Robotic Perception - Project Proposal

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1 Abstract

In this project, we propose fusing the sensor data available in cell phones collected while riding in a vehicle. We then propose a comparison scheme with a "reliable" and "accurate" sensor which is already present on the vehicle and is known to have given "reliable" and "accurate" readings in the past. The motivation to do this is to test the robustness of sensor fusion algorithms learnt and discussed in class with proprietary sensor readings which are known to be good. The sensors typically being used in the cell phones are GPS, gyroscopes, magnetometers and accelerometers with low accuracy. The sensor used in the vehicle is called a VectorNav which typically gives accurate GPS, gyroscope and accelerometer data output with a proprietary sensor fusion algorithm running internally not available to the user. In this project we use filtering algorithms and present an evaluation of the sensor fusion algorithms with the VectorNav sensor reading.

2 Methodology

In this project, we propose fusing cell phone sensor data collected while riding in a vehicle. We would use the Polaris Ranger as the vehicle since it has an INS VectorNav VN-300 system already mounted and working with ROS. We would compare our fused state estimate from the phones' data to the state estimate from the Vectornav to see how accurate our state estimate is. Since the VectorNav's data will be much more accurate and reliable than our phones' data, it will be a suitable standard we can use to measure how accurate, reliable, and robust our own state estimate from the phones' data is.

We expect to use a particle filter, Kalman filter, or Bayes filter to fuse the data from 2 phones, including their readings from GPS, gyroscopes, magnetometers, and accelerometers. We will use the Matlab Mobile App to collect and save data from the phones, and we will collect the data from the VectorNav in a rosbag file. The data will be processed in Matlab offline, after the experiment.

The Vectornav is mounted onto an 80/20 aluminum rail in the back of the Polaris, so we will 3D print a simple platform, bolt it onto the same 80/20 rail, and secure our phones onto the platform. This will help ensure that the data from our phones is in a similar reference frame to that of the VectorNav.