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VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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A Seminar Report
on

"OBSTACLE AVOIDING ROBOT USING ARDUINO AND ULTRASONIC SENSOR"

Submitted in the partial fulfillment of the requirement for the award of

Bachelor of Engineering

in

Information Science and Engineering

Submitted By

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CERTIFICATE

This is to certify that the seminar work entitled "**Obstacle Avoiding Robot using Arduino and Ultrasonic Sensor"** is a bonafide work carried out by **Sai Karthik P K (1DT17IS072) and R Shreyas (1DT17IS064)** in partial fulfillment for the award of **Bachelor of Engineering in Information Science and Engineering** of the Visveswaraiah Technological University, Belgaum during the year **2019-2020 .** It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The seminar report has been approved as it satisfies the academic requirements with respect to the Seminar work prescribed for the said Degree.

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1.Introduction:

Obstacle Avoiding Robot is an intelligent device which can automatically sense the obstacle in front of it and avoid them by turning itself in another direction. This design allows the robot to navigate in unknown environment by avoiding collisions, which is a primary requirement for any autonomous mobile robot. The application of Obstacle Avoiding robot is not limited and it is used in most of the military organization now which helps carry out many risky jobs that cannot be done by any soldiers.

We will use **Arduino and Ultrasonic Sensor to build an Obstacle Avoider.** Here an Ultrasonic sensor is used to sense the obstacles in the path by calculating the distance between the robot and obstacle. If robot finds any obstacle it changes the direction and continue moving.

2.Components Required:

1. Arduino Uno 1x
2. HC-SR04 Ultra sonic sensor 3x
3. L293D Motor driver 1x
4. 100 RPM Geared DC Motors 2x
5. Robot Chassis 1x
6. Wheels 2x
7. 360 degree wheel 1x
8. Jumper wires
9. Batteries (9V)
10. Battery cap with DC pin
11. USB to printer Cable

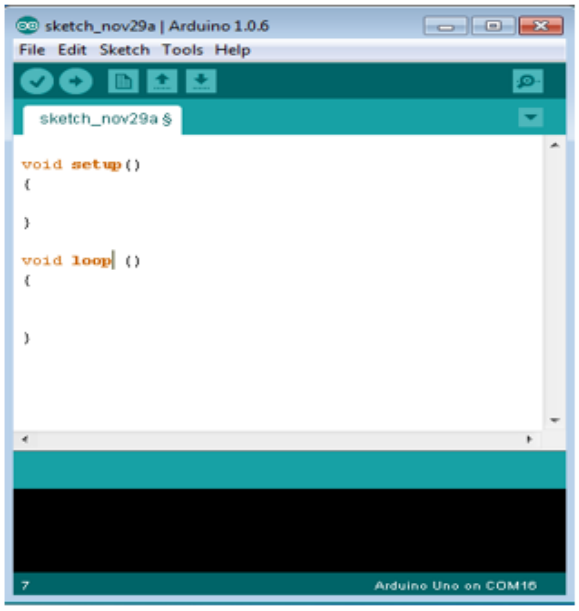
3.Components Description:

(A) Arduino Board

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programed (referred to as a microcontroller) and software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

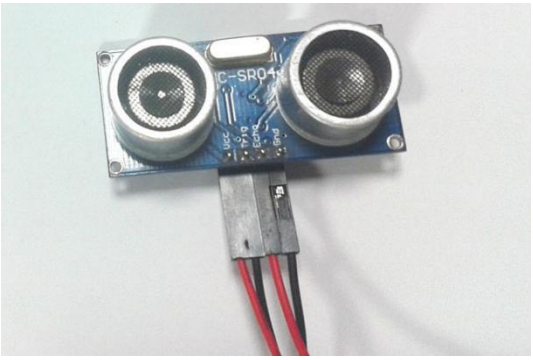
The key features are –

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.

