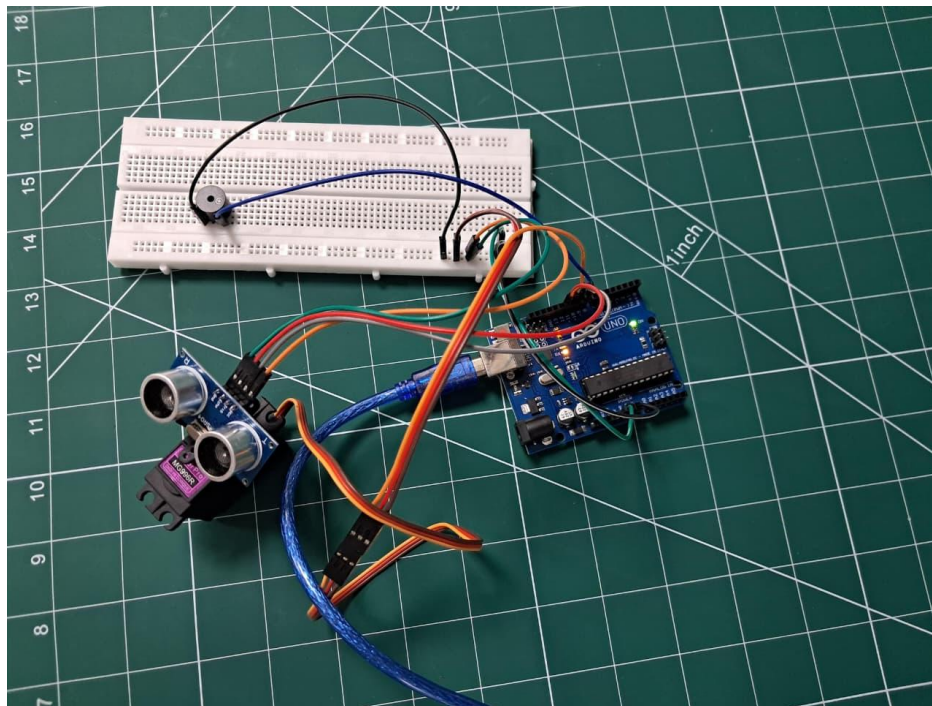


## Mini Radar System using Arduino Uno

- Overview

In this Project, we made a Radar system in Arduino Uno with the use of:

- Servo Motor
- Ultrasonic Sensors
- Active Buzzer



This is inspired by real radar technology and instead of using of radio waves, we are using ultrasonic waves.

In this system allows to scan the area through the ultrasonic sensors embedding upon the Servo motor which triggers the buzzer and lead it to activate whenever any object or obstacle comes into the range of 20 cm (or as much set up by the user.)

## 1. Servo Motor

Servo motor is an electrical motor that allows the precise control of angular positions, velocity and acceleration in a system.

It has three pins: Vcc, GND, and signal/output.

Vcc and Gnd are connected to the board's 5V and GND GPIO pins using jumper wires and a breadboard. The motor is powered through Arduino 5V and Gnd pins, and its output is connected with the digital Pin 9(PB1) of the Board.

## 2. Ultrasonic sensor

An ultrasonic sensor is a device that creates high frequency sound waves and uses it to detect any object within a certain distance (ranges 220 cm – 400 cm).

It has 4 pins: Vcc, Trig (Trigger), Echo and GND

It emits an ultrasonic sound wave via a Transmitter (which is too high pitched for a human to hear), and detects the former reflected sound waves by an object through a Receiver. The Trig pin is high when the sound pulses are generated and when the receiver receives a signal the Echo pin will turn high and gives an output.

## 3. Buzzer

The Buzzer we are using in the project is an Active Buzzer. An active buzzer consists of a built-in oscillator circuit to generate a continuous sound wave at a certain frequency. Since it is an active buzzer, it can produce sound with a DC power supply. The positive terminal of the buzzer is connected with the digital pin 8(PB0) of the Arduino board, and the negative terminal is connected to the GND.

### • How the project Works?

Firstly, the servo rotates progressively from 0° to 180° then back again the ultrasonic sensor changes direction each time it moves. The ultrasonic sensor emanates a pulse via transmitter and waits for its reflection at every angle and the time it takes for the echo to return is used to calculate the distance via the receiver.

The 5V and GND terminals are connected with the breadboard and the servo, ultrasonic Vcc pins are connected with it respectively. And the signal output pin of the servo is connected with the digital pin 9(PB1) of the Arduino board which is also a PWM pin giving it a delay of 5 secs. Similarly, the Trig and Echo pins are connected with PB2 and PB3 respectively and

the positive terminal of the Buzzer is connected with PB0 (pin 8). So, whenever any object that comes within the range of 20 cm the reflected sound waves are detected by receiver and it triggers the buzzer to produce a beep sound, i.e., if the distance is less than 20cm, then the Arduino will turn the buzzer on. Otherwise, it remains OFF. As for the output, the Arduino sends the angle data and distance values to the serial monitor, so the user can see in real time the scan of the radar.

- Source Code

```
#include <Servo.h>

#define trigPin 10
#define echoPin 11
#define buzzer 8

Servo servoMotor;

long duration;
int distance;

void setup() {
  Serial.begin(9600);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(buzzer, OUTPUT);
  servoMotor.attach(9);
}

void loop() {
```

```
// Sweep from 0 to 180 degrees
for (int angle = 0; angle <= 180; angle++){
    servoMotor.write(angle);
    delay(5);
    distance = getDistance();

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

    if (distance > 0 && distance <= 20) { // Object within 20 cm
        digitalWrite(buzzer, HIGH);
    } else {
        digitalWrite(buzzer, LOW);
    }
}

// Sweep back from 180 to 0 degrees
for (int angle = 180; angle >= 0; angle--){
    servoMotor.write(angle);
    delay(5);

    distance = getDistance();

    Serial.print("Angle: ");
    Serial.print(angle);
```

```

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

if (distance > 0 && distance <= 20) {
    digitalWrite(buzzer, HIGH);
} else {
    digitalWrite(buzzer, LOW);
}
}

// Function to get distance from Ultrasonic Sensor
int getDistance() {
    digitalWrite(trigPin, LOW);
    delayMicroseconds(2);
    digitalWrite(trigPin, HIGH);
    delayMicroseconds(10);
    digitalWrite(trigPin, LOW);

    duration = pulseIn(echoPin, HIGH);
    int dist = duration * 0.034 / 2;
    return dist;
}

```

- **Conclusion:**

This project illustrates how an Arduino Uno, ultrasonic sensor, and servo motor can work together to create a mini radar system. It demonstrates distance measurement and scanning, and includes a buzzer for feedback.

