American International University- Bangladesh

Department of Computer Science

Lab Report Cover Sheet

Course Name	MICROPROCESSOR AND EMBEDDED SYSTEMS
Lab Report No.	10 [OEL]
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Section	M
Group No.	04

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Title: Speed control system based on a obstacle distance.

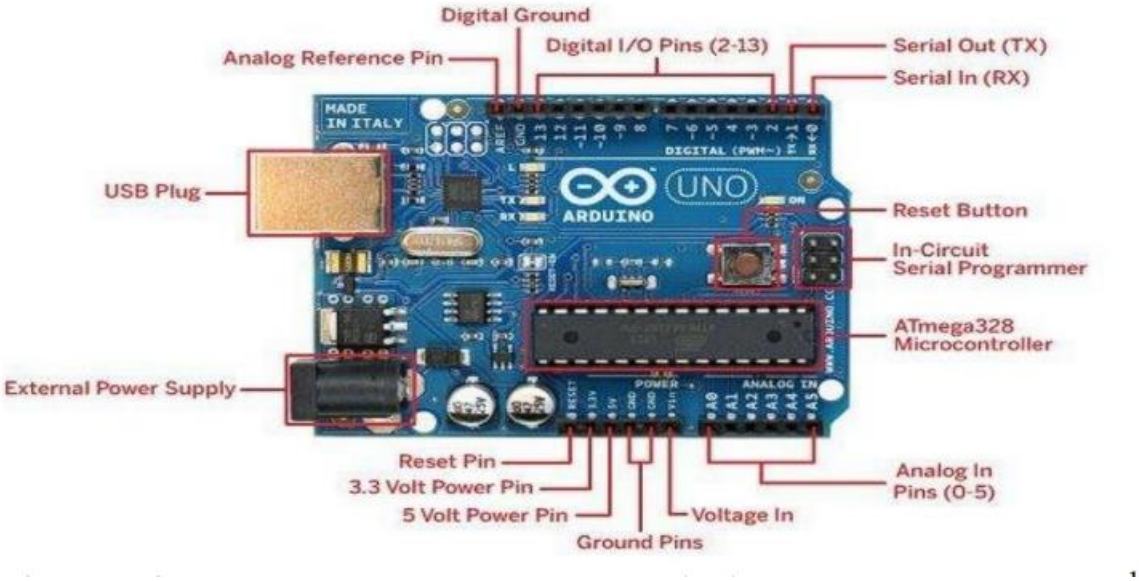
Abstract:

The objective of this experiment is to detect and measure the distance from the obstacle to the object and automatically control the speed based on the distance. When an obstacle is detected within 10 cm, a LED will turn on and the motor will rotate.

Theory and Methodology:

Aurdino is a open-source platform for creating interactive electronic project . It consists both programable microcontroller and a piece of software that runs on your computer.

Overview of the Board (Arduino UNO R3)

