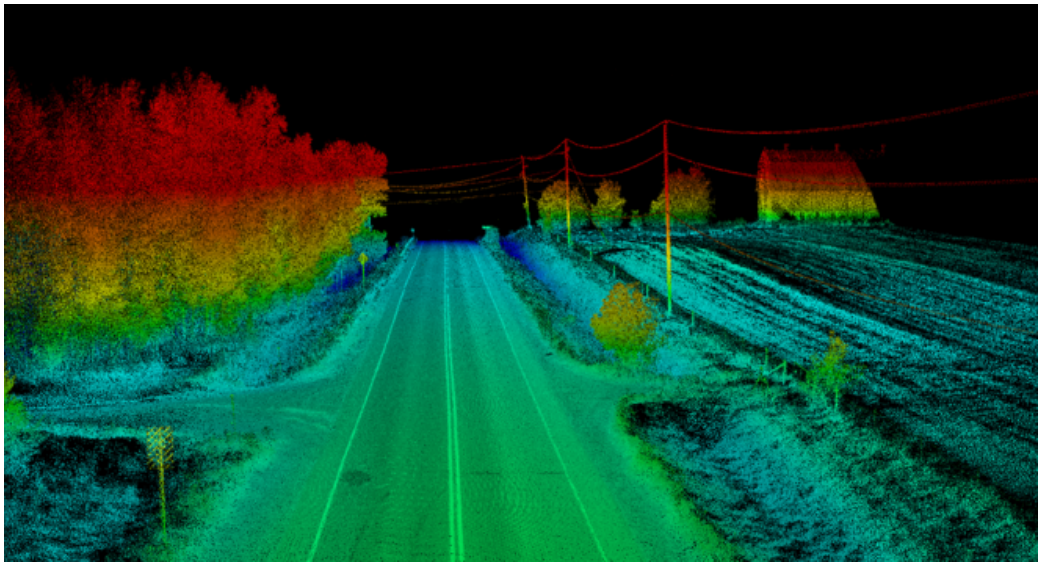
- On Service roads surroundings are dynamic
- Off site 3D estimations make use of accurate road representations
- Mobile Lidar -->“ A tool in the toolbox”

- Massive data
- Geomatics Knowledge
- **Several software suits when on house processing**



