

CIS-033-53082 Robotics and Embedded System

Lab 4 Ultrasound Sensor Yizhe Wang 06/17/2023 Summer 2023

- Task 1: Design a device to measure the distance between the device and the object in front of it. Write the distance to the LCD continuously in one second intervals. Include a RED LED to blink when the device is close (less than 20 cm) to the object. Include a GREEN LED to be green if the device is in a safe range (more than 20 cm) from the object.

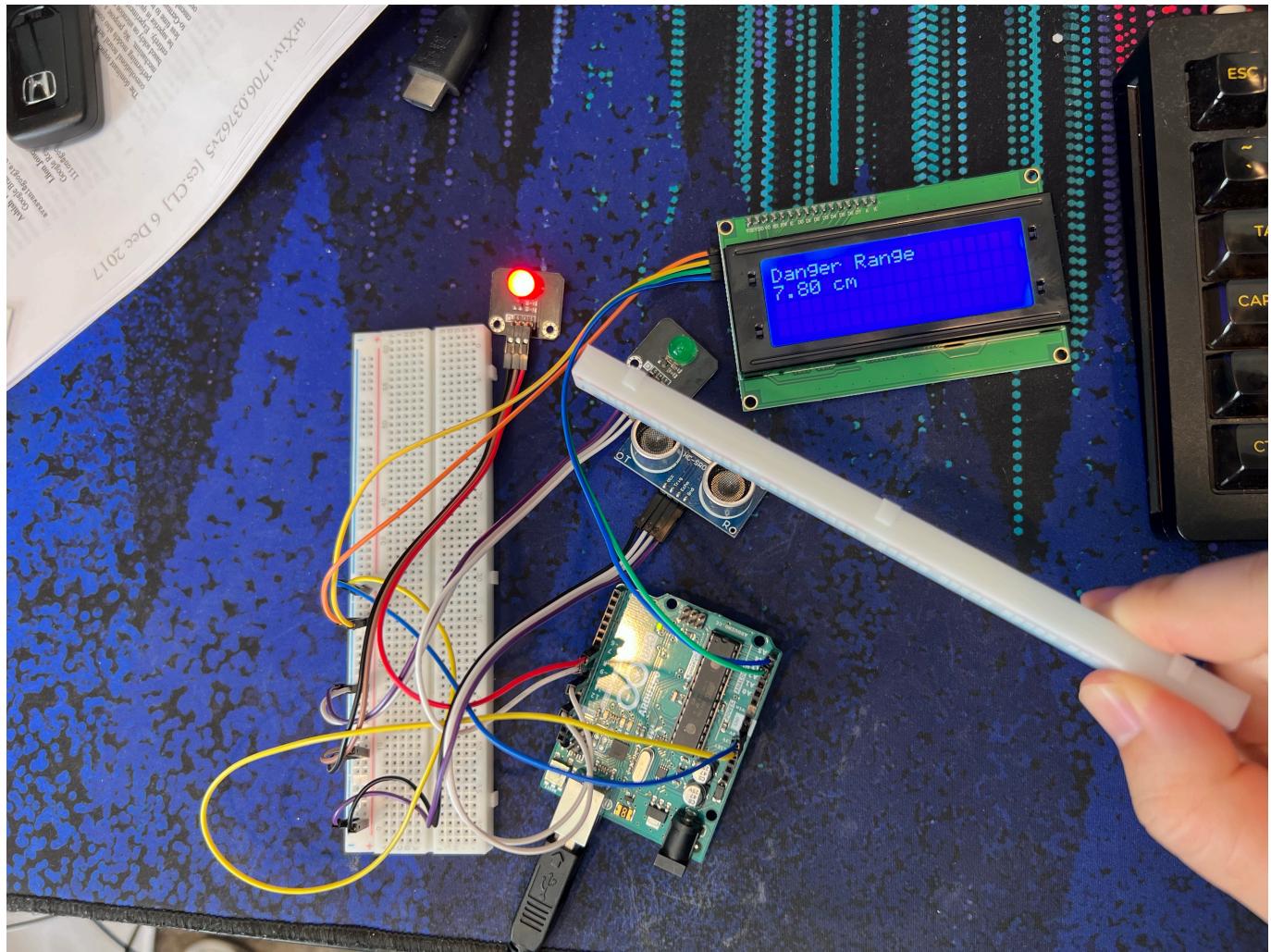
Code: (See next page)

```
1 #include <LiquidCrystal_I2C.h>
2 #include <Wire.h>
3
4 #include <NewPing.h>
5 #define TRIGGER_PIN 10
6 #define ECHO_PIN 13
7 #define MAX_DISTANCE 200
8
9 NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE);
10 LiquidCrystal_I2C lcd(0x27, 16, 2);
11
12 float duration, distance;
13 int interation = 5;
14 int red_light_pin = 7;
15 int green_light_pin = 8;
16
17 void setup()
18 {
19     Serial.begin(9600);
20     lcd.init();
21     lcd.backlight();
22 }
23
24 void loop()
25 {
26     duration = sonar.ping_median(interation);
27     distance = (duration / 2) * 0.0343;
28     Serial.print("Distance: ");
29     if (distance >= 20 || distance <= 0)
30     {
31         lcd.clear();
32         digitalWrite(red_light_pin, LOW);
33         digitalWrite(green_light_pin, HIGH);
34         lcd.setCursor(0, 0);
35         if (distance <= 0 || distance > MAX_DISTANCE) {
36             lcd.setCursor(0, 0);
37             lcd.print("Out of range");
38         } else {
39             lcd.print("Safe Range");
40             lcd.setCursor(0, 1);
41             lcd.print(distance);
42             lcd.print(" cm");
43         }
44     }
45     else
46     {
47         lcd.clear();
48         digitalWrite(red_light_pin, HIGH);
49         digitalWrite(green_light_pin, LOW);
50         lcd.setCursor(0, 0);
51         lcd.print("Danger Range");
52         lcd.setCursor(0, 1);
53         lcd.print(distance);
54         lcd.print(" cm");
55     }
56     delay(1000);
57 }
```

