*SHANZEH BATOOL*

19BAI10017

Assignment 2

Q. *Develop an "Automatic garage door opening system". Use an Ultrasonic sensor to detect if there is a vehicle in front of the garage. if any vehicle is detected open the garage door (rotate the servo motor) for some time and close it. Understand the Working of Ultrasonic Sensor.*

How the HC-SR04 Ultrasonic Sensor Works

It emits an ultrasound at 40,000 Hz 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 HC-SR04 Ultrasonic Module has 4 pins, Ground, VCC, Trig and Echo. The Ground and the VCC pins of the module needs to be connected to the Ground and the 5 volts pins on the Arduino Board respectively and the trig and echo pins to any Digital I/O pin on the Arduino Board.

Arduino Board with HC-SR04 Ultrasonic Sensor, Micro Servo & LED
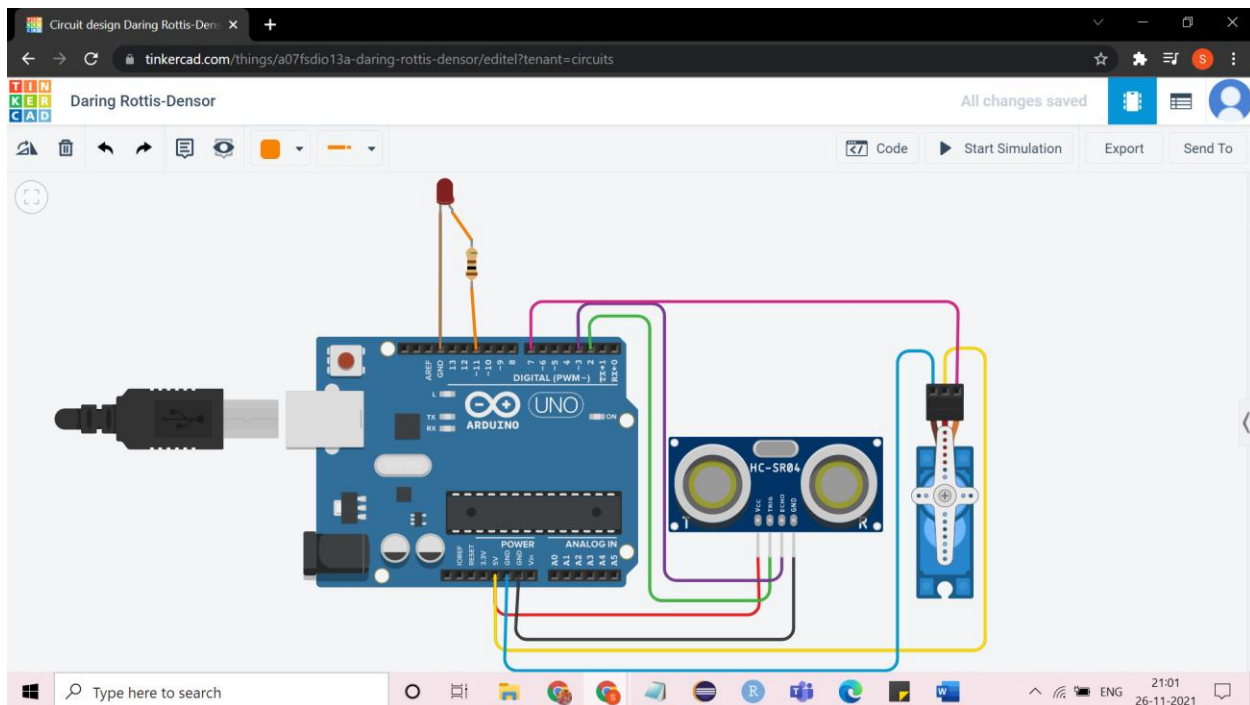
Arduino and HC-SR04 Ultrasonic Sensor with Micro Servo Motor & LED Code


```
1   #include<Servo.h>
2   Servo servo1;
3
4   void setup(){
5
6       servo1.attach(7);
7
8       pinMode(2,OUTPUT);
9       pinMode(3, INPUT);
10
11      pinMode(11, OUTPUT);
12
13      Serial.begin(9600);
14  }
15
16  void loop(){
17
18      digitalWrite(2, LOW);
19
20      digitalWrite(2, HIGH);
21      delayMicroseconds(10);
22      digitalWrite(2, LOW);
23
24      float dur = pulseIn(3, HIGH);
25
26      float dis = (dur*0.0343)/2;
27
```



```
21      delayMicroseconds(10);
22      digitalWrite(2, LOW);
23
24      float dur = pulseIn(3, HIGH);
25
26      float dis = (dur*0.0343)/2;
27
28      Serial.print("Distance in cm: ");
29      Serial.println(dis);
30
31      if(dis<=100)
32      {
33          servo1.write(90);
34          delay(100);
35
36          digitalWrite(11, HIGH);
37          delay(1000);
38          digitalWrite(11, LOW);
39          delay(1000);
40      }
41      else
42      {
43          delay(100);
44          servo1.write(0);
45      }
46  }
47
```

Code

```
#include<Servo.h>  //for servo motor
Servo servo1;

void setup(){

  servo1.attach(7);    //signal pin of servo motor connected

  pinMode(2,OUTPUT);   //sets TRIG pin as output
  pinMode(3, INPUT);     //sets ECHO pin as input

  pinMode(11, OUTPUT);  //for LED

  Serial.begin(9600);    //start the serial communication for showing the results on the serial monitor
}

void loop(){

  digitalWrite(2, LOW);    // Clears the TRIG pin

  digitalWrite(2, HIGH);    //Sets the TRIG pin on HIGH state for 10 micro seconds
  delayMicroseconds(10);
  digitalWrite(2, LOW);

  float dur = pulseIn(3, HIGH); //Reads the ECHO pin, returns the sound wave travel time in microseconds

  float dis = (dur*0.0343)/2;   //Calculating the distance
```

```arduino
Serial.print("Distance in cm: ");   //Prints the distance on the Serial Monitor

Serial.println(dis);


if(dis<=100)    //if object(car) is detected within the given distance
{
  servo1.write(90);   //open the garage by rotating the servo motor
  delay(100);


  digitalWrite(11, HIGH);    //also blink LED to indicate the garage door is open
        delay(1000);
        digitalWrite(11, LOW);
        delay(1000);
}
//if object is not detected within the specified distance, close the garage door by rotating the servo
motor and the LED stops blinking
  else
  {
  delay(100);
  servo1.write(0);
  }
}
```

Output

At distance 90.1 cm - Garage door open(servo motor rotated) with blinking LED

At distance 278.2cm - Garage door closed(servo motor rotated) with LED off

Applications Involving Ultrasonic Detection is Ultrasonic Distance Measuring where distance measurement is based on the measurement of time-of-flight. The time between sending and receiving the reflected sound signal is calculated by the sensor. Distance measurement would be applied in a **garage parking application**, sensing when a vehicle is in front of the garage and if detected the garage door is opened and closed accordingly with the help of rotating a micro servo motor. A blinking LED also indicates that the garage door is open.