



American International University- Bangladesh

Department of Electrical and Electronic Engineering

EEE4103: Microprocessor and /Embedded Systems Laboratory

OEL: Distance Measuring using Ultrasonic Sensor with OLED.

Objective: To measure distance of an obstacle and display it on the OLED display.

Theory and Methodology:

Ultrasonic sensors are used primarily as proximity sensors. They can be found in automobile self-parking technology and anti-collision safety systems. Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology. In comparison to infrared (IR) sensors in proximity sensing applications, ultrasonic sensors are not as susceptible to interference of smoke, gas, and other airborne particles (though the physical components are still affected by variables such as heat). Ultrasonic sensors are also used as level sensors to detect, monitor, and regulate liquid levels in closed containers (such as vats in chemical factories).

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 Mega 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



Fig 1: Ultrasonic sensor

Apparatus:

- 1) Arduino Mega
- 2) Breadboard
- 3) Ultrasonic Sensor
- 4) OLED display
- 5) Connection wires

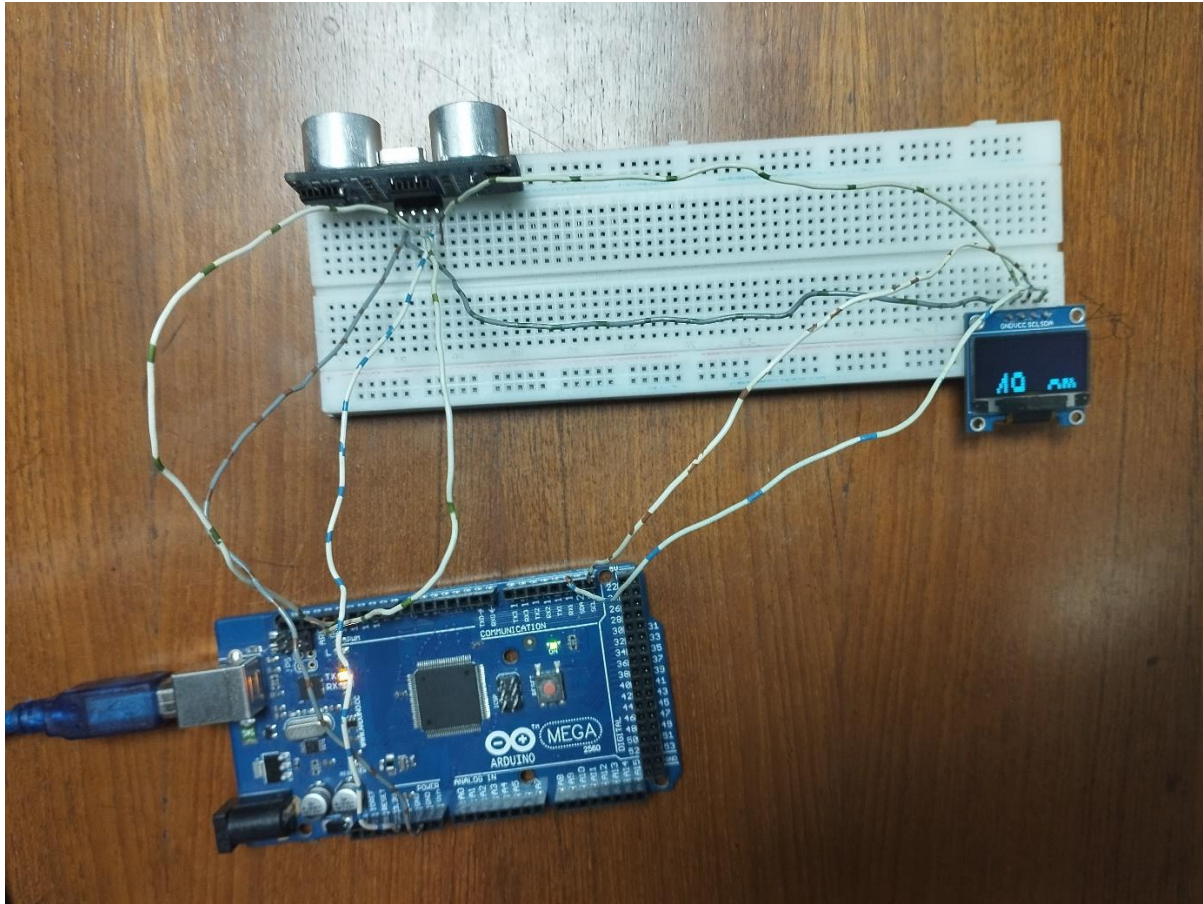
Simulation Setup:

Fig 2: Hardware setup for distance measuring system

Coding Program:

First of all, we imported some header files like `SPI.h`, `Wire.h`, `Adafruit_GFX`, `Adafruit_SSD1306`, and `Adafruit_BMP085`. Then we set the screen width, and height. In the setup function, we passed `SSD1306_SWITCHCAPVCC` to generate the display voltage. Then we defined the trigger and echo pins. Then in the loop function, it just takes input through the sensor and shows the output in OLED.

```
#include <SPI.h>
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

#define CommonSenseMetricSystem
// #define ImperialNonsenseSystem

#define trigPin 13
#define echoPin 12

#define OLED_RESET 4
```

```

Adafruit_SSD1306 display(OLED_RESET);

void setup() {
  Serial.begin (9600);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  display.begin(SSD1306_SWITCHCAPVCC, 0x3C); //initialize with the I2C addr 0x3C
  (128x64)
  display.clearDisplay();
}

void loop() {
  long duration, distance;

  digitalWrite(trigPin, LOW); //PULSE ___|---|___
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  duration = pulseIn(echoPin, HIGH);

  distance = (duration/2) / 29.1;

  display.setCursor(22,20); //oled display
  display.setTextSize(3);
  display.setTextColor(WHITE);
  display.println(distance);
  display.setCursor(85,20);
  display.setTextSize(3);

  display.println("cm");

  display.display();

  delay(500);
  display.clearDisplay();

  Serial.println(distance);//debug
}

```


Simulation results:

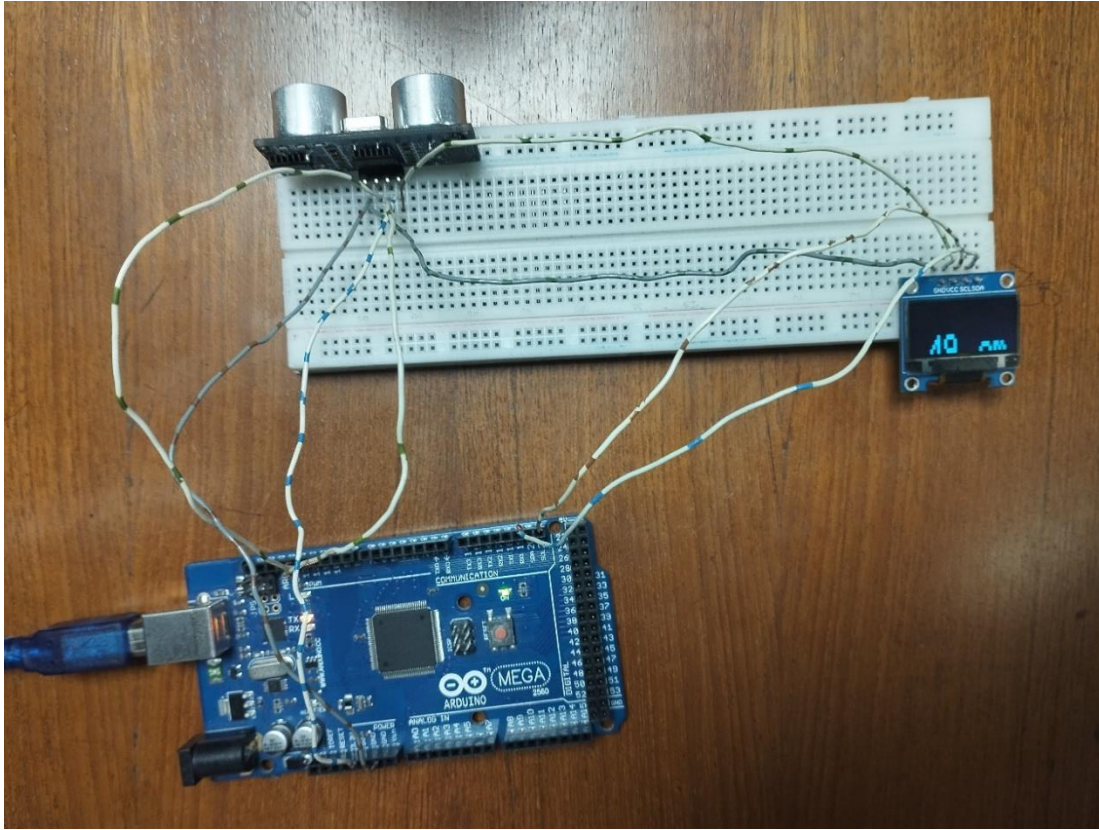


Fig 3: Obstacle at 49cm distance

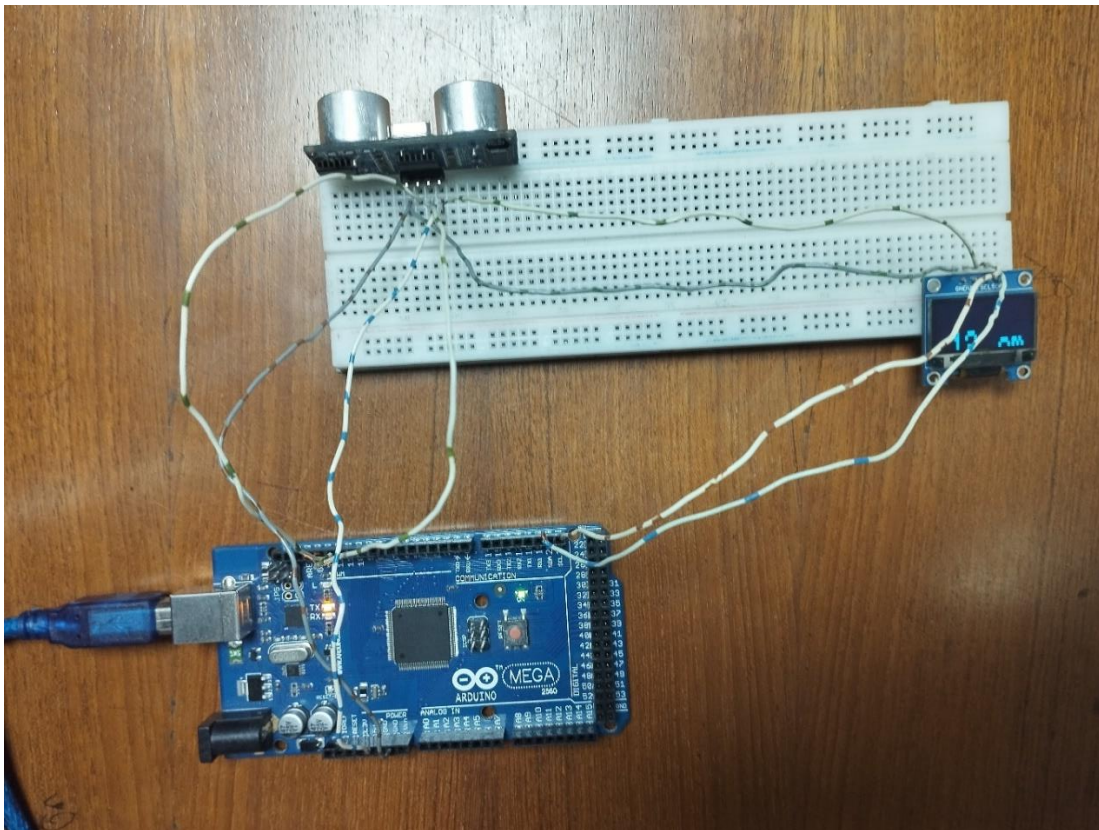


Fig 4: Obstacle at 13cm distance

Discussions:

In this experiment a hardware setup was implemented to measure the distance of an obstacle and display it on an OLED display. A circuit diagram was generated to connect the display and the ultrasonic sensor to the Arduino Mega microcontroller. An Arduino code was written for Arduino ide and it was connected through usb cable. After uploading the code to Arduino, the ultrasonic sensor was detecting the distance of an obstacle and showing the distance in cm as per written code. It was easy to implement and has many usefulness.