CHAPTER 1

INTRODUCTION

1.1 Introduction

Driving is a compulsory activity for most people. The population of our country has been increasing rapidly which indirectly has increased the vehicle density and with increasing technology the rush through life has also increased which became the causes of Road accidents.The number of vehicle is increasing day by day produced high risk to accident. Nowadays, the numbers of accident is so high and uncertainly. Accident occurs everytime and everywhere and cause worst damage, serious injury and dead.

India accounts for highest number of road deaths in the world according to **International Road Federation (IRF)**, out of which major of the deaths were due to overspeeding. Over the past few years **overspeeding** accounted for highest share of 66%accidents and 61% of deaths. Many accidents also occur due to **rear end collisions** which mostly take place at turns, as the driver is not aware of the vehicle coming from opposite side.

Reasons for overspeeding :

- people in hurry.
- people who enjoy driving fast.
- Driver is unaware of the speedlimit.

Reasons for Rear end collisions :

- Aggressive or reckless driving.
- Not knowing about the presence of other vehicle.
- Speeding
- Driver fatigue

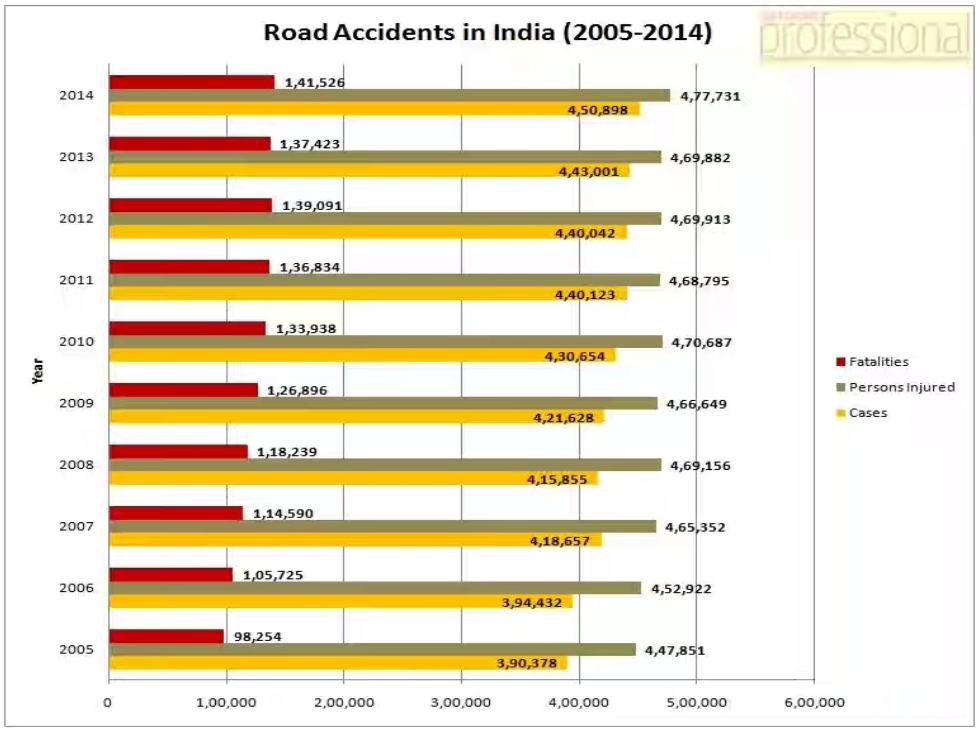


Fig 1.1- Figure showing Road accidents in India 2005-2014

For prevention of this accident's, government made some rules. Such as helmet, seat belt compulsion and Speed control at particular road etc. Even though there are rules for vehicle safety, the growth in number of accidents is continuously increasing. Rash driving, system failure, collision due to obstacles, exiting speed control limit etc. are just some causes of accidents. Therefore there has been development of several advanced technology and innovations for vehicle safety.

Fig 1.2- Figure showing rear end collision

1.2 Motivation and Objective

We see many accidents in our day to day life. One of the current existing problem is accidents at blind turns (with no divider) and overspeeding. The turns are called blind turns as the driver is unaware of the presence of a vehicle on the other side of the turn, which leads to bumping of vehicles into each other and if the speed of vehicle is high then the extent of accident becomes severe.

In the below figure we can see that the two cars A & B are coming in opposite directions. Since both doesn't know the presence of each other at the end of turn this leads to probability of collision.

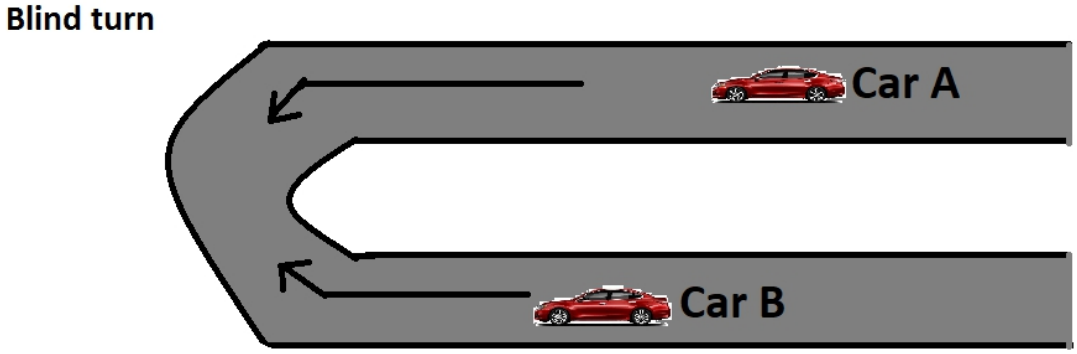


Fig 1.3- Probability of collision at blind turns

The existing solution to the above problem is to use speed breakers so that the speed of vehicles decreases therefore the extent of collisions could be less. In the below figure so as to decrease the probability of collision seen in fig 1.3 . Design of series speed breakers is used to reduce the speed and help in decrease of collision. But this design isn't efficient because of below reasons.

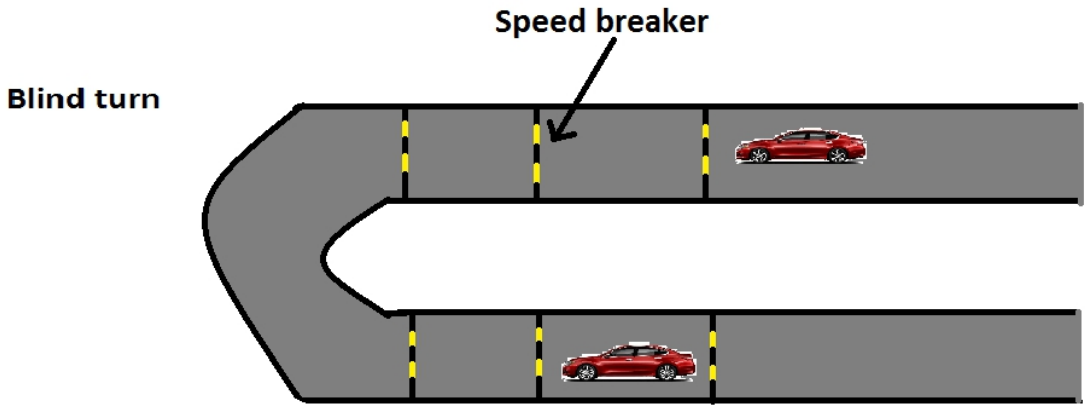


Fig 1.4- Usage of existing solution for problem showed in fig 1.3

Disadvantages of using above system [1] :

- Construction Cost : Here to make the vehicles move with slow speeds we need series of speed breakers but such system is very costly.

- Maintenance Cost : It is observed that the road surface near the humps shows development of potholes and signs of subsidence which requires a greater road maintenance cost.
- Ride Discomfort : They are uncomfortable and painful to people who suffering from medical conditions such as back problems.
- Loss of Lives :

1. Speed humps are a major problem for an emergency vehicles such as ambulances and fire engines. It is found that in USA about 85 people die due to delay of emergency vehicles because of speed breakers.

2. As per the road accident report, 2014 in India a total of 4726 lives were lost due to crashes at speed breakers on National Highways.

Considering the disadvantages of the above model and to overcome those we proposed a design which provides both

i) Automated Speed control

ii) Alert system for dectection of vehicle at turn

Objective of this project is to develop a system to keep the vehicle secure by avoiding the accidents due to overspeeding, highly effective collisions and by providing alert system at curves to detect the presence of vehicles coming from the other end. The main components used in implementing this project are color sensor and ultrasonic sensor.

1.3 Background

People driving cars or any vehicle are mostly dealing with accidents these days. Therefore there is need to control such accidents which can be done by means of automation i.e using some techniques to overcome the need of a human or to

help the human in making wise decisions while driving on the road. Therefore our project concentrates to -

- Avoid high speed collisions.
- Provide Automatic speed control.
- Facilitate in decrease of head on collisions.

This model can also be used to control the vehicle speed at speed limiting areas

In order achieve this the **prerequisites** are:

SOFTWARE REQUIREMENTS	**HARDWARE REQUIREMENTS**
	1. L-298N Motor driver
	2. Arduino UNO
1. Arduino IDE	3. TCS3200 Color Sensor
2. Bluetooth Car App	4. Bluetooth Sensor
	5. Ultrasonic Sensor
	6. Car Module
	7. Jumper wires and LED's
	8.XL6009 DC-DC Step up module

The **actions done** using above are:

1. Arduino IDE was used to build, verify and upload (to arduino UNO board) the code.
2. Car was modelled using the car module and it's speed was controlled by a motor driver.
3. Bluetooth Car App was used to control the movement of modelled car by transmitting the information to the Bluetooth sensor mounted on car.
4. The color sensor mounted on car detected the colors and based on that the speed control has taken place.
5. Ultrasonic sensor kept on the sides of road, on presence of vehicle at that turn, made the LED glow on the oppiste side of that turn.(used of detection vehicles at the turns).
6. Therefore at the end overall setup up was made and the working model was observed.

