Rplidar A2 Accuracy
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Introduction

Objective: The goal of the research was to see how accurate the Rplidar A2 sensor can detect objects. Then install the sensor on the test vehicles to increase the vision of the vehicles.

- The Rplidar A2 is a sleek, indoor, 360 degree 2D LIDAR. It can take up to 8000 samples of laser ranging per second. The Rplidar A2 can perform 2D 360 degree scans within a range of 12 meters. In addition, the LIDAR point cloud data can be used in mapping, localization and object/environment modeling.

Results

- Throughout the summer research the Rplidar A2 was producing extremely noisy polar graphs. Figure 7 shows the data with no filter.
- I combined the IIR and mean filter into the program in order to reduce the noise however, the data still seemed noisy and no sort of box shape was being produced in the polar graph. (see figures 8, 9, 10)
- On the last day of my research I ran a scatterplot with IIR filter (figure 11) and it clearly showed that Rplidar is inside a box and it accurately measured the box dimensions.
- Finally, I created an excel radar chart that shows that the Rplidar A2 was able to map the box with precise accuracy. (see figure 12)

Methods

- Used putty to log on to the Bandit server and learn how to use Linux commands so that I was able to interact with Rplidar A2.
- Used Github to download packages from LIDAR repository. (See figure 5)
- I constructed different size boxes to collect data produced by the Rplidar A2 inside the boxes. I put different objects inside to see if the Rplidar was detecting the objects. (See figure 6)
- Wrote a python program from scratch to open the data files and plot a polar graph of the data.
- Implemented the mean function to my program in order to reduce the noise of the graphs. (see figure 4)
- Learned about infinite impulse response (IIR) filter. It’s a filter that depends linearly on finite number of input samples and a finite number of previous filter outputs.
- Used this knowledge to write a new python program that implemented the IIR filter to eliminate noise from the polar graphs (see figure 3)
- Finally combined both equations into one program to see if it improve the graphs that were being produced and used excel to organize the data.

Conclusions

- The Rplidar A2 measured its surrounding with accuracy. It was able to produce a map of the box with the correct dimensions.
- With more time
  - Need to test outside the lab to see if the sun disrupts the Rplidar A2
  - Program the Rplidar to communicate to test vehicle
  - Mount the Rplidar on the vehicle

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