- Highly accurate and dense 3D data; 1,000,000 pps
- Productivity
- Deployment

Introduction



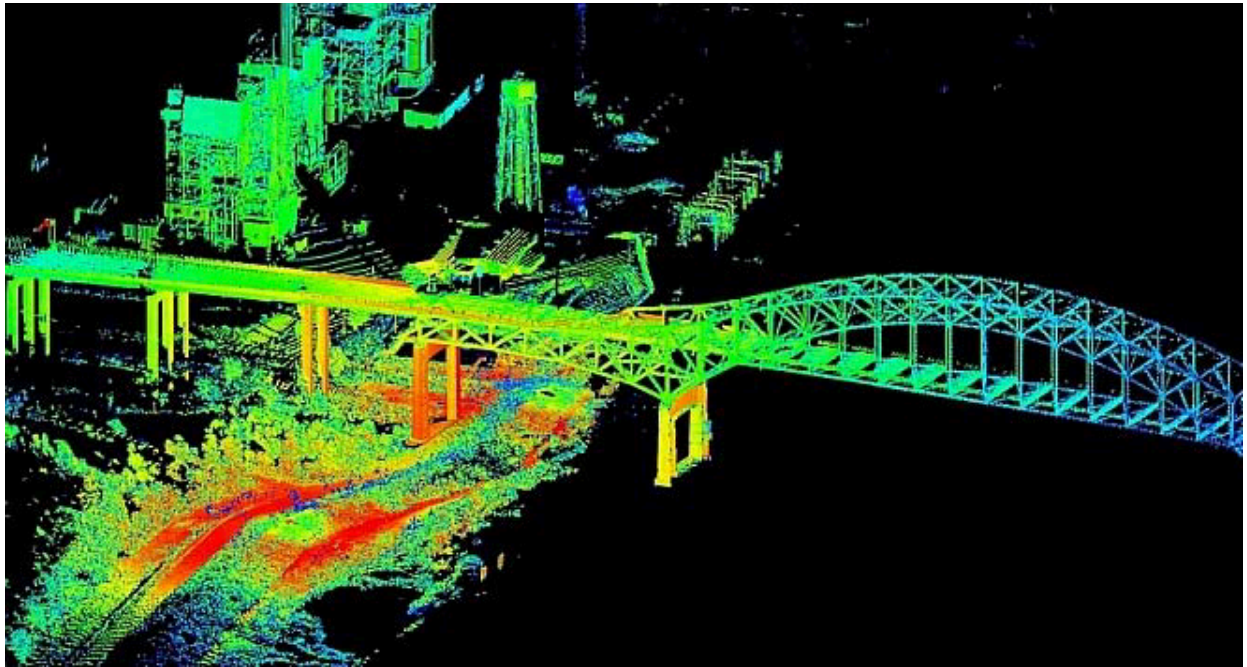
ALS / MLS / TLS

Scan configuration

Crop

Project / Transform

```
12.7388 -45.3612 -0.0256 5.0290 0 0 0 0
12.8169 -45.3612 -0.0264 4.8362 0 1 0 0
12.8950 -45.3612 -0.0271 4.8362 0 2 0 0
```



Goals

- Identify ASD tasks required --> Input data

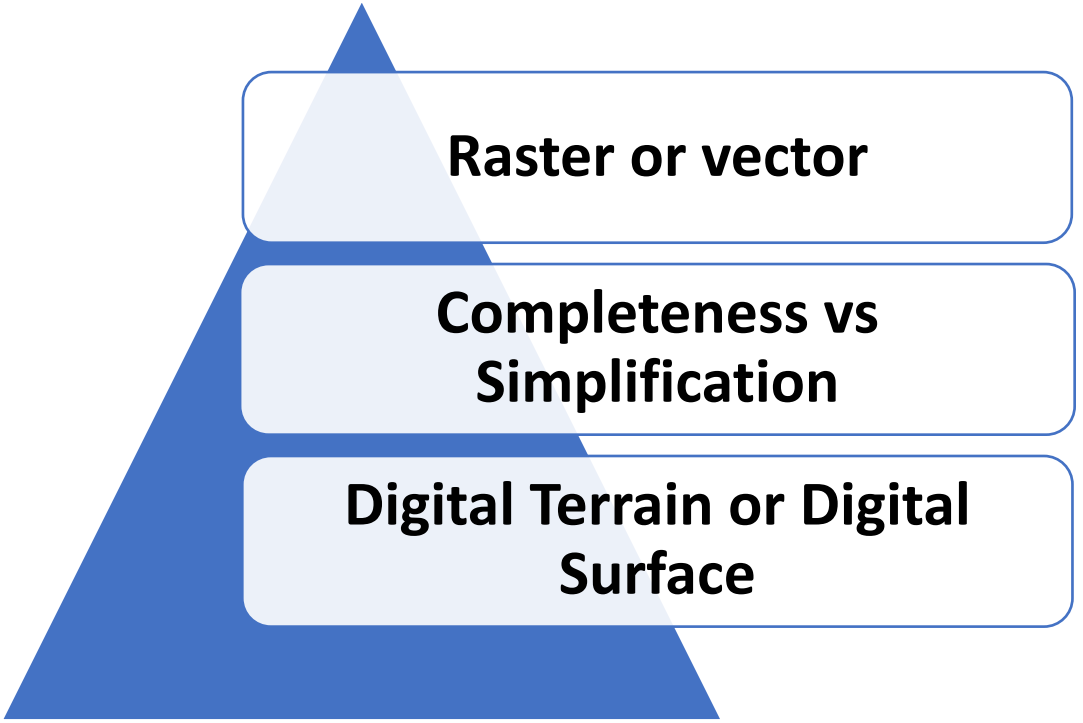
- Evaluate selected software on providing specific functionalities --> Completeness