CHAPTER 2

Literature Review

Sandor Szabo, Joseph Falco and Richard Norcross[1] proposed a design to determine potential safety benefits and user acceptance of integrated rear-end, lane-change/merge and road departure crash warning system for vehicles and heavy commercial trucks. The authors used Laser scanners (front) to measure the ranges to obstacles in front of the tested vehicle and calibrated cameras(front and sides) to measure the distance to lane markers and the vehicle's position within the lane

.

In S.P. Bunker, et al [2] described a real-time online safety prototype that controls the vehicle speed under driver fatigue. The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. The main components of the system consist of number of real time sensors like gas, eye blink, alcohol, fuel, impact sensors and a software interface with GPS and Google Maps APIs for location.

In Jyotika Kapur et al [3] dealing with India there has been an increase of 17.4% in the total number of road accidents during the period of 2011-2012.This percentage has raised eyebrows and caught the attention of many to curb the growing rate. It is found that 80% of the times it is the fault of the driver. This can be avoided if we could device a mechanism which could alert the driver about the coming jeopardy. This can be achieved by monitoring the distance between two cars using Bluetooth. If the

distance decreases than the one specified, the driver would be signaled and according to the signal, necessary actions will be taken by the mini gadget present in the car. This paper proposes that with the help of Bluetooth technology, we can keep track of the speed of the car and take appropriate actions to avoid accidents.

K.Dhamodharan, S. Naresh Krishna, R.Thanasekaran[4] proposed a model which includes controlling of speed at curves, using displacement sensors to sense distance between itself and obstacles, speed sensor to detect speed and also a night vision camera facility was provided and a load sensor that calculates the load carried by the vehicle. The type of displacement sensor they have used is Ultrasonic Sensor which can accurately detect the object and measure the distance between them by transmitting a short burst of ultrasonic sound toward a target. When the sound is reflected, it returns to the sensor as an echo. The distance between the ultrasonic linear position sensor and is calculated from the signal's return time.

CHAPTER 3

OVERVIEW OF SOFTWARE & HARDWARE TOOLS

3.1 Arduino IDE 1.8.5

An **integrated development environment** (**IDE**) is a software application that provides comprehensive facilities to computer programmers for software development. An IDE normally consists of a source code editor, build automation tools, and a debugger. Most modern IDEs have intelligent code completion.

The **Arduino integrated development environment (IDE)** is a open source cross-platform java application that serves as a code editor and compiler and is also capable of transferring firmware serially to the board. This IDE is available to all types of operating systems like Windows, Mac OS X and Linux . It contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

3.1.1 Working with Arduino IDE

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor. he console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Functioning of few icons present in the software

Verify

Checks code for errors compiling it.

Upload

Compiles code and uploads it to the configured board

New

Creates a new sketch.

Open

Presents a menu of all the sketches in sketchbook. Clicking one will open it within the current window overwriting its content..

Save

Saves sketch.

Serial Monitor

Opens the serial monitor.

This displays serial sent from the Arduino or Genuino board over USB or serial connector. To send data to the board, we enter text and click on the "send" button or press enter.

3.1.2 Uploading

Before uploading the sketch, select the correct items from the Tools > Board and Tools > Port menus. Once you've selected the correct serial port and board, press the upload button in the toolbar or select the Upload item from the Sketch menu. On most boards, the RX and TX LEDs blink as the sketch is uploaded. The Arduino Software (IDE) will display a message when the upload is complete, or show an error

On uploading the sketch, we will be using the Arduino bootloader, a small program that has been loaded on to the microcontroller on the board. It allows us to upload code without using any additional hardware. The bootloader is active for a few seconds when the board resets, then it starts whichever sketch was most recently uploaded to the microcontroller. The bootloader will blink the on-board (pin 13) LED when it starts (i.e. when the board resets).

3.2 Arduino UNO

3.2.1 Introduction to Arduino UNO

Arduino is an open source computer hardware and software company, project and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world.

The board are equipped with sets of digital and analog input/output(I/O) pins that may be interfaced to various expansion boards or Breadboards and other circuits. The boards features 14 Digital pins 6 Analog pins.

“Uno” means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno is the latest in the series of USB Arduino boards.

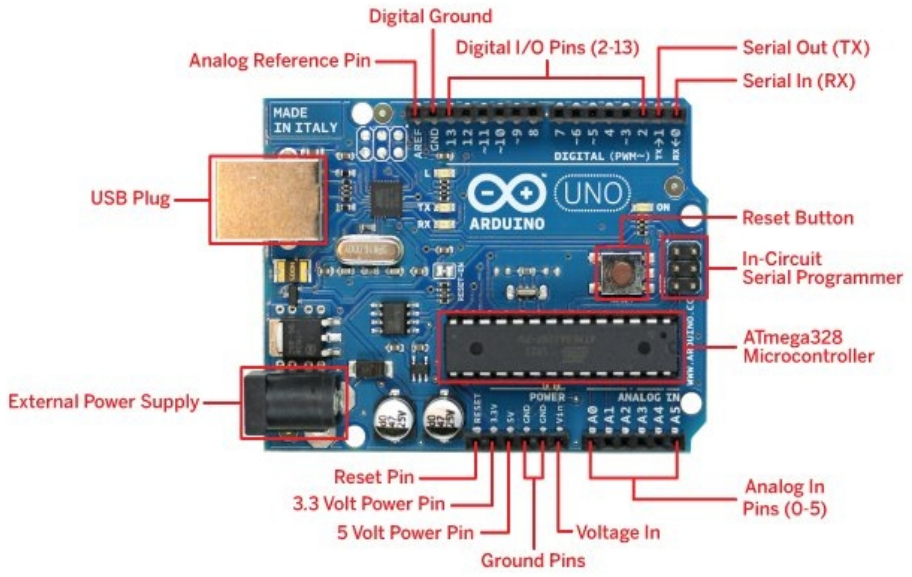


Fig 3.1- Arduino UNO

3.2.2Pins

a)General pin functions

1. **LED:** There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
2. **VIN:** The input voltage to the Arduino/Genuino board when it's using an external power source(as opposed to 5volts from the USB connection or other regulated power source). We can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
3. **5V:** this pin outputs a regulated 5v from the regulator on the board.
4. **3V3:** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50mA.
5. **GND:** Ground pins.
6. **IOREF:** This pin on the Arduino board provides the voltage reference with which the microcontroller operates.

7. **Reset:** Typically used to add a rest button to shields which block the one on the board.

b) Special Pin Functions

1. **Serial :**pins 0 (Rx) and 1(Tx). Used to receive (Rx) and transmit (Tx) data.
2. **External Interrupts :**Pins 2 and 3. These pins can be performed to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
3. **PWM (Pulse Width Modulation):** Pin 3,5,6,9,10,11 can provide 8-bit PWM output with the analogWrite() function.
4. **SPI(Serial Peripheral Interface):** 10,11,12,13 pins. These pins support SPI communication using the SPI library.
5. **TWI(Two Port Interface):** A4 or A5 pin. Support TWI communication using Wire library.
6. **AREF(Analog REFerence):**Reference voltage for the analog inputs.

3.2.3 USB Cable A to B

Universal Serial Bus(USB) is an industry standard that was developed to define cables, connectors and protocols for connection, communication and power supply between personal computers and their peripheral devices.This cable is used to establish connection between arduino and the system.

Fig 3.2- USB cable A to B

3.3 Bluetooth Car App

3.3.1 Overview of app

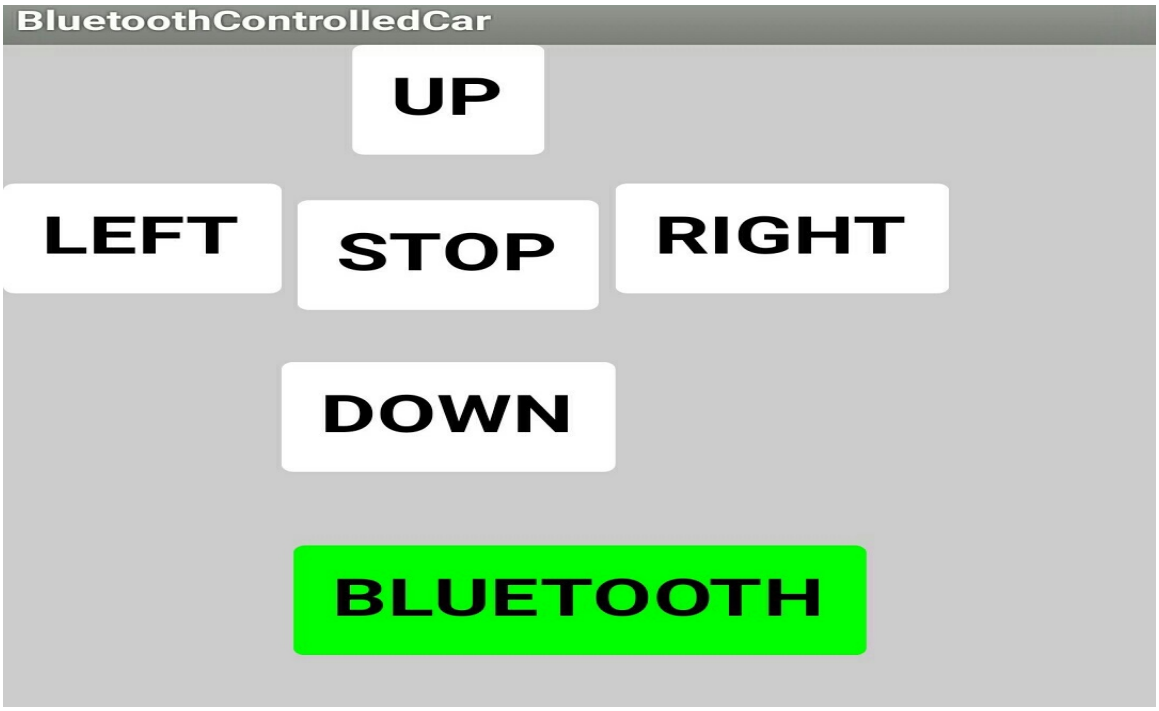


Fig 3.3- UI of App

This app controls the movement of car by sending signals to the Bluetooth sensor mount to the car. Clicking

1. Bluetooth button helps in connecting to Bluetooth sensor and also to transfer the info about buttons to arduino through the Bluetooth sensor.
2. Up button makes car to move in forward direction.
3. Down button makes car to move in backward direction.
4. Left button makes car to rotate or turn left.
5. Right button makes car to rotate or turn right.
6. Stop button makes the car to stop.

