



Mobile Terrain Scanning System

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PROBLEM

Objective

- Develop a mobile terrain scanning system that will use existing equipment from Caterpillar to retrieve surface data from a moving vehicle and produce a virtual surface.

Purpose

- Virtually test and analyze equipment
- Document Testing Conditions

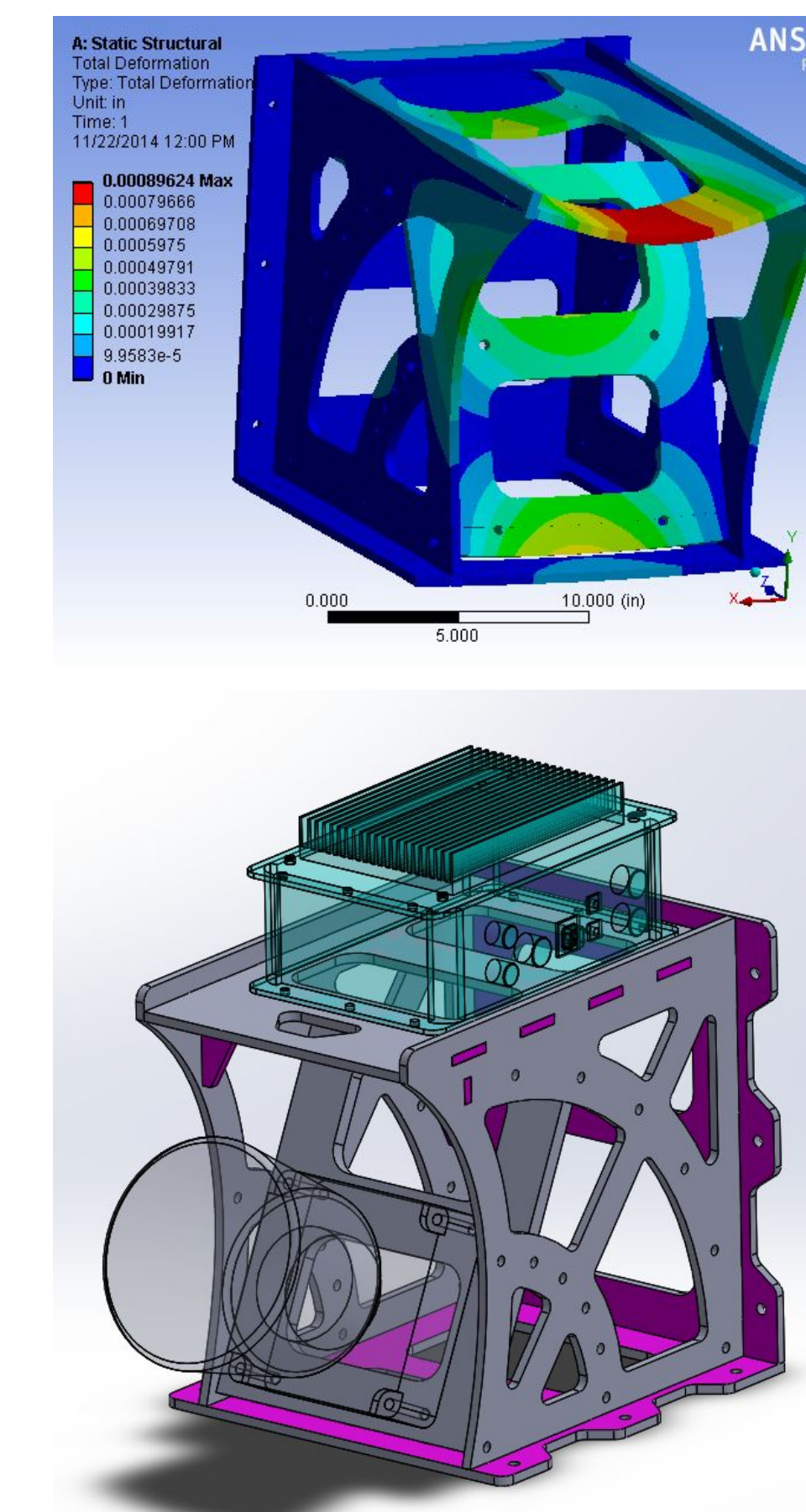
MOUNTING SYSTEM

Design Considerations

- Adaptable to Different Vehicles
- Fix Component Positions
- Adjustable Lidar Angle
- Simple Construction

