

## CSE 3442 Embedded Systems I

### Spring 2024, Lab 8

This lab is due at the time of the defense stated in the syllabus.

In this lab, you will complete the project. The following steps will guide you through this process:

1. Add code to detect when motion is detected and activate the red LED for a short period of time. This is less annoying in the lab than sounding a buzzer. Motion detection should only be detected when the robot has been stationary for a period of time to prevent false alarms.
2. Develop a system to measure distances from the robot to walls using 1 or more SR04 ultrasonic sensors.

Based on the `freq_time` example from class, write a function,

`uint32_t measure_mm(uint8_t n)`

- Sends a pulse at least 10us in length on a TRIGn pin and
- Measures the time until an echo is received by either:

Option A:

Waits for the ECHOn pin to go high, start the timer, wait for the ECHOn pin to go low, stop and read the count

Option B:

Setup a timer in edge time mode with falling and rising edge triggers and retrieve the values and calculate the difference.

- Returns the distance (converted from timer units to distance in mm).

3. Add a command “distance [N]” which returns the distance in mm. N is used for multiple sensor implementations.
4. Based on your choice of sensor count and location, develop a system to “navigate” autonomously. The goal is to be able to roam a hallway or room, not hitting walls or other obstacles, while stopping periodically to look for motion. You are free to experiment with your algorithm or you can use the methods from class.
5. Add a command “navigate ON|OFF” that controls whether auto-navigation is enabled or not. Also add an IR remote button(s) to turn navigation on and off.
6. Demonstrate your code and submit your spreadsheet and code with the file name *project\_your\_name.zip* to the TA. This code will include the code from the work of Labs 4-8.