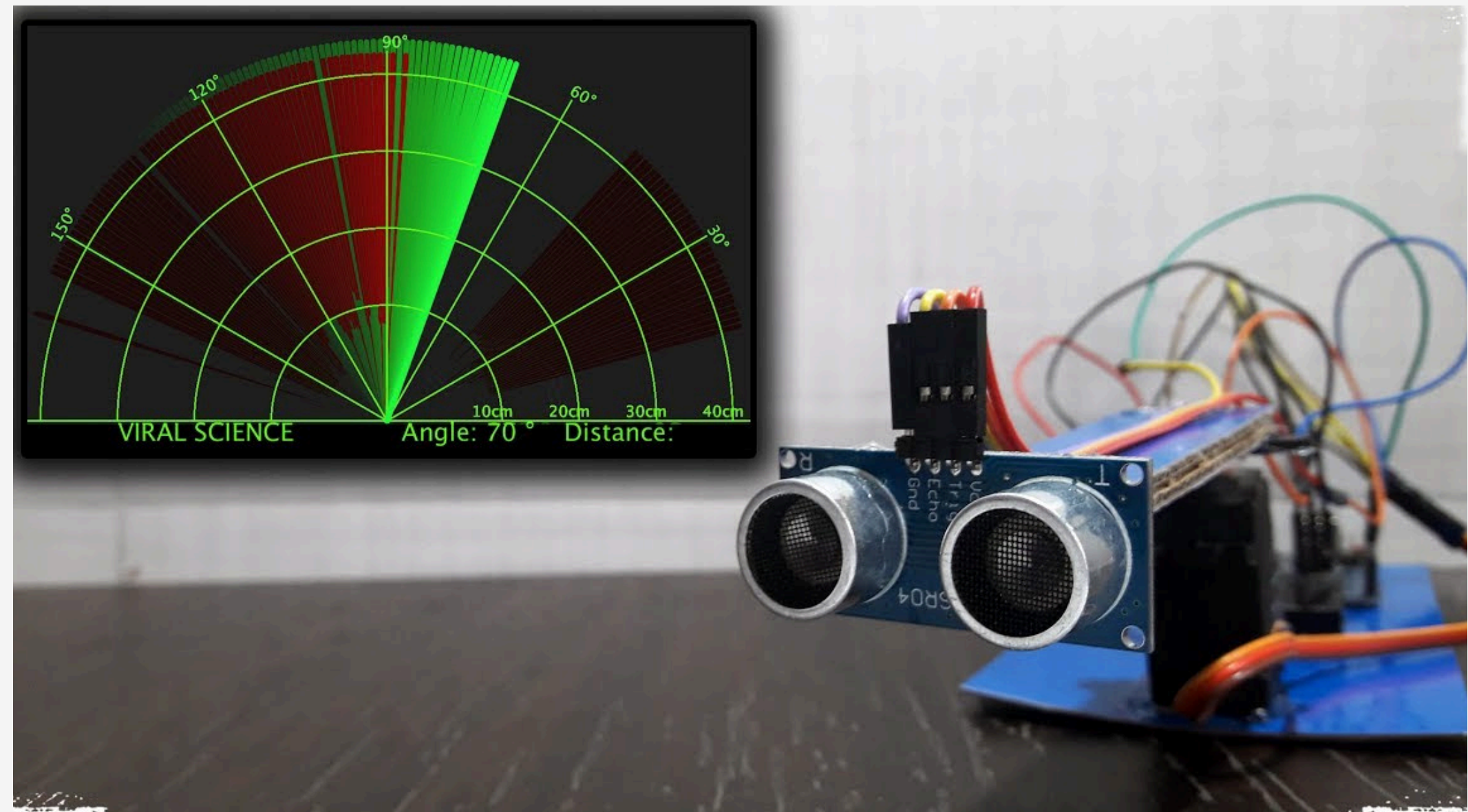
