ASSESSMENT 2 PROPOSAL

Group Members:

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Topic Selection: What subsystem / behaviour will you investigate, how can this subsystem performance be observed in the greater context of mapping performance:

Our baseline system would involve the use of the IR sensor, following the wall on one side to get to an endpoint. We will be investigating the performance of map representation and path planning by improving the baseline system using a graph topology with RRT as our final implementation.

We aim to test these subsystems on the same environment. We hypothesise that the changes made will reduce the time taken and the distance travelled for the robot to complete a maze with obstacles.

What will you implement (e.g., key goals to achieve for a good experiment):

(Minimum expectation) We must implement the baseline grid based wall following solution to a maze/course with physical obstacles. This will have to utilise the IR sensor. We also must keep track of variables and record relevant performance data (speed/ distance/collisions). Some form of graph based solution must be implemented as an alternative which the baseline system can be compared to.

(Normal expectation) We should implement the graph solution based on RRT. Control variables to create consistent environments to experiment our implementations on. Make multiple readings in order to get more reliable data.

(Stretch Goal) We could introduce the accelerometer/magnetometer to the experiment to make heading readings more robust. The difference in performance would then have to be measured and evaluated.

How will you assess the success of your work?

- *What how will you conduct your experiments (e.g., scenario, number of iterations, etc)?*
    - Our experiments will be conducted on the map used for the earlier assessment but with obstacles placed on it. These obstacles will always be in the same position for consistency. We will repeat an experiment 5 times before getting an average value to use for analysis.
- *What will you measure (e.g., qualitative, quantitative, how captured)?*
    - *Qualitative - Smoothness of path traversal*
    - *Quantitative - overall speed, distance travelled, number of collisions, time taken to calculate tree?*
    - *Captured - Speed/tree calculation duration calculated using stopwatch when getting to the endpoint. Distance captured by Romi's encoder counts. Observers to count collisions.*

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- *What do you expect to see?*
    - *Graph based solution making use of RRT will complete maze faster and travel less distance while doing so.*
    - *Use of accelerometer and magnetometer will increase precision in pose/ heading reported by Romi, improving overall performance*

Proposed timeline (Include key milestone dates, a cut-off date for implementation, dates to run experiments, and how each group member will contribute)

End of week 9: Simple wall following maze solution implemented

End of week 10: Wavefront grid solution implemented **and** more advanced graph solution such as RRTs implemented with simple experiments comparing the two completed. Start the report.

Mid week 11: Use of the accelerometer and magnetometer to improve the accuracy of both the baseline and graph based implementations so that there is less variation between runs; Run experiments comparing the distance travelled and time taken from both the grid based and graph based solutions.

Mid week 12: Finish report

As a team, we have agreed to work evenly on all aspects of the assessment, including implementation, experimentation and writing the report.