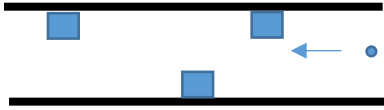


## ECGR4161/5196, MEGR4127 – Introduction to Robotics

### Lab Assignment #8– Version 1.0 – Spring 2022

See Canvas for the due date/time

This lab assignment has two parts and can be done individually or in pairs. Both of these parts will use skills/code from previous labs. Note that each pair submits one video and one report.



The “arena” is a 2.4-meter-wide by 3-meter-long hallway. You will place your robot at the center of the hallway at one end (over the dot) at the start of both parts of the lab. It is suggested that you orient the front of the robot to face in the direction of the arrow. You will need three 30 cm by 30 cm boxes.

**Robot preparation:** You will need to mount a servo motor to the front of your robot and mount the ultrasonic sensor to the arm of the servo robot. The 90-degree direction of the servo should be facing forward. Connect the servo robot control line to an unused digital output pin and connect your ultrasonic sensor in the usual way.

**Part 1:** This part is the “learning process” (learning for YOU) to see how the robot can build a map of a space and identify the location of an obstacle. The main objective of this part of the lab is to have your robot drive straight the length of the hallway and collect distance information from the ultrasonic sensor. The robot should record distance information on each side (90-degrees from front, both sides) by turning the sensor (mounted on the servo). Record this data every 20 cm, and store in one or two arrays. Place the 30cm by 30 cm boxes against the wall somewhere in the hallway, at least one on each side.

You will provide this sensor information in your lab report in the form of a table. You should examine this data to determine how this measurement can identify the location of the box. Part 1 code can be a totally different program from the code in part 2.

**Part 2:** Before you run this part, move the boxes in the hallway. The main objective of this part of the lab is for the robot to again build a map of the hallway, including identifying the location of the box. When the robot reaches the end of the hallway (3 meters), it should:

1. Rotate the robot in place 180-degrees,
2. turn the servo to point forward,
3. travel back down the hallway
4. while returning to the starting point, do the following:
  - a. stop next to each obstacle
  - b. turn the servo towards the object
  - c. wait 3 seconds
  - d. turn the servo forward
  - e. start moving again towards the starting point

## **Lab Deliverable Submission**

### **Demonstration**

You only need to demonstrate your robot running part 2. The robot should take less than 90 seconds to complete the task. Remember the lab check-off sheet.

### **Lab Report - Submission Instructions**

1. Prepare a file, output to PDF that includes:
  - a. Your name and your “partner’s” name (if applicable)
  - b. What the general objective the robot / apparatus is expected to perform, and
  - c. Commentary on the lab (lessons learned, problems encountered).
  - d. Attach your code to the end of the report, as detailed by TA Joey Phillips (video, document guidelines posted on the discussion area of Canvas). We want to see structure, indentation, and comments. Lots of comments.

Upload the PDF to Canvas, Lab 8 submission