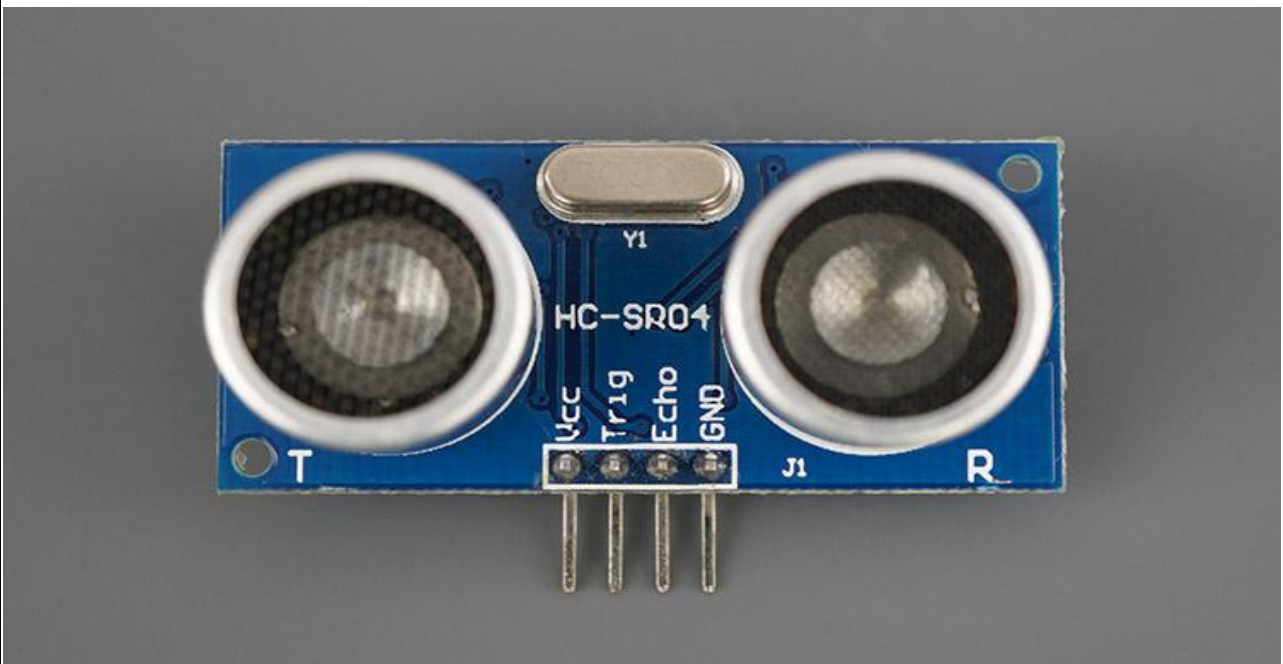


Practical -4

Objective: Write a Program to display of Real-Time sensor data of ultra-sonic sensors with ARDUINO.

Introduction: The HC-SR04 ultrasonic sensor uses sonar to determine the distance to an object. This sensor reads from 2cm to 400cm (0.8inch to 157inch) with an accuracy of 0.3cm (0.1inches), which is good for most hobbyist projects. In addition, this particular module comes with ultrasonic transmitter and receiver modules.

The following picture shows the HC-SR04 ultrasonic sensor.



HC-SR04 Ultrasonic Sensor Technical Data:

The following table shows the key features and specs of the HC-SR04 ultrasonic sensor. For more information, you should consult the sensor's datasheet.