Design Process and Features

- FEA analysis
- Water Jet Cut Frame



TESTING

Hardware

Correction	Results
Time Sync	✓

Software

Correction	Results
Coordinates	✓
Pitch	✓
Roll	✓
Yaw	✓



REQUIREMENTS

Components

- Velodyne HDL64ES3 LiDAR
- Oxford RT4000 IMU
- Garmin GPS 18x LVC

Performance

- +/- 25mm point accuracy

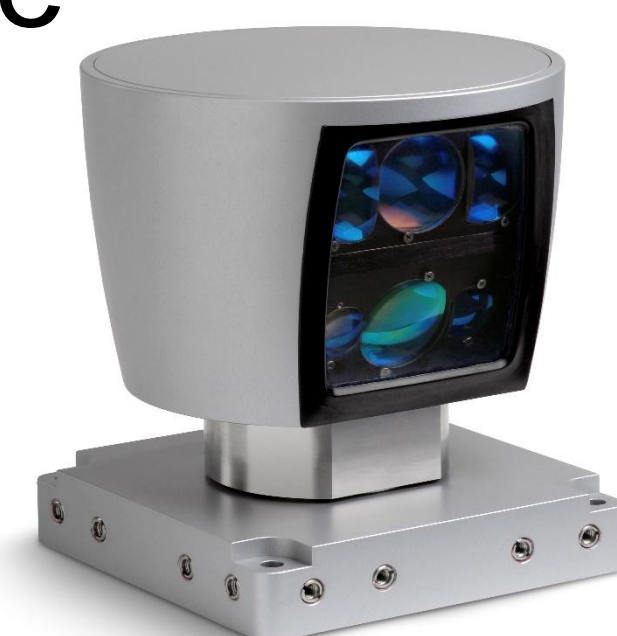


Operational

- Output STL file
- Scan from moving vehicle



IMU