- Evaluate software performance --> Resources

- Statistical Analysis of ASD results from data

Background

- Literature on ASD utilizing Geospatial representations of roads
- Deliverables - Models or directly on Point cloud
- Line-of Sight-algorithms
- Models :



Software Selection Process

LiDAR derived → Geospatial representation → GIS, CAD, Road, …

Useful for → Civil engineering → Transportation applications + GIS tasks

Widespread, Mature, Interoperable, Load Point size, Coordinate Reference System, Skills required

3DReshaper

Carlson Point Cloud

MARS® Explorer

CIVIL 3D

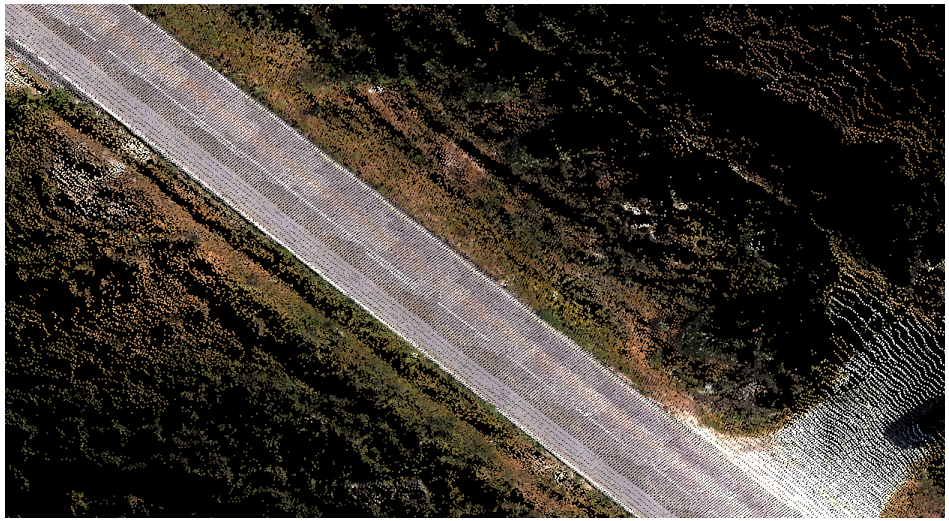
orbit

MDTop

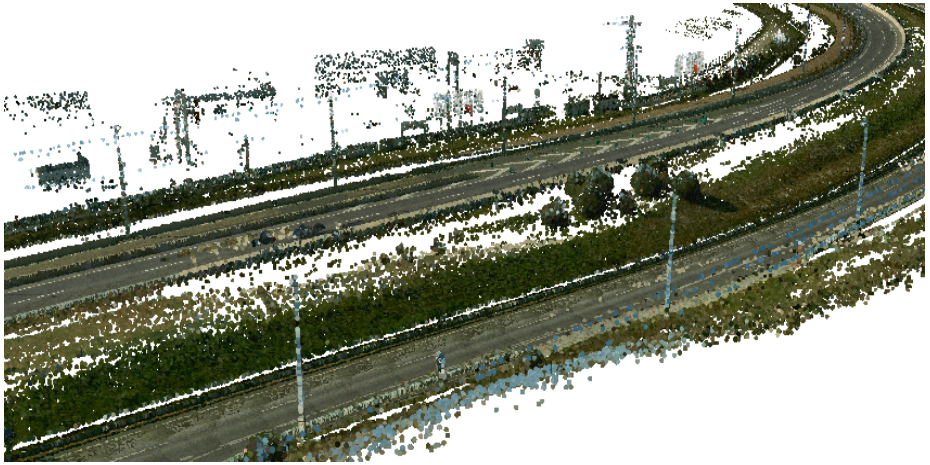
