ECGR4161/5196, MEGR4127 – Introduction to Robotics
Lab Assignment #7 – Spring 2021

See Canvas for the due date/time

This lab assignment has one parts and will be done in teams of one or two (your choice).

The objective of Lab 7 is to travel as consistently to 10 cm from the wall of a 1.5 x 1.5 to 2 x 2 meter "room". The robot should also go around two obstacles in the room.

As described in class, you can solve this with increasing amount of points earned:

A. Able to follow the walls, but uses bumpers (or uses a combination of bumpers and ultrasound).
B. Able to follow the walls using ultrasound (no bumpers used).
C. Able to follow the walls and go around one obstacle, but uses bumpers (or uses a combination of bumpers and ultrasound).
D. Able to follow the walls and go around two obstacles, but uses bumpers (or uses a combination of bumpers and ultrasound).
E. Able to follow the walls and go around one obstacle using ultrasound (no bumpers used).
F. Able to follow the walls and go around two obstacles using ultrasound (no bumpers used).

See the requirements below for the specific output that will be assessed for grading.

Requirements

Req. 1. You must use the vehicle provided.
Req. 2. You may run at any speed.
Req. 3. The video submission will show one lap around the "room" of the robot completing the assignment.
Req. 4. The exercise must be demonstrated on any flooring where a room has been set up.
Req. 5. The room size shall be a minimum of 1.5 m by 1.5 m.
Req. 6. The room size shall be a maximum of 2m by 2m (so, user choice on the size).
Req. 7. The room dimensions does not need to be square.
Req. 8. Full points will be awarded if you do not use the robot bumpers.
Req. 9. At the beginning of the trial, the vehicle should be placed 10cm from any wall facing towards the wall in front of it.
Req. 10. When you start the vehicle, it should follow the wall until stopped.
Req. 11. The vehicle should also travel around obstacles placed in front of it, keeping the same 10 cm distance from the obstacle.
Req. 12. Full points will be awarded if the robot travels around two obstacles.
Req. 13. The obstacles should not be on the same wall.
Req. 14. The vehicle must complete the lap in 1 minute or less.
Req. 15. The traversal of the room and obstacles shall not be "hard coded", meaning you must use the sensors to navigate and not pre-program distances to obstacles/walls.

Submission type: Video and lab report (must include your name(s) and all video requirements mentioned below).

Video Instructions:

1. The video should be normal speed and must be less than 1 minute in its entirety. It should make one lab around the entire "room".
2. Upload a video to your YouTube account (or other location with a URL). Provide the URL in the report.

Lab Report

1. Prepare a file, output to PDF that includes:
    a. Your names
    b. What the general objective the robot / apparatus is expected to perform
    c. URL of the video
    d. (in report or video) Commentary on the lab (lessons learned, problems encountered).
2. Upload the PDF to Canvas, Lab 7 submission

Code upload

You will have only one main file with your setup, loop, and other functions. It will be a text file – copy the file and rename this file Lab07.txt. Upload the file to the Canvas assignment Lab07Code. It should go without saying that you should use appropriate commenting.