LAB 4-MEC830
Ultrasonic Radar
(Individual Lab)

1. Purpose

The purpose of this lab is to get hands-on experience with modules such as serial port, motors, and GUI. You will learn about transferring data from Arduino to your laptop/pc via serial port.

2. Scope

You will learn about serial port and interfacing Arduino with a laptop. You will work with 1) *servo motor*, 2) *sonar sensor* 3) *serial port to plot data on GUI*.

3. Documents

The following documents will help you through the Lab:

- Lecture notes
- ELEGOO programing examples

4. Procedure

Familiarize with the ELEGOO Starter Kit.

- Try loading the examples from class and the kit.
- Use the serial monitor to help debug your program.

Task: building hardware and software

You will build an ultrasonic radar system in this lab (see Figure 3). The hardware will sense the environment and will send the data to a pc/laptop for visualization.

(a) Mount the sonar sensor on top of the servo motor using double-sided tape or hot glue, etc (see Figure 4).

(b) Connect all wires to the Arduino according to the schematic (see Figure 2).

(c) Write a program to read sensor data, while the servo is sweeping left/right. Send data to your laptop via serial port. Send the following information:

 <an integer for the position of the servo motor [0,180]><,><distance in cm>, e.g. 1,3

(d) Use the Python code to plot the data. You need to install Python on your system.

Use the following guide and follow the steps to install the latest version of Python and Pycharm, a cross platform editor developed by Jetbrains, on your PC:

https://www.guru99.com/how-to-install-python.html

Note: Use the Python code provided as the radar sceen. The python code is on D2L.

Watch the videos to see how this lab should work, and what you need to present.

https://youtu.be/6ZJM6cEQKgo

Once the task is working properly, demonstrate to your TAs and ask them to sign off.

