# Lab 02

# Avoid-Obstacle and Random Wander Worksheet

Robot Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Team Member Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Team Member name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Purpose

In your own words, state the purpose of lab 02 in the following space.

## Part I – Mount IR and Sonar Sensors to Robot

In the following space, list what distance sensors are mounted to your robot.

What is one advantage of using sonar instead of infrared sensors?

What is one advance of using an infrared instead of a sonar sensor?

## Part II – Sensor and State Machine Sample Code

In your own words, how do you use sensors and motion to create a state machine on a mobile robot?

## Part III –Infrared Range Sensor Calibration

In the following space, insert table 1 for the Sharp IR Sensor data and calibration.

In the following space insert the equation found using curve fitting for each of the IR sensors.

In the following space insert a plot of the analog and distance data for each of the infrared sensors.

In the following space, insert the data output in inches from 1” to 20” for each of the IR sensors. Make sure you also do an error analysis to determine what a reasonable range would be for each of the sensors.

In the following space, discuss the accuracy in the range for the four IR sensors.

## Part IV – Sonar Range Sensor Calibration

In the following space, insert the table for the measured sonar data versus the actual 1” to 20”.

In the following space plot the Excel data and use curve fitting to find the equation to relate the output to distance for each of the sonar sensors.

In the following space, discuss the sonar range and accuracy.

## Part V – Avoid-Obstacle Behavior (Layer 0)

## Part VI – Random Wander (Layer 1)

What was the general plan you used to implement the random wander and obstacle avoidance behaviors?

## Part VII – Subsumption Architecture – Smart Wander Behavior (Layers 0 and 1)

How did you create a modular program and integrate the two layers into the overall program?

Did you use the sonar and IR sensors to create redundant sensing on the robot’s front half.

How could you create a smart wander routine to entirely cover a room?

What kind of errors did you encounter with the obstacle avoidance behavior?

How could you improve the obstacle avoidance behavior?

Were there any obstacles that the robot could not detect?

Were there any situations when the range sensors did not give you reliable data?

How did you keep track of the robot’s states in the program?

Did the robot encounter any “stuck” situations? How did you account for those?

## Part VIII – Integrate Avoid-Obstacle and Go-To-Goal Behaviors (Layer 2)

How did you keep track of the goal position and robot states as it integrated avoid-obstacle and go-to-goal behaviors?

What should the subsumption architecture look like for the addition of the go-to-goal and avoid-obstacle behaviors?

Compare the performance of your robot to the theory and software design plan you made. What worked well? What did not work well?