3.3.2 Creating the App:

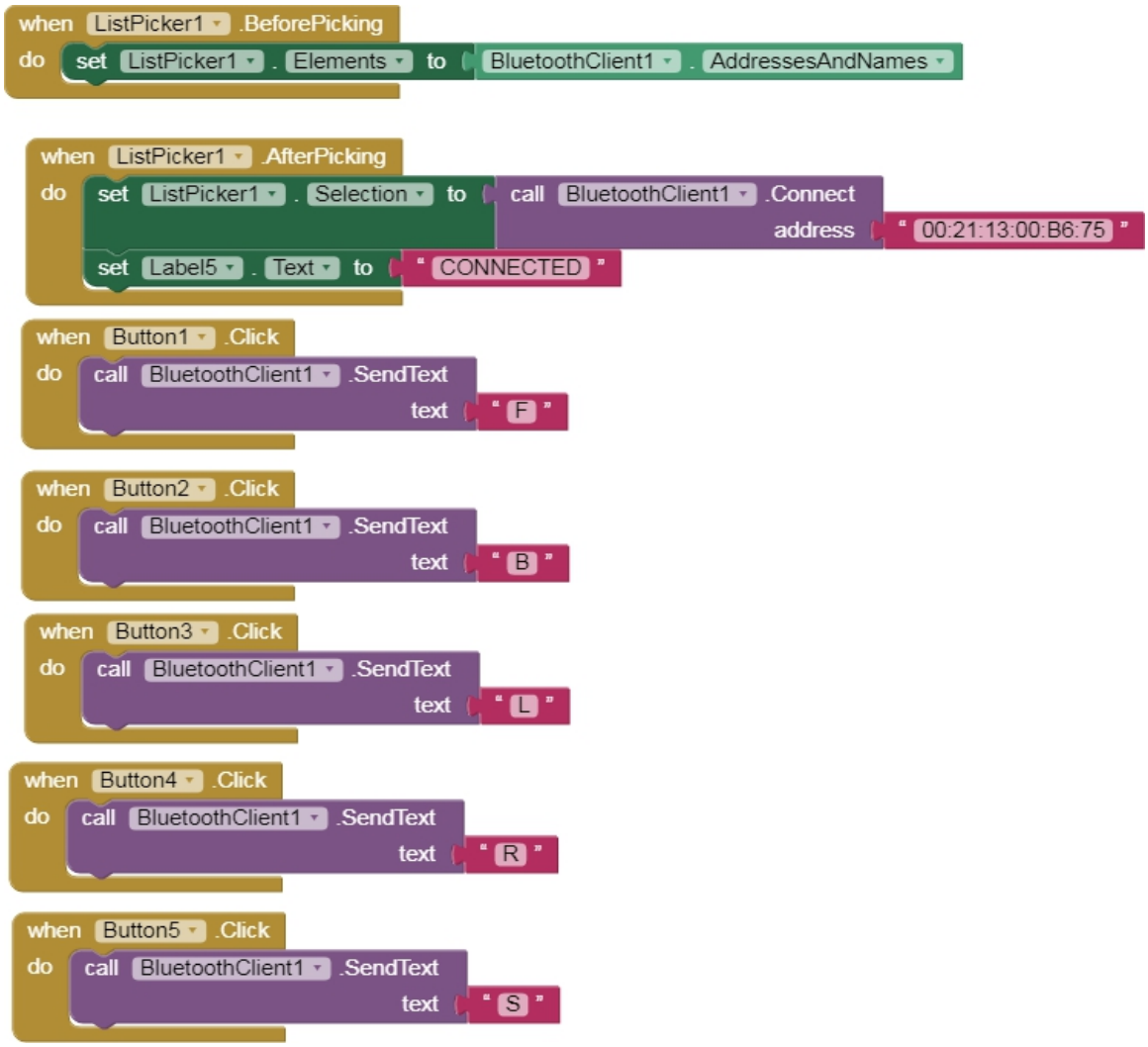


Fig 3.4- implementation code of app

We have used MIT App Inventor to create this app. To create the app required blocks are added in the editor. First and second blocks are for creating Bluetooth interface done by using list picker having certain properties and function. Before picking i.e before getting connected, the elements of list picker are shown. After picking it shows the status that is connection is made or not. Remaining blocks contains buttons and its fuction i.e from above if button1 is clicked the text 'F' is sent to the arduino and based on the code written in arduino board the process takes place on receiving alphabet 'F'.Similar manner other blocks also work.In such way the app is created using MIT App Inventor.

3.4 L-298N Motor driver

The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A.

3.4.1 Introduction to H-Bridge

An H-Bridge is a simple electronic circuit consisting of four switching elements like transistors (BJT or MOSFET) that can drive a motor in both the directons without switching the leads.

The name “H-Bridge” refers to look of the connection consisting of four transistors and in the center forming the letter “H”.

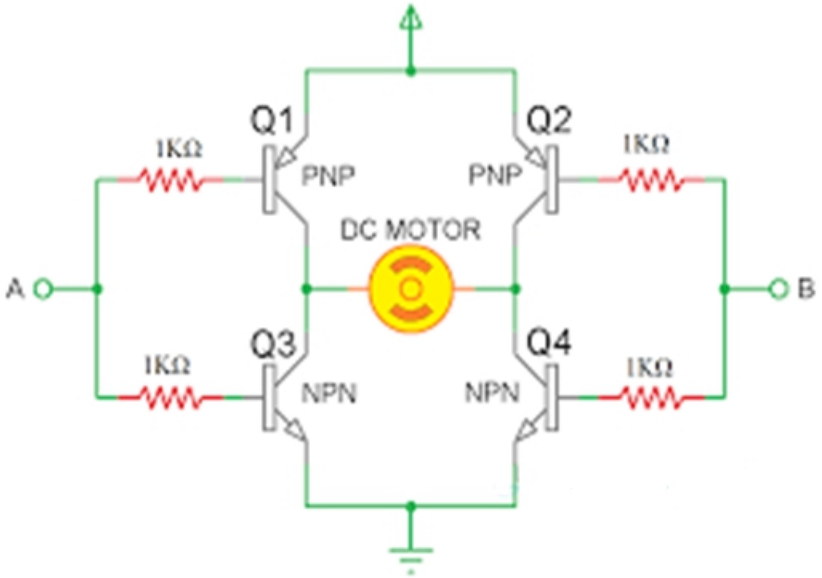


Fig 3.5- H-Bridge connection using four transistors and a motor

Table- 3.1 Operation of H-Bridge

A	B	LEFT OF MOTOR	RIGHT OF MOTOR	Motor Action
0	0	0	0	Stop
0	1	0	Vcc	Anticlockwise
1 (5V)	0	Vcc	0	Clockwise
1	1	Vcc	Vcc	Brake

3.4.2 Pin Description

L-298 is a 15-lead high voltage, high current Motor Driver IC with two full bridge drivers hence can control two motors at the same time with individual inputs. The logic levels of L298N IC are compatible with standard TTL and IC can be used to drive different inductive loads like DC Motors, Relay etc.

The module has two screw terminal blocks for the motor A and B, and another screw terminal block for the Ground pin, the VCC for motor and a 5V pin which can either be an input or output. This makes a voltage drop of about 2V

It also has logic control inputs Enable A and Enable B used for enabling and controlling the speed of the motor. If a jumper is present on this pin, the motor will be enabled and work at maximum speed, and if we remove the jumper we can connect a PWM input to this pin and in that way control the speed of the motor. If we connect this pin to a Ground the motor will be disabled

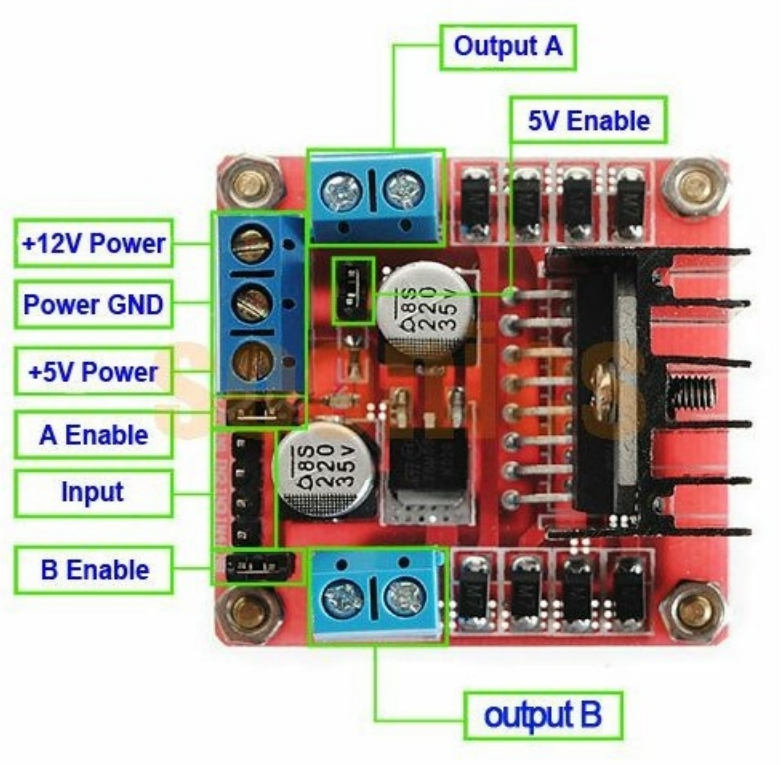


Fig 3.6- L298N Motor driver

3.5 TCS3200 COLOR SENSOR

TCS3200 color sensor is a complete color detector, including a RGB sensor chip and 4 white LEDs. The TCS3200 can detect and measure a nearly limitless range of visible colors.