Figure 1: Bill of materials

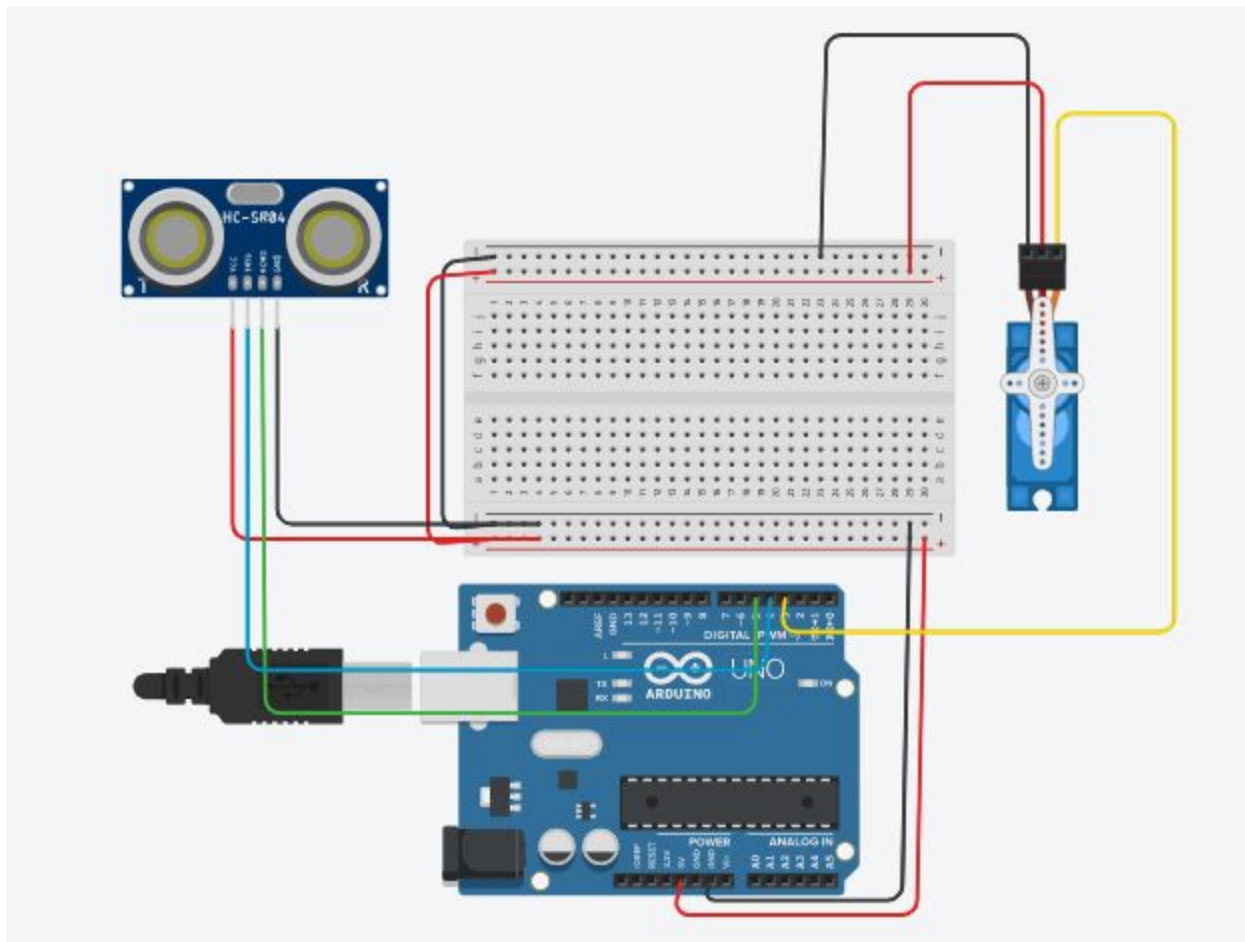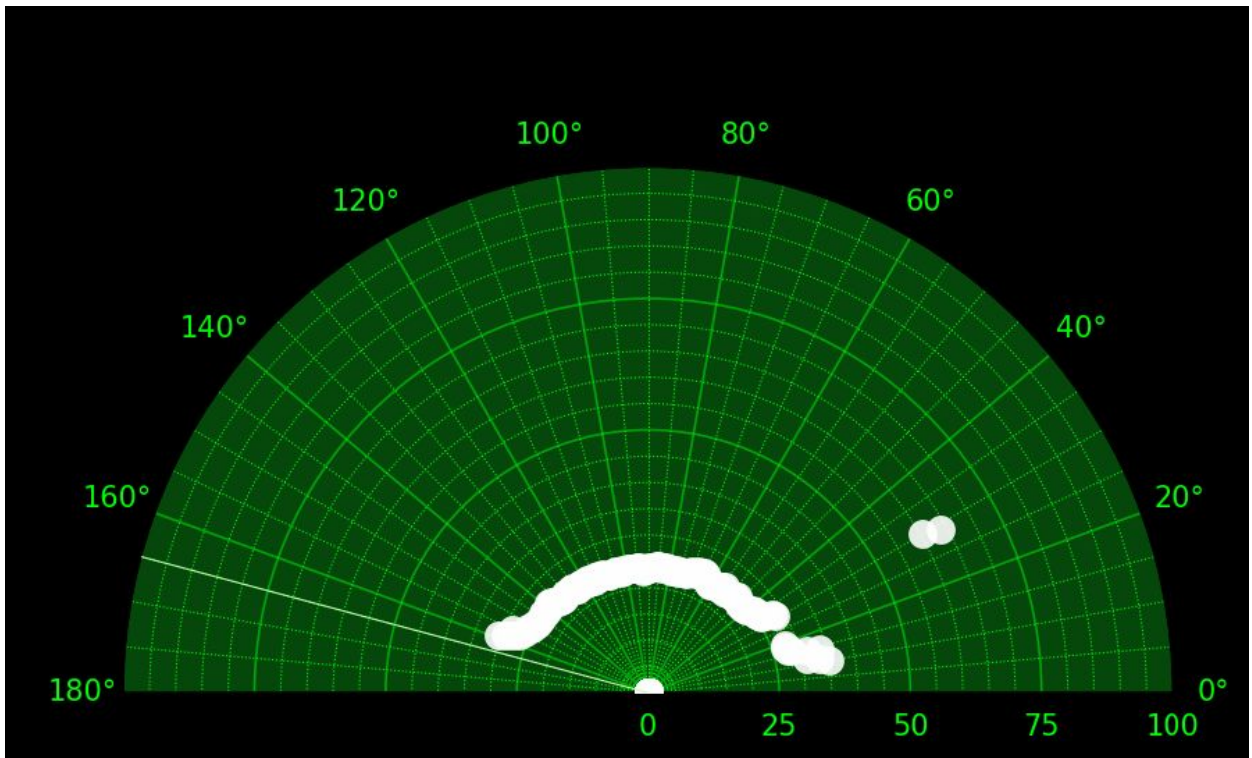| Quantity	Component
1	Arduino Uno R3
1	Ultrasonic Distance Sensor
1	Micro Servo

