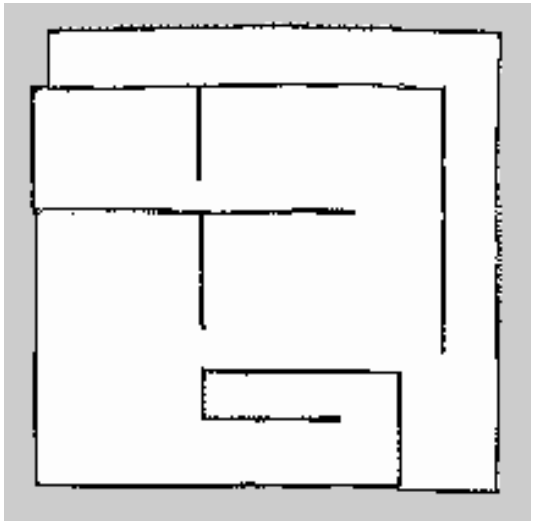
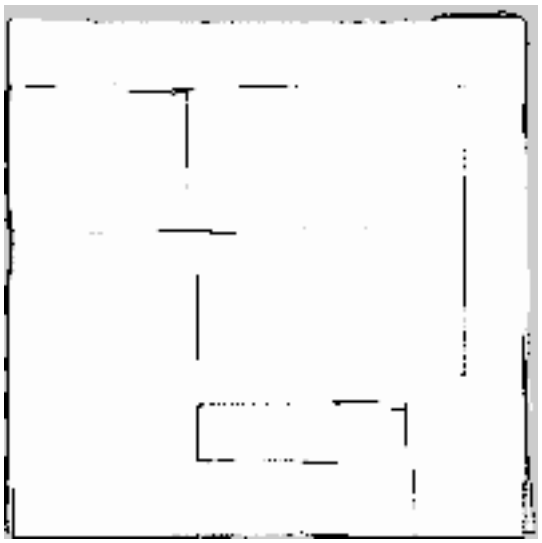
Homework 3

Part 1:

For this homework, we needed to create a map with ROS Gmapping, and compare it with a mapping code of our own. For this part, I implemented my own occupancy grid mapping algorithm.



Gmapping map



Custom Occupancy grid mapping

The map created by my occupancy grid mapping implementation is certainly not very good compared to the map created by ROS gmapping. This is because there needs to be more tuning on the log-odds parameters. The main problem I am facing with my implementation is that currently, it finds occupied cells, and then erases them when it sees the same pixels from a different robot position. This might have to do with the occupied pixels in my code being only one pixel thick. Inflating the occupied pixels could be one way to make the mapping better. Also, updating the map only when it is not moving very fast could also result in a better map.

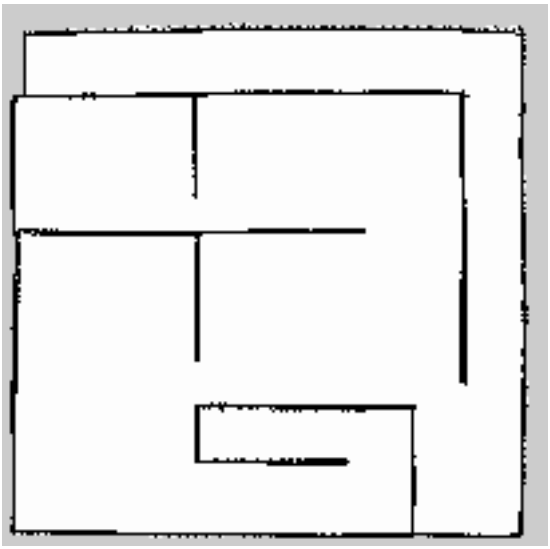
Part 2:
The robot successfully moves to each of the four corners of the world.
See video: hw3_corners

Part 3:
The robot successfully patrols the four corners in a “U” shape. It is able to deal with invalid poses. The way it does this is, when an invalid pose is given, the move_base aborts the plan, and then the code logic cancels the waypoint and goes to the next waypoint
See video: hw3_patrol.

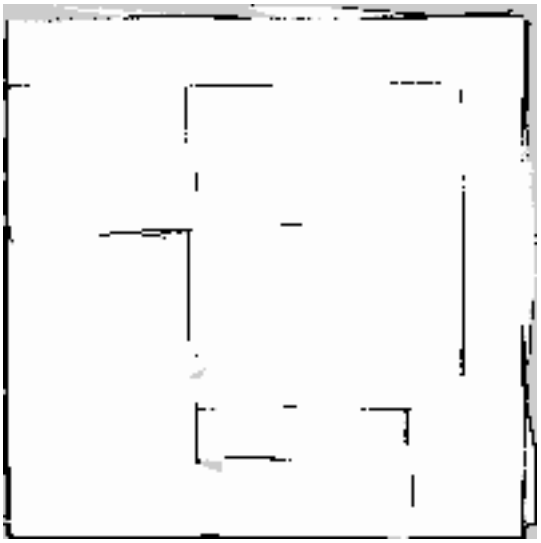
Part 4:
We create two maps, one with gmapping, and another with a custom occupancy grid implementation. We explore the unexplored areas by checking the unexplored areas in the current map, and randomly choosing a move_base target pose.

Both mapping methods with random exploration are able to create a complete map (after some attempts).

The maps created are shown below:



Gmapping map



Custom Occupancy grid mapping

The videos for map creation are:
- for gmapping, “hw3_explore_gmapping”
- for custom occupancy grid mapping, “hw3_explore_ogm”

Link to videos:
https://drive.google.com/drive/folders/1Aqw6jRty_fUkgpRc_3yOM5Wp1ZYsBqcK?usp=sharing