Power Supply	5V DC
Working Current	15 mA
Working Frequency	40 kHz
Maximum Range	4 meters
Minimum Range	2 cm
Measuring Angle	15°
Resolution	0.3 cm
Trigger Input Signal	10uS TTL pulse
Echo Output Signal	TTL pulse proportional to the distance range
Dimensions	45mm x 20mm x 15mm

HC-SR04 Ultrasonic Sensor Pinout:

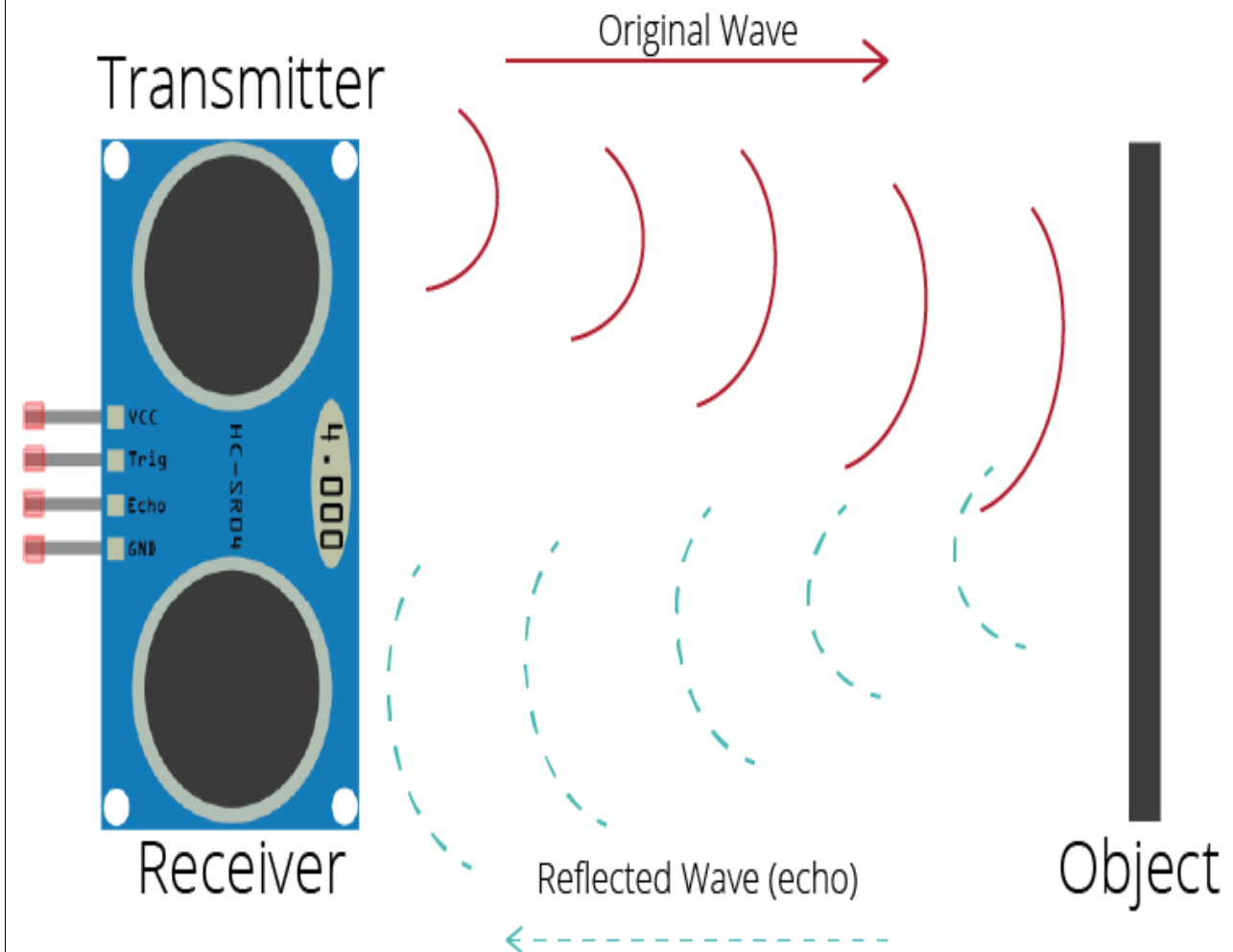
Here's the pinout of the HC-SR04 Ultrasonic Sensor.

