

Mapping Buildings and Structures Using a Rover with an Attached LiDAR System

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Abstract

The team's project is a rover that will autonomously drive itself through a building in order to create a 3D map of it via LiDAR. This design could be useful for mapping out an area that may be otherwise difficult or dangerous for people to do manually. The project will collect data about its surroundings using the LiDAR sensor, and will send it to a Raspberry Pi on the rover. Using this data, it will control where the rover will need to go to continue the mapping process. This will allow it to explore and scan as much of an environment as it can move through, including stairs and open doors. The team expects the rover to be able to map out a building.

Goal

Mapping an area, building, or structure to create a 3D model using a small rover.

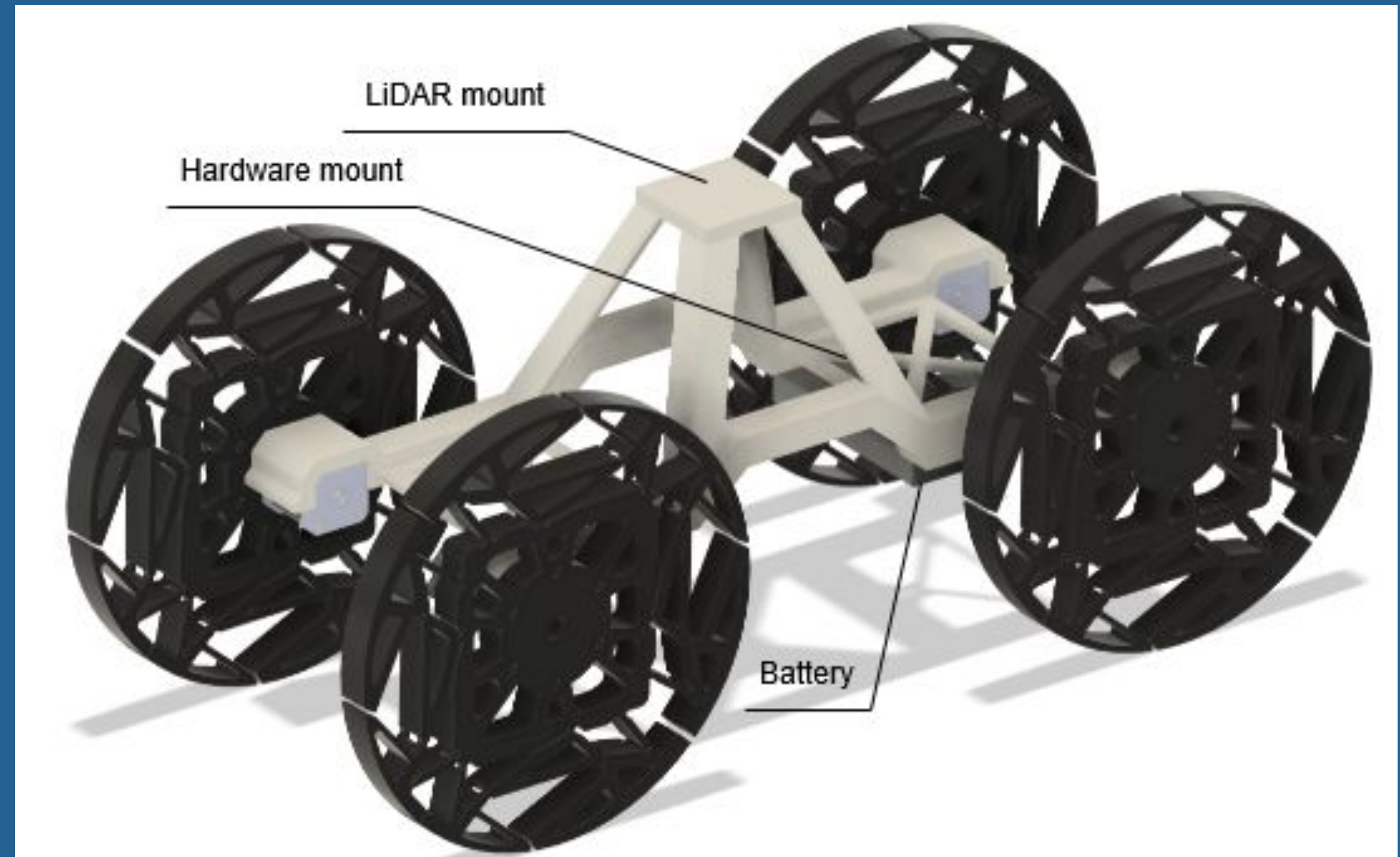
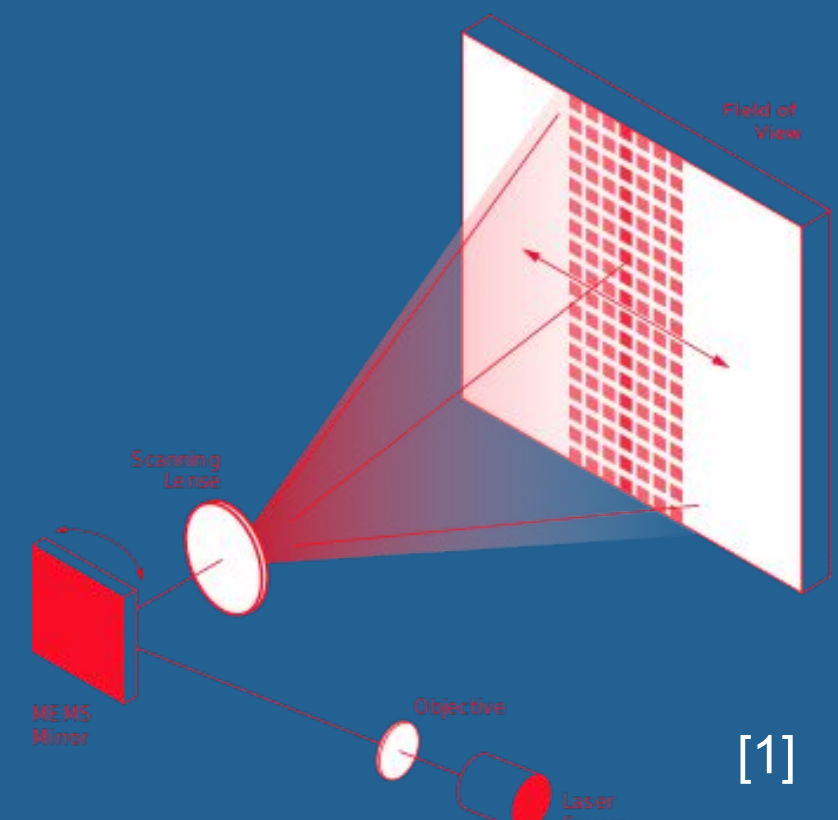


