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----------PRACTICAL 04----------

Interface Ultrasonic Sensor with Arduino, LED and a buzzer.

Parts needed :

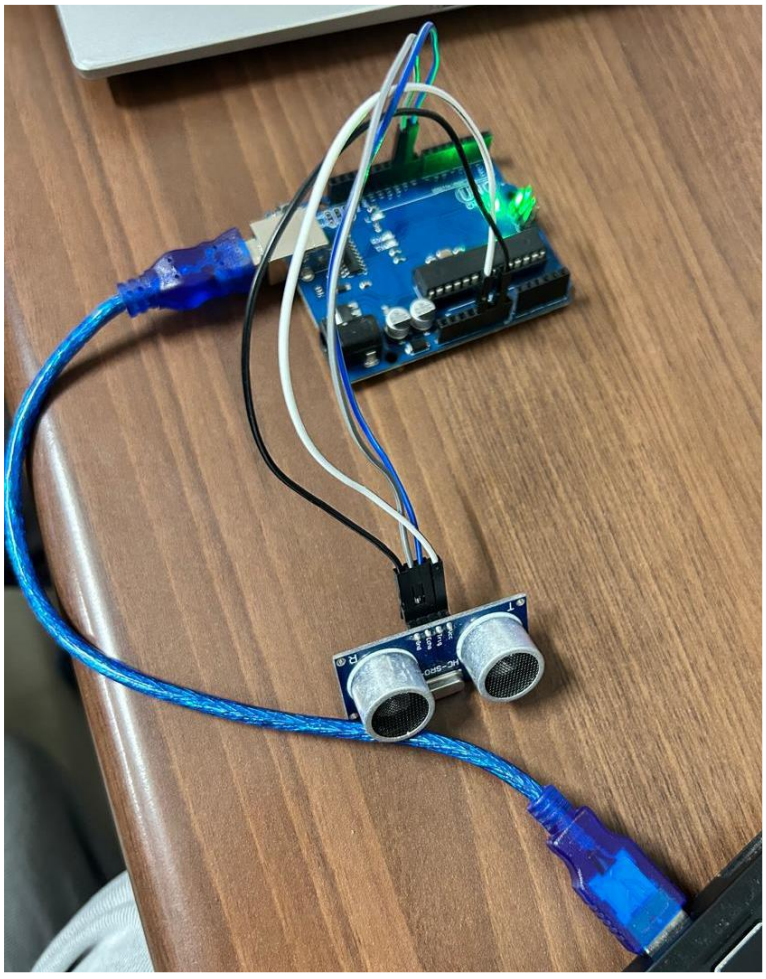
1) Arduino uno
2) led
3) Ultrasonic Sensor
4) Buzzer
5) Jumper wires