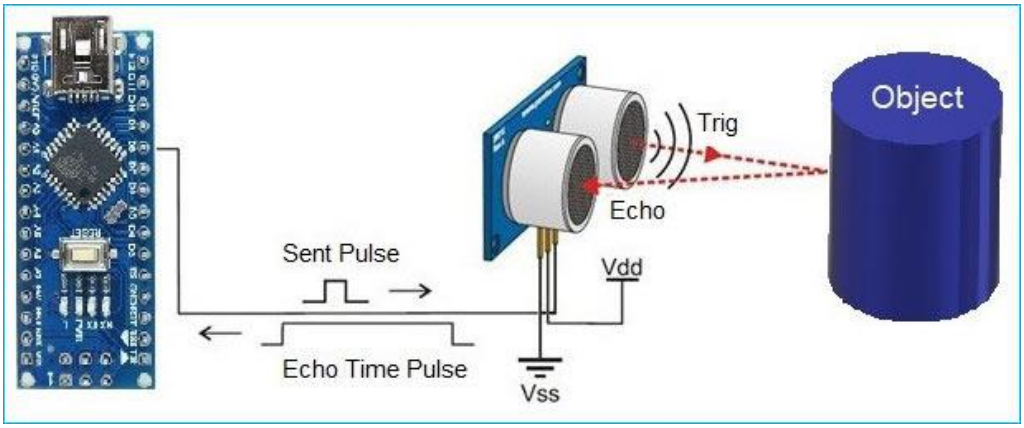


(B) HC-SR04 Ultrasonic Sensor

It is important to understand how the ultrasonic sensor works because this sensor will have important role in detecting obstacle. The basic principle behind the working of ultrasonic sensor is to note down the time taken by sensor to transmit ultrasonic beams and receiving the ultrasonic beams after hitting the surface. Then further the distance is calculated using the formula. In this project, the widely available **HC-SR04 Ultrasonic Sensor** is used. To use this sensor, similar approach will be followed explained above.



So, the Trig pin of HC-SR04 is made high for at least 10 us. A sonic beam is transmitted with 8 pulses of 40KHz each.
The signal then hits the surface and return back and captured by the receiver Echo pin of HC-SR04. The Echo pin had already made high at the time sending high.



The time taken by beam to return back is saved in variable and converted to distance using appropriate calculations like below

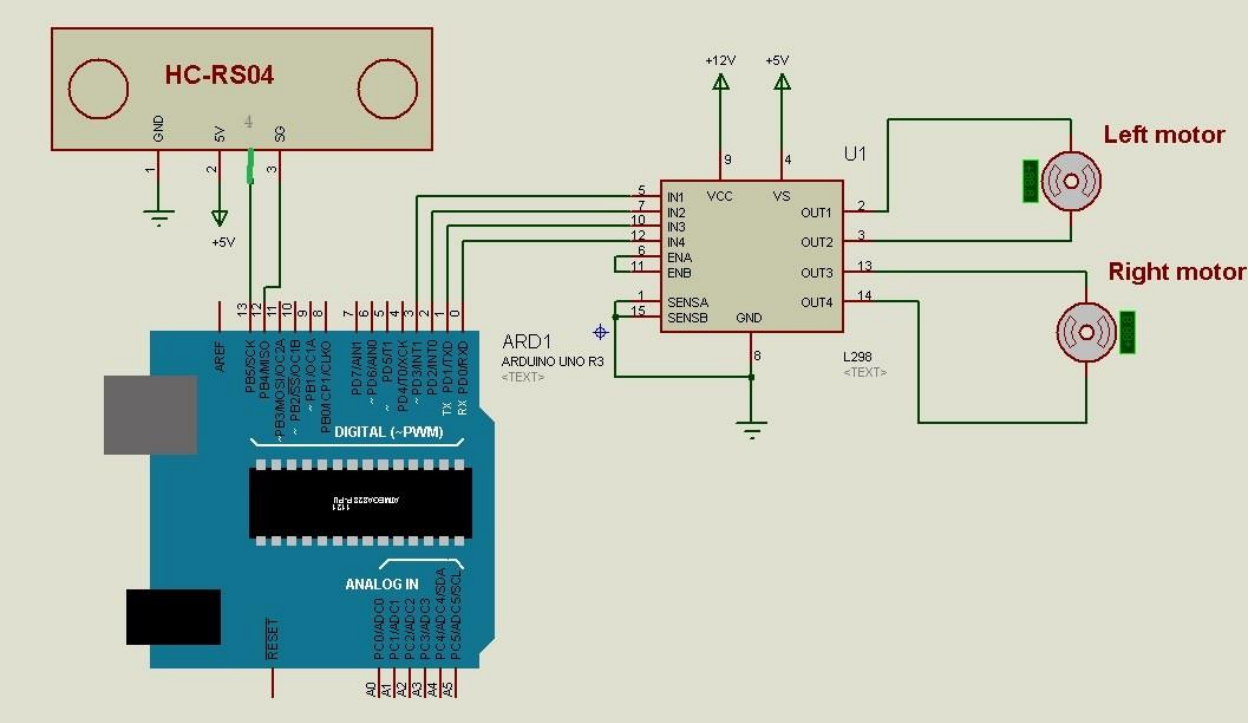
```
Distance= (Time x Speed of Sound in Air (343 m/s))/2
```

