Project Name : Ultra Sonic Sensor

Himani Patel, Regd No. 12200526, Roll No. A01
Aditya, Regd No.12205653, Roll No. A02
Deepak Kumar Pandey, Regd No.12205680, Roll No.A03
Nitin Babu, Regd No.12213039, Roll No.A23

Section: K22BH

I : Introduction

Aim:

The aim of this project is to find distance using ultrasonic sensor. Ultrasonics can easily integrate with any type of controller. Their high frequency, sensitivity, and power make it easy to detect objects.

They have greater accuracy than many other methods at measuring thickness and depth of a parallel surface. Ultrasonics are easy to use and not dangerous during operation. Their small size makes it easy to integrate into projects and also an inexpensive option

Components used:

1) Arduino uno R3 CH340
2) Ultrasonic Sensor HC-SR04
3) Data Cable
4) Laptop
5) Arduino Uno

Description of the components:

Arduino uno:

Arduino Uno is a Microcontroller based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 along inputs, a 16 MHz ceramic resonator (CSTCE16MOV53-RO), a USB connection, a power jack, an ICSP header and a rest button. It contains every thing needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started
“UNO” means one In Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference version of Arduino, now evolved to newer release. The Uno board is first in a series of USB Arduino board, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Procedure and Working:

Ultrasonic Sensor HC-SR04 is a sensor that can measure distance. It emits an ultrasound at 40 000 Hz (40kHz)
which travels through the air and if there is an object or obstacle on its
path It will bounce back to the module. Considering the travel time and
the speed of the sound you can calculate the distance.
The configuration pin of HC-SR04 is VCC (1), TRIG (2), ECHO (3), and
GND (4). The supply voltage of VCC is +5V and you can attach TRIG and
ECHO pin to any Digital I/O in your Arduino Board.

In order to generate the ultra sound we need to set the Trigger Pin on a High State for 10 µs. That will send out an 8cycle sonic burst which will travel at the speed sound and it will be received in the Echo Pin. The Echo Pin will output the time in microseconds the sound wave travelled.

For the programming code, first we need to define the Trigger Pin and Echo Pin that connected to Arduino board. In this project Echo Pin is attached to D2 and Trig Pin to D3. Then define variables for the distance (int) and duration (long).

In the loop first you have to make sure that the trig Pin is clear so we have to set that pin on a LOW State for just 2 µs. Now for generating the ultrasound wave we have to set the trig Pin on HIGH State for 10 µs. Using the pulse In () function you have to read the travel time and put that value into the variable “duration”

This function has 2 parameters, the first one is the name of the echo pin and for the second one you can write either HIGH or LOW.

In this case, HIGH means that the pulse In () function will wait for the pin to go HIGH caused by the bounced sound wave and it will start timing, then it will wait for the pin to go LOW when the sound wave will end which will stop the timing. At the end the function will return the length of the pulse in microseconds. For getting the distance we will multiply the duration by 0.034 and divide it by 2 as we