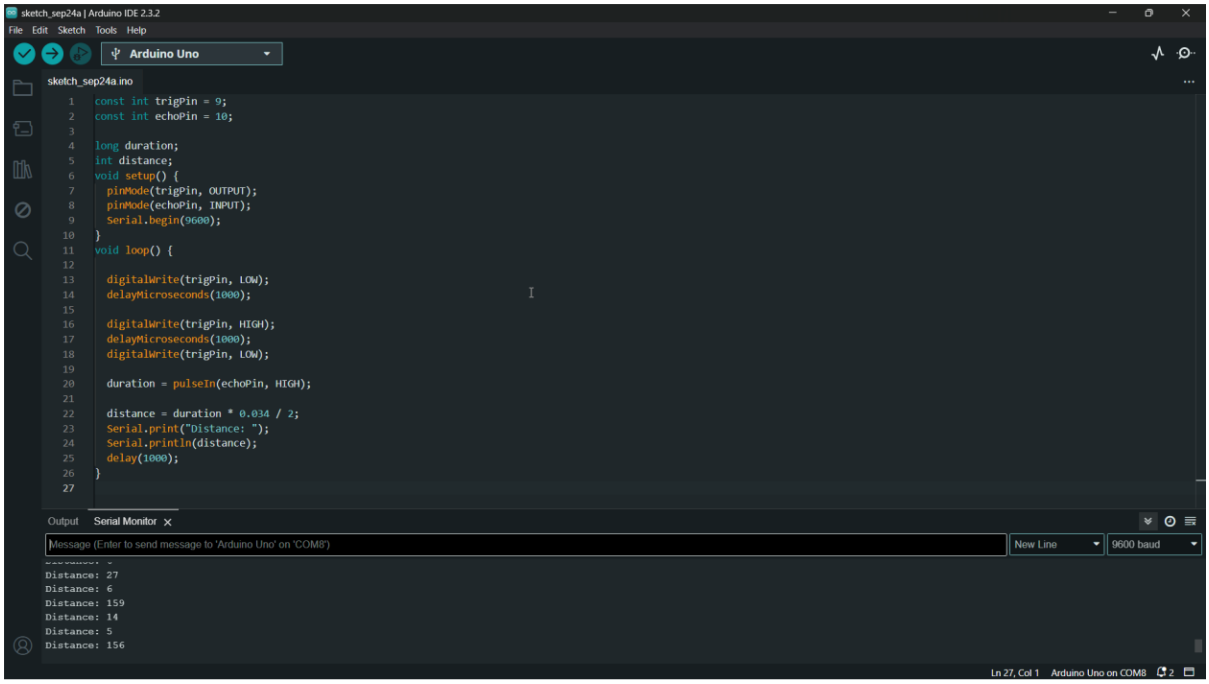
✓ Source Code :

```
const int trigPin = 9;      // Pin connected to the Trigger pin of the
ultrasonic sensor
const int echoPin = 10;     // Pin connected to the Echo pin of the
ultrasonic sensor

long duration;              // Variable to store the time it takes for
the pulse to return
int distance;               // Variable to store the calculated
distance

void setup() {
    pinMode(trigPin, OUTPUT);  // Set the Trigger pin as an output
    pinMode(echoPin, INPUT);   // Set the Echo pin as an input
    Serial.begin(9600);        // Initialize serial communication at
9600 baud
}
```

```
void loop() {
    // Send a 10µs pulse to trigger the ultrasonic sensor
    digitalWrite(trigPin, LOW);
    delayMicroseconds(1000);    // Delay to stabilize sensor
    digitalWrite(trigPin, HIGH);
    delayMicroseconds(1000);    // 10µs pulse
    digitalWrite(trigPin, LOW);

    // Read the pulse duration
    duration = pulseIn(echoPin, HIGH);

    // Calculate the distance in centimeters
    distance = duration * 0.034 / 2;

    // Print the distance to the Serial Monitor
    Serial.print("Distance: ");
    Serial.println(distance);

    // Wait 1 second before taking another measurement
    delay(1000);
}
```