Photo of current rover design

LiDAR:

Light Detection and Ranging (LiDAR) is a remote sensing method that uses light in the form of a pulsed laser to measure ranges. Used as a technique in autonomous driving, topography, measurements, and augmented reality.



Objectives

- Self navigating an area
- Traversing obstacles (doorways, stairs, etc.)
- Taking scans for 3D modeling



Photo of LiDAR and Raspberry Pi

Future Work:

- Finish acquiring all components and materials
- Finalize rover structure and 3D print it
- Put together system
- Code the Raspberry Pi
- Setup point cloud software

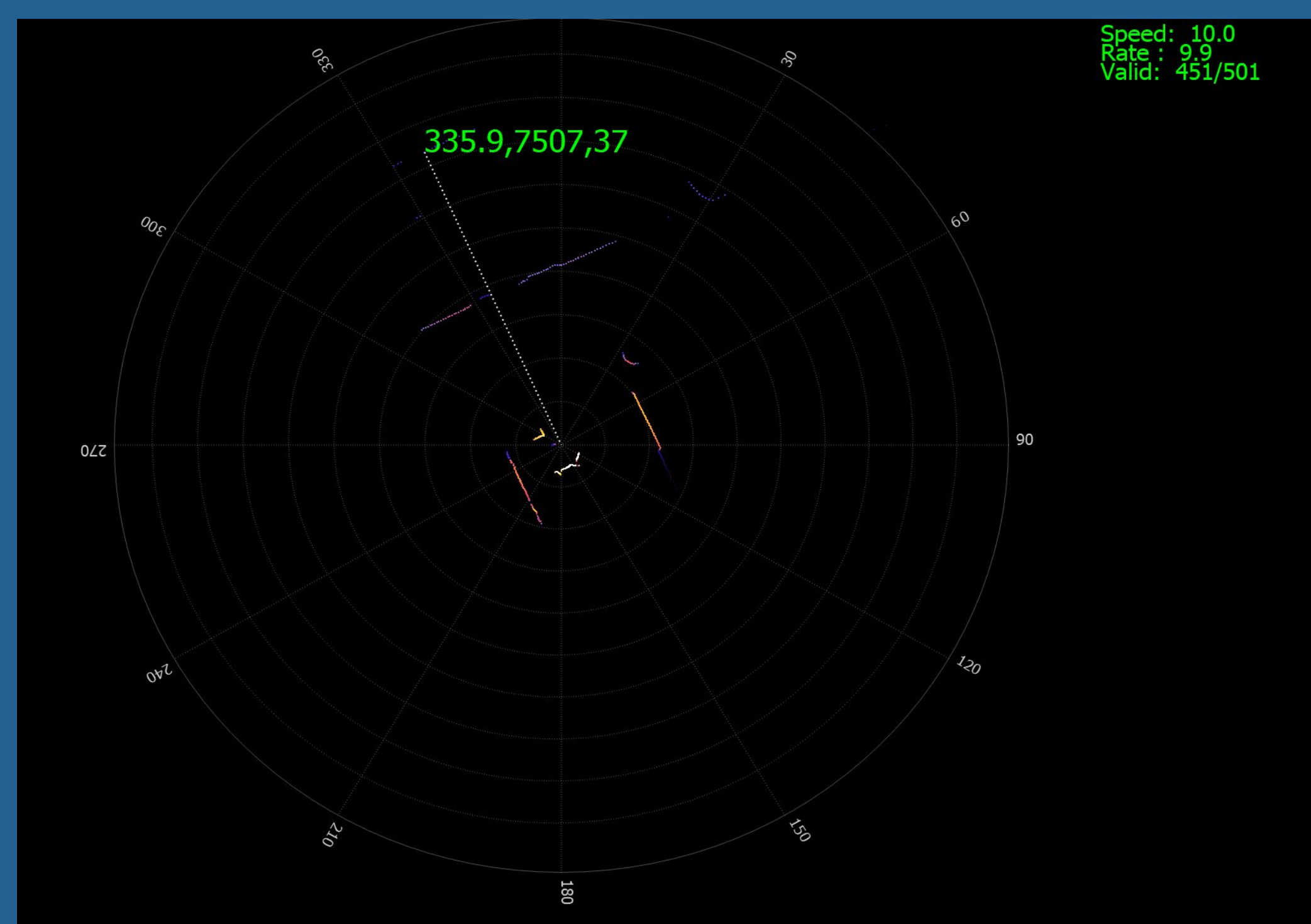


Photo using LDS Point Cloud Viewer with LiDAR STL26.

Research Needs:

- Who Our Audience Is
 - Homeowners
 - Inspectors
 - Architectures
 - Archivist
- Constraints and Requirements
- Materials and Components
- Rover Chassis
- Circuit Design
- Software/Programming