The TCS3200 color sensor for aurdino has an array of photo detectors, each with either a red, green or blue filter, or no filter(clear). Internal to the device is an oscillator which produces a square-wave output whose frequency is proportional to the intensity of the chosen color.

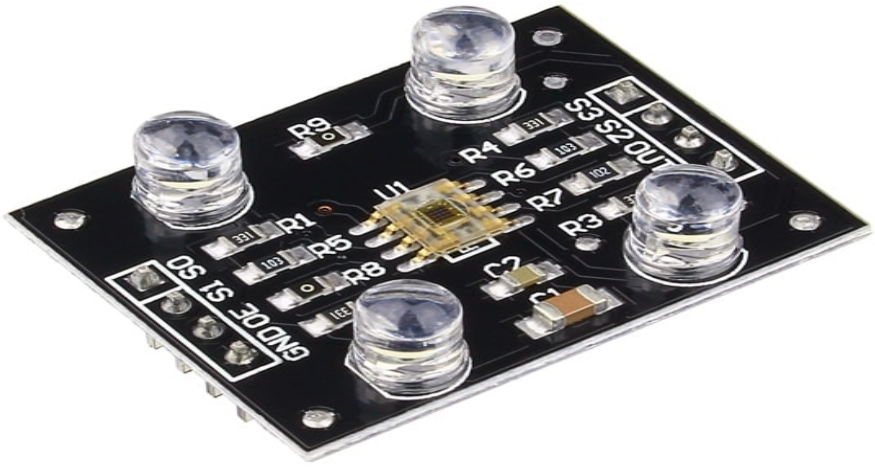


Fig 3.7- TCS3200 color sensor

3.5.1 Working principle of color sensor

In the TCS3200, the light-to-frequency converter reads an 8 X 8 array of photodiodes. 16 photodiodes have blue filters, 16 photodiodes have green filters, 16 photodiodes have rd filters and 16 photodiodes are clear with no filters. When choosing color filter, the TCS3200 can allow only one particular color to get through and prevent other color.

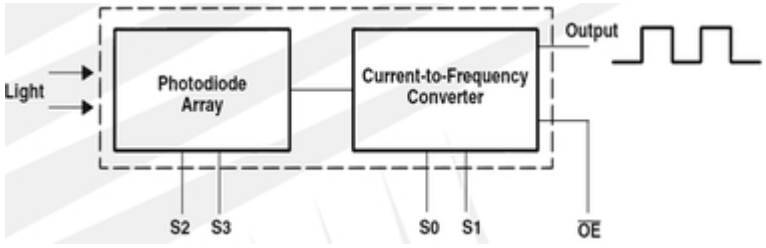


Fig 3.8- working of photodiode

The output is a square wave (50% duty cycle) with frequency directly proportional to light intensity (irradiance).

3.5.2 Pin Description

Table 3.2- pins of color sensor

TERMINAL NAME	TERMINAL NO.	I/O	DESCRIPTION
GND	4		Power supply ground. All voltages are referenced to GND.
$\overline{OE}$	3	I	Enable for f_o (active low).
OUT	6	O	Output frequency (f_o).
S0, S1	1, 2	I	Output frequency scaling selection inputs.
S2, S3	7, 8	I	Photodiode type selection inputs.
V_{DD}	5		Supply voltage

Table 3.3- output based on pin value of color sensor

S2	S3	PHOTODIODE TYPE
L	L	Red
L	H	Blue
H	L	Clear (no filter)
H	H	Green

3.6 Bluetooth sensor

HC-05 module is an easy to use **Bluetooth SPP (Serial Port Protocol) module**, designed for transparent wireless serial connection setup. In order to pair this with mobile use pass code as 0000 or 1234.

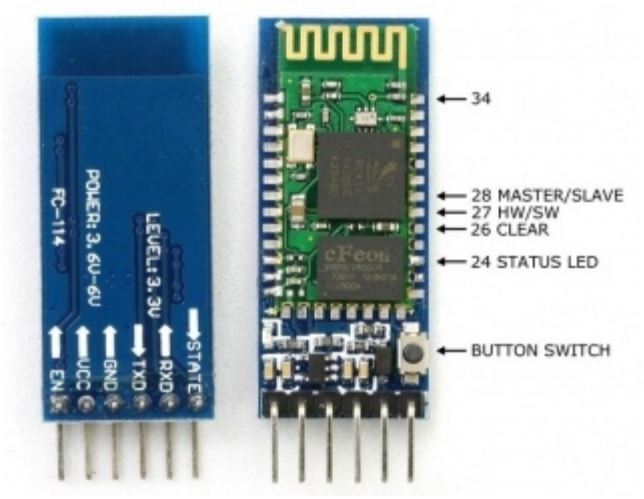


Fig 3.9-Bluetooth sensor

3.6.1 Pin Description

The HC-05 Bluetooth Module has 6pins. They are as follows:

ENABLE:

When enable is pulled **LOW**, the module is disabled which means the module will **not turn on** and it **fails to communicate**.When enable is **left open or connected to 3.3V**, the module is enabled i.e the module **remains on** and **communication also takes place**.

Vcc:

Supply Voltage 3.3V to 5V

GND:

Ground pin

TXD & RXD:

These two pins acts as an UART interface for communication

STATE:

It acts as a status indicator.When the module is **not connected to / paired** with any other bluetooth device,signal goes **Low**.At this **low state**,the **led flashes continuously** which

denotes that the module is **not paired** with other device.When this module is **connected to/paired** with any other bluetooth device,the signal goes **High**.At this **high state**,the **led blinks with a constant delay** say for example 2s delay which indicates that the module is **paired**.

BUTTON SWITCH:

This is used to switch the module into AT command mode.To enable AT command mode,press the button switch for a second.With the help of AT commands,the user can change the parameters of this module but only when the module is not paired with any other BT device.If the module is connected to any other bluetooth device, it starts to communicate with that device and fails to work in AT command mode.

3.7 Ultrasonic sensor

Fig 3.10- Ultrasonic sensor

3.7.1 Working Principle

Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

$$distance = \frac{speed\ of\ sound\ \times time\ taken}{2}$$

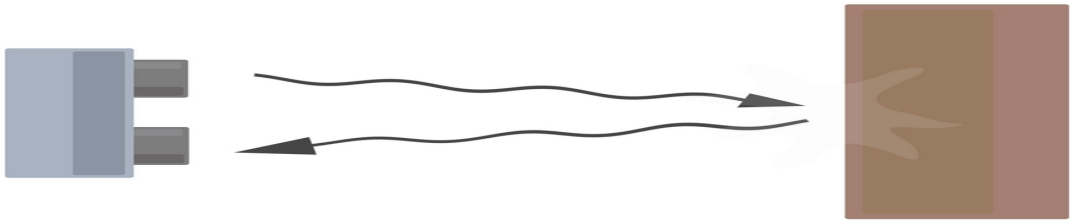


Fig 3.11- Working of ultrasonic sensor

3.7.2 Specifications

- Working Voltage: 5V(DC)
- Static Current: Less than 2mA
- Output Signal: Electric frequency signal, high level 5V, low level 0V
- Sensor Angle: Not more than 15 degrees
- Detection Distance: 2 cm to 450 cm
- High Precision: Up to 2mm
- Input Trigger Signal: 10us TTL impulse
- Echo Signal: Output TTL PWL signal
- Note: The module has a blind spot of 2cm (very near)
- So obstacle held too closely will not be detected

Table 3.4- Pin Description

Pin Number	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V

2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

3.8 Car Module

1.Chassis - The base frame of a car, carriage, or other wheeled vehicle.

2.DC Motor- The machine that converts electrical energy given by battery into mechanical energy and Wires, Battery, tyres, screws.

Specification :

- Operating voltage : 3v ~ 12v dc
- Rpm : Approximately 100 rpm
- No load current : 40 ~ 80ma

Fig 3.12- components used in making car

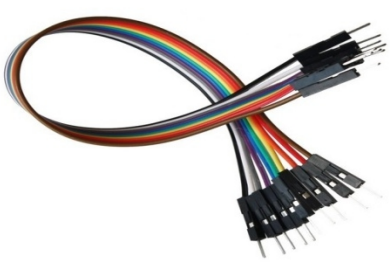
3.9 Jumper Wires and LED's

3.9.1 Introduction to jumper wires

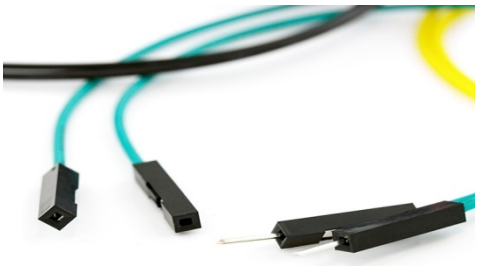
A jumper wire is an electric wire, or group of them in a cable, with a connector or pin at each end, which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

A) Male to Male



B) Male to Female



C) Female to Female

Fig 3.13- Types of Jumper wires

3.9.2 LED's

3.9.2 a) Introduction to LED's

Light emitting diode emits light when activated. When a current is applied to leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons.

