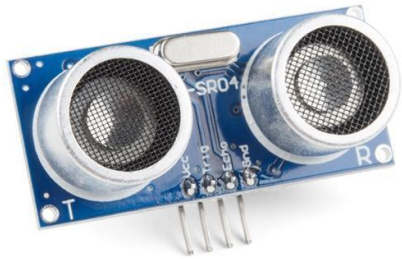
LAB - 11

Interface Ultrasonic Sensor (HC SR04 Module) with Node



Ultrasonic Sensor (HC SR04 Module) module Overview

HC-SR04 Module is an Ultrasonic Distance Sensor that can report the range of objects up to 13 feet away.

At its core, the HC-SR04 Ultrasonic distance sensor consists of two ultrasonic transducers. The one acts as a transmitter which converts electrical signals into 40 KHz ultrasonic sound pulses. The receiver listens for the transmitted pulses. If it receives them it produces an output pulse whose width can be used to determine the distance the pulse travelled.

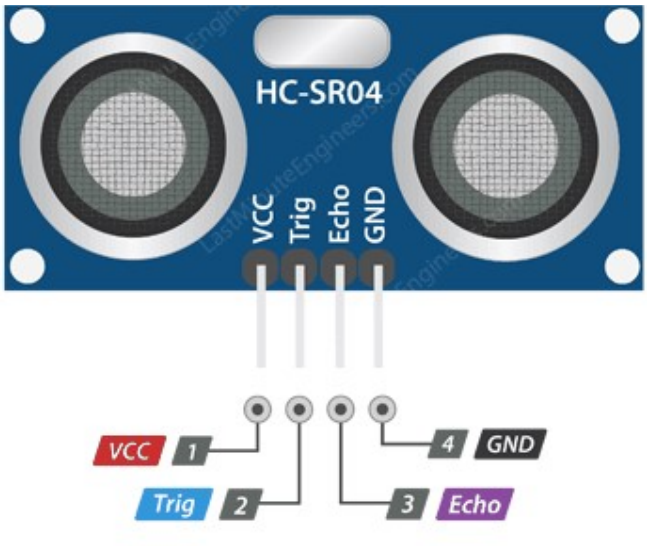
The sensor is small, easy to use in any robotics project and offers excellent non-contact range detection between 2 cm to 400 cm (that's about an inch to 13 feet) with an accuracy of 3mm. Since it operates on 5 volts, it can be hooked directly to an Arduino or any other 5V logic microcontrollers.

Here are complete specifications:

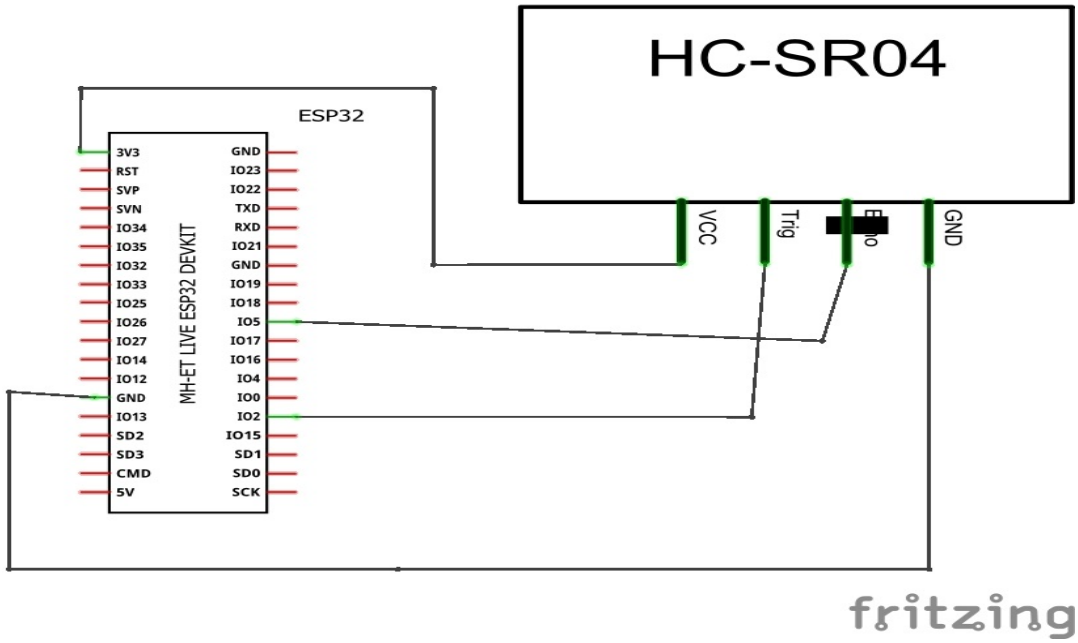
Operating Voltage	DC 5V
Operating Current	15mA
Operating Frequency	40KHz
Max Range	4m

