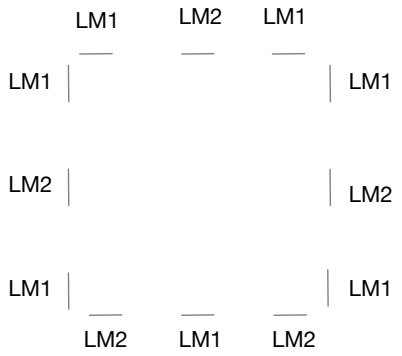
Homework 5 - CSE 276A - Intro Robotics

Due: Friday, 6 December 2024, before midnight

The objective of the final homework is to design a "roomba" like system. The robot should be able to navigate an environment and provide a level of coverage of the area. You are free to choose any architecture for this assignment, but subsumption may be a good starting point.

1. Setup an environment in a 10ft $\times$ 10ft area with landmarks at the edges as shown in the figure, you are free to use more than two types of landmarks. The landmarks could be AprilTags markers as used in HW2/3/4. Measure the position of your landmarks / walls



2. Use localization systems from earlier homework to ensure the robot has a certain level of situation awareness. It is not expected that the robot will be able to detect walls / obstacles so you have to provide (virtual) boundaries through localization.

3. What behaviors do you need to provide coverage / avoidance?

4. Implement a basic version of the system using ROS or Python

5. Provide a diagram that explains the control flow in your system

6. Demonstrate the performance of the system with a video / graphical illustration of the trajectories generated by the system

7. (Extra credit 25%) Can you provide any performance guarantees for coverage with your system?

8. (Extra credit 25%) Using a SLAM system (your creation not an off-the-shelf package or a TA reference solution) to map the environment on the fly

9. Report should as a minimum contain i) architecture of system, motivate your design choice(s) ii) brief description of your modules, iii) illustration of the performance of your system. iv) (optional) derivation / description of performance guarantees. v) description of extra functionality (SLAM), vi) include link to a video and graph with performance illustration, vii) include code with your report. **Please submit your pdf report separately and do NOT include it in your zip file.**