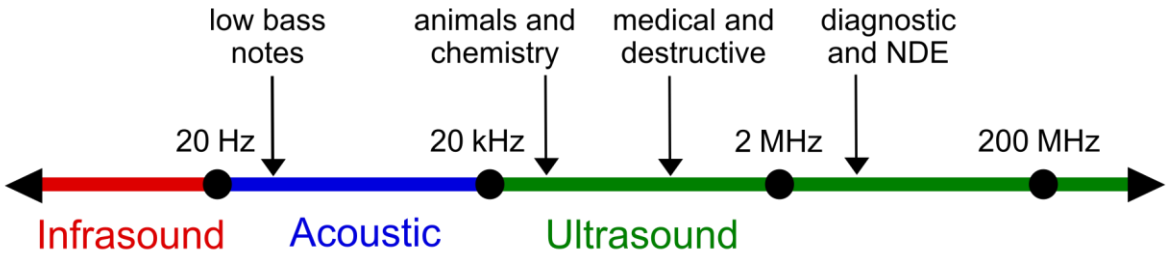
EXPERIMENT NO. 6

Aim : To Interface Ultrasonic sensor (HC-SR04) with Arduino UNO.

Apparatus Required : HC-SR04 sensor module, Arduino UNO board, breadboard, jumper wires.

Theory :



This is the HC-SR04 ultrasonic distance sensor. This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit.

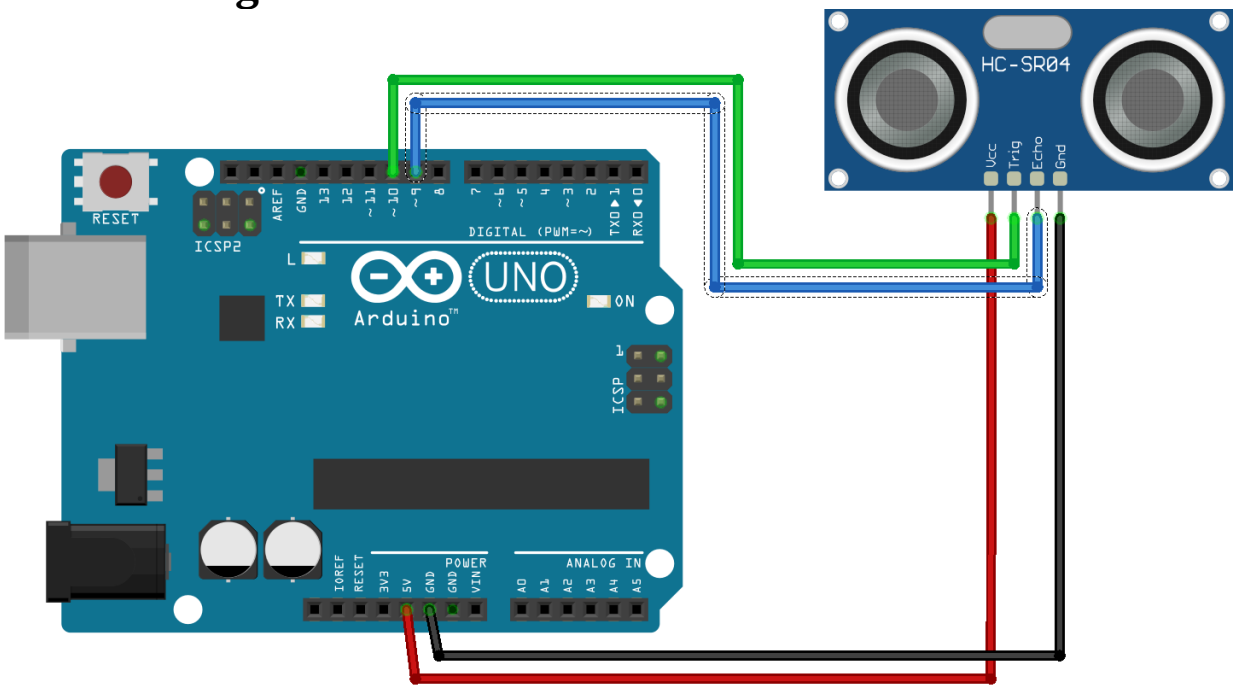
Operating Voltage	DC 5V
Operating Current	15mA
Operating Frequency	40KHz
Max Range	4m
Min Range	2cm
Ranging Accuracy	3mm
Measuring Angle	15 degree
Trigger Input Signal	10µS TTL pulse
Dimension	45 x 20 x 15mm

The transmitter converts the electrical signal into 40 KHz ultrasonic sound pulses. The receiver listens for the transmitted pulses.

When the receiver receives these pulses, it produces an output pulse whose width is proportional to the distance of the object in front.

This sensor provides excellent non-contact range detection between 2 cm to 400 cm (~13 feet) with an accuracy of 3 mm.

Circuit Diagram:



Code :

```
int echoPin=9;
int triggerPin =10;

//defines varables
long timetofly;
int distance;

void setup()
{
  pinMode(triggerPin,OUTPUT); //Sets trigger to output
  pinMode(echoPin,INPUT); //Sets echo to input
  Serial.begin(9600); //Starts the serial communication
```

```
}

void loop ()
{
  //Clears the trigger pin
  digitalWrite(triggerPin, LOW);
  delayMicroseconds(2);
  // Sets the trigger pin on High state for 10 us
  digitalWrite(triggerPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(triggerPin, LOW);

  // Reads the echoPin, returns the travel time in ms
  timetofly = pulseIn(echoPin, HIGH);
  //Calculating the distance (time to fly calculation)
  distance = timetofly*0.034/2;
  //Prints the distance on the serial monitor in cm
  Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println("cm ");
  delay(500);
}
```

Or we can use NewPing library for ease :

```
#include <NewPing.h>
//(Library: New Ping by Tim Eckel v 1.9.6)

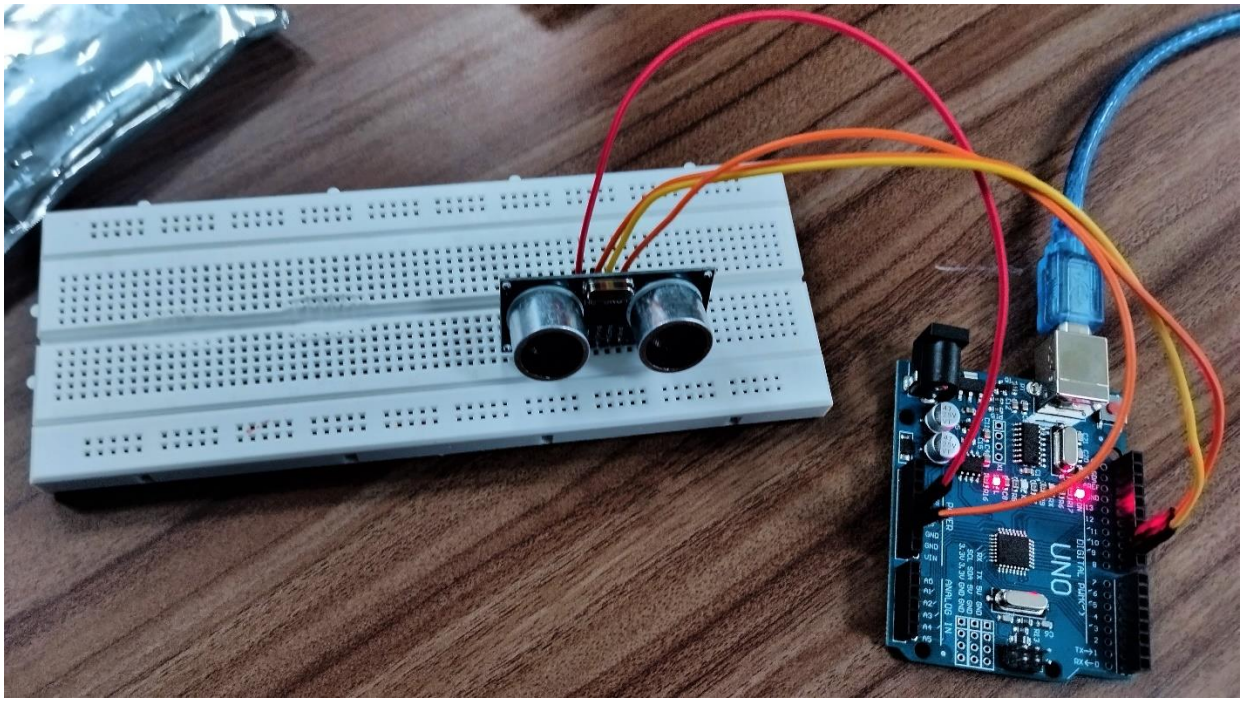
int triggerpin=10;
int echopin= 9;

//Maximum distance we want to ping for (in centimeters)
#define MAX_DISTANCE 400

//NewPing setup of pins and maximum distance
NewPing sonar(triggerpin, echopin, MAX_DISTANCE);

void setup(){
  Serial.begin(9600);
}
void loop(){
  Serial.print ("Distance= ");
  Serial.print (sonar.ping_cm());
  Serial.println ("cm ");
  delay(1000);
}
```

Result : Hence, We successfully interfaced HC-SR04 Ultrasonic sensor with Arduino UNO.



```
COM6

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