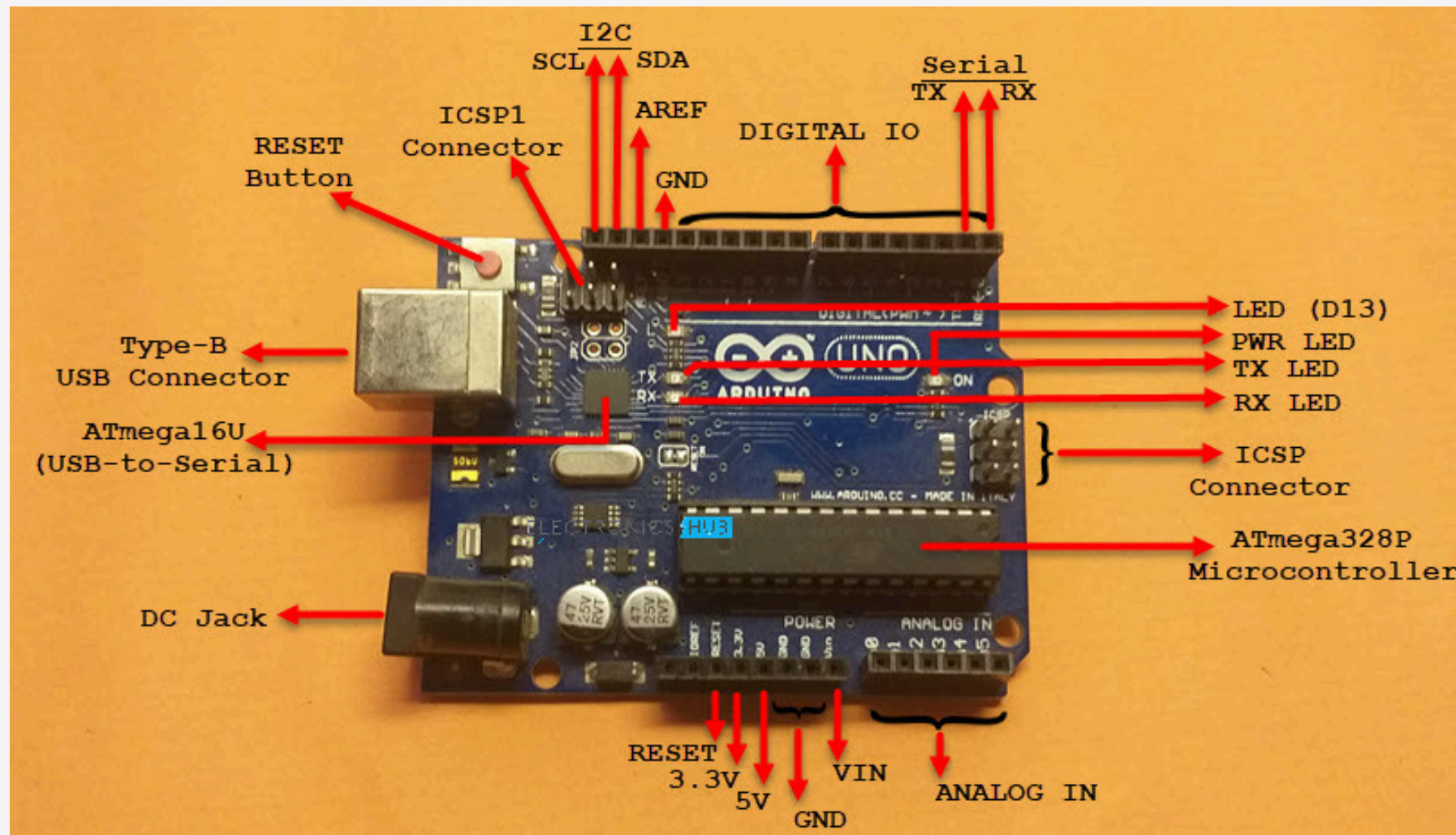