GlobalMapper

LAStools

Case Study



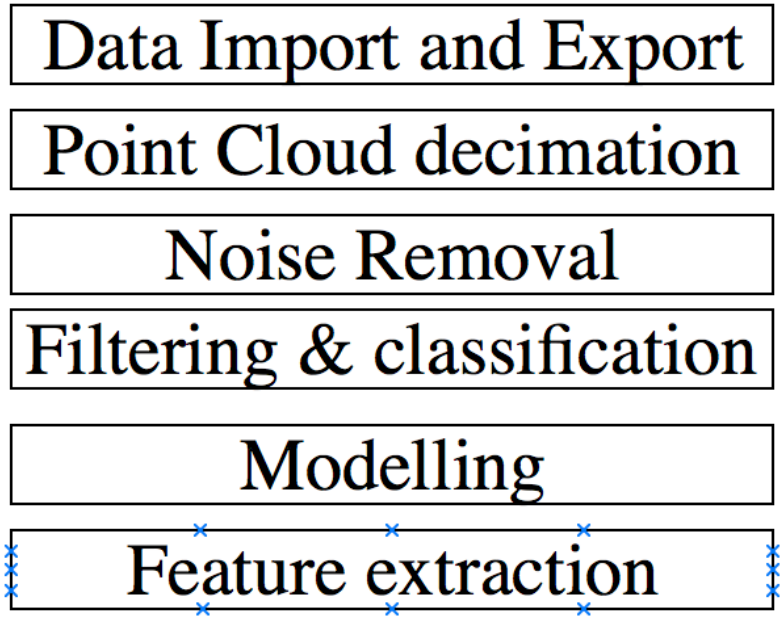
- Rural
- 4 Million points
- IP-S2
- **Suitability**



- Rural
- 120 Million points
- IP-S3
- **Performance**

Evaluation

- Suitability: Comparing required to completed



- Efficiency: Behavior & Capacity

- Statistical: Analysis of sight distance results obtained

Results and discussion: Suitability

- Data import and export: I/O LiDAR formats WMS, imagery, Polylines.

- Point cloud decimation → Clever & non Clever options →

LAStools

- Noise Removal → Specifying isolated distance, manually, outliers…. Vehicle filtering less straight forward for MMS data.

