ROB 550 BotLab Report

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I. MAPPING AND SLAM

1.1 - Mapping - Occupancy Grid

Write a paragraph or two description including the following:

- Provide the values of the incremental log odds you're using for a free & occupied cells.
- Describe the method used determine which cells to update.
- Comment on mapping behaviour.

1.2.1 - MCL - Action Model

Write a paragraph or two description including the following:

- Specify what type of action model you're using.
- Provide all noise constants that you're using.
- Comment on the your action model:
  - Does the distribution grow as expected for the particles?
  - Do you think the action model constants will differ drastically from one mbot to another?

Fig. 1: Final png showing the particle distribution you obtained at the end of drive square with action only

Fig. 2: Final png showing the particle distribution you obtained at the end of obstacle slam with action only

Fig. 3: Final png showing the particle distribution you obtained at the end of straight line calm with action only

1.2.2 - MCL - Sensor Model & Particle Filter

Write a paragraph or two description including the following:

- Specify what type of sensor model you're using, and how you are weighting and resampling.
- Provide all noise constants that you're using.
- Is the estimated pose closer to the true pose with your localized pose estimate compared to that from odometry?
- Do the particles remain in a tight region as the robot moves?
- Do the particles spread more aggressively with a certain motion type? (rotation, for example).

Fig. 4: Final png showing the particle distribution you obtained at the end of drive square with localization only

Fig. 5: Final png showing the particle distribution you obtained at the end of obstacle slam with localization only

Fig. 6: Final png showing the particle distribution you obtained at the end of straight line with localization only

1.3 - Simultaneous Localization and Mapping (SLAM)

Write a paragraph or two description including the following:

- Did you obtain similar/close performance for obstacle_slam_10mx10m_5cm.log compared to the previous two runs? Why or why not?
- Did the change of map resolution affect your computation time? Did it improve/harm your slam results?
- Did you have to change your mapping log odds to improve on performance? If so, report them.

Fig. 7: Final png showing the particle distribution you obtained at the end of Obstacle Slam with Full SLAM

Fig. 8: Final png showing the particle distribution you obtained at the end of Maze LowRes with Full SLAM

Fig. 9: Final png showing the particle distribution you obtained at the end of Maze HiRes with Full SLAM

II. PATH PLANNING AND EXPLORATION

2.1 - Obstacle Distances

Comment on whether your code passed or failed the three tests in obstacle_distance_grid_test. Provide remarks on the code's performance and whether there is anything major slowing it down.

Fig. 10: Final png showing the obstacle distance grip obtained at the end of Obstacle Slam

2.2 - A Path Planning*

Report statistics on your path planning execution times for each of the example problems in the data/astar folder. If your algorithm is optimal and fast, great. If not please discuss possible reasons and strategies for improvement.

2.3 - Map Exploration

Comment on your exploration performance:

- What are the factors that are preventing your exploration from being ideal?
- Provide your logic behind tackling frontiers (how do you go about chosing your next frontier to go to)
- Comments on the performance of Astar and path planning with automated exploration commands.