CSC 445, Spring 2018, Final Project

Purpose: Mobile Robot Navigation

Due: 4:00pm, Thursday, May 10, 2018

Assignment Description

The goal of this project is to navigate a mobile robot through a series of waypoints.

For this assignment, you may work in groups of up to three students. If you choose to work in a group, then you must first get my permission for the proposed group.

The parameters for the differential drive robot are as follows:

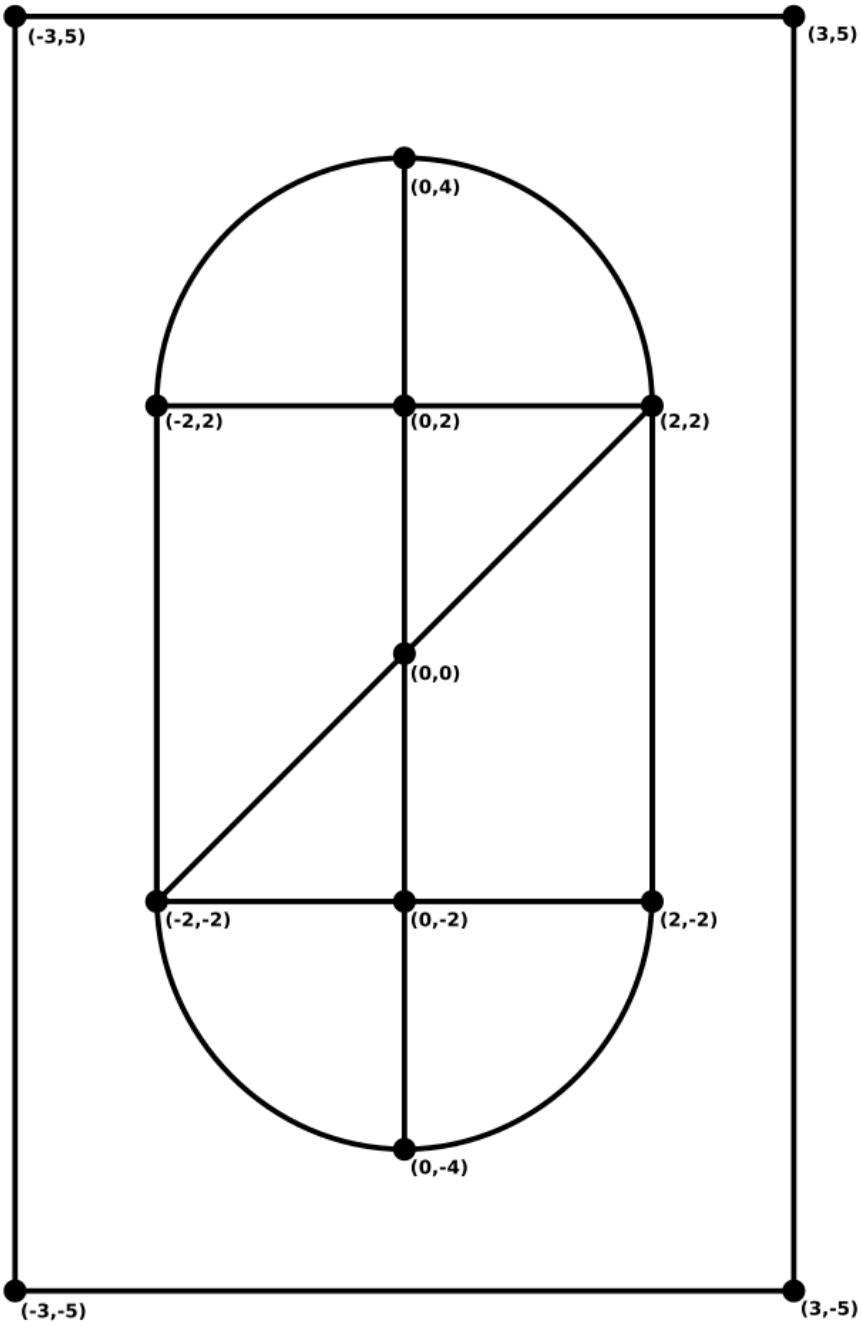
- $d = 0.25$
- $r = 0.125$
- The top wheel velocity is $\pm$ 0.5 radians per second

The robot implementation will be evaluated by total simulated time that it takes to hit all of the waypoints. The waypoints will only be in the set $\{(0,0),(0,2),(0,-2),(0,4),(0,-4),(2,2),(-2,2),(-2,-2),(2,-2)\}$. A waypoint will be considered successfully hit if the center of the robot comes within 5cm of the waypoint. If the robot does not successfully traverse all of the waypoints of a given trial, it will be evaluated by the number of waypoints successfully hit.