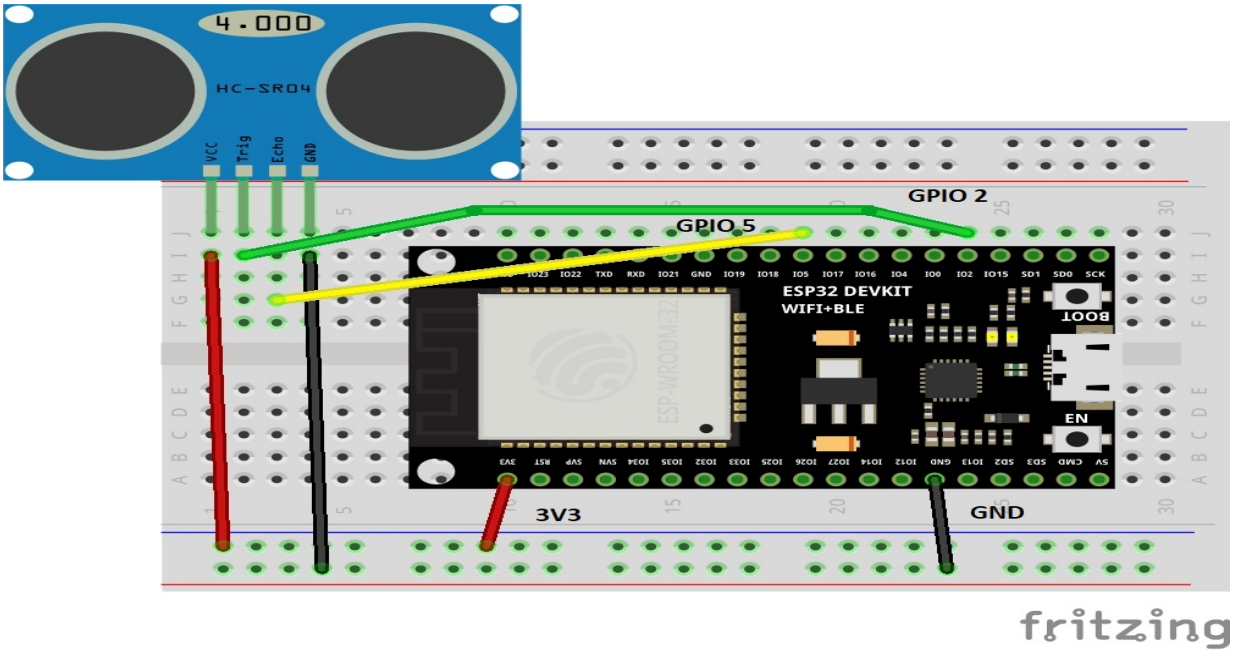
Min Range	2cm
Ranging Accuracy	3mm
Measuring Angle	15 degree
Trigger Input Signal	10µS TTL pulse
Dimension	45 x 20 x 15mm

HC-SR04 Ultrasonic Sensor Pinout



VCC is the power supply for HC-SR04 Ultrasonic distance sensor which we connect the 5V pin on the Arduino.
Trig (Trigger) pin is used to trigger the ultrasonic sound pulses.
Echo pin produces a pulse when the reflected signal is received. The length of the pulse is proportional to the time it took for the transmitted signal to be detected.
GND should be connected to the ground of Arduino.





1. Connect the VCC pin of HC-SR04 to 3.3V on the arduino
2. Connect the GND pin of HC-SR04 to ground on the arduino
3. Connect the Trig pin of HC-SR04 to D2 on the arduino
4. Connect the Echo pin of HC-SR04 to D5 on the arduino

Algorithm:

1. Define GPIO2 as trig pin and GPIO5 as echo pin.
2. In setup define echo pin as INPUT pin and trig pin as OUTPUT pin.
3. Begin Serial communication with a certain baudrate.
4. In loop, Clear the trig pin by passing high value and low value with small delays.
5. From the duration time recorded by the echo pin of the Ultrasonic sensor, calculate the distance of the object by given formula.
6. Print the result that is the distance of the object detected in the serial monitor.

Code:

```
// defines pins numbers
constinttrigPin= 2;
constintechoPin= 5;

// defines variables
float duration;
float distance;

voidsetup(){
pinMode(trigPin,OUTPUT); // Sets the trigPin as an Output
pinMode(echoPin,INPUT); // Sets the echoPin as an Input
Serial.begin(9600); // Starts the serial communication
}

voidloop(){
// Clears the trigPin
digitalWrite(trigPin,LOW);
delayMicroseconds(2);

// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(trigPin,HIGH);
delayMicroseconds(10);
digitalWrite(trigPin,LOW);
```

```
// Reads the echoPin, returns the sound wave travel time in microseconds
duration=pulseIn(echoPin,HIGH);

// Calculating the distance
distance= duration*0.034/2;

// Prints the distance on the Serial Monitor
Serial.print("Distance: ");
Serial.println(distance);
delay(5000);

}
```

Result:

Thus the interfacing with Ultrasonic sensor is done successfully.