CpE 4010 – Lab 9

• Objective: To have the student experiment with an ultrasonic range detector wherein the ultrasonic sensor output represents our "sensed" input and the LEDs, buzzer and Serial Monitor display our "actuated" outputs.

• Procedures will be highlighted in red boxes; some procedures require you to collect data for your report. Enter all required data in the appropriate field within the accompanying Datasheet. Also, be sure to enter your name at the top of the Datasheet

• Once you have completed all of the following procedures and filled in your Datasheet, upload your complete Datasheet to the "Lab 9" folder under "Assignments"

1) Construct the HC-SR04 Ultrasonic Sensor circuit below.
https://wiki.keyestudio.com/052043_Super_Learning_Kit_for_Arduino#Project_26:_HC-SR04_Ultrasonic_Sensor
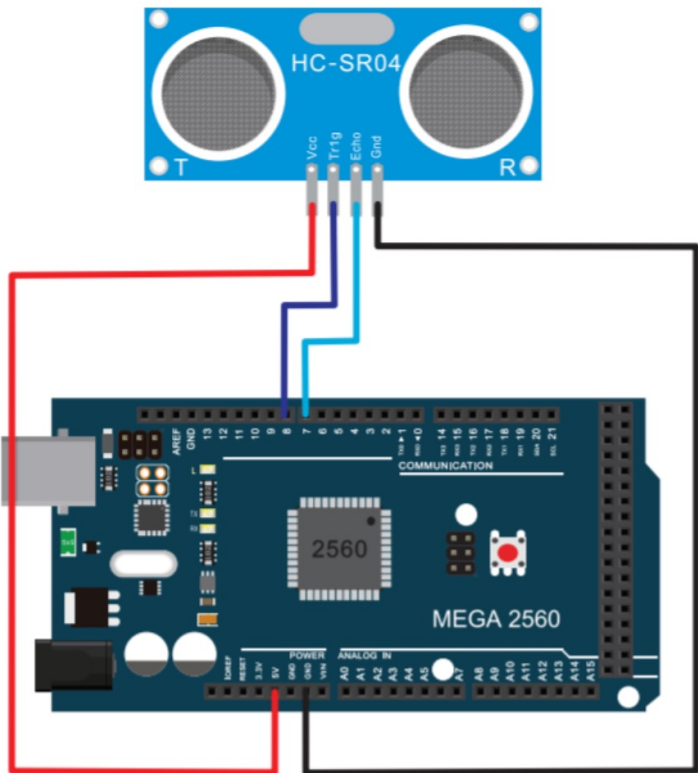
2) Copy and paste the sample code into your IDE code window, then compile, upload, and run the program.
2a) Try to move your hand back and forth in front of the sensor and see if the Serial Monitor displays correct ranges.

3) Modify the circuit and sample code so that you will have three LEDs (Green, Yellow Red) connected where only Green Led will be on when the range is above 12 cm, only Yellow Led will be on when the range is between 5 and 12 cm, and Red Led will be on when the range is smaller than 5 cm.

4) Take a photo of your circuit and insert it into the associated section of your Datasheet.

5) Take a screenshot of your IDE code and Serial Monitor and insert it into the associated section of your Datasheet.

6) Modify the circuit and source code to control a Buzzer depending on the range ultrasonic sensor detects. The Buzzer will generate tones with a frequency range 2500 Hz to 500 Hz when the distance is changing from 2 cm to 12 cm. Above 12 cm, there will not be any tone generated from the Buzzer. Also display Buzzer frequency in the Serial Monitor.

7) Take a photo of your circuit and insert it into the associated section of your Datasheet.

8) Take a screenshot of your IDE code and Serial Monitor and insert it into the associated section of your Datasheet.

9) Place a piece of paper under your setup and locate an object in front of the sensor at 15 cm. Starting from this point move your object to the left and right till the Ultrasonic sensor does not show proper reading. Label these 2 points on the paper to find the angular span of the sensor. Using the perpendicular distance from the center of the sensor and initial position of the object, and the points on the right and left side of this center point, calculate the effective angle of the sensor using trigonometry.

10) Insert measured angle in your Datasheet.

11) Write a conclusion in the "Conclusions" section of the Datasheet explaining your observations and lessons learned.