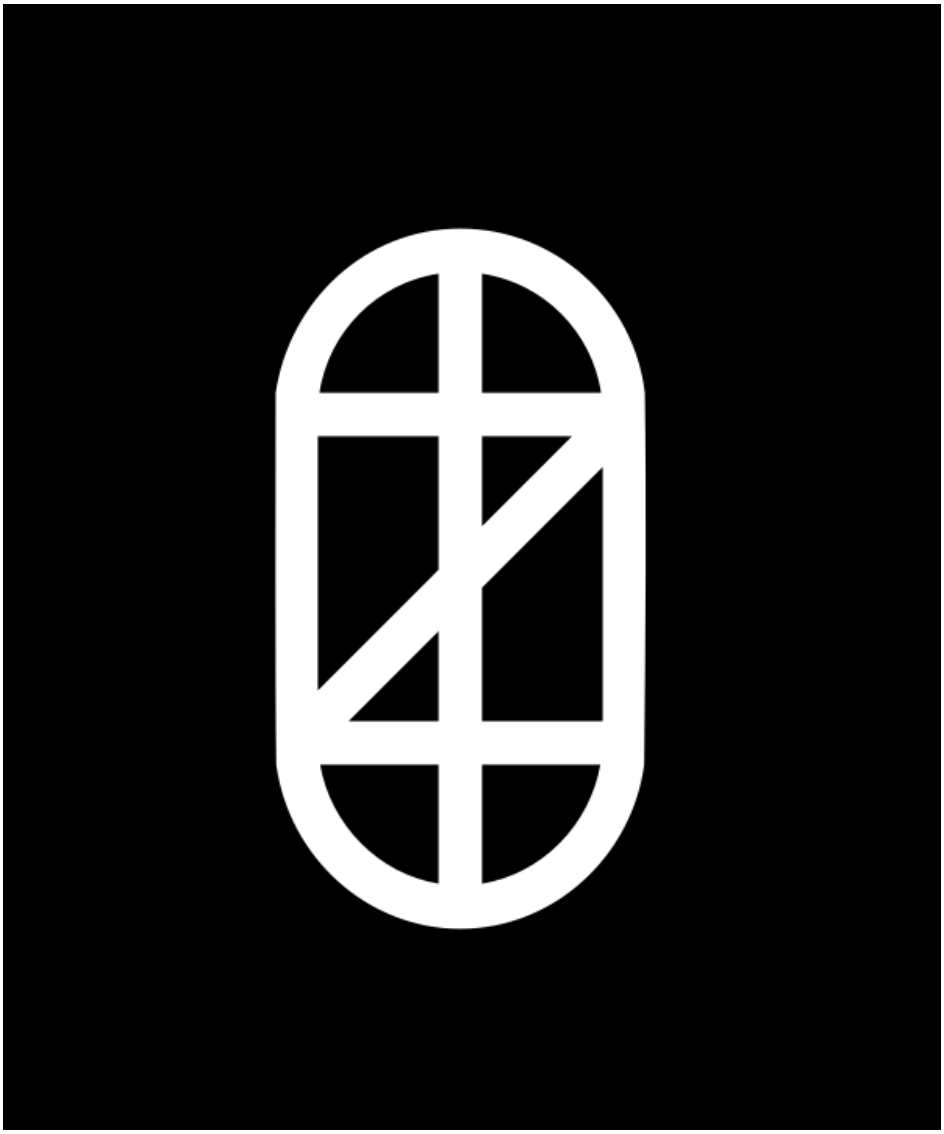
At each time step, the robot will receive distance measurements to four beacons located at coordinates $(3,5),(-3,5),(-3,-5)$, and $(3,-5)$. This is a 2D approximation of a GPS sensor.

The robot implementation will be evaluated in both an ideal environment and a noisy environment. In the noisy simulation, the controls have additive noise distributed as $\mathcal{N}(0,0.005)$ and measurements have additive noise distributed as $\mathcal{N}(0,0.1)$. Additionally, there is a chance on a given time step that some of the beacon measurements will be missing (indicated by NaN values).

Topological Map



Occupancy Map



Turning in the Assignment

To turn in the assignment, create a zip file named `csc445_final_project.zip` containing the relevant files (the `final_project.py`, the report, and any other files that your implementation may require). Submit the zip file to the appropriate folder on D2L.

To create a zip file of a folder on Windows, right click the folder, select the "Send to" option, and then select "Compressed (zipped) folder" option. To create a zip file of a folder on MacOS, right click the folder and select the "Compress" option.