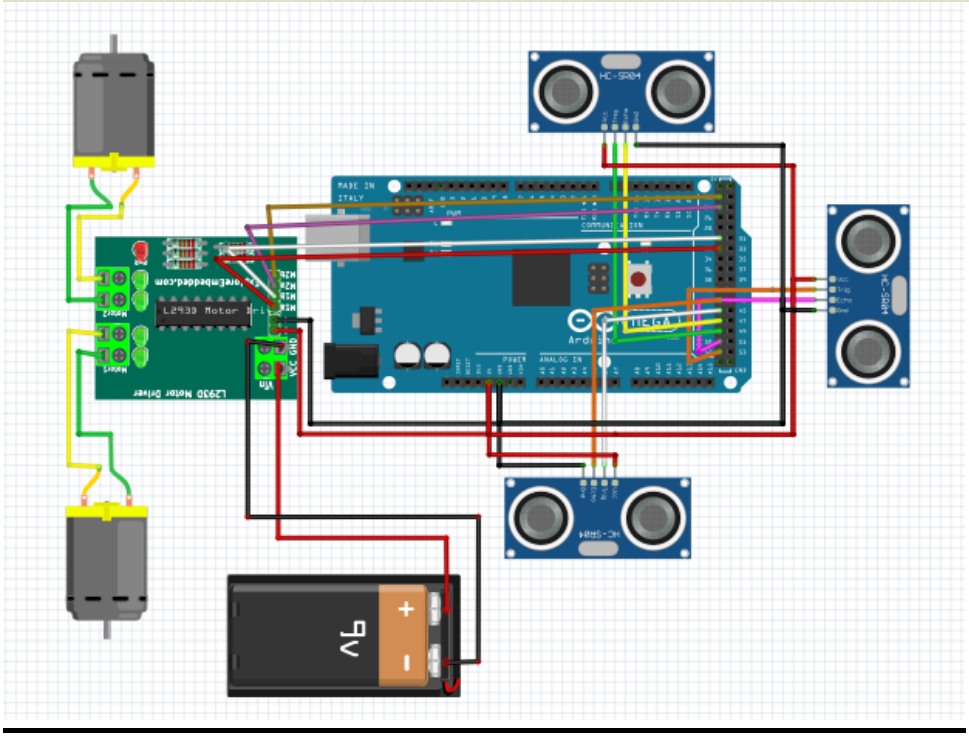
(C) L293D Motor Driver

The L293D is a popular 16-Pin **Motor Driver IC**. As the name suggests it is mainly used to drive motors. A single **L293D IC** is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently.

Using this L293D motor driver IC is very simple. The IC works on the principle of **Half H-Bridge**, let us not go too deep into what H-Bridge means, but for now just know that H bridge is a set up which is used to run motors both in clock wise and anti clockwise direction. As said earlier this IC is capable of running two motors at the any direction at the same time, the circuit to achieve the same is shown below.

4.Connections:





5.Code:

```
const int inputPin1  = 22;    // Pin 15 of L293D IC
const int inputPin2  = 24;    // Pin 10 of L293D IC
const int enable1    = 26;
const int enable2    = 28;
const int inputPin3  = 30;
const int inputPin4  = 32;
int trigPin = 52;      // trig pin
int echoPin = 50;     // Echo pin
int trigPinL = 37;
int echoPinL = 39;
int trigPinR = 33;
int echoPinR = 35;
long duration, distance;
long durationL, distanceL;
long durationR, distanceR;

void setup()
{
   delay(random(500,2000));   // delay for random time
   Serial.begin(9600);
   pinMode(enable1,OUTPUT);
   pinMode(inputPin1, OUTPUT);
   pinMode(inputPin2, OUTPUT);
   pinMode(enable2,OUTPUT);
   pinMode(inputPin3, OUTPUT);
   pinMode(inputPin4, OUTPUT);
   pinMode(trigPin, OUTPUT);        // set trig pin as output
   pinMode(echoPin, INPUT);        //set echo pin as input to capture reflected waves
   pinMode(trigPinL, OUTPUT);       // set trig pin as output
   pinMode(echoPinL, INPUT);        //set echo pin as input to capture reflected waves
   pinMode(trigPinR, OUTPUT);       // set trig pin as output
   pinMode(echoPinR, INPUT);        //set echo pin as input to capture reflected waves
}
void loop()
{
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);     // send waves for 10 us
  delayMicroseconds(10);
  duration = pulseIn(echoPin, HIGH); // receive reflected waves
  distance = duration / 58.2;   // convert to distance
```

```
delay(10);

digitalWrite(trigPinL, LOW);
delayMicroseconds(2);
digitalWrite(trigPinL, HIGH);     // send waves for 10 us
delayMicroseconds(10);
durationL = pulseIn(echoPinL, HIGH); // receive reflected waves
distanceL = durationL / 58.2;   // convert to distance
delay(10);

digitalWrite(trigPinR, LOW);
delayMicroseconds(2);
digitalWrite(trigPinR, HIGH);     // send waves for 10 us
delayMicroseconds(10);
durationR = pulseIn(echoPinR, HIGH); // receive reflected waves
distanceR = durationR / 58.2;   // convert to distance
delay(10);

if (distance > 15 && distanceL > 20 && distanceR > 20)
{
  forward();
}
if(distanceL<19 && distanceR<19 && distance>15)
{
  forward();
  delay(1000);
}
if (distance < 14 && distanceL >19 && distanceR > 19)
{
  stopcar();
  delay(500);
  reverse();
  delay(500);
  right();
  delay(1500);
}
if(distanceR < 19 && distanceL >19 && distance >15)
{
  stopcar();
  delay(500);
  right();
  delay(500);
}
else if(distanceL < 19 && distanceR >19 && distance >15)
```

```
  {
    stopcar();
    delay(500);
    left();
    delay(500);
  }

}

void reverse()
{
    digitalWrite(enable1,HIGH);
    digitalWrite(inputPin1,HIGH);
    digitalWrite(inputPin2,LOW);
    digitalWrite(enable2,HIGH);
    digitalWrite(inputPin3,LOW);
    digitalWrite(inputPin4,HIGH);
}

void forward()
{
    digitalWrite(enable1,HIGH);
    digitalWrite(inputPin1,LOW);
    digitalWrite(inputPin2,HIGH);
    digitalWrite(enable2,HIGH);
    digitalWrite(inputPin3,HIGH);
    digitalWrite(inputPin4,LOW);
}

void right()
{
    digitalWrite(enable1,HIGH);
    digitalWrite(inputPin1,LOW);
    digitalWrite(inputPin2,HIGH);
    digitalWrite(enable2,HIGH);
    digitalWrite(inputPin3,LOW);
    digitalWrite(inputPin4,HIGH);
}

void left()
{
    digitalWrite(enable1,HIGH);
    digitalWrite(inputPin1,HIGH);
    digitalWrite(inputPin2,LOW);
```

```
  digitalWrite(enable2,HIGH);
  digitalWrite(inputPin3,HIGH);
  digitalWrite(inputPin4,LOW);
}

void stopcar()
{
  digitalWrite(enable1,LOW);
  digitalWrite(inputPin1,HIGH);
  digitalWrite(inputPin2,LOW);
  digitalWrite(enable2,LOW);
  digitalWrite(inputPin3,HIGH);
  digitalWrite(inputPin4,LOW);
}
```

6.Applications:

- Obstacle avoiding robots can be used in almost all mobile robot navigation systems.
- They can be used for household work like automatic vacuum cleaning.
- They are used in self driving vehicles.

7.Conclusion:

The above Arduino controller and ultrasonic sensor were studied and the HcSR-04 ultrasonic sensor was selected, as the controlling result are satisfying for its use in the automobile prototype system bring developed. It was used to sense the obstacle and avoidance them. On successful implementation of obstacle avoidance algorithm was successfully carried out too with minimal errors, by coding the algorithm in python. Obstacle avoidance is a very good application to be used in vehicle preventing many accidents and loss of life.

8.Acknowledgements:

We would like to thank all those who have directly or indirectly encouraged us to take up this project.