

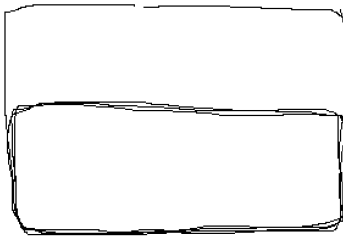
D19 - Developing a robot that autonomously collects LIDAR data and improving loop closure detection in SLAM

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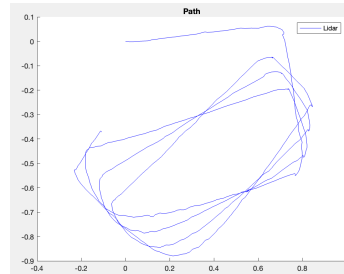
Simultaneous Localization and Mapping (SLAM) is used to track the position of a moving object and construct a map of its environment. Many sensors can be used for SLAM, but no sensor is 100% accurate. The goal of my project is to combine data from multiple sensors to be able to most accurately determine a robot's position.

To collect data for my project, I built a robot that has multiple sensors to collect data. The robot has a Lidar, a camera for AprilTag detection, a gyro sensor, and an optic sensor. The robot drove on a path and collected data from each sensor. Then, I used the data from the sensors to calculate the path of the robot.

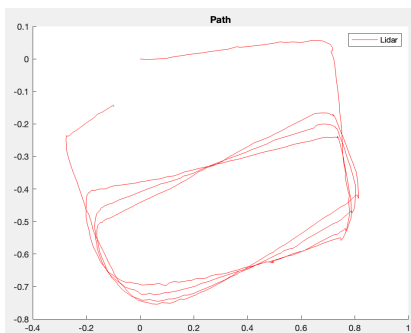
When I used only data from the Lidar and calculated the path of the robot using the ICP algorithm, the path was very inaccurate as the ICP algorithm wasn't able to accurately determine the rotation at sharp turns. When I combined data from the Lidar with rotation data from the gyro sensor, the accuracy of the path improved, but it still wasn't perfect. When I combined data from the Lidar with rotation data from the AprilTags, the path was very accurate.



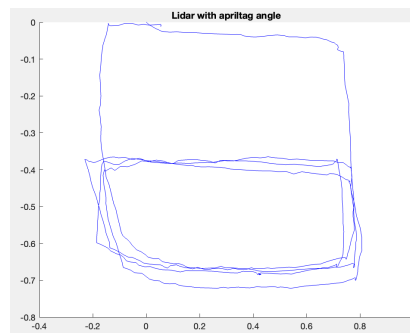
Path the robot drove on



Using only data from the Lidar to calculate the path



Calculating the path by combining Lidar data with rotation data from the gyro



Calculating the path by combining Lidar data with rotation data from the AprilTags

In this project, I demonstrated that by combining data from multiple sensors the accuracy of SLAM can be improved.