VCC	Powers the sensor (5V)
Trig	Trigger Input Pin
Echo	Echo Output Pin
GND	Common GND

HC-SR04 Ultrasonic Sensor Work?

The ultrasonic sensor uses sonar to determine the distance to an object. Here's how it works:

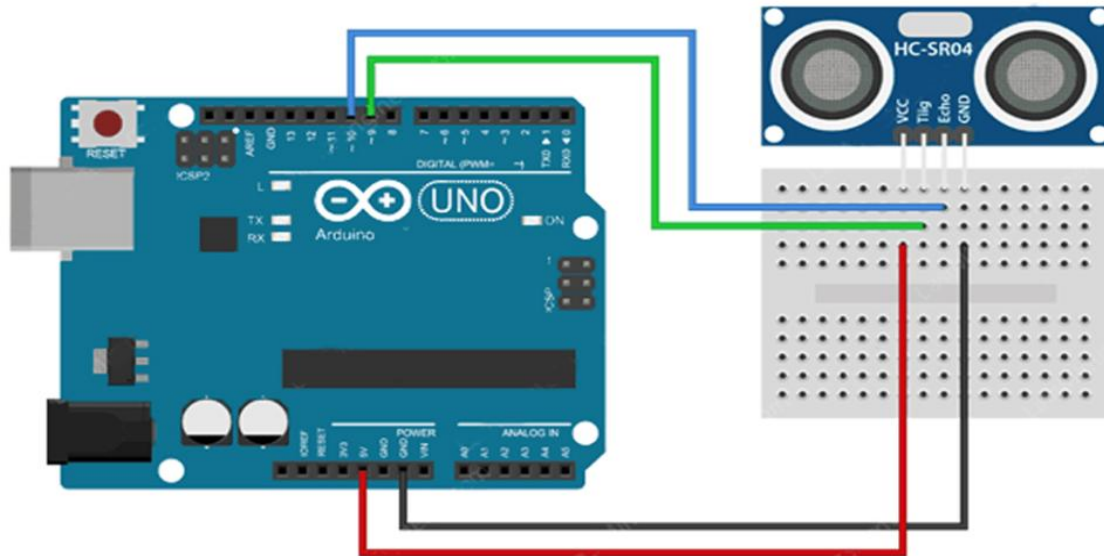
1. The ultrasound transmitter (trig pin) emits a high-frequency sound (40 kHz).
2. The sound travels through the air. If it finds an object, it bounces back to the module.
3. The ultrasound receiver (echo pin) receives the reflected sound (echo).



Taking into account the sound's velocity in the air and the travel time (time passed since the transmission and reception of the signal) we can calculate the distance to an object. Here's the formula:

distance to an object = ((speed of sound in the air)*time)/2
speed of sound in the air at 20°C (68°F) = 343m/s

Connection Diagram:



HC-SR04 Ultrasonic Sensor Arduino Circuit

Features:

- Here's a list of some of the HC-SR04 ultrasonic sensor features and specs—for more information, you should consult the sensor's datasheet:
- **Power Supply:** +5V DC
- **Quiescent Current:** <2mA
- **Working Current:** 15mA
- **Effectual Angle:** <15°
- **Ranging Distance:** 2cm – 400 cm/1" – 13ft
- **Resolution:** 0.3 cm
- **Measuring Angle:** 30 degree
- **Trigger Input Pulse width:** 10uS TTL pulse
- **Echo Output Signal:** TTL pulse proportional to the distance range
- **Dimension:** 45mm x 20mm x 15mm

Connection Program:

```
int trigPin = 9; // Transfer to data
int echoPin = 10; // receive to data

void setup() {
  Serial.begin(9600); // Port Rate
  pinMode(trigPin, OUTPUT); //trig-ring for to transfer to device
  pinMode(echoPin, INPUT); //echo receiving to voice
}

void loop() {
  long distance, duration;
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(1000);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = (duration/2)/29.1;
  Serial.print(distance);
  Serial.println("CM");
  delay(500);
}
```

Program Output:

