AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)
Faculty of Engineering
Department of EEE and CoE
Undergraduate Program

Course: Microprocessor and Embedded Systems **Summer 2021-22, Final**

Experiment 6: Interfacing the Arduino with an external sensor to establish communication using the RS-232 protocol with implementing an obstacle detection system.

Submitted By:

Name	ID
MD SHAMIM SIDDIKY	20-42649-1
WASIUDDIN	15-30843-3
TANJIM HOSSAIN	18-36964-1
MD. SAKIB HOSSAIN RIJON	19-39460-1
SADIA AFRIN ETY	19-39659-1
FERDOUS SUNY	19-40485-1
DIPONKAR SUTRA DHAR	19-41004-2

Section: O
Group: 6

Submitted To

Md Ali Noor
Lecturer
Faculty of Computer Engineering
American International University-Bangladesh

Theory and methodology:

Arduino is an open-source platform used for creating interactive electronics projects. Arduino consists of both a programmable microcontroller and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the microcontroller board. Arduino Uno also doesn't need a hardware circuit (programmer/ burner) to load a new code into the board. We can easily load a code into the board just using a USB cable and the Arduino IDE (that uses an easier version of C++ to write a code).

Objectives:

(i) To code a simple Obstacle Detection System in Arduino IDE.

(ii) To implement a simple Obstacle Detection System in Hardware.

Equipment List:

1) Arduino IDE (any version)
2) Arduino Uno (R3) board
3) Sonar Sensor (HCSR04)
4) LED

Circuit Diagram:

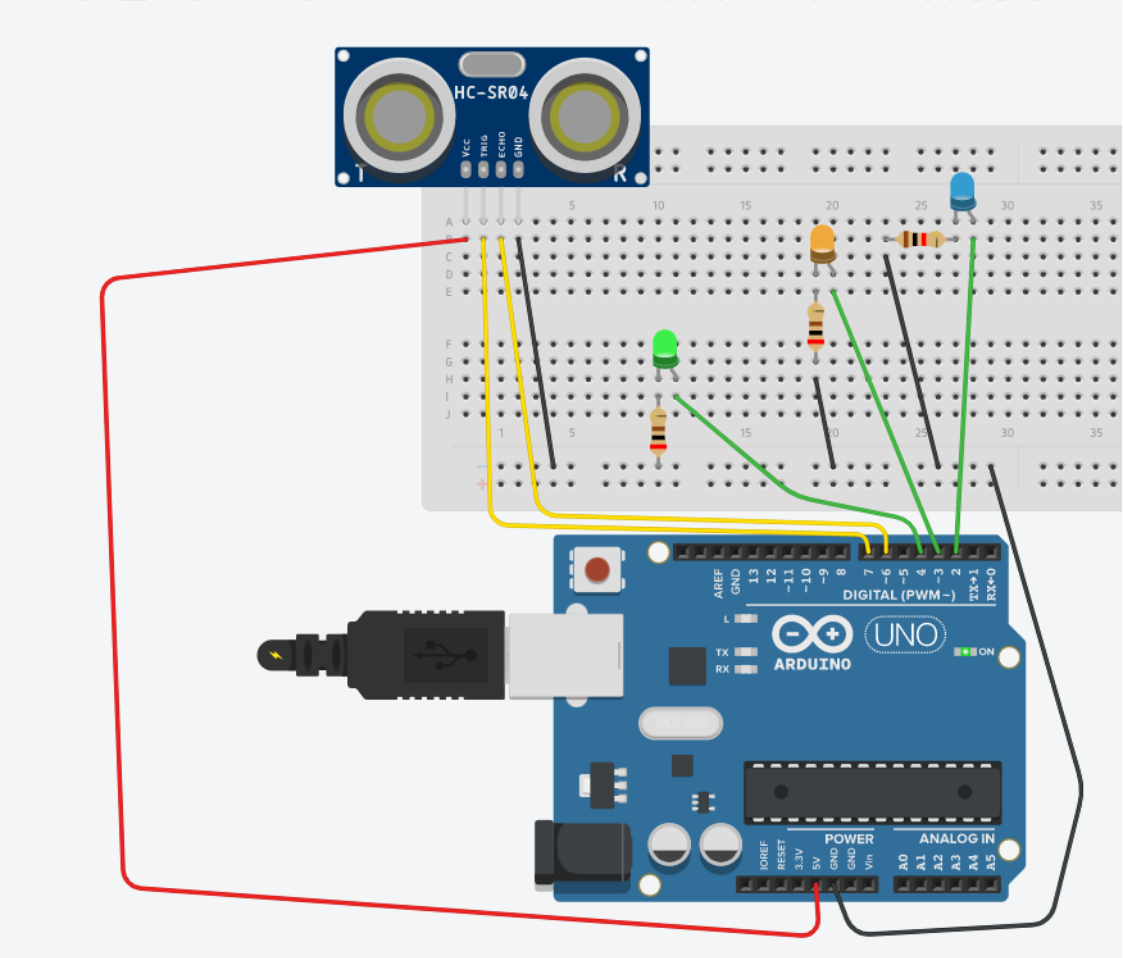

Fig 1: Circuit diagram for Object detection system

Hardware Setup:

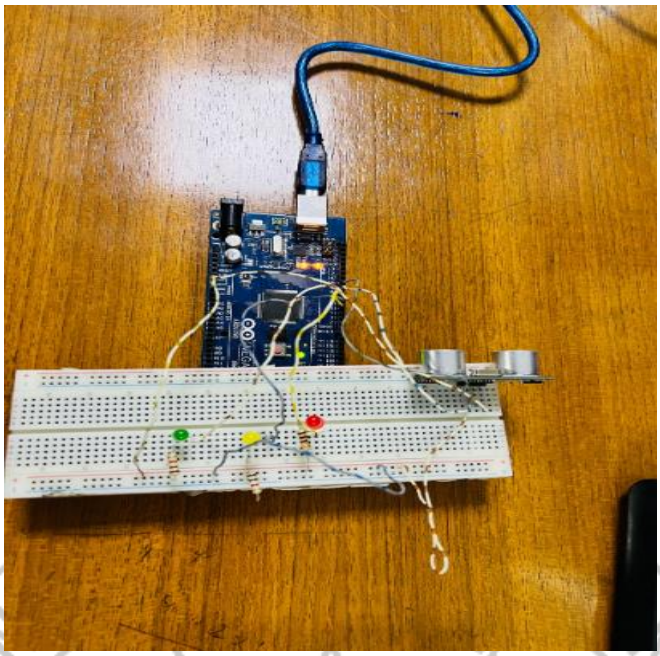

Figure 2: Hardware Set-up for Object detection system

Experiment result:

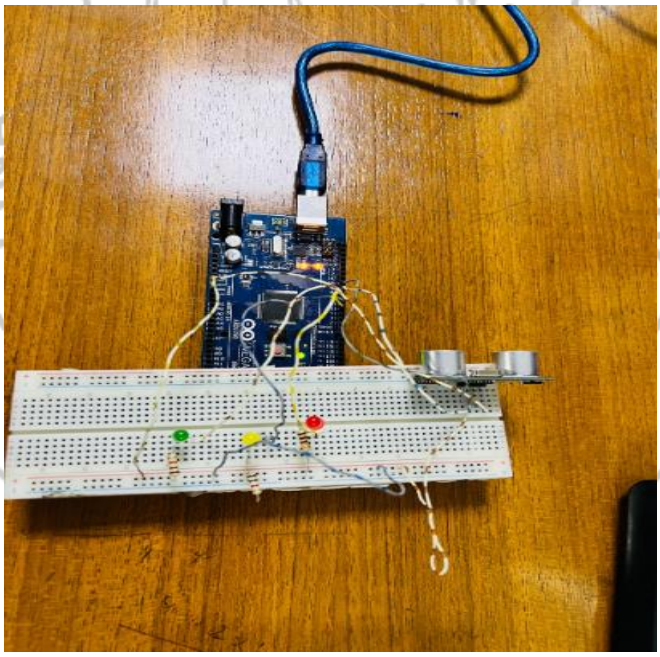

Fig 3: All LED off for more than 80cm distance

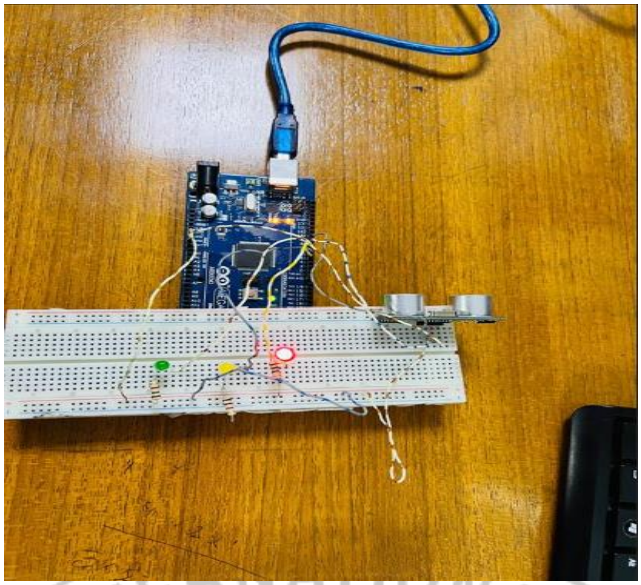

Fig 4: Red LED on for 50-80cm distance

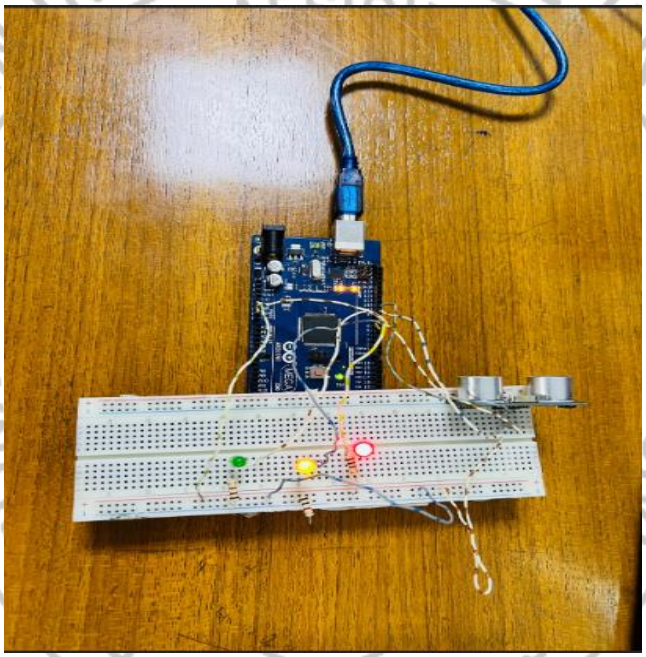

Fig 5: Red LED on for 20-50cm distance

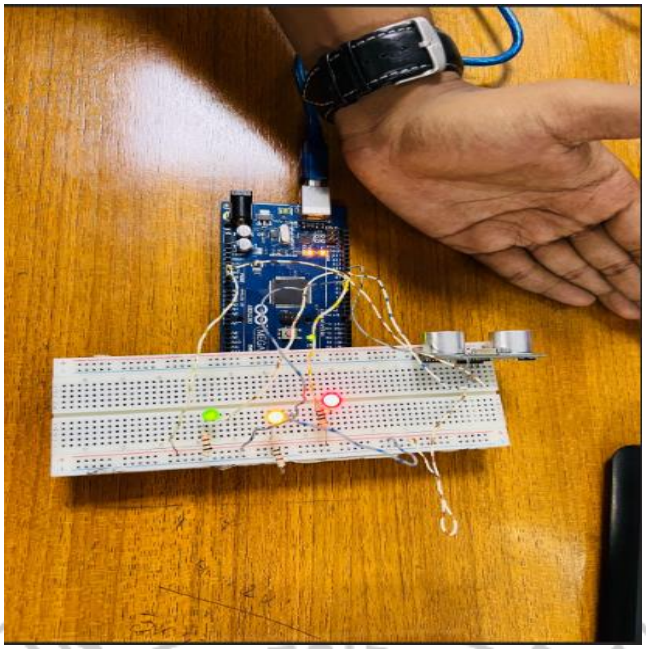

Fig 6: All LED on for 0-20cm distance

Code Analysis:

A sensor takes its reading based on the object's position and compares the situation with predefined values. If the condition falls in the particle logic based on this, the light turns on and off. When the sensor detects something echoPin return some value of sound which is converted to distance .The distance is measured in cm units here. Here distanceThreshold variable is used to measure the distance between the sensor and object.

```
int distanceThreshold;
int cm;
int inches;
long readUltrasonicDistance (int triggerPin, int echoPin)
{
pinMode (triggerPin, OUTPUT); // Clear the trigger
digitalWrite (triggerPin, LOW);
delayMicroseconds(2);
// Sets the trigger pin to HIGH state for 10 microseconds
digitalWrite (triggerPin, HIGH);
delayMicroseconds(10);
digitalWrite (triggerPin, LOW);
pinMode (echoPin, INPUT);
// Reads the echo pin, and returns the sound wave travel time in microseconds
```

```
return pulseIn (echoPin, HIGH);
}
void setup()
{
Serial.begin(9600);
pinMode(5, OUTPUT);
pinMode(6, OUTPUT);
pinMode(7, OUTPUT);
}
void loop()
{
// set a threshold distance to activate LEDs
//considering the features of ultrasonic sensor
distanceThreshold = 80;
// measure the ping time in cm, 340m/s=0.034cm/µs, therefore 0.034/2=0.017 mainly as the signal is working as echo
cm = 0.017 * readUltrasonicDistance(9, 8);
 // convert to inches by dividing by 2.54
inches = (cm / 2.54);
Serial.print(cm);
Serial.print("cm, ");
Serial.print(inches);
Serial.println("in");

if (cm > distanceThreshold) {
digitalWrite(5, LOW);
digitalWrite(6, LOW);
digitalWrite(7, LOW);
}
if (cm < distanceThreshold && cm > distanceThreshold-30 ) {
digitalWrite(5, HIGH);
digitalWrite(6, LOW);
digitalWrite(7, LOW);
}
if (cm < distanceThreshold-30 && cm > distanceThreshold-60 ) {
```

```
digitalWrite(5, HIGH);
digitalWrite(6, HIGH);
digitalWrite(7, LOW);
}
if (cm < distanceThreshold-60 && cm > distanceThreshold-80 ) {
digitalWrite(5, HIGH);
digitalWrite(6, HIGH);
digitalWrite(7, HIGH);
}
delay(100); // Wait for 100 millisecond(s)
}
```

Discussion:

In this experiment, a sonar was used to measure the distance of an object. This concept is used in our day-to-day life. Three lights were used here. Three loops were used to control when the lights will turn on or off if an obstacle comes in the range of the sonar. A threshold distance was declared in the program. If an obstacle is in 20 cm distance, all the led's were on. If it is within 20 to 50 cm, Red and Yellow LED were on. For 50 to 80 cm distance only the Red Led was on. And if the obstacle is more than 80 cm away, then all the led's were off.