Fig 3.14 - LED

3.9.2 b) Working principle of LED

A P-N junction can convert absorbed light energy into proportional electric current. The same process is reversed here(i.e the P-N junction emits light when electrical energy is applied to it). This phenomenon is generally called electroluminescence, which can be defined as the emission of light from a semiconductor under the influence of an electric field. The charge carriers recombine in a forward-biased P-N junction as the electrons cross from the N-region and recombine with the holes existing in the P-region. Free electrons are in the conduction band of energy levels, while holes are in the valence energy band. Thus the energy level of the holes is less than the energy levels of the electrons. Some portion of the energy is emitted in the form of heat and light.

CHAPTER 4

PROPOSED DESIGN

4.1 Introduction

This work is design to develop a new system that can control speed of the system based on color strips on the roads where the speed control within limit is required. The methodology explains that a various color strips are marked on turnings or on the roads where speed control within limit is required and vehicle will have a sensor attached which will recognize the color marked on the road and accordingly maintain the vehicles speed in that particular limit. For alerting the vehicle on the opposite side of the curve we used an ultrasonic sensor. LED is placed before both the ends of the curves. When an Ultrasonic sensor detects any vehicle on one side of the LED on the other side glows.

The speed control of motor is done based on PWM (Pulse Width Modulation) technique. Whereas alert system is based on echo mechanism.

4.2 PWM DC Motor Control

PWM, or pulse width modulation is a technique which allows us to adjust the average value of the voltage that's going to the electronic device by turning on and off the power at a fast rate. The average voltage depends on the duty cycle, or the amount of time the signal is ON versus the amount of time the signal is OFF in a single period of time.

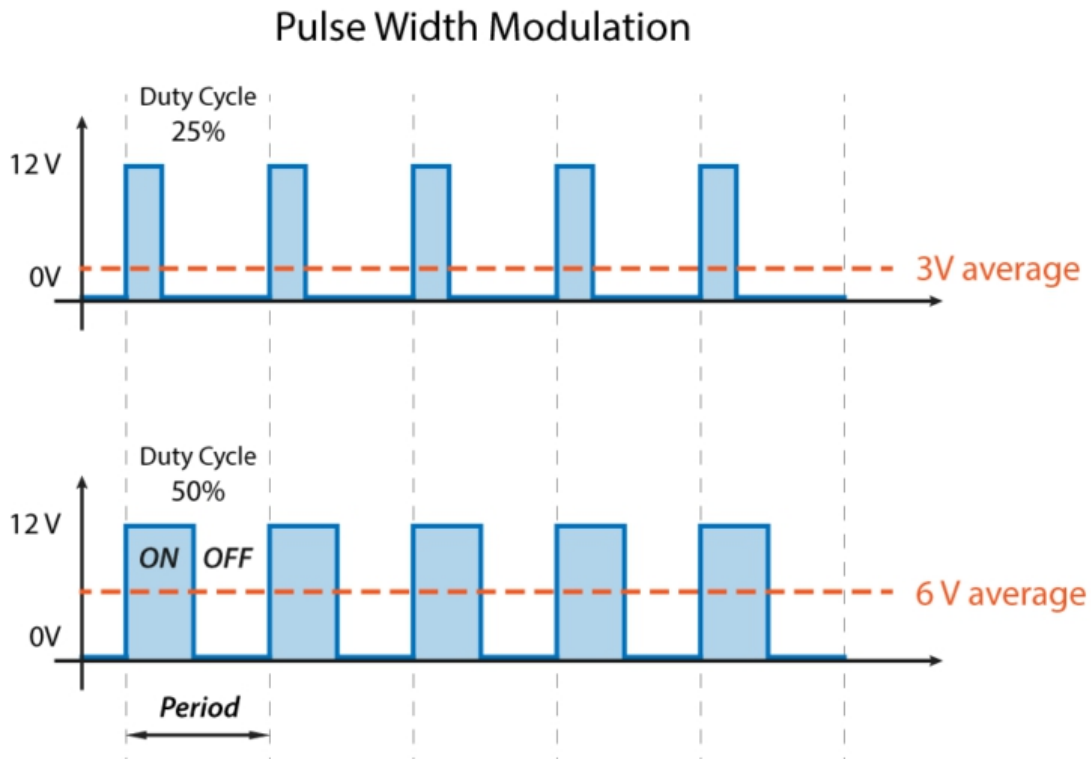


Fig 4.1- Pulse Width Modulation

So depending on the size of the motor, we can simply connect an Arduino PWM output to the base of transistor or the gate of a MOSFET and control the speed of the motor by controlling the PWM output. The low power Arduino PWM signal switches on and off the gate at the MOSFET through which the high power motor is driven.

4.3 Design for Speed Control

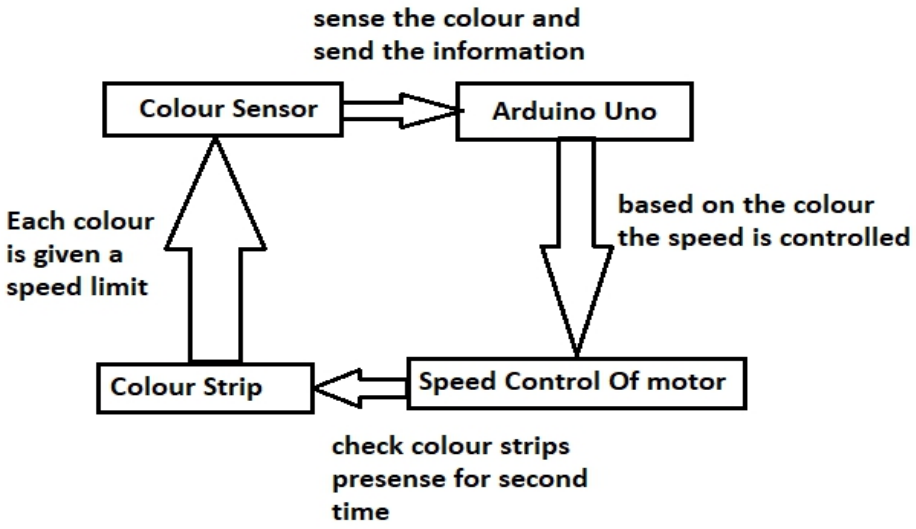


Fig 4.2-Flow of proposed model for speed control

The Road is painted in stripes with Red, Green, Blue color's, Inorder to gradually bring down the speed of vehicles. Detection of blue decreases the speed a little, while the green color makes the car to move at moderate speed and the red color means minimum required speed.

4.4 Design for Alerting system :

For this an ultrasonic sensor and an LED is placed before both the ends of the turns. On detection of vehicle on one side the LED on the other side glows which indicates the presence of vehicle i.e alerts the driver
about the vehicle coming by.

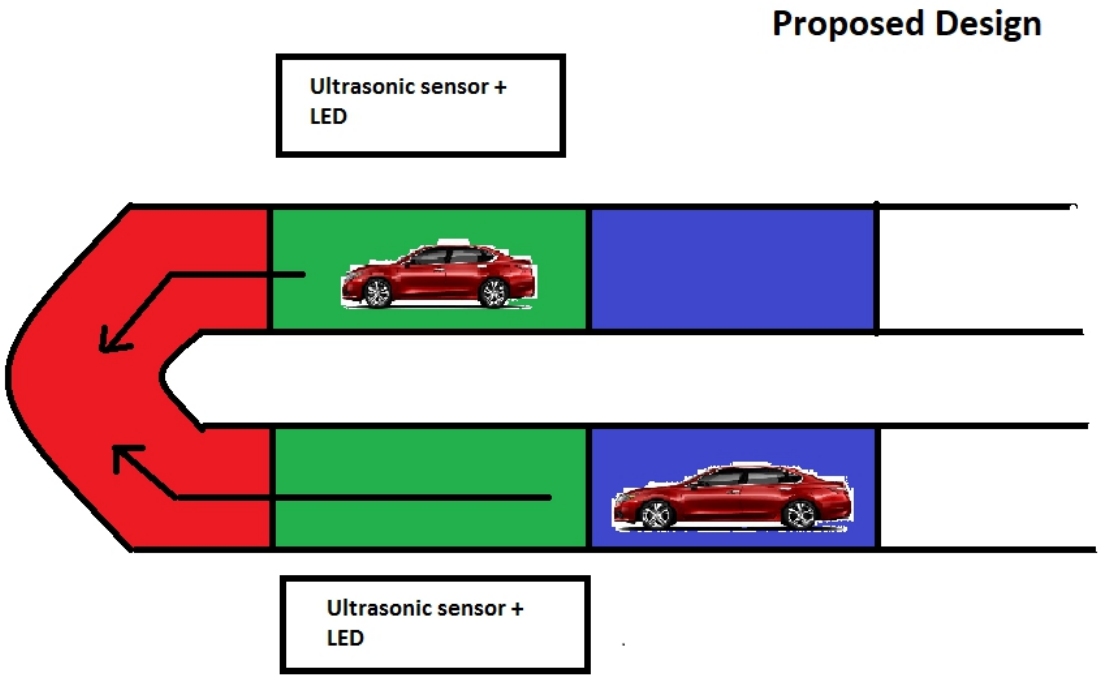


Fig 4.3- proposed Design

CHAPTER 5

IMPLEMENTATION

The implementation is done using Arduino UNO board as an ideal evelopment platform. Here, the basic concept which leads to the development of
Our project is PWM (Pulse Width Modulation) technique i.e to control the speed of motor or vehicle and echo mechanism to detect the presence of vehicle.