Arduino Ultrasonic Radar System: Exploring the Basics and Advanced Applications

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ICE



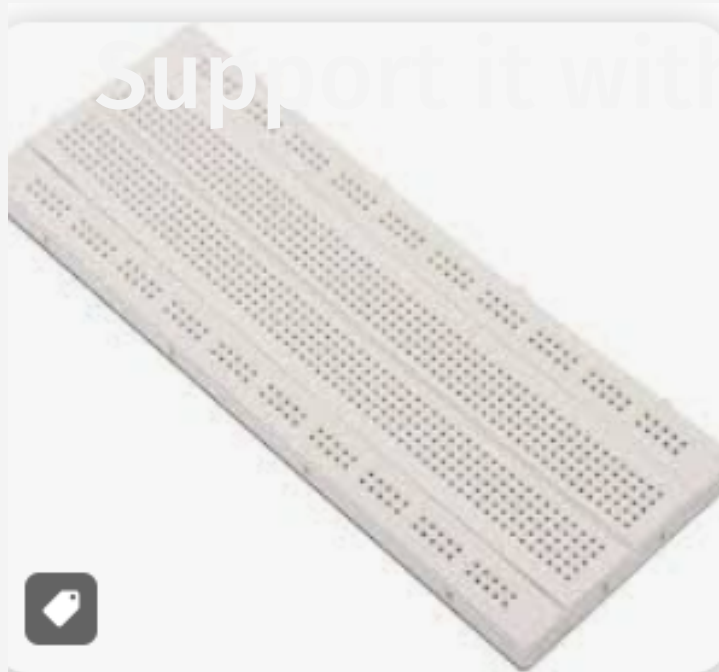
Arduino UNO



- Arduino is an open-source electronics platform based on easy-to-use hardware and software.
- It consists of a microcontroller that can be programmed to sense and control the physical world.
- Arduino boards are designed for beginners and professionals interested in creating interactive projects.
- It has a strong community and extensive online resources
- Arduino is used in a wide range of applications, from simple LED blinking to complex robotics and automation projects.

