Experiment 2.1

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Subject Name: Internet of Things Lab
Subject Code: 20CSP-358

1. Aim:

To measure the distance of an object using an ultrasonic sensor.

2. Objective:

- Learn about interfacing.
- Learn about IoT programming.

3. Requirements:

- Arduino Uno R3 board
- Ultrasonic sensor (HC-SR04)
- 16×2 LCD I2C Display
- Jumper Wires

4. Procedure:

Arduino:
It is an open-source electronics platform. It consists ATmega328 8-bit Micro controller. It can be able to read inputs from different sensors & we can send instructions to the micro controller in the Arduino. It provides Arduino IDE to write code & connect the hardware devices like Arduino boards & sensors.

Ultrasonic Sensor:
An ultrasonic Sensor is a device used to measure the distance between the sensor and an object without physical contact.This device works based on time-to-distance conversion.

Setup

1. Connect the Echo pin of the sensor to the D2 pin of the Arduino.
2. Connect the Trig pin of the sensor to the D3 pin of the Arduino.
3. Navigate to Tools and select board and port.
4. Verify and compile the code, then upload the code to the Arduino Uno R3 board.
5. Monitor the output in the Serial monitor (Set the baud rate as 9600). To open Serial monitor Tools>Serial Monitor or (Ctrl+Shift+M).

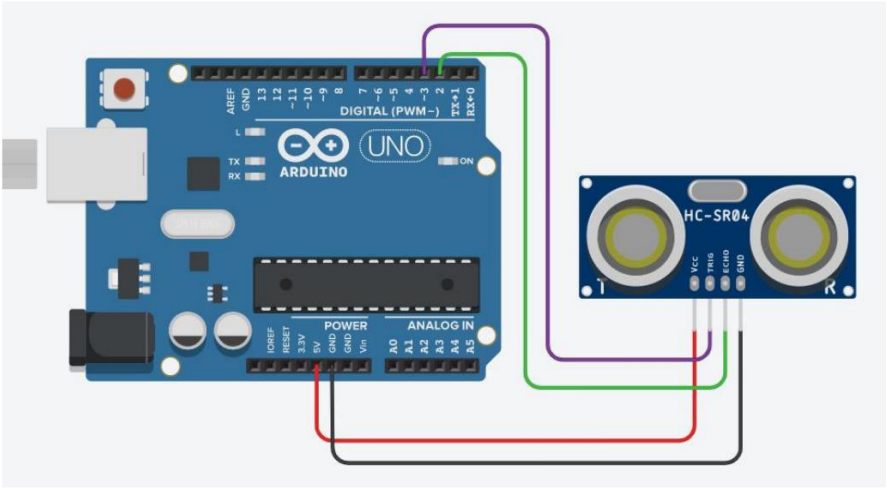
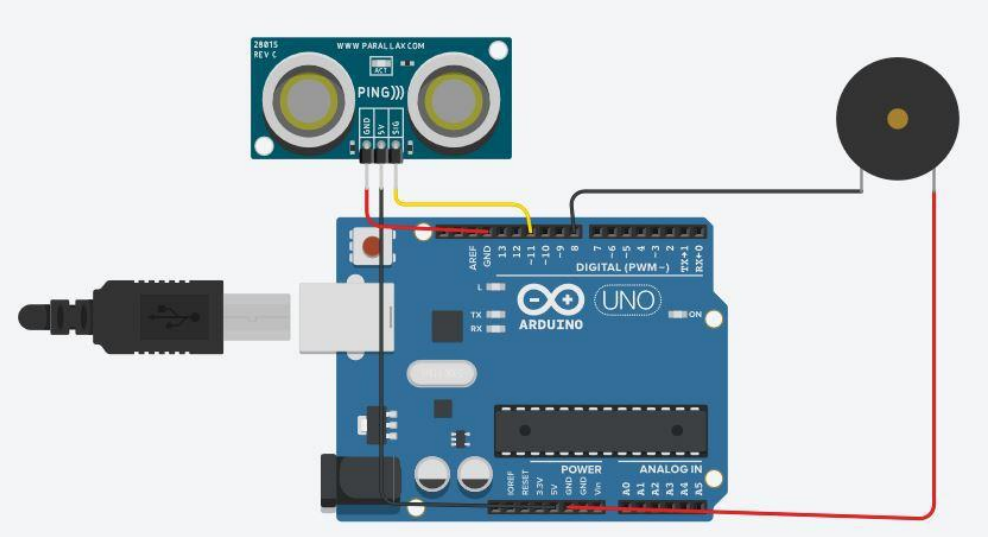