5.1 CIRCUIT DIAGRAM

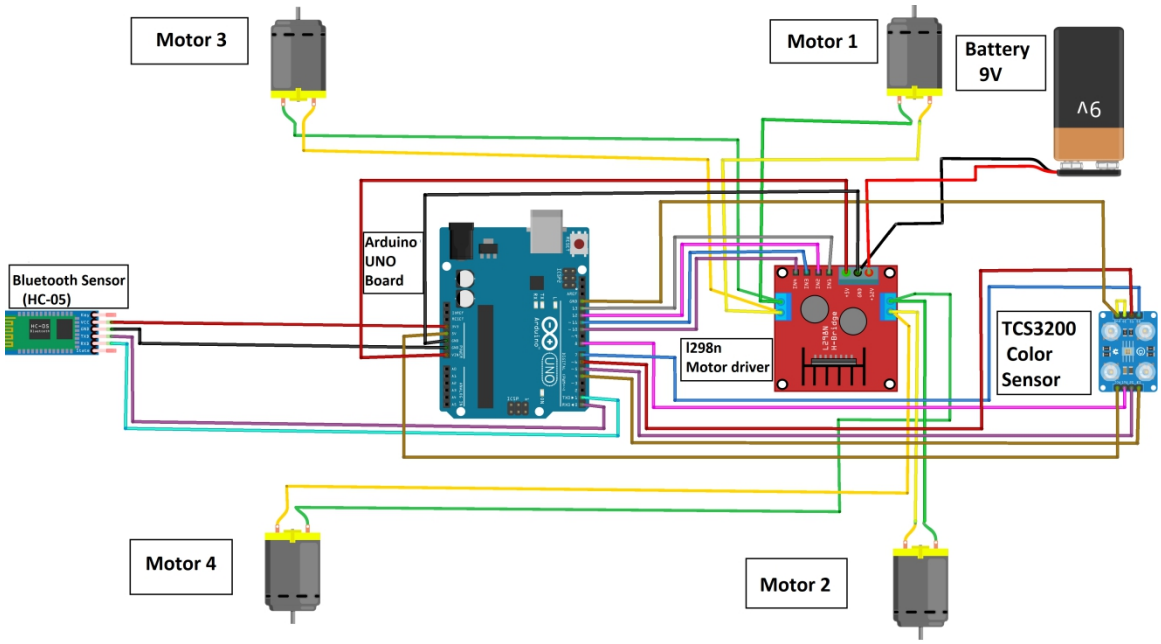


Fig 5.1- Implementation of speed control

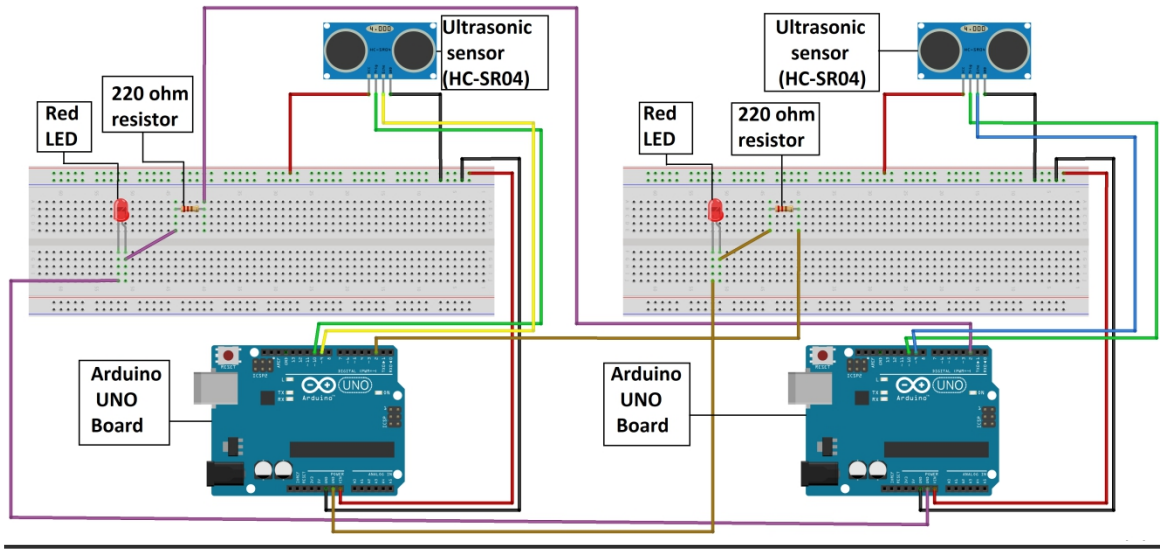


Fig 5.2 Implementation of alert system

5.2 PROGRAM CODE

- **PROGRAM FOR SPEED CONTROL OF THE CAR: -**

```
constint ENA = 2;
constint ENB = 3;
constint s0 = 7;
constint s1 = 6;
constint s2 = 5;
constint s3 = 4;
constint out = 8;
int red = 0;
int green = 0;
int blue = 0;
char t;

voidspeed_control(int,int);
intcolor_sensor_function();
voidcolor();
```

```
void setup() {
pinMode (ENA, OUTPUT);
pinMode (ENB, OUTPUT);
pinMode(13,OUTPUT);
pinMode(12,OUTPUT);
pinMode(11,OUTPUT);
pinMode(10,OUTPUT);
Serial.begin(9600);
pinMode(s0, OUTPUT);
pinMode(s1, OUTPUT);
pinMode(s2, OUTPUT);
pinMode(s3, OUTPUT);
pinMode(out, INPUT);
digitalWrite(s0, HIGH);
digitalWrite(s1, HIGH);
}
void loop() {
if(Serial.available()){
  t = Serial.read();
Serial.println(t);
}
if(t == 'B'){
digitalWrite(13,LOW);
digitalWrite(12,HIGH);
digitalWrite(11,HIGH);
digitalWrite(10,LOW);
}
else if(t == 'F'){
digitalWrite(13,HIGH);
digitalWrite(12,LOW);
digitalWrite(11,LOW);
```

```
digitalWrite(10,HIGH);
}
else if(t == 'R'){
digitalWrite(13,LOW);
digitalWrite(12,LOW);
digitalWrite(11,LOW);
digitalWrite(10,HIGH);
}
else if(t == 'L'){
digitalWrite(13,HIGH);
digitalWrite(12,LOW);
digitalWrite(11,LOW);
digitalWrite(10,LOW);
}
else if(t == 'S'){
digitalWrite(13,LOW);
digitalWrite(12,LOW);
digitalWrite(11,LOW);
digitalWrite(10,LOW);
}
int CS=color_sensor_function();
if(CS==4) speed_control(255,255);
if(CS==1) speed_control(250,250);
if(CS==2) speed_control(175,175);
if(CS==3) speed_control(100,100);
delay(100);
}

voidspeed_control(inta,int b) {
analogWrite(ENA, a);
analogWrite(ENB, b);
```

```
}

intcolor_sensor_function()
{
color();
if (red < blue && red < green && red < 20) return 3; //red
if (blue < red && blue < green) return 1;//blue
if (green < red && green < blue) return 2;//green
return 4;
 }

voidcolor()
{
digitalWrite(s2, LOW);
digitalWrite(s3, LOW);
red = pulseIn(out, digitalRead(out) == HIGH ? LOW : HIGH);
digitalWrite(s3, HIGH);
blue = pulseIn(out, digitalRead(out) == HIGH ? LOW : HIGH);
digitalWrite(s2, HIGH);
green = pulseIn(out, digitalRead(out) == HIGH ? LOW : HIGH);
}
```

- **PROGRAM FOR DETECTION OF THE CAR AND TURNING ON THE LEDs: -**

```
#define trigPin 10

#define echoPin 9

#define led 2


void setup() {
```

```
Serial.begin (9600);
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
pinMode(led, OUTPUT);
}

void loop() {
long duration, distance;
digitalWrite(trigPin, LOW);  // Added this line
delayMicroseconds(2); // Added this line
digitalWrite(trigPin, HIGH);
delayMicroseconds(10); // Added this line
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance = (duration/2) / 29.1;
if(distance>0 && distance<=20)
  {digitalWrite(led,HIGH);
delay(2000);
  }
elsedigitalWrite(led,LOW);
Serial.println(distance);
delay(100);
}
```