✓ **Output :**



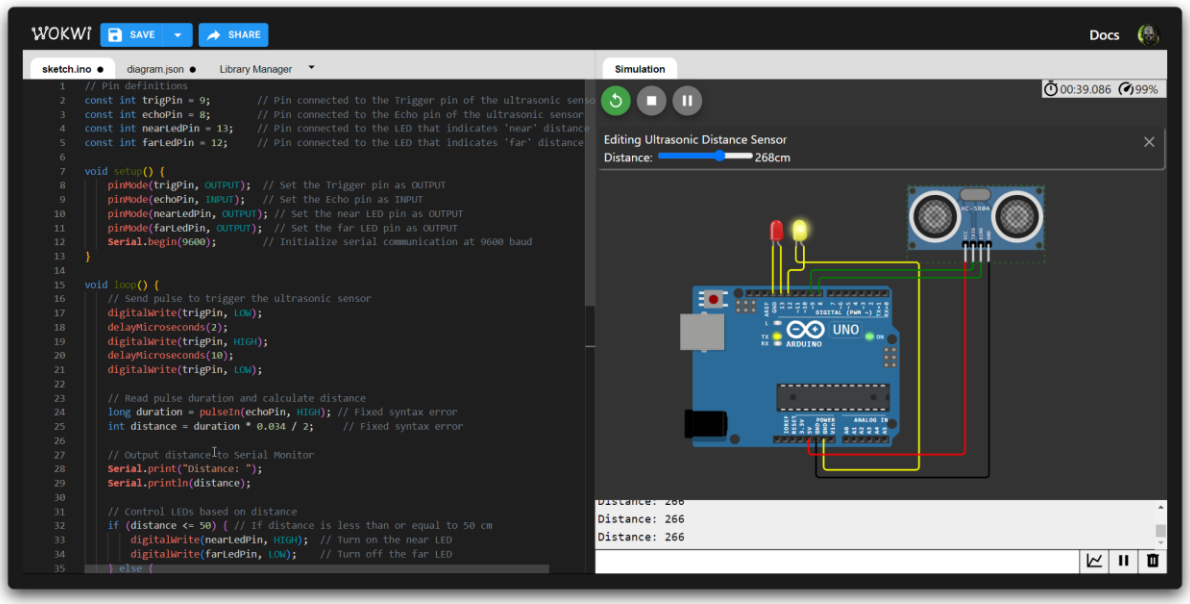


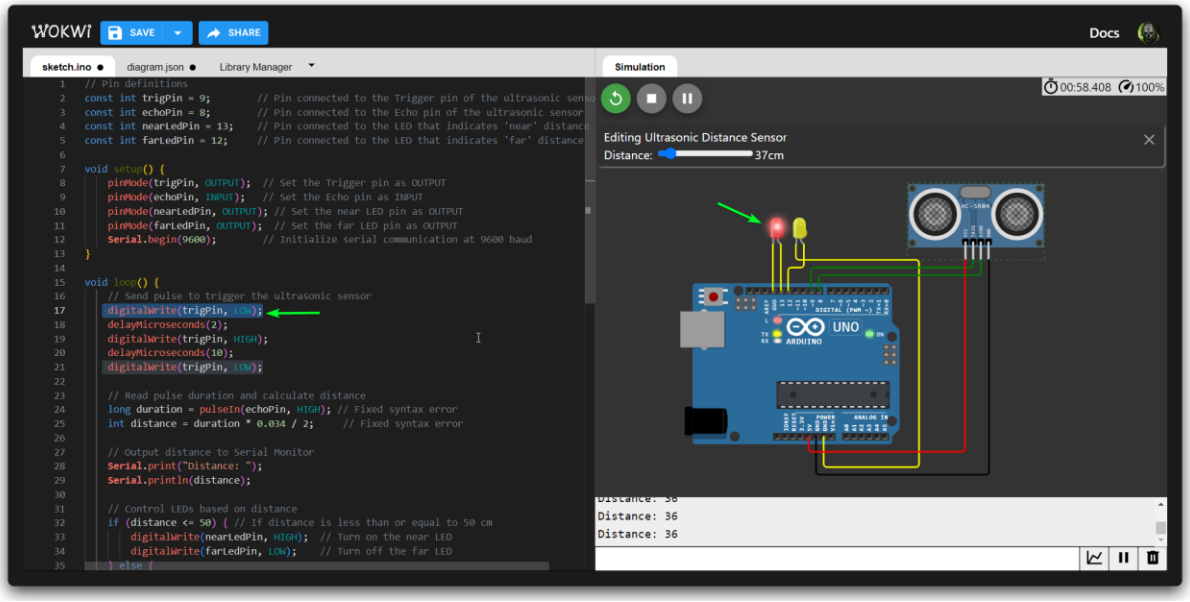
✓ Ultrasonic Sensor with Led :

```
// Pin definitions
const int trigPin = 9;        // Pin connected to the Trigger pin
of the ultrasonic sensor
const int echoPin = 8;        // Pin connected to the Echo pin of
the ultrasonic sensor
const int nearLedPin = 13;    // Pin connected to the LED that
indicates 'near' distance
const int farLedPin = 12;     // Pin connected to the LED that
indicates 'far' distance

void setup() {
    pinMode(trigPin, OUTPUT);  // Set the Trigger pin as OUTPUT
    pinMode(echoPin, INPUT);   // Set the Echo pin as INPUT
    pinMode(nearLedPin, OUTPUT); // Set the near LED pin as
OUTPUT
    pinMode(farLedPin, OUTPUT);  // Set the far LED pin as OUTPUT
    Serial.begin(9600);        // Initialize serial communication
at 9600 baud
}

void loop() {
    // Send pulse to trigger the ultrasonic sensor
    digitalWrite(trigPin, LOW);
    delayMicroseconds(2);
    digitalWrite(trigPin, HIGH);
    delayMicroseconds(10);
    digitalWrite(trigPin, LOW);
```

```
    // Read pulse duration and calculate distance
    long duration = pulseIn(echoPin, HIGH); // Fixed syntax error
    int distance = duration * 0.034 / 2;     // Fixed syntax
error

    // Output distance to Serial Monitor
    Serial.print("Distance: ");
    Serial.println(distance);

    // Control LEDs based on distance
    if (distance <= 50) { // If distance is less than or equal to
50 cm
        digitalWrite(nearLedPin, HIGH);  // Turn on the near LED
        digitalWrite(farLedPin, LOW);    // Turn off the far LED
    } else {
        digitalWrite(nearLedPin, LOW);   // Turn off the near LED
        digitalWrite(farLedPin, HIGH);   // Turn on the far LED
    }

    delay(100); // Wait 100 ms before the next measurement
}
```