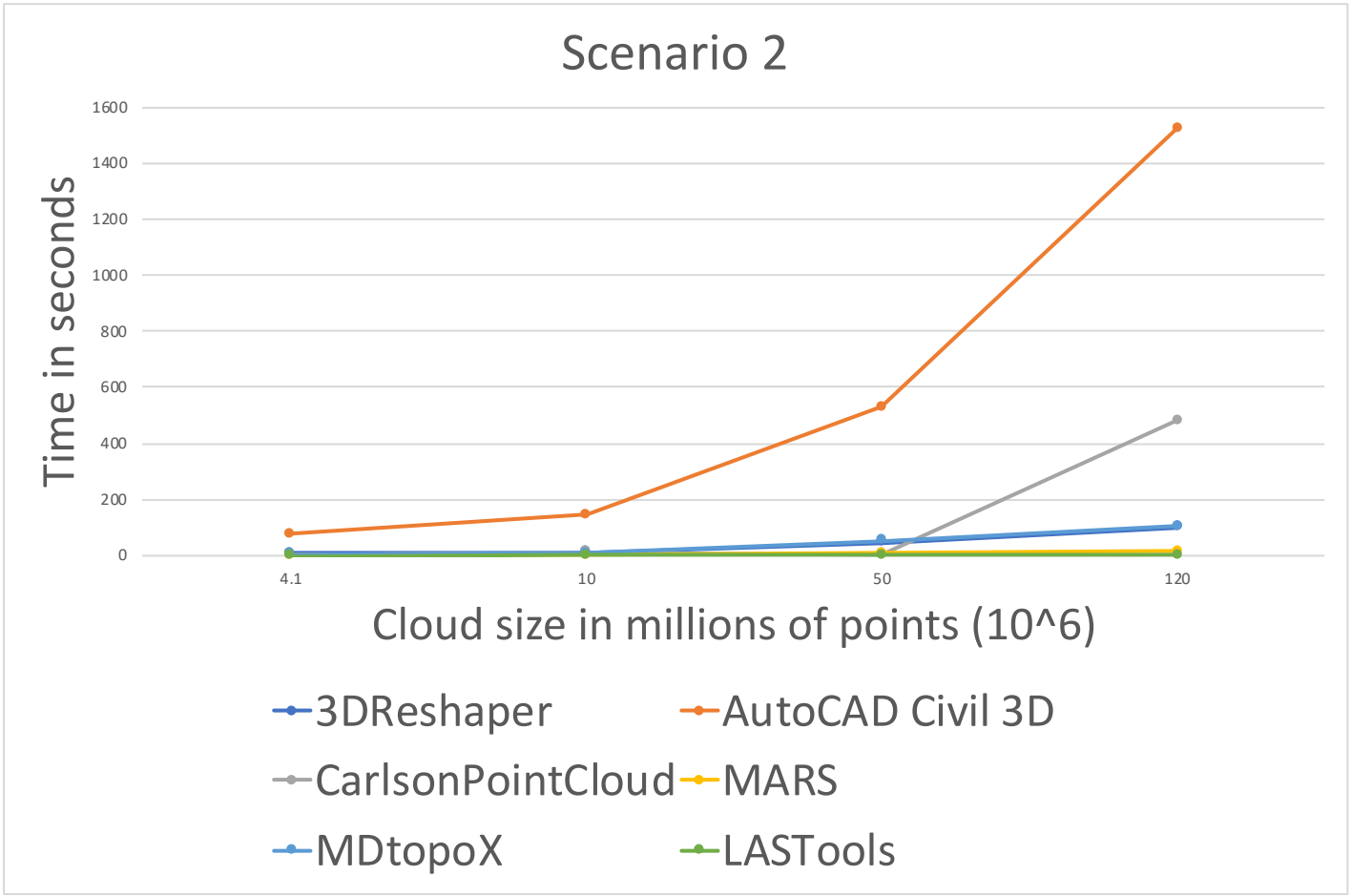
Results and discussion: Suitability

- Filtering and classification →Black box algorithms make harder to find more suitable; Parameters→:
  - Adaptive TIN
  - Morphologic
  - Terrain type
  - Statistical
- Modelling
- Feature extraction

Software	Parameters required
3DReshaper	Terrain Type
Carlson Point Cloud	Varies depending on the method selected (Grid or Profile)
FUSION	Cell size
Global Mapper	Curvature deviations, Height departure from local mean, distinctive parameter information and extern files
LAStools	Terrain Type, granularity
MARS	Varies depending on the algorithm selected
MDTopX	Terrain Type, distinct parameter information and extern files