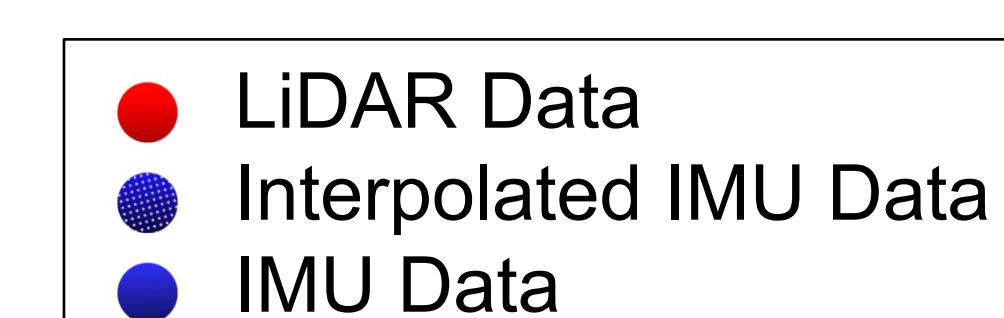


LiDAR

SOFTWARE AND DATA

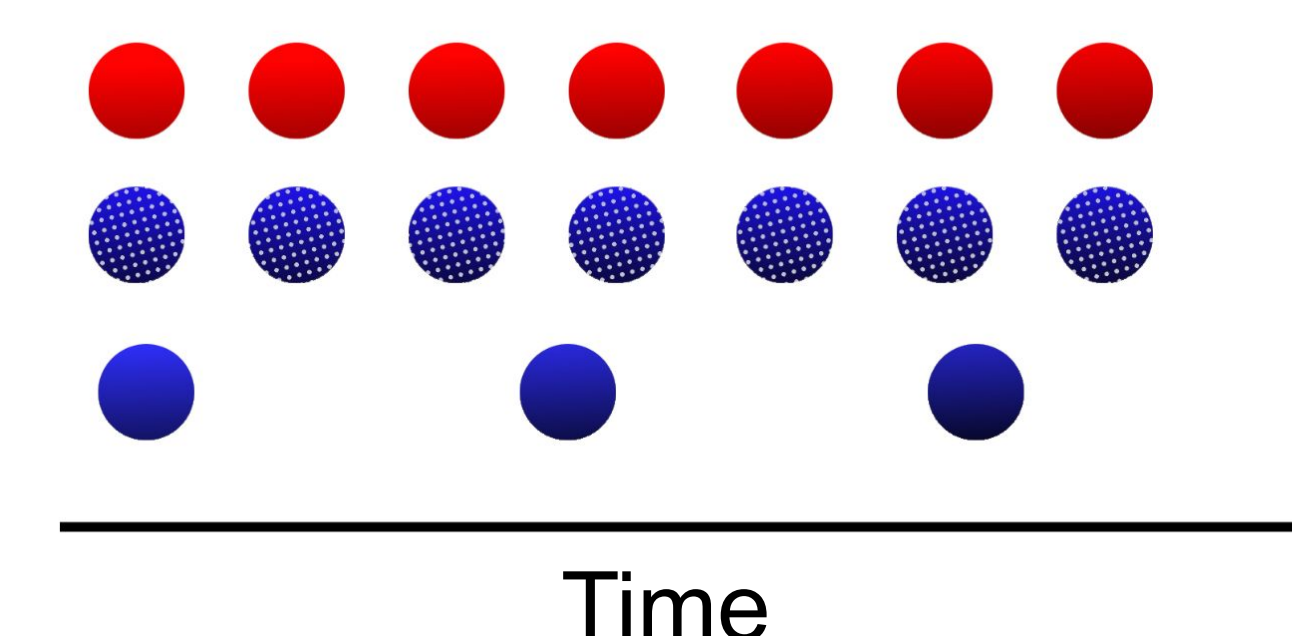
Point Cloud Correction

- Reads IMU and LiDAR data
- Determines the frames needed to map desired surface
- LiDAR and IMU time synchronization
- IMU data Interpolation
- LiDAR data coordinate transformation



Surface Meshing

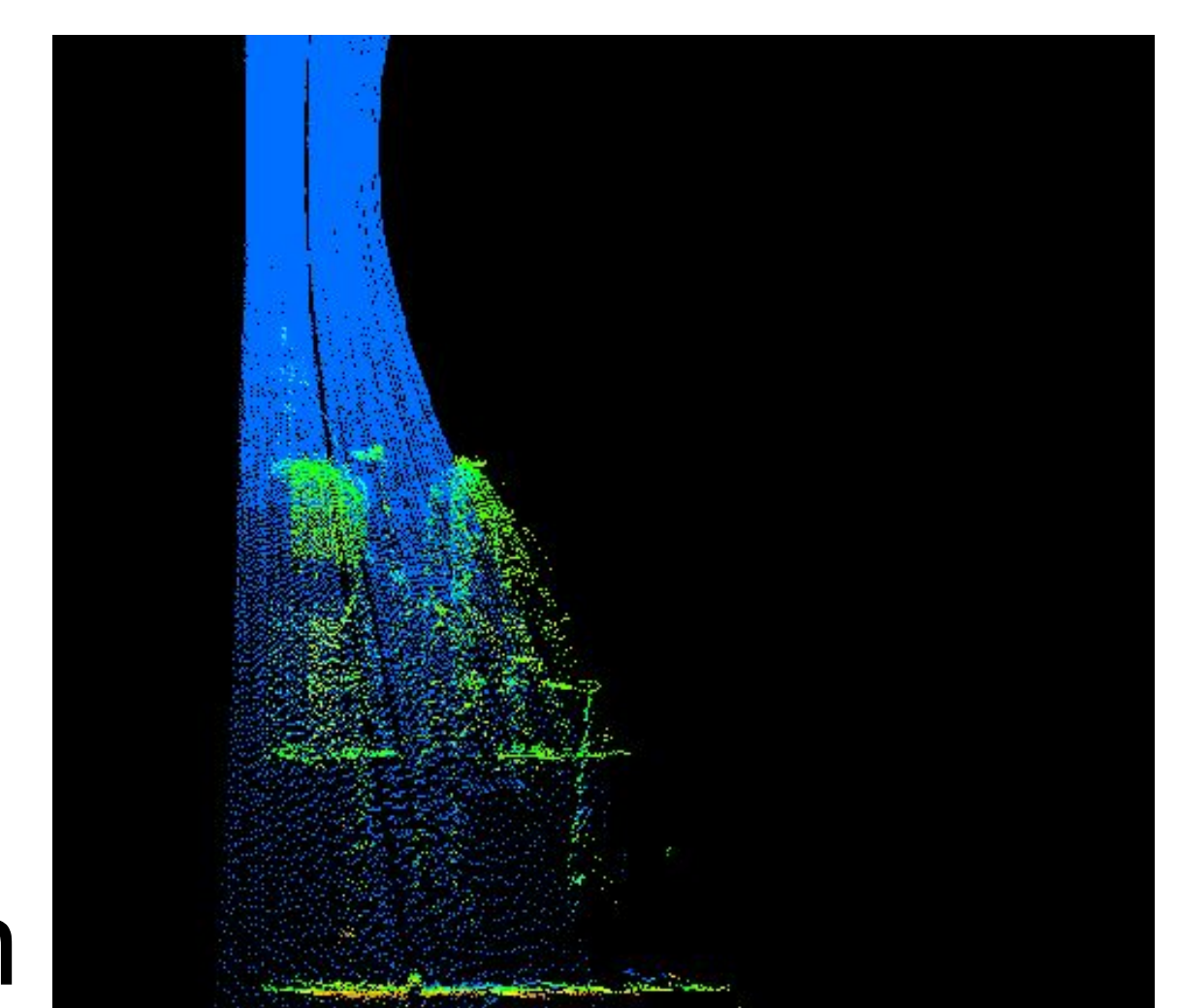
- Delaunay Triangulation
- Normal Vector Calculation
- Point Cloud to Surface File