Figure: Ultrasonic Distance measurement circuit



5. Code/Program:

```
const int pingPin = 3; // Trigger Pin of Ultrasonic Sensor
const int echoPin = 2; // Echo Pin of Ultrasonic Sensor
const int led = 13;
void setup() {
Serial.begin(9600); // Starting Serial Terminal
pinMode(led,OUTPUT);
pinMode(8, OUTPUT);
}

void loop() {
long duration, inches, cm;
pinMode(pingPin, OUTPUT);
digitalWrite(pingPin, LOW);
delayMicroseconds(2);
```

```
digitalWrite(pingPin, HIGH);
delayMicroseconds(10);
digitalWrite(pingPin, LOW);
pinMode(echoPin, INPUT);
duration = pulseIn(echoPin, HIGH);
inches = microsecondsToInches(duration);
cm = microsecondsToCentimeters(duration);
Serial.print(inches);
Serial.print("in, ");
Serial.print(cm);
Serial.print("cm");
Serial.println();


if(cm <50)
{
digitalWrite(led, HIGH);
digitalWrite(8,HIGH);
}
else
{
digitalWrite(led, LOW);
digitalWrite(8,LOW);
}
delay(1000);
}

long microsecondsToInches(long microseconds) {
return microseconds / 74 / 2;
}
long microsecondsToCentimeters(long microseconds) {
return microseconds / 29 / 2;
}
```

