

Robot Data Visualization

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Function Specification

Background:

- The goal of the project is to create a tool that allows robotics researchers to quickly visualize data obtained from their robot. Without this tool, it is difficult to gain physical intuition about what the robot is seeing.
- Specifically, the program will take time series data samples of GPS and lidar from the robot to generate a visualization of the robot's path and global map with respect to time via a GUI. Additionally, we will attempt to implement a SLAM (Simultaneous Localization and Mapping) algorithm after successful.

User profile:

- The intended users for our data visualization tool are Robot developers that need a visualization output from the Lidar data collected.
- Other users could be robotics teachers who want to show their students how robots make maps and how a variety SLAM algorithms work.
- Users will need to have some web browsing skills, a basic understanding of lidar and GPS and access to a google maps API key.

Data sources:

- Google Maps API: Data will be pulled from the API using matplotlib and expressed as a static image which we will introduce robot data on top of.
- NCLT datasets from UMichigan robotics lab: Data is structured in CSV files with timestamp, GPS data, lidar data, etc.

Use cases:

- Data Loader
 - Objective: The Data Loader objective is to load and preprocess user selected robot data from the web.
 - Interaction: The GUI will be used to choose the dataset and specify which data the user wants to load and then the data loader will process the selected data correctly.
- Show the visualization
 - Objective: The GPS or SLAM objective is to implement algorithms that plot GPS data on a map (google maps) and run a SLAM algorithm that

superimposes lidar data recorded by a robot on top of the combined GPS and map data.

- Interaction: The user will use a GUI to select the type of visualization they want to perform on the data loaded by the Data Loader and the GPS and/or SLAM algorithms will run at the click of a button. The user will be able to review the data temporally using a slider. The user will be able to save the output as a GIF.