CS 556: Task-Sheet for Lab 2

Sensors

Name: Colin Treziok & Cameron Lee

Robot ID: 20

Question:	1 Prelab	2	3	4.1	4.2	4.3	4.4	4.5	Total
Points:	20	5	5	15	25	10	10	10	100
Score:									

Pre-lab Submission (on Canvas, Due Wednesday, 23:59 PM before lab #2):

- 1) Task-Sheet Pre-lab task (one PDF file: TeamX_LabY_Prelab_Tasksheet.pdf)
- 2) Draft Code (No need to submit a Draft Code for this lab)

Post-lab submission (On Canvas, Due Wednesday, 23:59 PM after lab #2) Submit in 3 separate files (do NOT zip these four together):

- 1) Task-Sheet tasks (one PDF file: TeamX_LabY_Postlab_Tasksheet.pdf).
- 2) Final code (No need to submit a Final Code for this lab).
- 3) Videos (one zip folder: TeamX_LabY_Videos.zip).

Lab Grading Criteria:

- Every member of the team must submit the same set of final materials for the post-lab to receive a grade.

- For the pre-lab submissions, no extensions will be offered. Failure to prepare for the lab will result in a 20% deduction from your total grade for that week's lab.

- For the post-lab submissions, late work or post-lab submissions will incur a 20% penalty per day, up to a maximum deduction of 100%.

- Lab attendance is mandatory – a missed lab will mean 0 points for you.

- Before you leave, make sure you return all robots and tools used to the front desk in the same format that you received them. If not done so, 10 points will be deducted.

- Your code must follow the industry guidelines for coding; if not done so, 10 points will

be deducted. Comment out code for easy review, add new code below, and label each task with clear, descriptive comments. Ensure a modular, well-structured design with meaningful names, minimal globals, and avoid hardcoding values.

1. Pre-lab

(a) (20 points) To be completed prior to lab: Look through the servo and sonar datasheets and write down the important parameters you think you will need in this lab.

Some important parameters I think for the Sonar will be the range of 2cm to 3m, and the indicator LED showing the sensor activity. For the Servo I think the 180 degree rotation angle, plus the torque and speed at different Voltage being 4.8V vs 6V will be important for the lab.

(b) No need to prepare a Draft Code for this lab.

2. (5 points) Test sonar and display values to screen [Video]

3. (5 points) Test servo [Video]

4.1

(a) (7 ½ points) Minimum sensing range: 0.03 m We moved the block towards the sensor until it reached its lowest value, and used a ruler to double check.

(b) (7 ½ points) Maximum sensing range: 1.01 m We kept moving the block farther away until it no longer picked up the block, and used a ruler to double check.

4.2

(a) (5 points) The ten distances selected for measurement accuracy characterization:

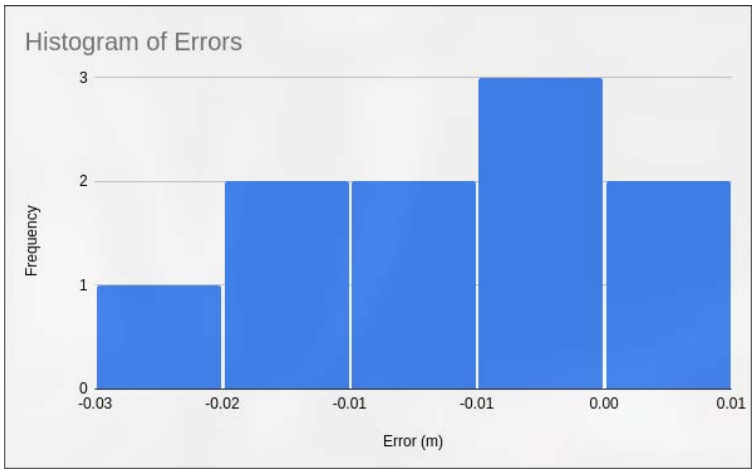
Expected: 0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 all in meters

Actual 0.0498 0.104 0.211 0.323 0.406 0.508 0.616 0.697 0.804 0.913

(b) (5 points) Mean of errors: -0.0081 m

(c) (5 points) Standard Deviation of errors: 0.00827 m

(d) (10 points) Histogram of errors: [Screenshot]



4.3

(a) (10 points) Cone size/angular range: 63°

4.4

(a) (8 points) Critical angle: 41°

(b) (2 points) Method:

We started the block at a 90° angle facing the robot and slowly turned it until the reading was no longer accurate.

4.5

(a) (2½ points) Measurement Material A: 0.197m Backpack

(b) (2½ points) Measurement Material B: 0.219 m Flag

(c) (5 points) Observation and Reasoning:

We saw that the backpack was pretty accurate to the exact reading, while the flag appeared to overcalculate the distance which would make sense if it dampens the sound waves since they would then take longer to travel back to the sonar sensor.