Figure 2: Schematics

Figure 3: Radar screen
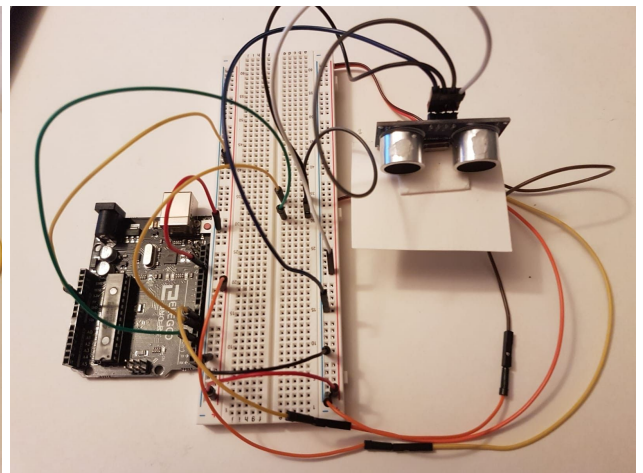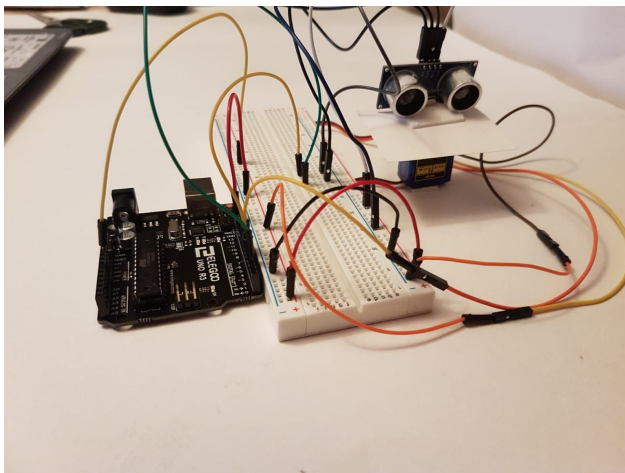
Figure 3: Reference images

5. Report

Your lab report should include:

- Signed lab report cover page: http://www.ryerson.ca/mie/documents/
  (make sure you put your lab group number on the front)
- Abstract
- Introduction
- Experimental Equipment (ie. what was used)
- Description of the Program with Flowchart
- Conclusions & Recommendations
- Appendix: Program Listing
- Report file name convention:
- Report_[Section#]_[Student_ID]_ [Last_Name}_[First_Name]_LAB1.pdf, e.g. Report_09_00099887766_Smith_John_LAB1.pdf
- Your code also should be submitted in a zip file, if more than one file needs to be submitted. Otherwise submit the code unzipped.
- Code file name convention:
  Code_[Section#]_[Student_ID]_[Last_Name}_[First_Name]_LAB1.pdf, e.g.
  Code_09_00099887766_Smith_John_LAB1.[c, zip]

- Lab reports are due in 1 week since your lab session starts.
- Submit to D2L→ Assessment → Assignment → Lab4
- Late submissions will be penalized at a rate of 10% per day, where weekends count as two days for online submission.
- Each student should submit his/her own individual report/work. This is not group work.
- Lab attendance is mandatory. If you submit a report without attending the lab, you will get zero marks.
- Weight:
  - 50%: TA confirms that you did the lab during the lab hour
  - 50%: Lab report and the code