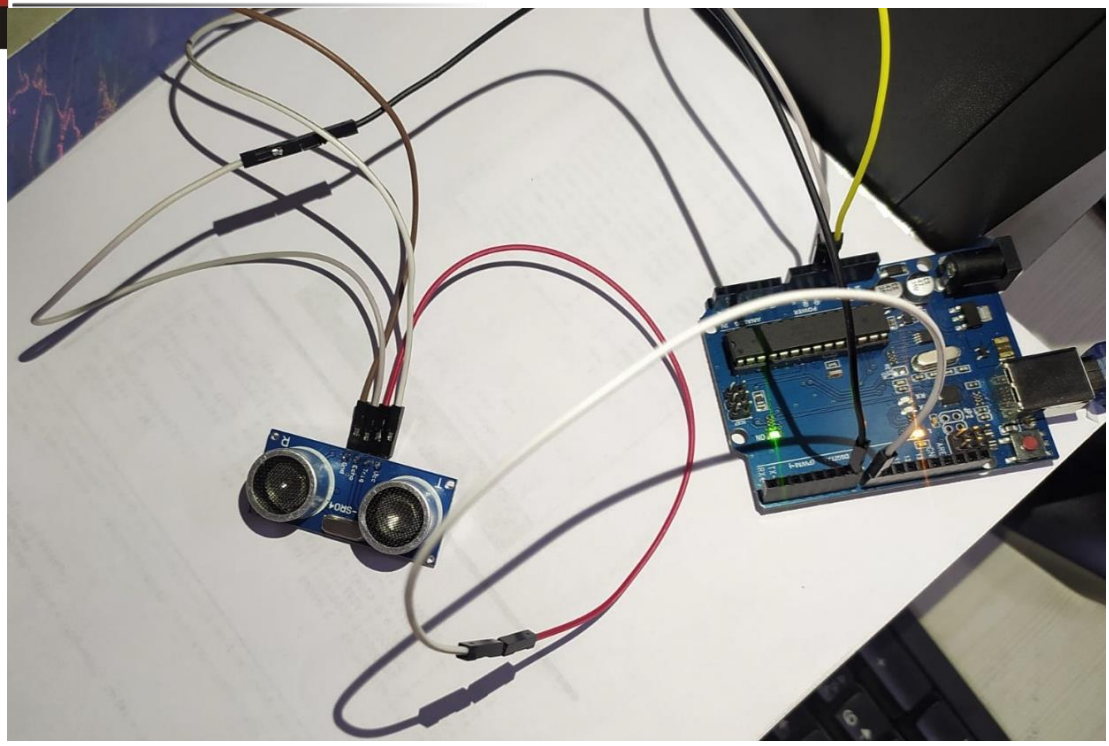
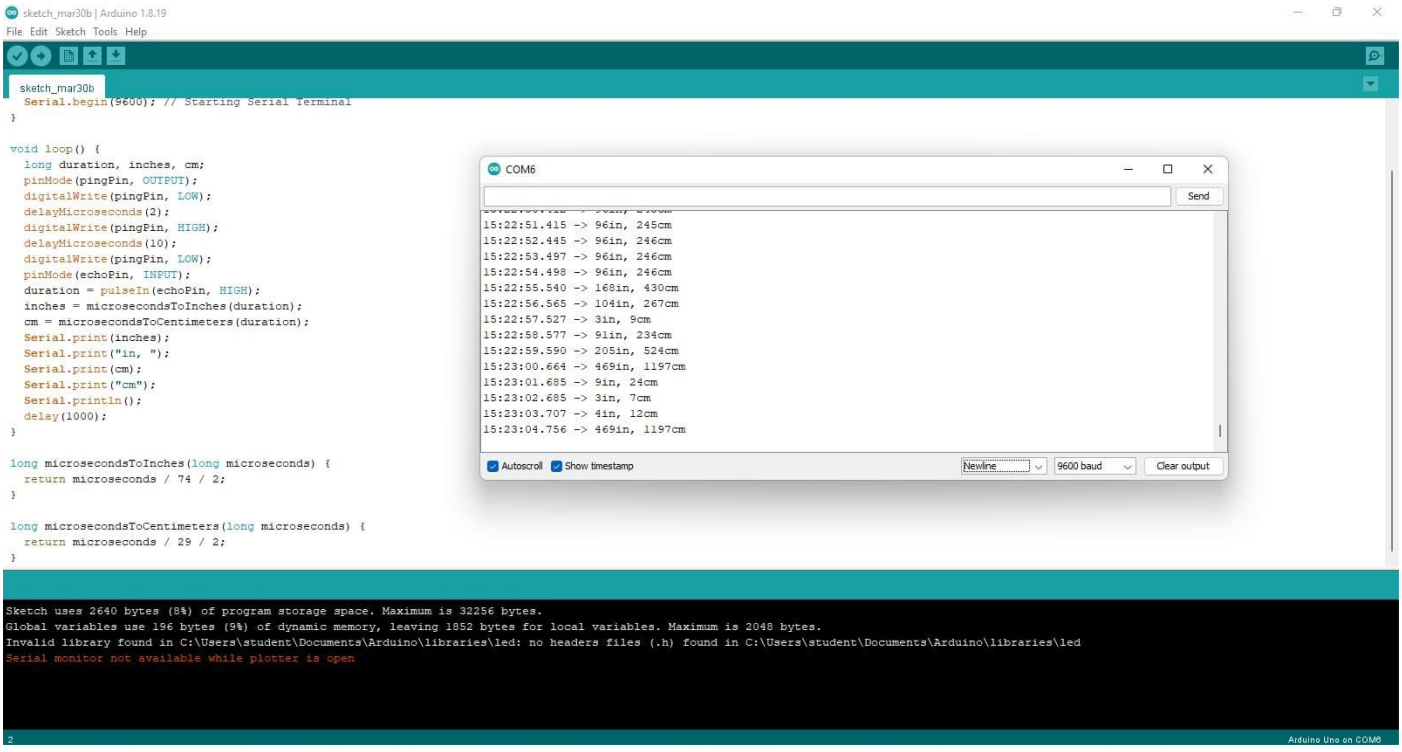