Layout of Arduino UNO Board

Components



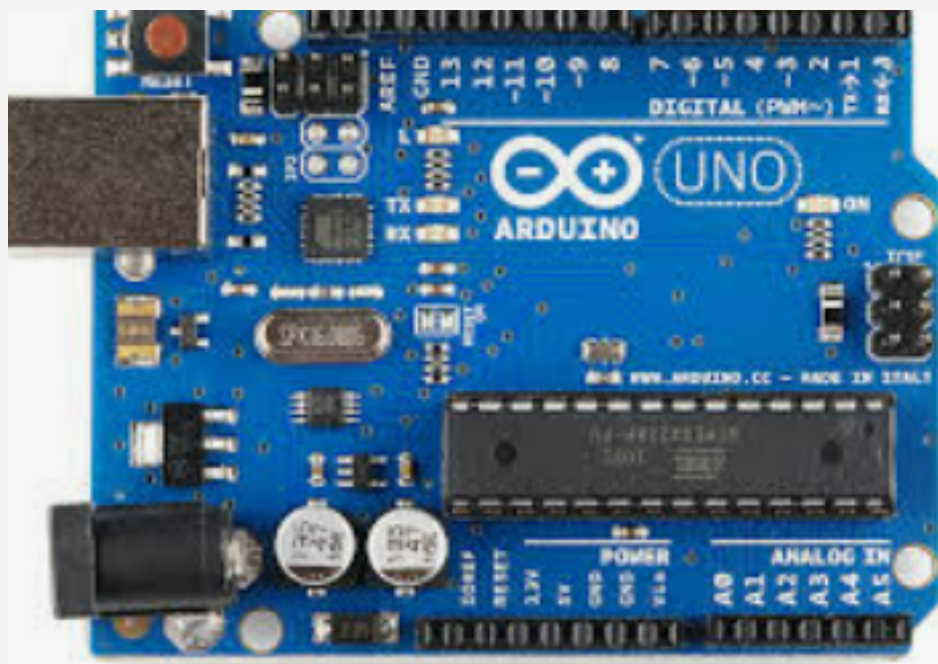
Breadboard



**Connecting
wires**



Servo Motor



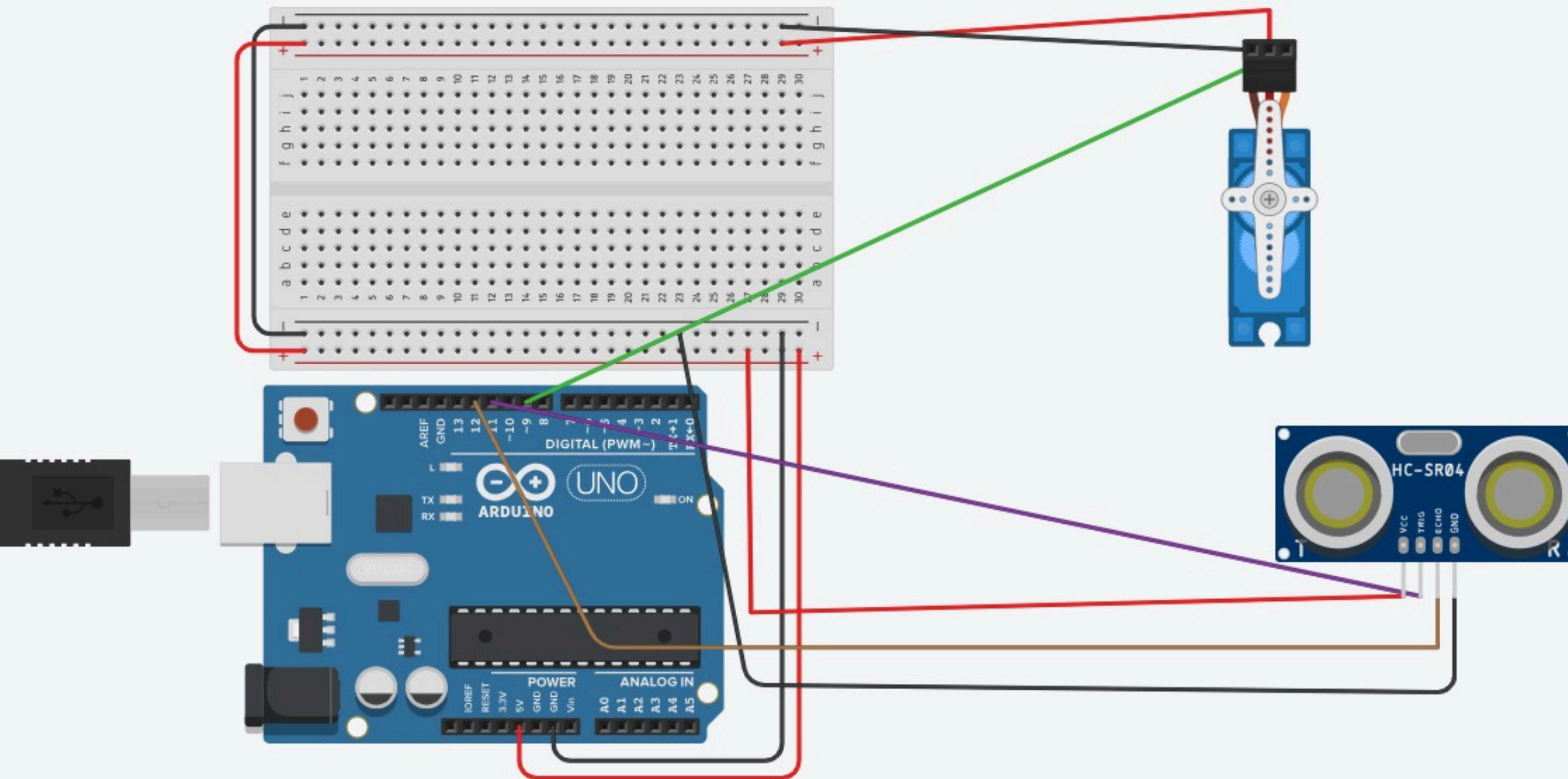
Arduino UNO



Ultrasonic Sensor

**Estimated cost of the
project=RS 4800/-**

Circuit Diagram



Connections

- Trigger of the ultrasonic sensor is connected to the pins =**11**
- The echo of the ultra sonic sensor is connected to the pins =**12**
- The signal input of the servo of the ultrasonic sensor is connected to the pins=**9**