CHAPTER 6

RESULTS & DISCUSSIONS

6.1 Results

Fig 6.1 Designed system

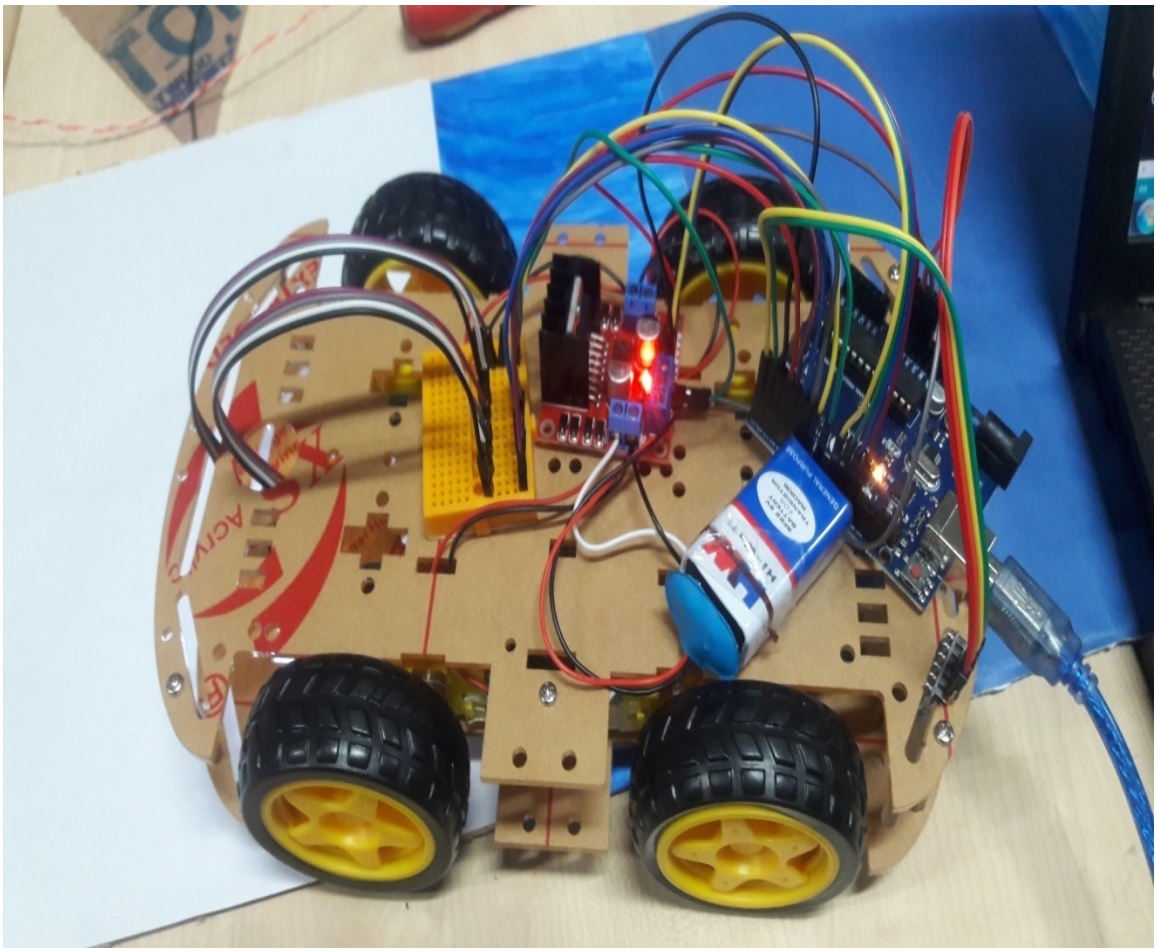


Fig 6.2- Figure showing cars presence on road

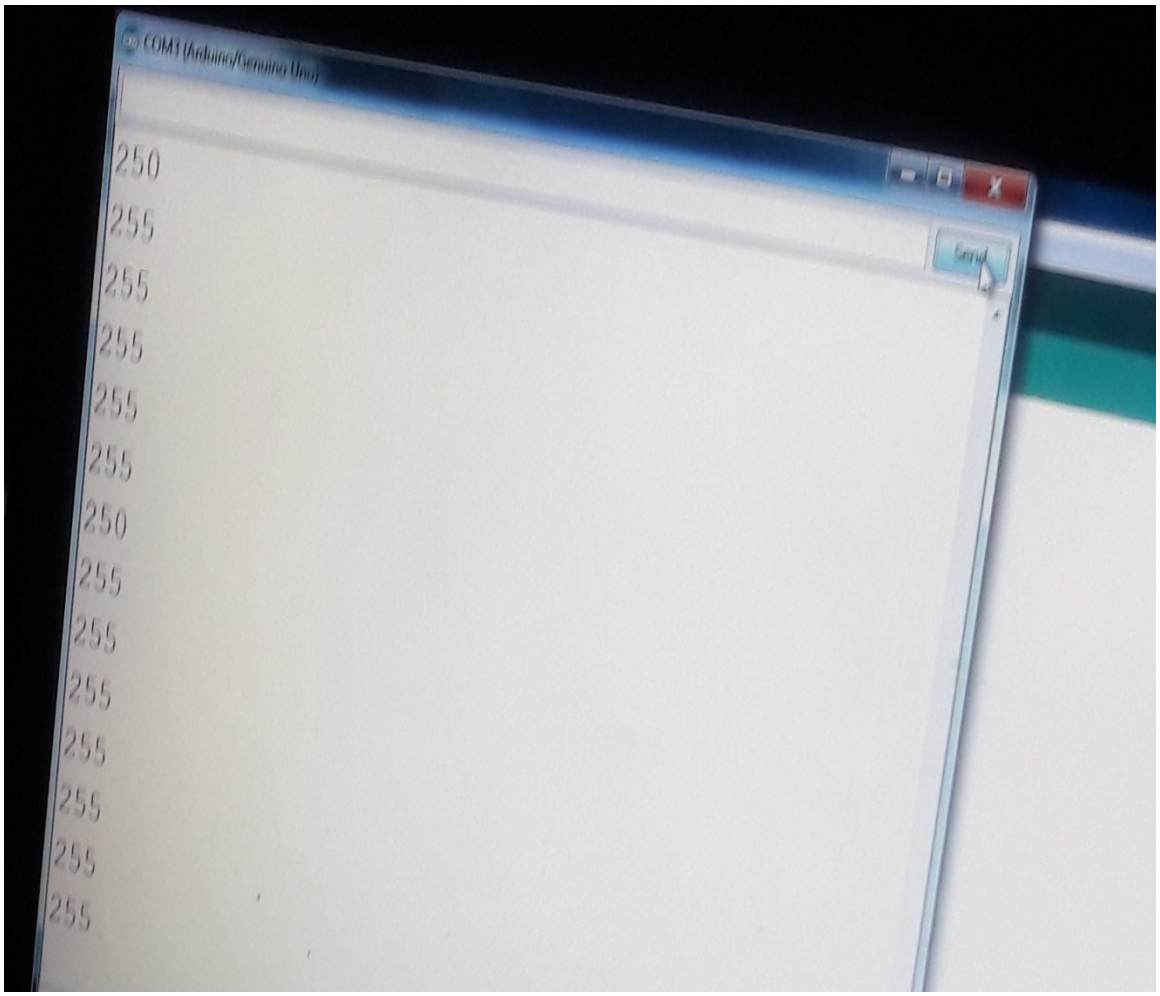


Fig 6.3- Output speed when on road with no color

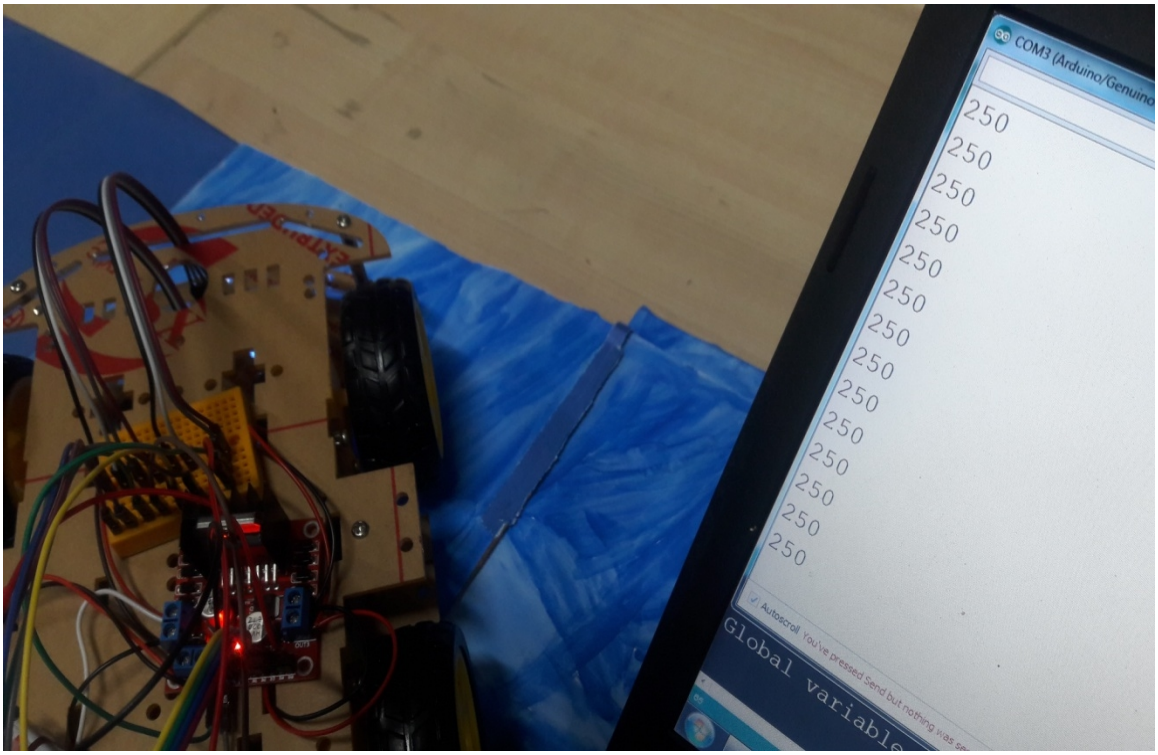


Fig 6.4-Figure showing output speed when on road painted with blue color

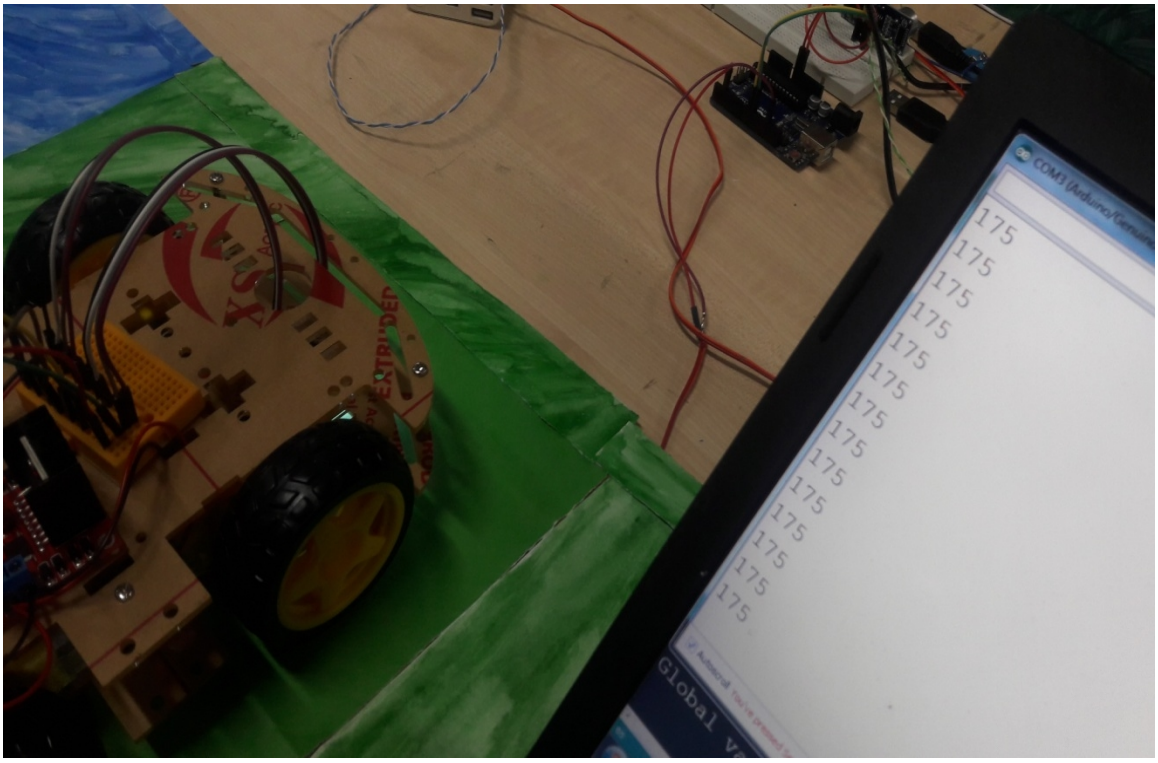


Fig 6.5- Figure showing output speed when on road painted with green color

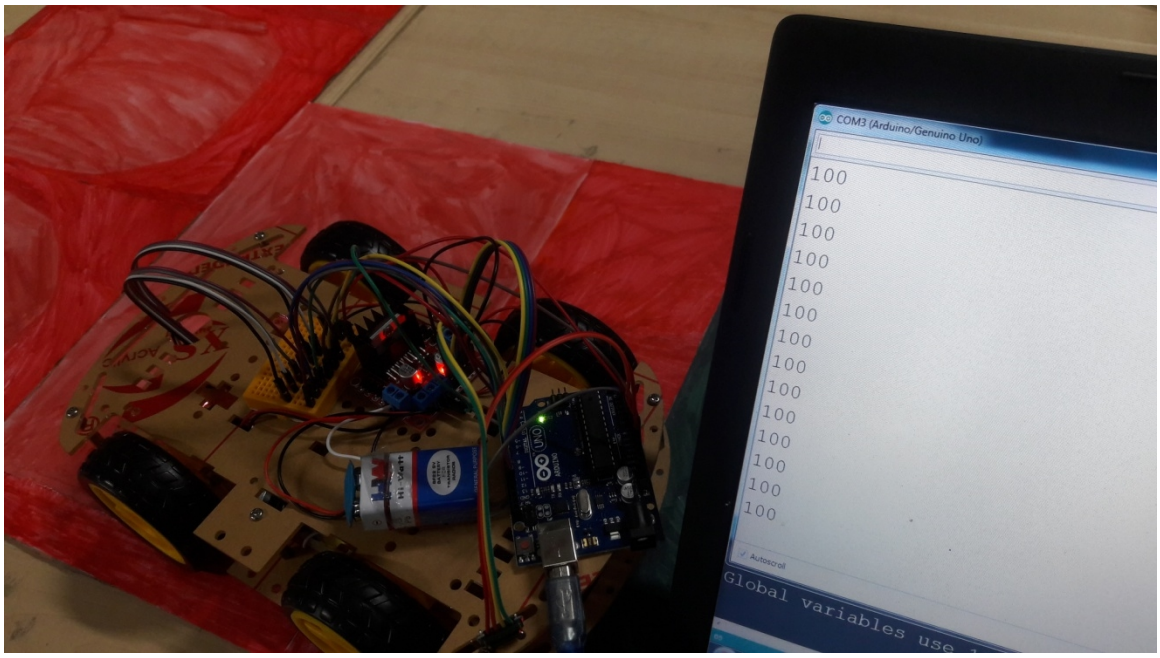


Fig 6.6- Figure showing output speed when on road painted with red color

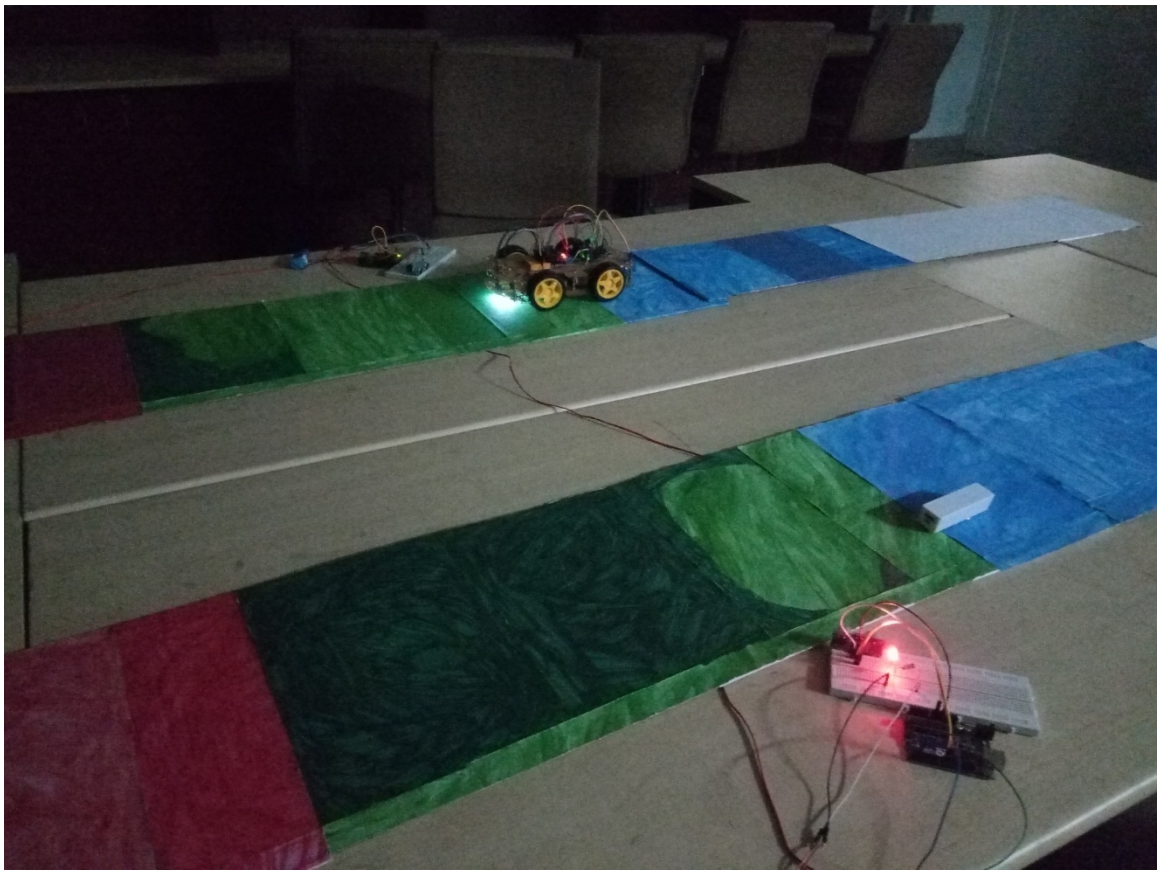


Fig 6.7 Alerting the white vehicle about the presence of vehicle on other side of turn

From the above results we can see that the speed has been controlled or reduced based on color value and also the proposed alert system is seen where the red LED is glowing showing the presence of vehicle on other end of turn.

6.2 Future Scope

In future, we can implement this system over normal speed limiting roads also so as to control the speed and decrease the number of accidents and also to decrease the amount of burden over the driver i.e by automatic speed control there is no need for driver to concentrate over the speedometer as it is being controlled automatically over the time.This can also be used in place of divider's and speed breakers, usage of this system as speed breaker helps in the smooth travel rather than those harsh ups and downs of speed breaker & usage as a divider(or as edge detection system too) helps in prevention of high speed collisions to divider at night, also helps vehicle in maintaining its path i.e by controlling the direction (automatically move away from the divider incase of detection) . This also leads to less cost for the government and it can use the conserved money for future big projects or in the development of our country.

CHAPTER 7

SUMMARY AND CONCLUSION

In this project , we presented a system design for automatic speed control and vehicle detection at turns to reduce the probability of accidents. It is designed by using PWM (Pulse Width Modulation) technique for speed control and echo mechanism followed by ultrasonic sensor for the detection of vehicle on Arduino UNO board. The utilization of the customized codes in the design models delivers high level of performance and efficiency. Thus it resulted in an efficient implementation of the hardware. In addition, This implementation is advantageous because the system becomes highly flexible, simple and reliable.

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