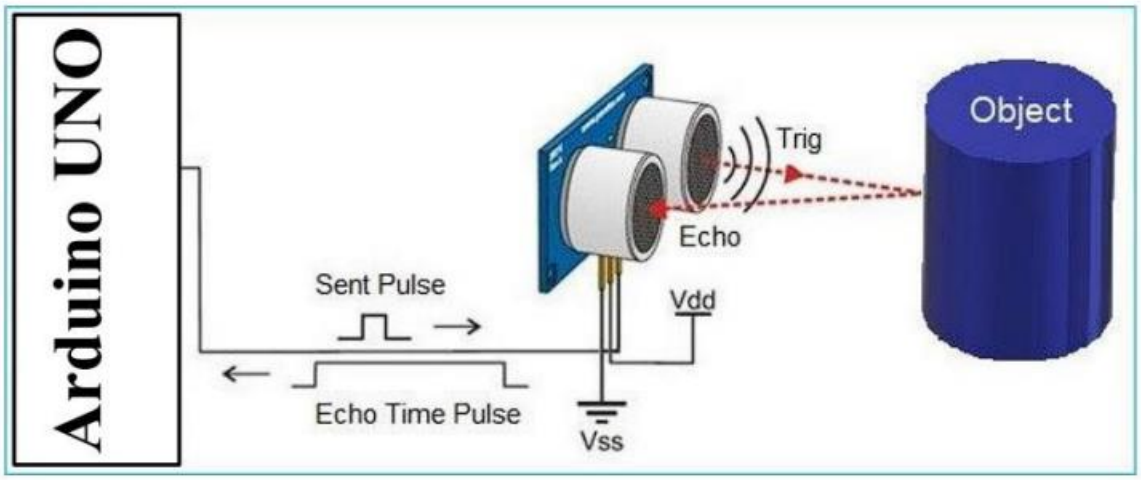


HCS R04 is an ultrasonic ranging module that consists of a transmitter , receiver and control circuit.It has four pins for VCC,GND,Trigger and Echo.The module automatically sends 40KHz and detects whether there is a pulse signal back. As the pin generate from the Arduino board travel out from the trigger and comes back to the echo.The objective we take half of the distance covered by the trigger will be calculated by the following equation:

distance , cm=microseconds /29/2

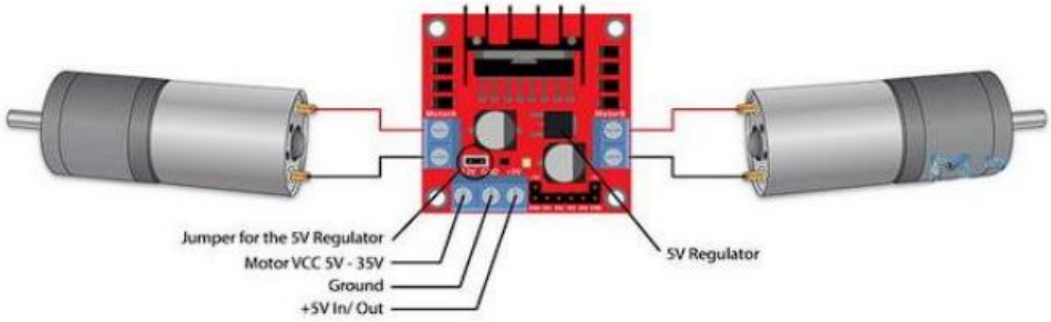
Distance, in=microseconds/74/2

Overview of Sonar Sensor:

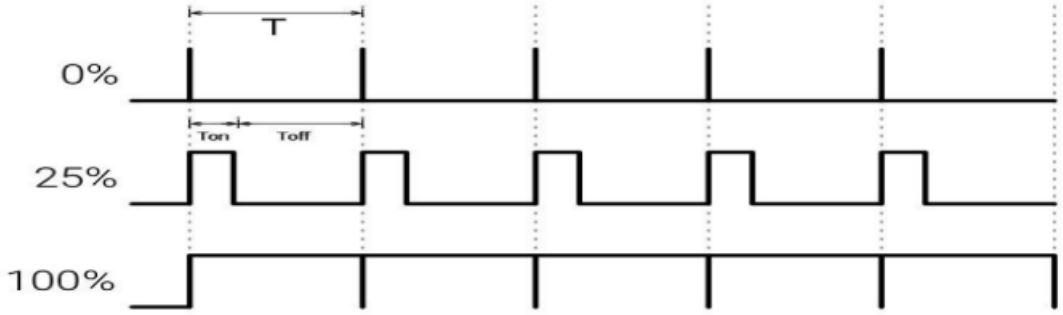


Motor speed varies according to duty cycle.Duty cycle is function of one time period.the duty cycle is commonly expressed as a percentage or ratio. A period is a time it takes for a signal to complete on and off cycle.

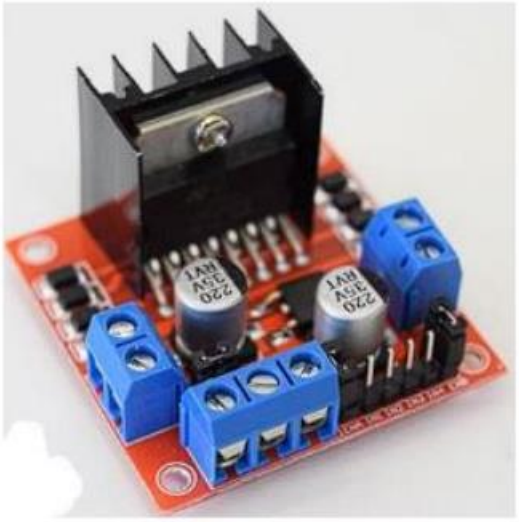
Duty cycle=(Ton/T) X 100%



Suppose the duty is zero and the motor does not run.and when the duty cycle is 100% the motor moves on maximum RPM . the motor running after giving some fixed voltage that is called threshold voltage.



The L298 driver is a dual H-bridge motor driver which allows speed abd direction control of 2 DC motors at the same time.the module has two terminal .The VCC for motor and a 5V pin which can wither be an input output . Nexts are the logic unit. The input 1 and the input 2 pins are used for controlling rotaion direction of the motor.



Apparatus:

01.Arduino Mega

02.Resistors

03.LED Indicator

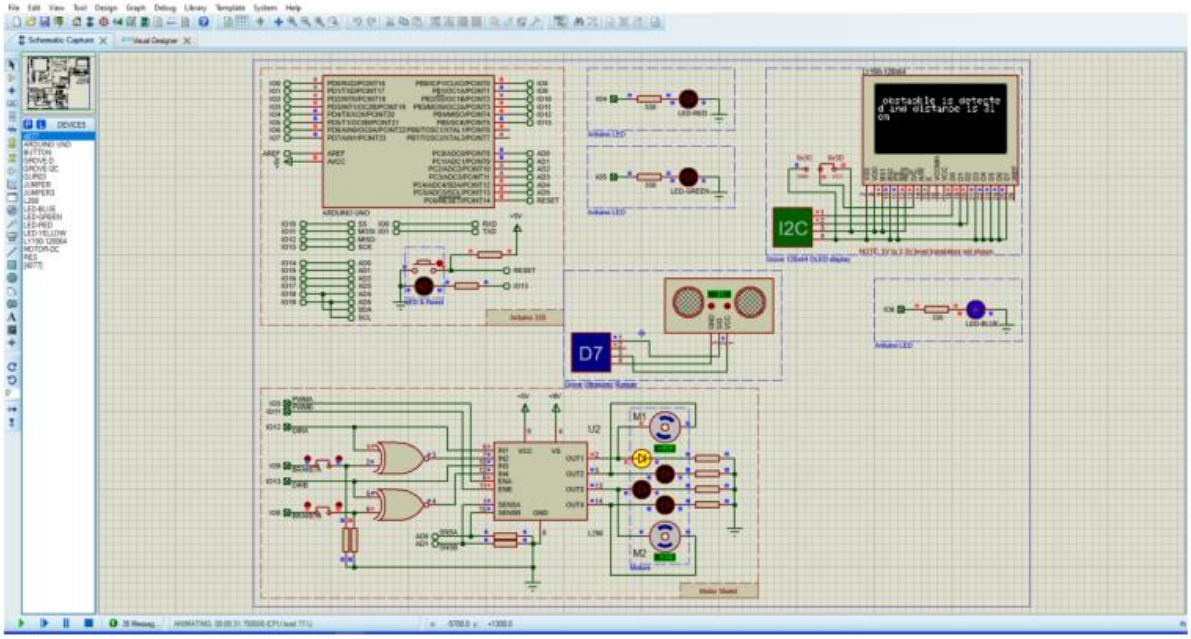
04.Ultrasonic Sensor

05.DC Motors

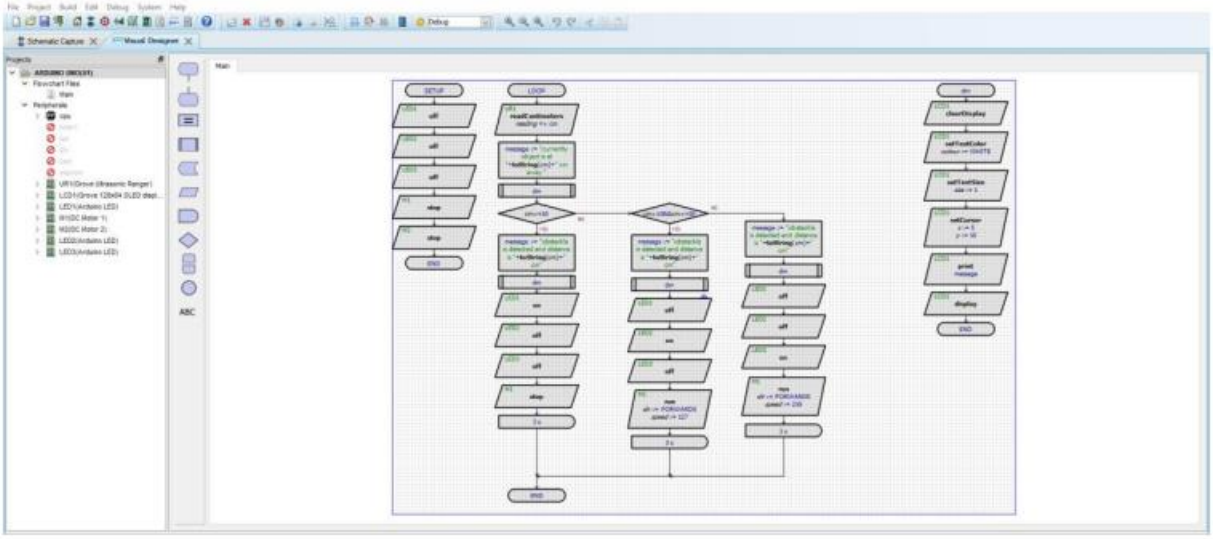
06.Breadboard

07.Jumper wires

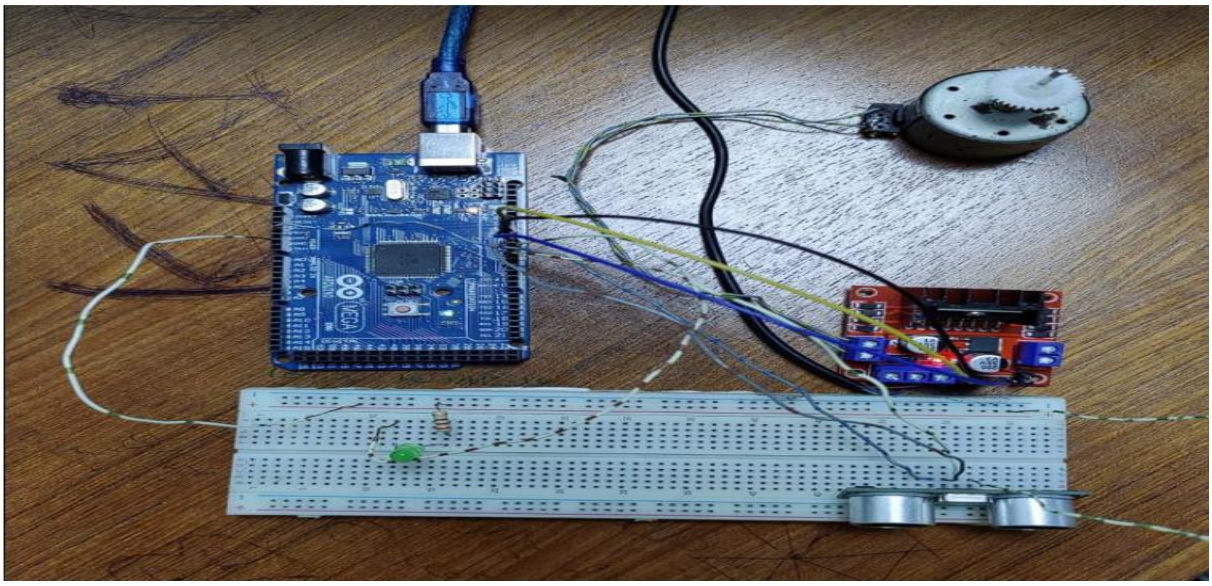
Simulation Setup and Schematic Diagram:

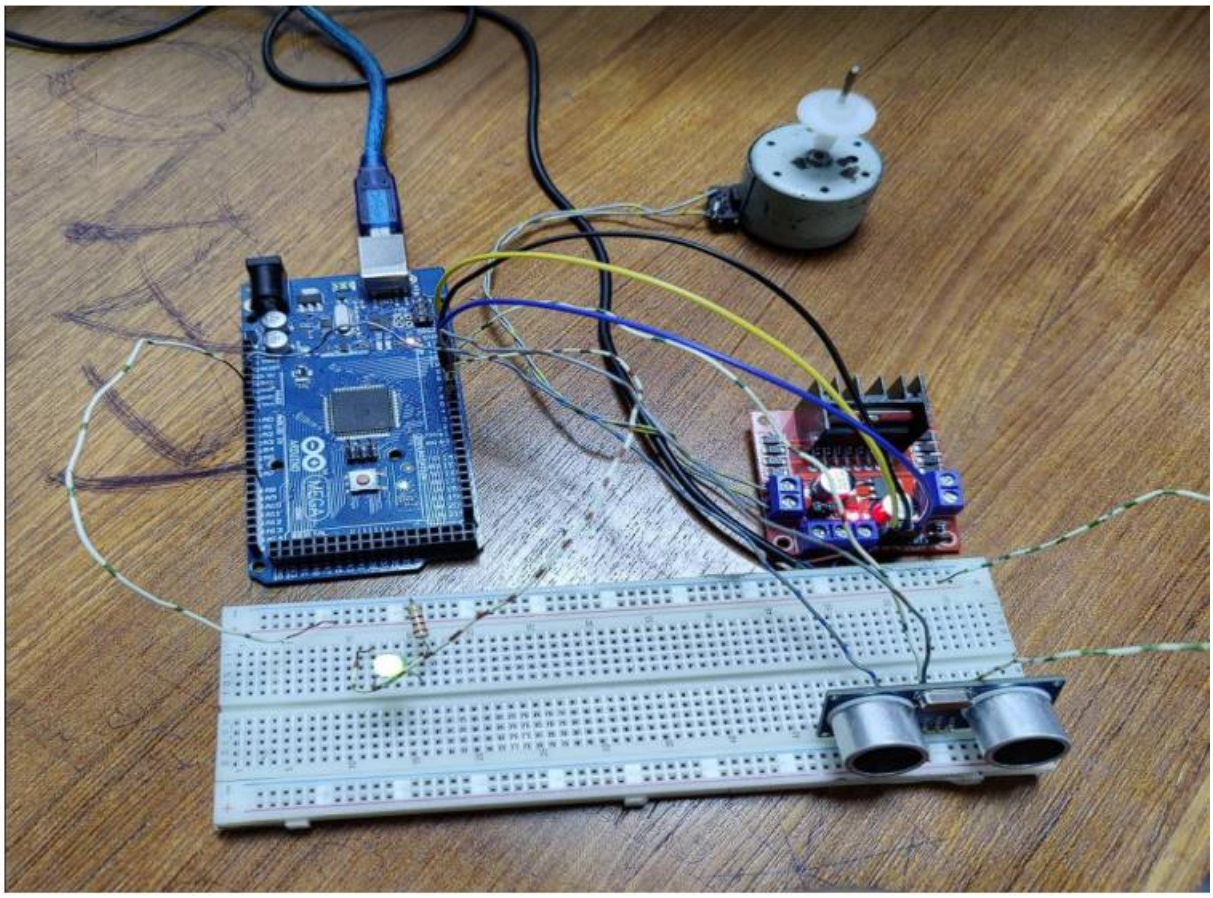


Flowchart:



Hardware Set-Up:





Data Collection table

Distance	Motor Status
10	**Off**
5	**On(high speed)**
7	**On(high speed)**
2	**On(low speed)**
15	**off**

Program/Lab Code:

```
const int echoPin = 6; // Echo Pin of Ultrasonic Sensor
const int trigPin = 7; // Trigger Pin of Ultrasonic Sensor
const int LED = 4; // LED at Pin 4

#define MOTOR_EN_1_2  10
#define MOTOR_IN1     9
#define MOTOR_IN2     8



#define normal 255
int Speed;

void Forward_Rev(void) {
  analogWrite(MOTOR_EN_1_2, Speed);
  digitalWrite(MOTOR_IN1, HIGH);
  digitalWrite(MOTOR_IN2, LOW);
}
void Brake(void) {
  digitalWrite(MOTOR_IN1, HIGH);
  digitalWrite(MOTOR_IN2, HIGH);
}
```

```
void setup()
{
 Serial.begin(9600); // Starting Serial Communication
 pinMode(trigPin, OUTPUT); // initialising pin 7 as output
 pinMode(echoPin, INPUT); // initialising pin 6 as input
 pinMode(LED, OUTPUT); // initialising pin 4 as output

 pinMode(MOTOR_EN_1_2, OUTPUT);
 pinMode(MOTOR_IN1, OUTPUT);
 pinMode(MOTOR_IN2, OUTPUT);
}
void loop()
{
 Speed = normal; // Normal Speed
 long duration, inches, cm;

 digitalWrite(trigPin, LOW);
 delayMicroseconds(2);
 digitalWrite(trigPin, HIGH);
 delayMicroseconds(10);

 digitalWrite(trigPin, LOW);

 duration = pulseIn(echoPin, HIGH); // using pulsin function to determine total time
 inches = microsecondsToInches(duration); // calling method
 cm = microsecondsToCentimeters(duration); // calling method
 if(cm<10)
 { Serial.print(inches);
 Serial.print("in, ");
```

```
 Serial.print(cm);
 Serial.print("cm");
 Serial.println();
 digitalWrite(LED, HIGH);
 Forward_Rev();
 //delay(500);
 }
 else
 {
  Brake();
  //delay(500);
  digitalWrite(LED, LOW);
 }
 delay(100);
}
long microsecondsToInches(long microseconds) // method to covert microsec to inches
{
return microseconds / 74 / 2;
}
long microsecondsToCentimeters(long microseconds) // method to covert microsec to cm
{
 return microseconds / 29 / 2;
}
```

Discussion:

In this OEL experiment , we were learn how to automatically control the motor speed based on the obstacle distance measured by the ultrasonic sensor.we also learned about L298N driver and how its functions in motor system. During the experiment we connected both ultrasonic sensor and motor to the Arduino board . Then we write doen the required program into Arduino Mega. During the the experiment some data were recorded into the data collection table.

Conclusion:

The aim of this experiment was to automatically control the speed based on the obstacle distance. From the data collection table we could see that speed of the motor was varying based on different obstacle distance. When the distance was low the motor was rotating as required speed and when the distance was high it was off. So it can be calculated that the objective of the experiment was achieved successfully.