Proposal for EECS 600: Algorithmic Robotics; Project 1

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The purpose of the first project in this class is to demonstrate my understanding of the first half of the course. For this project, I will create an occupancy grid map using a robot in simulation. Using this map data, I will also implement a Kalman Filter and an Extended Kalman Filter that will collect data from the robots odometry, velocity, and sensor models and provide an estimate of where the robot may be in that map.

The simulation will take place using the Simple 2D Robot Simulator (STDR) package in the Robot Operating System (ROS) “Hydro” environment. The virtual robot will be a holonomic (TurtleBot-like) system equipped with a laser scanner modeled after a Hokuyo URG-04LX-UG01.

STDR has not yet implemented a noise model for their sensors. In order to mitigate this problem, I will create a new ROS node that will accept a variety of sensor data (mainly the laser data) and return the same data but with added Gaussian noise.

After the algorithms have been implemented, I will measuring the relative effectiveness of them by comparing their accuracy when estimating the location of the robot in the environment.

I will:

- -Implement a filter-derived localization method by means of
  - -Velocity model from commands given to the robot
  - -Sensor model from a 'realistic' laser scanning sensor (LIDAR)
- -Create a map by having a robot drive around in a logical way
  - -And then having it use a grid-based mapping algorithm to create a map
  - -Occupancy grid mapping

I may:

Use the second part first as a kind of 'wandering robot' approach to creating a map and then use that map information as a part of my filter localization.