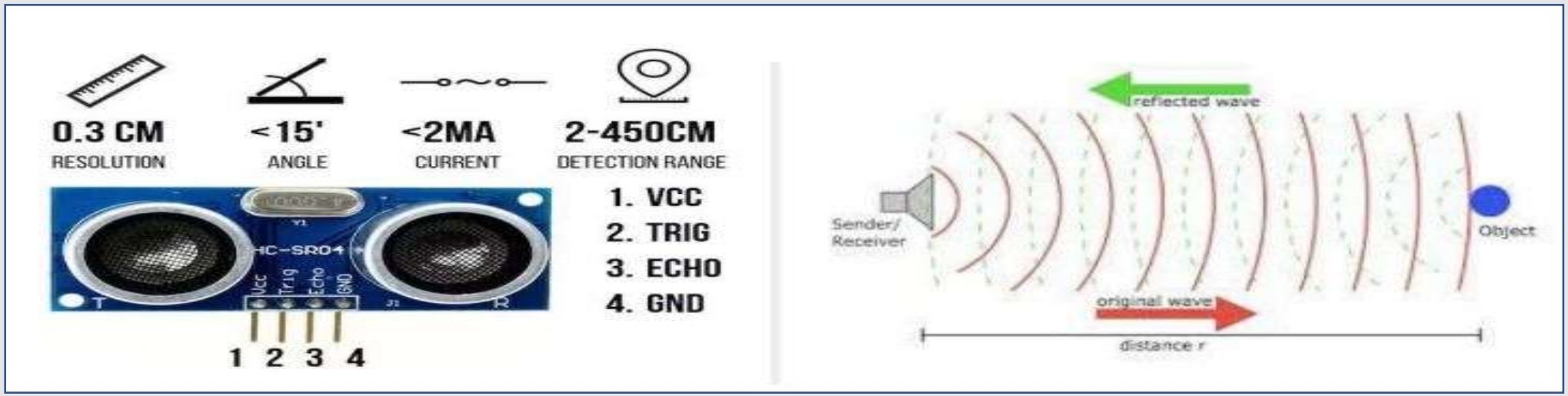

Fig:1 Ultra Sonic Sensor

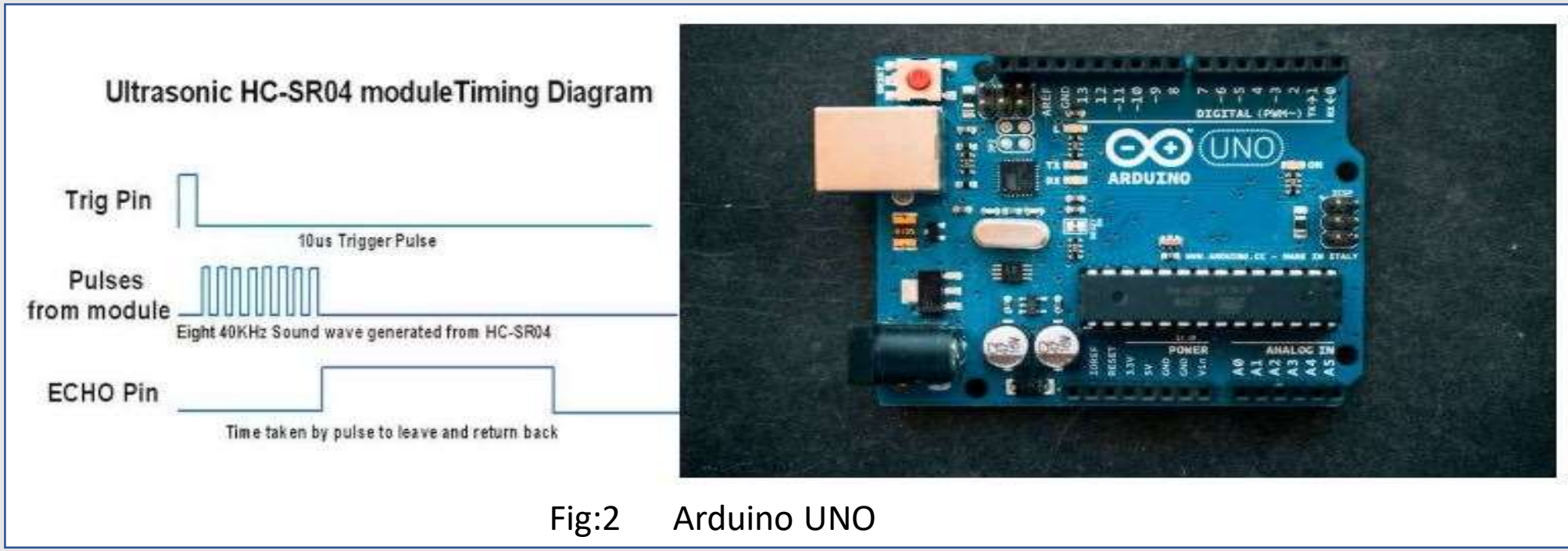

Fig:2 Arduino UNO

Technical specifications:

- Power supply - +5v DC
- Quiescent current - <2mA
- Working current - 15mA
- Ranging distance – 2cm – 4cm/1”- 13ft
- Measuring angle – 30degree

Sketch:

- Open the Arduino IDE software on your
- Laptop. Coding in the Arduino language will control
- your circuit. Open a new sketch file by clicking new.