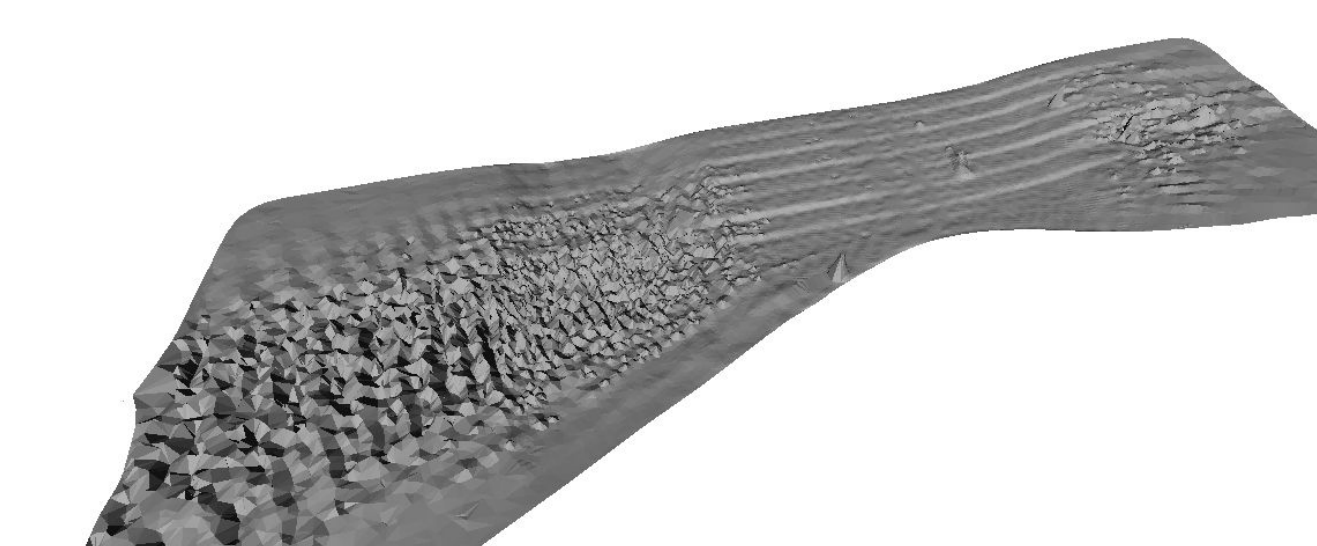
RESULTS

Summary

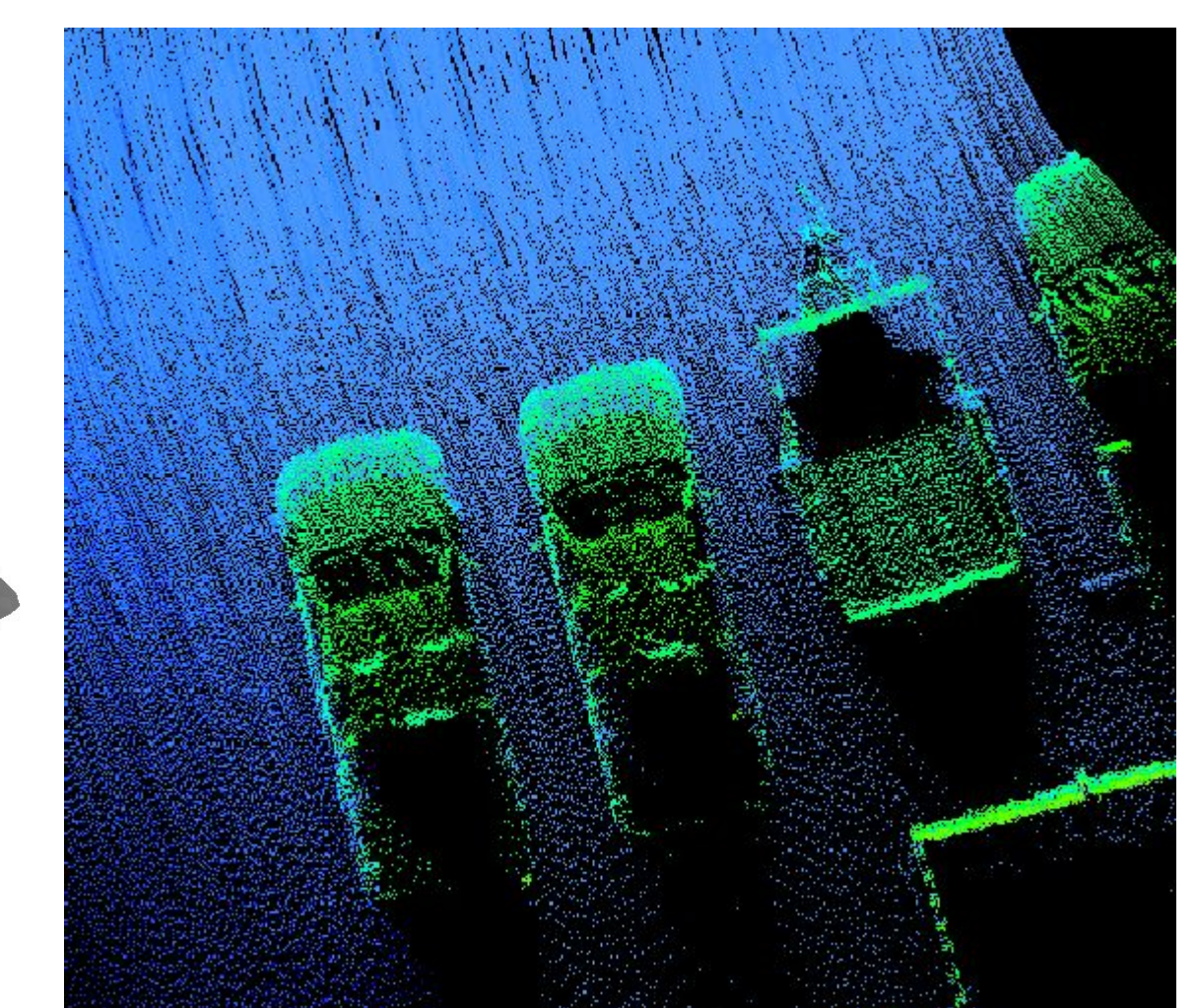
- Mount fixes component location
- Collect IMU and LiDAR data
- Point cloud correction
- Outputs adjusted point cloud and surface mesh



Uncorrected Point Cloud



Surface Mesh (STL)



Corrected Point Cloud