

PROJECT 10

RADAR SYSTEM MINI PROJECT TO UNDERSTAND HOW IT IS
IMPORTANT IN DEFENCE SECTOR.

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Radar System Overview:

A **radar system** works by emitting radio waves, detecting reflected signals (echoes), and calculating the **distance**, **angle**, and sometimes the speed of the target. In the defense sector, radar is crucial for:

1. **Surveillance:** Detecting enemy aircraft, missiles, ships, and vehicles.
2. **Target Tracking:** Continuous monitoring of moving threats.
3. **Navigation:** Assisting fighter jets, submarines, and drones in navigation.
4. **Missile Defense:** Detecting incoming projectiles and guiding anti-missile systems.

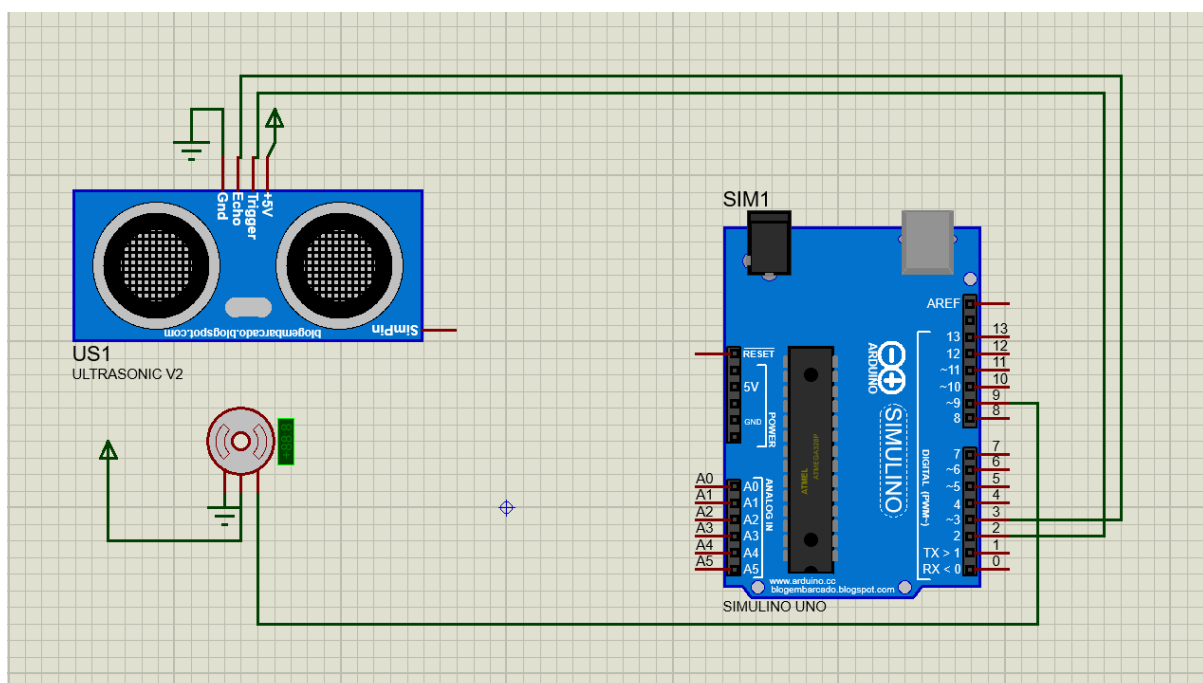
Objective:

- Detect objects within a specified range.
- Measure **distance** and **angle** of the objects.
- Visualize the radar scan in real-time using a PC.

Components Required:

- Arduino UNO R3
- Servo motor
- Ultrasonic sensor (HC-SR04)

Schematic Diagram:



Program:

```
1  #include <Servo.h>
2
3  Servo myServo;           // Servo motor object
4  const int trigPin = 2;   // Trigger pin of HC-SR04
5  const int echoPin = 3;   // Echo pin of HC-SR04
6  int servoAngle = 0;      // Angle of servo motor
7
8  void setup() {
9      Serial.begin(9600);   // Initialize Serial Monitor
10     myServo.attach(9);     // Attach servo to pin 9
11     pinMode(trigPin, OUTPUT);
12     pinMode(echoPin, INPUT);
13 }
14
15 void loop() {
16     for (servoAngle = 0; servoAngle <= 180; servoAngle += 2) {
17         myServo.write(servoAngle); // Rotate servo to angle
18         delay(30);                 // Allow servo to move
19         float distance = measureDistance();
20         Serial.print("Angle: ");
21         Serial.print(servoAngle);
22         Serial.print(" Distance: ");
23         Serial.println(distance);
24     }
25
26     for (servoAngle = 180; servoAngle >= 0; servoAngle -= 2) {
27         myServo.write(servoAngle); // Rotate servo back
28         delay(30);                 // Allow servo to move
29         float distance = measureDistance();
30         Serial.print("Angle: ");
31         Serial.print(servoAngle);
32         Serial.print(" Distance: ");
33         Serial.println(distance);
```

```
34     }
35 }
36
37 // Measure distance using HC-SR04
38 float measureDistance() {
39     digitalWrite(trigPin, LOW);
40     delayMicroseconds(2);
41     digitalWrite(trigPin, HIGH);
42     delayMicroseconds(10);
43     digitalWrite(trigPin, LOW);
44     long duration = pulseIn(echoPin, HIGH);
45     float distance = (duration * 0.034) / 2; // Convert to cm
46     return distance;
47 }
48
```

Working of the System:

1. The **servo motor** rotates from 0° to 180°, and the ultrasonic sensor measures the distance at each angle.
2. Data (angle and distance) is sent to the PC through **Serial Communication**.
3. The **Processing sketch** visualizes the data as a radar graph with lines showing the detected objects' positions.
- 4.

Defence Applications:

1. **Surveillance:**
 - Monitor surrounding areas for intrusions or enemy vehicles.
 2. **Object Detection:**
 - Detect drones, ships, aircraft, or objects in a battlefield.
 3. **Target Tracking:**
 - Continuously monitor the movement of detected threats.
 4. **Guidance Systems:**
 - Radar data can guide missile systems to intercept enemy targets.
 5. **Naval and Aerial defence:**
 - Radar systems on ships or fighter jets monitor vast regions to secure national boundaries.
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