# Week 7: Localization and Planning

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ME/EE/CS 169

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## 1: Complete the Localization

We spent a fair bit of time retuning localization to work better. In the end, we were able to get it to match pretty well:

Shape

Description automatically generated with medium confidence Radar chart

Description automatically generated

We were able to achieve pretty good behavior by changing the averaging time constant. Our localization uses the point-to-line method and takes a bigger fraction of the delta when the robot is stopped, and a much smaller fraction when the robot is moving. This makes it quite stable while it is moving but still allows some localization updating.

## 2: Planner/Driving

We used A\*! This was a fairly simple implementation, where A\* was allowed to take any of the four corners or the diagonals. We also grow the walls by about 200 mm to account for errors. The A\* works pretty well. See below: the path is yellow.

Shape, arrow

Description automatically generated

To make sure that the robot doesn’t just stop at each state, it automatically jumps to the next waypoint if the robot is close enough to the current one. At the final waypoint it turns in place to enforce orientation.

## 3: Planning and Driving Node

See A\* section. Our path color is bright yellow. Note that our A\* cannot avoid new obstacles.

## 4: Final Project

For the final project, we want to implement a point-based SLAM algorithm. We’ll flesh out more details over the weekend/into this week, but here’s the basic idea:

* Use the point cloud generated by the laser scanner to map out obstacles in continuous space. Attach a gaussian circle to each point and combine nearby points to filter out noise.
  + Effectively, we are discretizing the world into line segments, with circles of probability attached to each endpoint. More samples reduces the circles of probability if the samples fall close enough to them.
* As the robot explores, build a Voronoi diagram of the space. Use the probability and point cloud to identify areas that are worth exploring and go there.