Setup:

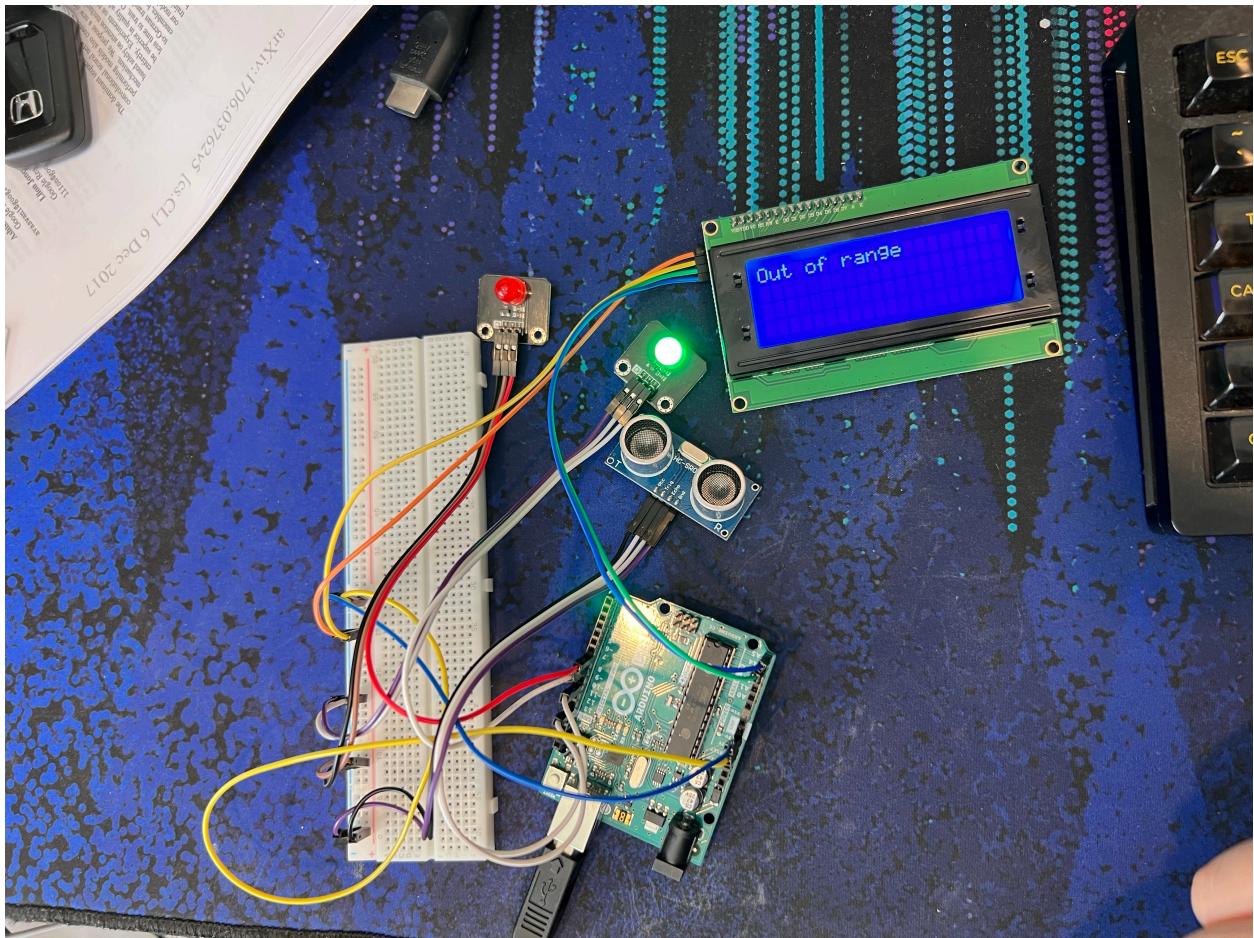
When the distance is between 0 and 20cm.

1. The red light is turned on,
2. The lcd displays “Danger Range” on the first line.
3. The lcd displays the actual distance on the second line.



When the distance is 0 or it's greater than the designed range of the sensor:

1. The red light is turned off, green light is turned on.
 2. The lcd displays “Out of range” on the first line.



When the distance is greater than 20cm and it's less than the designed max range of the sensor.

1. The red light is turned off, green light is turned on.
2. The lcd displays “Safe Range” on the first line.
3. The lcd displays the actual distance on the second line.