✓ **Output :**



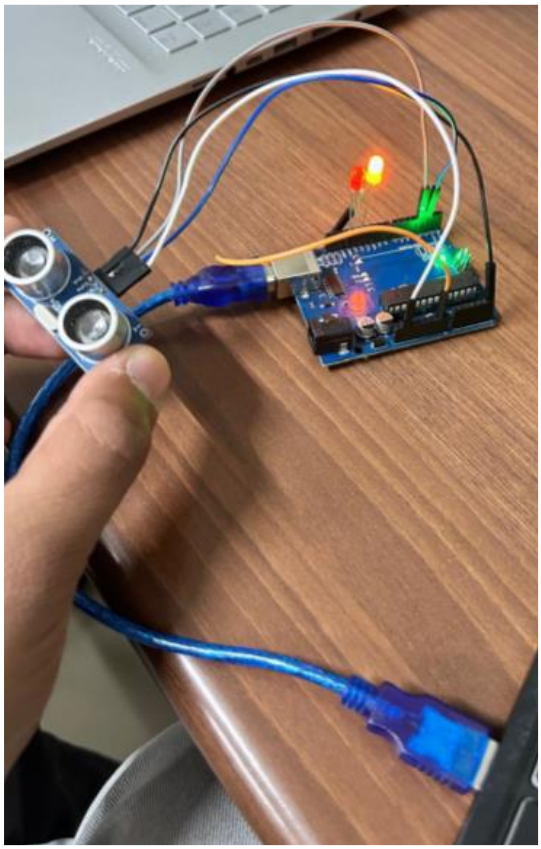


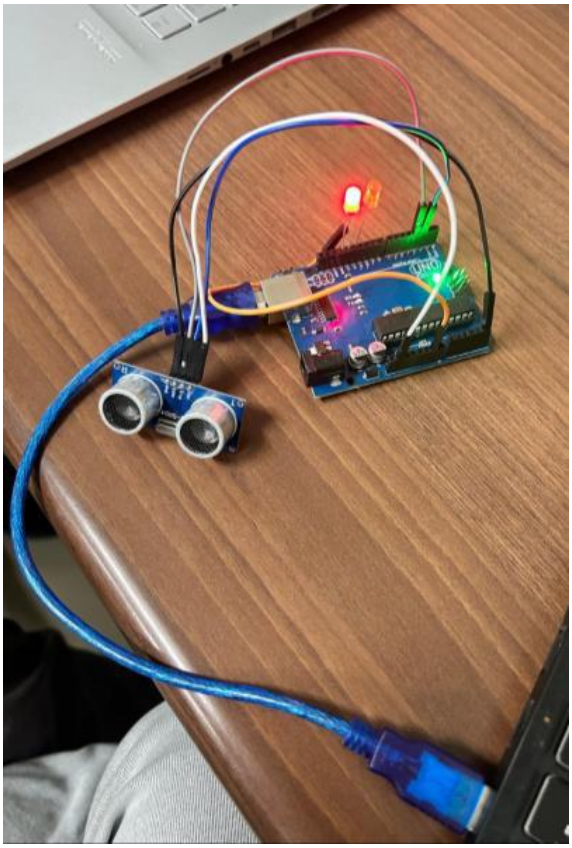
✓ Source Code :

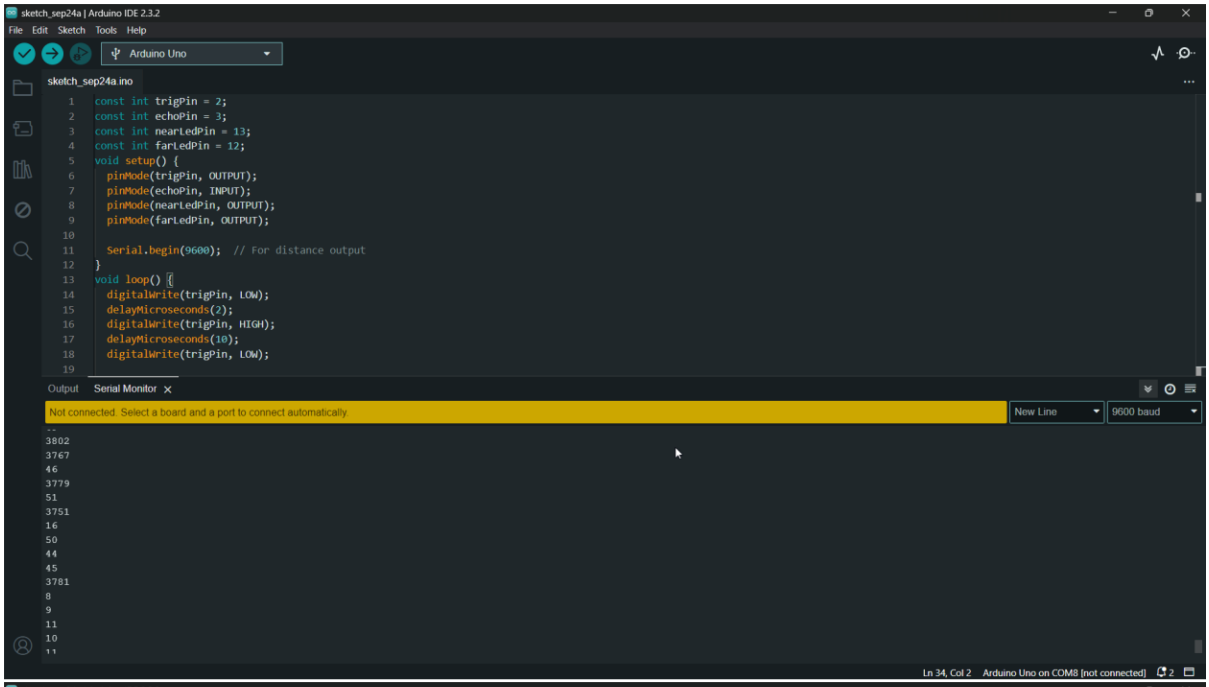
```
const int trigPin = 2;        // Pin connected to the Trigger pin of the ultrasonic
sensor
const int echoPin = 3;        // Pin connected to the Echo pin of the ultrasonic
sensor
const int nearLedPin = 13;    // Pin connected to the LED that indicates 'near'
distance
const int farLedPin = 12;     // Pin connected to the LED that indicates 'far'
distance

void setup() {
    pinMode(trigPin, OUTPUT);  // Set the Trigger pin as OUTPUT
    pinMode(echoPin, INPUT);   // Set the Echo pin as INPUT
    pinMode(nearLedPin, OUTPUT); // Set the near LED pin as OUTPUT
    pinMode(farLedPin, OUTPUT);  // Set the far LED pin as OUTPUT
    Serial.begin(9600);        // Initialize serial communication at 9600 baud
}

void loop() {
    // Trigger the ultrasonic sensor
    digitalWrite(trigPin, LOW);
    delayMicroseconds(2);
    digitalWrite(trigPin, HIGH);
    delayMicroseconds(10);      // Send a 10µs pulse
    digitalWrite(trigPin, LOW);

    // Read pulse duration and calculate distance
    long duration = pulseIn(echoPin, HIGH); // Read the pulse duration
    int distance = duration * 0.034 / 2;     // Calculate distance in cm
```