FIGURE: CIRCUIT



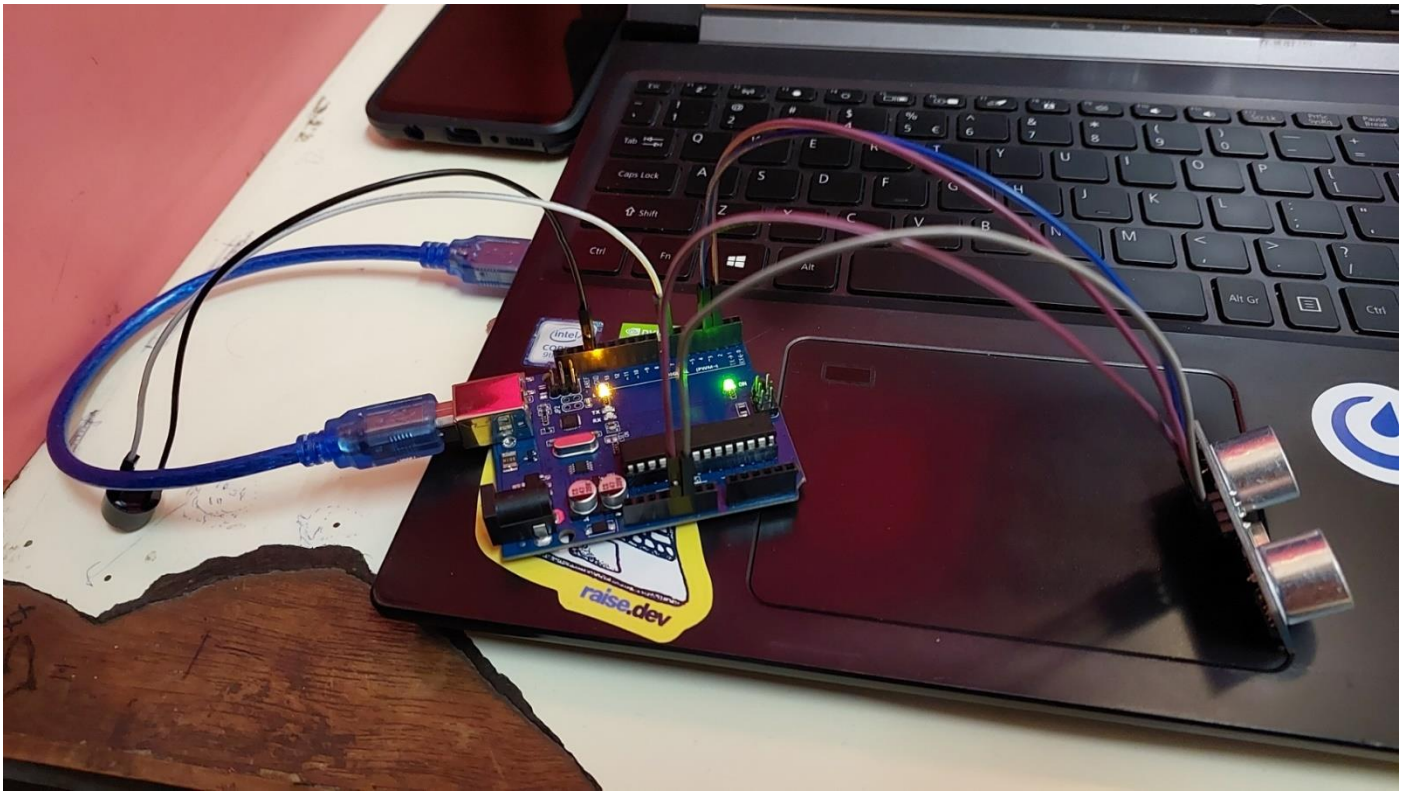


FIGURE: CIRCUIT WITH BUZZER

Learning outcomes (What I have learnt):

- The furthest we can record is 1197 cm.
- We put conditions such that when the distance is less than 50 cm it will blink the led at PORT number 13.
- Another observation we have noticed is by attaching a buzzer with above condition we can make a security device which will start ringing whenever something approaches closer than 50 cm.

Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			