Results and discussion: Performance

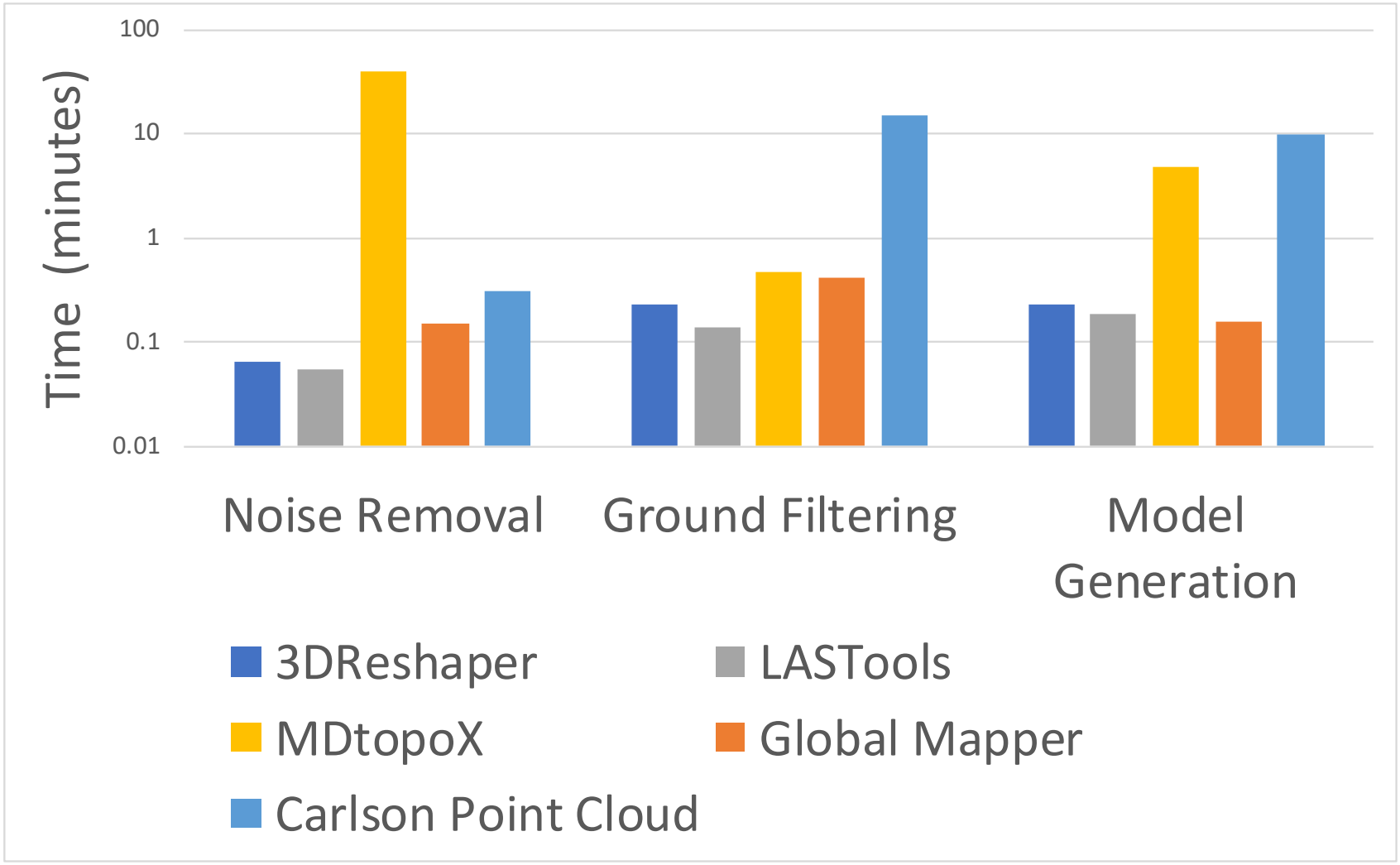
- Loading :