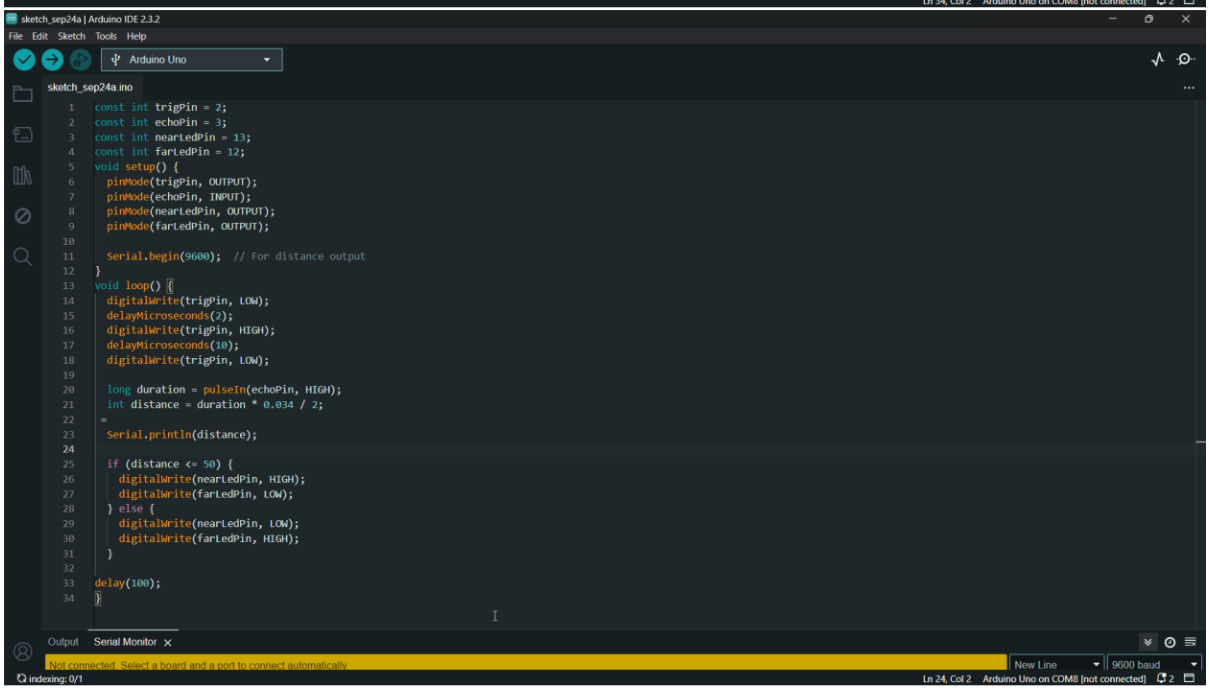
```
    // Output distance to Serial Monitor
    Serial.println(distance);

    // Control LEDs based on distance
    if (distance <= 50) {  // If distance is less than or equal to 50 cm
        digitalWrite(nearLedPin, HIGH);  // Turn on the near LED
        digitalWrite(farLedPin, LOW);    // Turn off the far LED
    } else {
        digitalWrite(nearLedPin, LOW);   // Turn off the near LED
        digitalWrite(farLedPin, HIGH);   // Turn on the far LED
    }

    delay(100); // Wait for 100 ms before the next measurement
}
```

