CS 556: Task-Sheet for Lab 2
Sensors

Name: __Joshua Van Doren & Kane

Cruz-Walker_____ Robot ID:

____Affettwo____Robot_#8, 5 _____

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.

For the Servo an important parameter will be the angle at which the Servo is to go to. For the Sonar it will most likely be I/O pin locations and maybe some integer time delays as parameters. The bot will need conditions of objects to be in the range of 2cm to 3 meters and hopefully reflective surfaces that can reflect the frequency back to the Sonar and not off into another direction. The Servo has a 180 degree directional turn.

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: ___**Bot Read out: 3.07cm; Real: 0.00cm**_____ (b) (7 ½ points) Maximum sensing range: ____**Real: 120cm; Bot read out: 115.07cm**____

4.2 (a) (5 points) The ten distances selected for measurement accuracy characterization: Expected: **10, 20, 30, 40, 50, 60, 70, 80, 90, 100 : all in cm**

Actual: **11.913, 21.972, 31.332, 40.91, 51.107, 61.254, 70.978, 81.534, 91.789, 98.986: all in cm**

(b) (5 points) Mean of errors: **_1.3803cm_** (c) (5 points) Standard Deviation of errors: **_0.3992657288351_** (d) (10 points) Histogram of errors: [Screenshot]

4.3 (a) (10 points) Cone size/angular range: **__60 degrees__**
4.4 (a) (8 points) Critical angle: **__60 degrees__**

(b) (2 points) Method:

For our critical angle measurements, we used the protractor tool provided. We placed the robot in the center of the protractor with the sensor pointing toward both lines (as it was folded in a way both lines paralleled each other to start). We then placed the box tangential and centered with the sensor. After confirming with the serial monitor that we were getting an accurate reading we began testing angles. We would move the top portion of the protractor ten degrees while the bottom portion stayed lined up with the box that hadn't moved. We continued until we reached illogical data in the serial monitor. Then we tested values by one

degree until we arrived at 60 degrees giving us consistent readings.

_ 4.5 (a) (21/2 points) Measurement Material A: **_These values can be found in 4.2(a)_**

(b) (21/2 points) Measurement Material B: **_In the Format of (Real: Robot output)**

10: 11.522
20: 21.832
30: 31.142
60: 59.912
70: 60
80: 59.60
90: 29.672
100: 34.622

(c) (5 points) Observation and Reasoning:

When testing Material B the Styrofoam box we were expecting either many misreads of distance with an output being much greater than the true distance due to the frequency never returning to the sonar, or a consistent amount of slightly offset data due to the material absorbing much of the sonar frequencies and sending them back to the sonar with slight delay. However we were receiving great offset with an output much less than actual, an outcome we were not expecting. We noticed that when running this test the class was coming to an end and there may have been much 3rd party noise affecting the results of the experiment.