- Capacity: 240 all but MDtopX

Results and discussion: Suitability

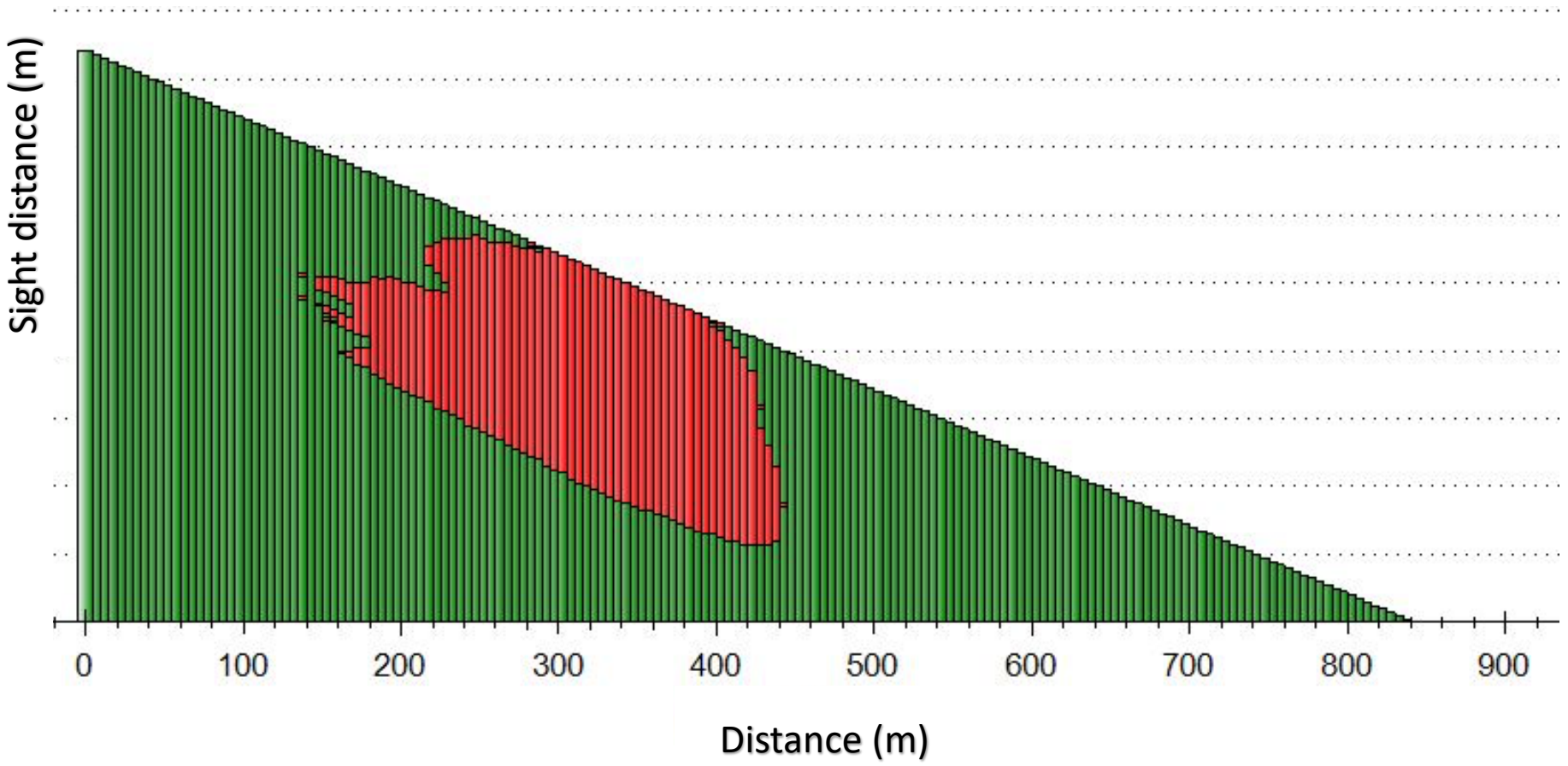
- Task performance:



Results and discussion: Statistics

- Mann–Whitney–Wilcoxon in pairs of two:

  No significant differences obtained results of sight distance



Conclusions

- Mobile Lidar -->“ A tool in the toolbox”
- Most tasks are provided → several MMS transportation applications share workflow
- *I/O .las format → interoperability
- Connect or overlay reference information adds value to datasets

Conclusions

- Classification & Filtering → required more knowledge from users & good understanding of LiDAR and dataset
- Straightforward software allows staff with little formation to carry out complete workflows
- Ongoing performance & capacity improvements
- Statistical differences of sight distance

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