✓ **Output :**









✓ Ultrasonic Sensor with buzzer :

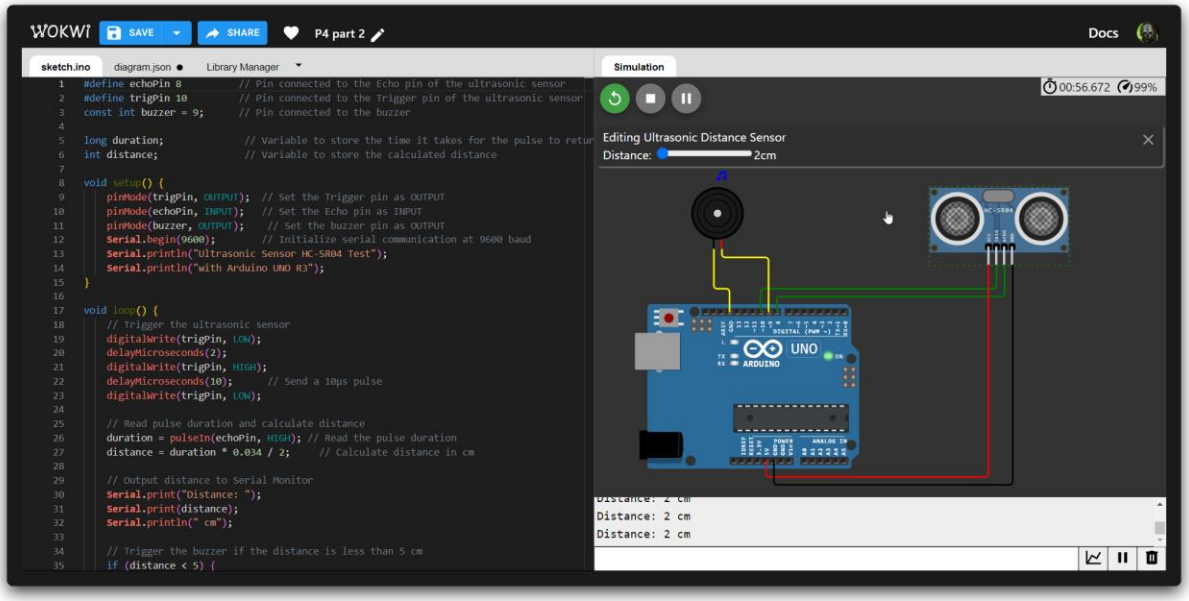
Source code :