Arduino Programming

```
#include<Servo.h>

// set ouptut pins
const int TriggerPin = 11;
const int EchoPin = 12;
const int motorSignalPin = 9;

// starting loaction
const int startAngle = 90;

// rotation limits
const int minimumAngle = 6;
const int maximumAngle = 175;

// speed
const int degreesPerCycle = 1;

// Library class instance
Servo motor;

void setup(void)
{
    pinMode(TriggerPin, OUTPUT);
    pinMode(EchoPin, INPUT);
    motor.attach(motorSignalPin);
    Serial.begin(9600);
}
```

```
void loop(void)
{
    static int currentAngle = startAngle;
    static int motorRotateAmount =
        degreesPerCycle;

    // move motor
    motor.write(currentAngle);
    delay(10);

    // calculate the distance from the sensor,
    and write the valu with locqtion to serial
    SerialOutput(currentAngle,
        CalculateDistance());

    // update motor location
    currentAngle += motorRotateAmount;

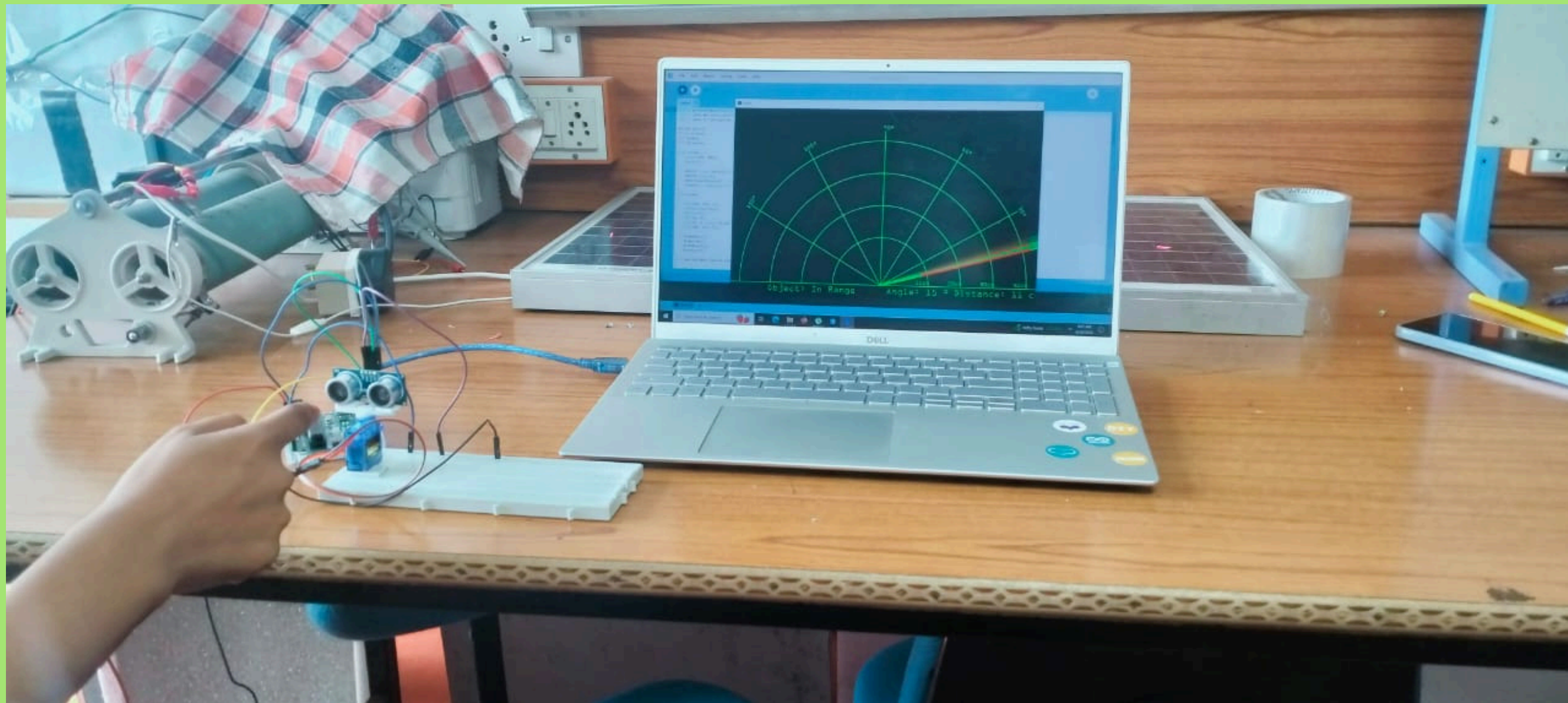
    // if the motor has reached the limits,
    change direction
    if(currentAngle <= minimumAngle ||
        currentAngle >= maximumAngle)
    {
        motorRotateAmount = -
            motorRotateAmount;
    }
}
```

```
int CalculateDistance(void)
{
    // trigger the ultrasonc senosr and
    record the time taken reflect
    digitalWrite(TriggerPin, HIGH);
    delayMicroseconds(10);
    digitalWrite(TriggerPin, LOW);
    long duration = pulseIn(EchoPin,
        HIGH);

    // convert this duration to a distance
    float distance = duration * 0.017F;
    return int(distance);
}

void SerialOutput(const int angle,
    const int distance)
{
    // convert the angle and distance to a
    string and serial print
    Serial.println(String(angle) + "," +
        String(distance));
}
```