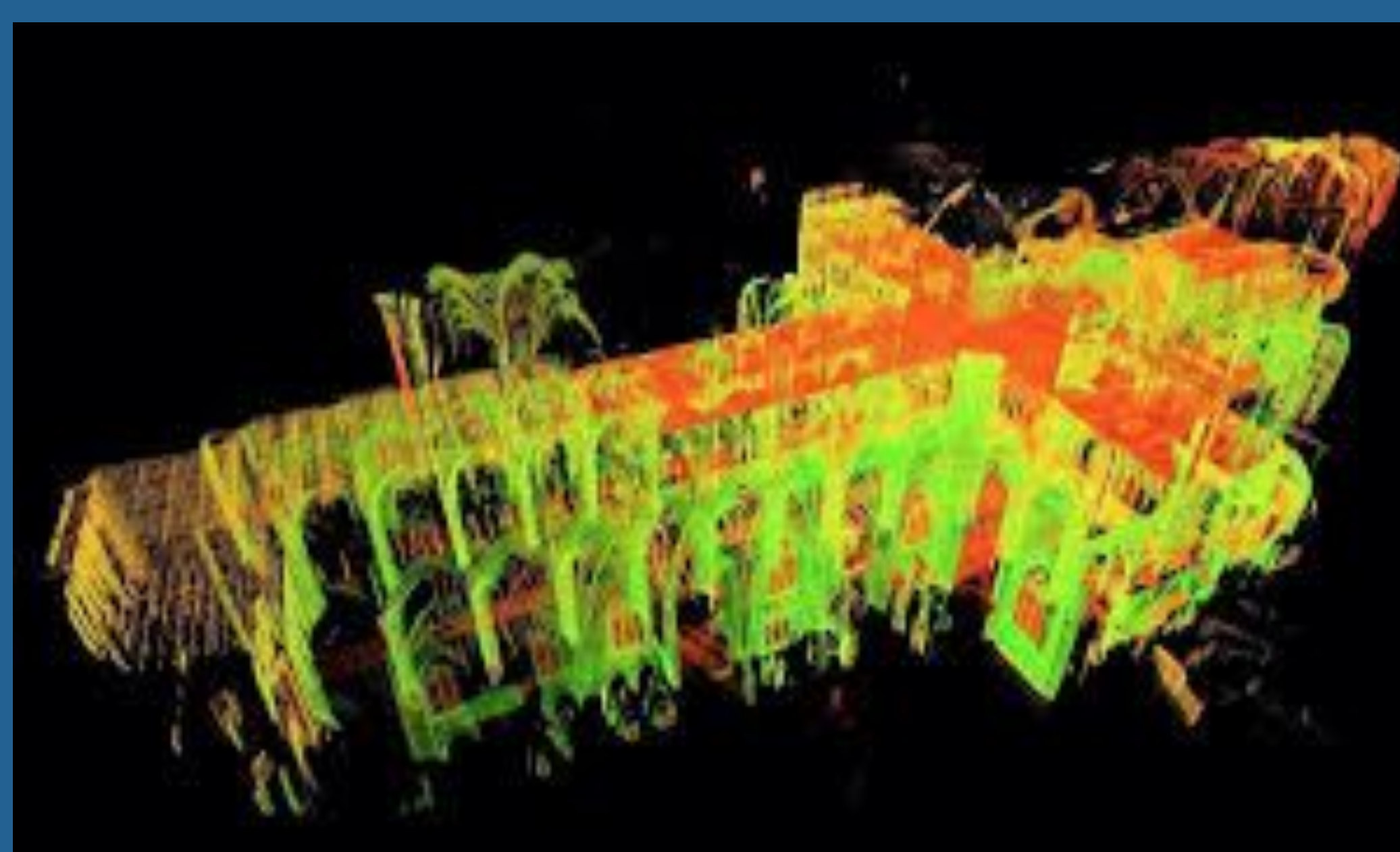


Photo of Notre Dame 3D point cloud being used to reconstruct the burnt building. [2]

References:

1. "Building Lidar Systems," LASER COMPONENTS Group, <https://www.lasercomponents.com/en/markets-applications/industrial/lidar/> (accessed Mar. 2, 2025).
2. Buczkowski, Aleks. "How the Tragic Fire at Notre Dame Will Accelerate the Adoption of Laser Scanning of Historic Architecture." *Geoawesome.com*, 2025, geoawesome.com/how-the-tragic-fire-at-notre-dame-will-accelerate-the-adoption-of-laser-scanning-of-historic-architecture/. Accessed 23 Mar. 2025.

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