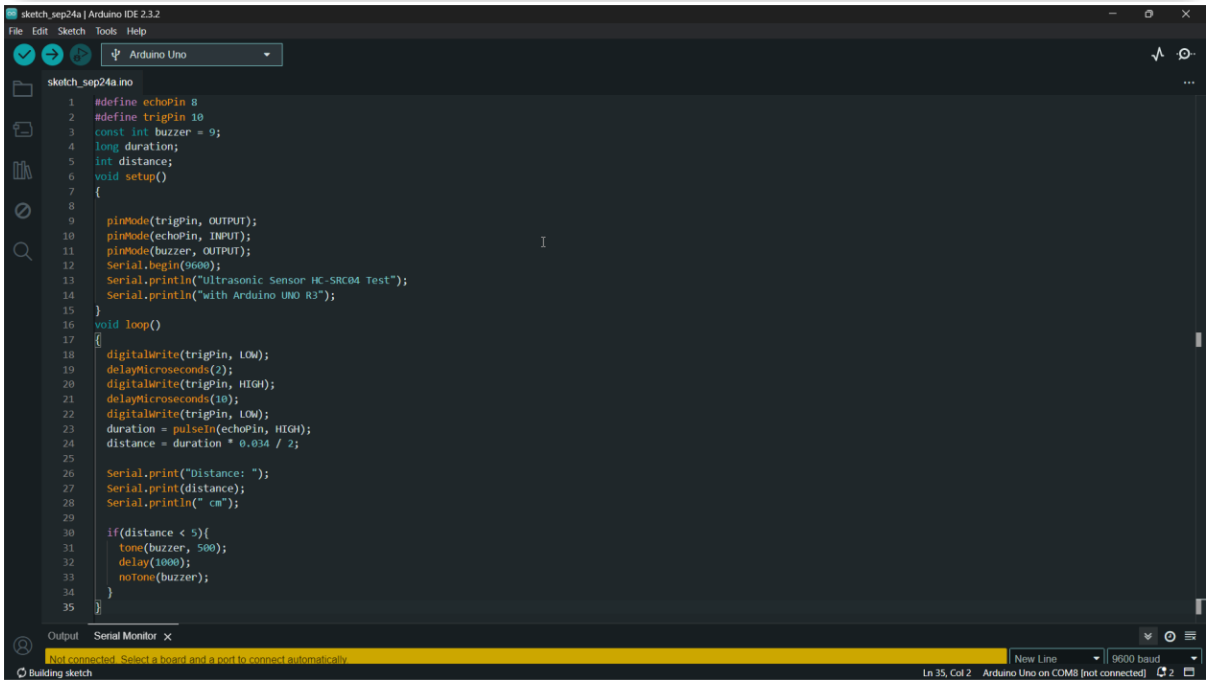
```
#define echoPin 8          // Pin connected to the Echo pin of
the ultrasonic sensor
#define trigPin 10         // Pin connected to the Trigger pin of
the ultrasonic sensor
const int buzzer = 9;      // Pin connected to the buzzer

long duration;              // Variable to store the time it
takes for the pulse to return
```

```
int distance;               // Variable to store the calculated
distance

void setup() {
    pinMode(trigPin, OUTPUT);  // Set the Trigger pin as OUTPUT
    pinMode(echoPin, INPUT);   // Set the Echo pin as INPUT
    pinMode(buzzer, OUTPUT);    // Set the buzzer pin as OUTPUT
    Serial.begin(9600);        // Initialize serial communication
at 9600 baud
    Serial.println("Ultrasonic Sensor HC-SR04 Test");
    Serial.println("with Arduino UNO R3");
}

void loop() {
    // Trigger the ultrasonic sensor
    digitalWrite(trigPin, LOW);
    delayMicroseconds(2);
    digitalWrite(trigPin, HIGH);
    delayMicroseconds(10);      // Send a 10µs pulse
    digitalWrite(trigPin, LOW);

    // Read pulse duration and calculate distance
    duration = pulseIn(echoPin, HIGH); // Read the pulse duration
    distance = duration * 0.034 / 2;     // Calculate distance in
cm

    // Output distance to Serial Monitor
    Serial.print("Distance: ");
    Serial.print(distance);
    Serial.println(" cm");

    // Trigger the buzzer if the distance is less than 5 cm
    if (distance < 5) {
        tone(buzzer, 500);     // Play a tone at 500 Hz
        delay(1000);           // Wait for 1 second
        noTone(buzzer);        // Stop the tone
    }

    delay(100); // Optional: add a small delay to prevent rapid
triggering
}
```

✓ **Output :**

At 2 cm we can see our buzzer sounds






```ino
#define echoPin 8
#define trigPin 10
const int buzzer = 9;
long duration;
int distance;
void setup()
{

  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(buzzer, OUTPUT);
  Serial.begin(9600);
  Serial.println("Ultrasonic Sensor HC-SRC04 Test");
  Serial.println("with Arduino UNO R3");
}
void loop()
{
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = duration * 0.034 / 2;

  Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println(" cm");

  if(distance < 5){
    tone(buzzer, 500);
    delay(1000);
    noTone(buzzer);
  }
}
```