The image of real project



FUNCTIONALITY AND OPERATION

- How the ultrasonic radar system operates

The ultrasonic radar system operates by emitting ultrasonic waves from a sensor and measuring the time it takes for the waves to bounce back after hitting an object. The system uses this information to calculate the distance to the object.

- How the servo motor rotates the sensor for scanning

The servo motor rotates the sensor for scanning by receiving control signals from the Arduino board. These signals instruct the servo motor on the desired angle of rotation. As the servo motor moves, it physically rotates the sensor, allowing it to sweep across the detection area.

- Illustration of how distance measurements are obtained and interpreted

Distance measurements are obtained by sending ultrasonic waves from the sensor and measuring the time it takes for them to bounce back after hitting an object. This time-of-flight information is converted into distance using a predefined algorithm.

Applications



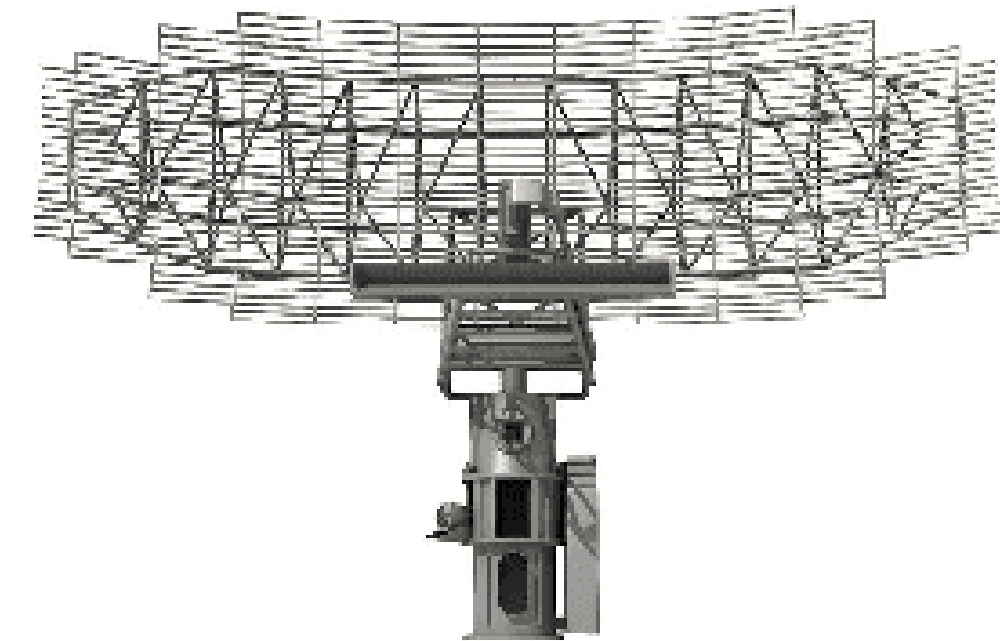
Integration with IoT

The potential integration of the radar system with IoT platforms for remote monitoring, data analytics, and cloud-based applications.



Educational Outreach

The educational significance of Arduino ultrasonic radar in fostering interest in STEM fields, promoting hands-on learning etc.



Radar

Customization Options

This system offers customization options for adjusting detection range, sensitivity, and data processing parameters.