Fig:3 Arduino IDE Software

Arduino code:

```
const int v=11;
const int t=12;
const int e=13;
long duration;
int distance;
void setup() {pinMode(v,OUTPUT);
digitalWrite(v,HIGH);
pinMode(t,OUTPUT);
pinMode(e,INPUT);
Serial.begin(9600);}
void loop() {digitalWrite(t,LOW);
delayMicroseconds(2);
digitalWrite(t,HIGH);
delayMicroseconds(10);
digitalWrite(t,LOW);
duration=pulseIn(e,HIGH);
distance=duration*0.034/2;
Serial.print("Distance: ");
Serial.print(distance);
Serial.println("cm");
delay(500);}
```

Result:

By doing this experiment you can see the distance measured by sensor in inches and CM on Arduino Uno serial monitor

Sketch diagram:

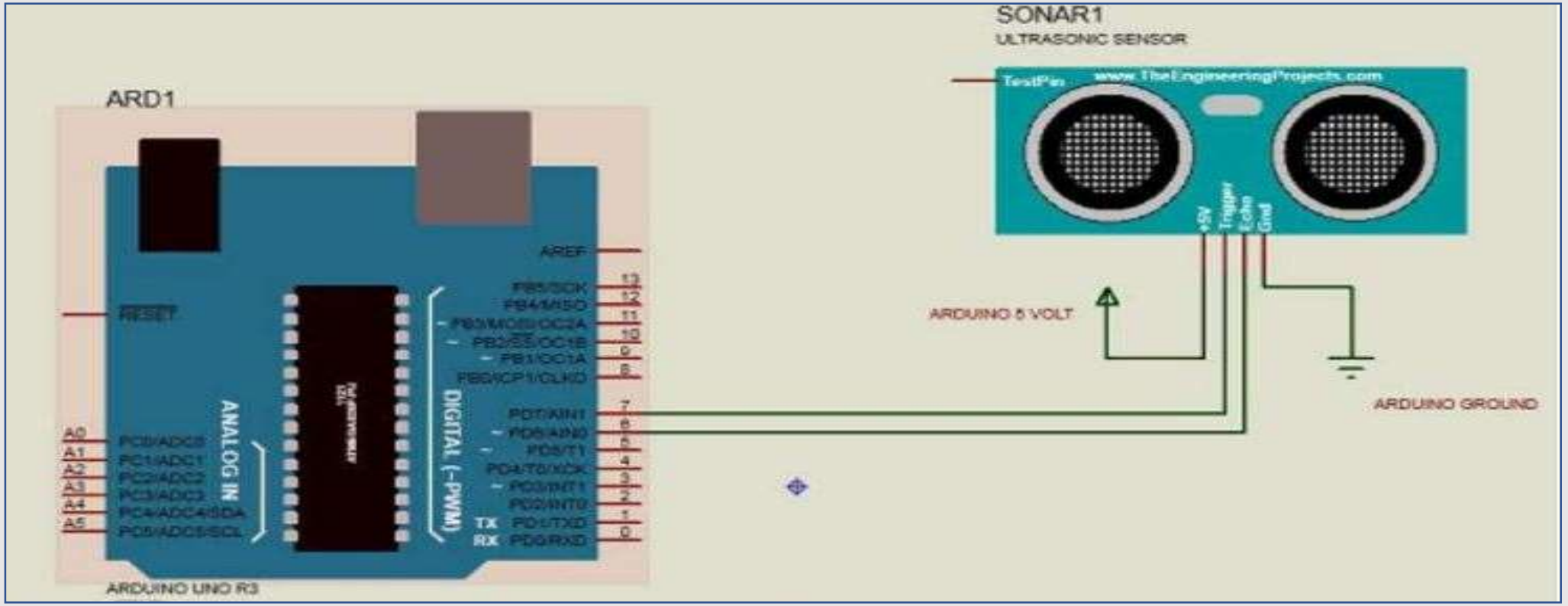

Fig:4 Ultra Sonic Sensor Interface To Arduino UNO