International Journal of Engineering Applied Sciences and Technology, 2020
Vol. 5, Issue 7, ISSN No. 2455-2143, Pages 292-295
Published Online November 2020 in IJEAST (http://www.ijeast.com)

AUTOMATIC VEHICLE SPEED REDUCTION & ACCIDENT PREVENTION SYSTEM USING RF TECHNOLOGY

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***Abstract*—This work is focused on solving one of the major problems with respect to Indian Road Safety i.e. Accidents caused due to over speeding vehicles and reckless driving near accident prone areas like highways,hospitals,schools etc.Since the world is moving towards automation using latest technologies,this project is a small leap towards automated road safety measures.In this project,we have incorporated micro controller along with radio frequency identification system to limit the overspeeding of vehicles.The transmitter and receiver module helped us in automatic speed reduction of overspeeding vehicles to permissible limits once the vehicle is inside an accident prone area.Additionally,couple of more functions are going to be incorporated such as automatic braking of vehicle before zebra crossing when the signal is ON and GSM based penalty system for exceptional vehicles.Along with this,an alcohol sensor will also be installed to restrict drunk drivers from driving the vehicle.**

Keywords—RFID, IoT, Sensors, Automation and Micro - Controller

I. INTRODUCTION

Despite a lot of efforts by the Indian Government Accidents due to overspeeding has increased rapidly over the past few years on Indian roads, putting a question mark on Indian Road Safety Measures and its infrastructure. As per reports of National Crime Records Bureau (NCRB), In 2019, a total of 4,37,396 road accidents were recorded across India. The data says, the majority (59.6%) of the road accidents were due to "over-speeding" which caused 86,241 deaths alone. This void loophole can be mitigated using automative speed reduction technologies. The aim of our project is to provide the solution to limit the speed of overspeeding vehicles automatically using RF transmitter and receiver once they enter an accident prone area such as schools, hospitals, highways etc. Once the speed of the vehicle comes down within permissible limits, driver will not be able to exceed the speed limit even if he accelerates the car to its full potential. The project will help to reduce the percentage of road accidents caused by over speeding. This in turn ensures the safety and security of human lives on road. As the accidents due to overspending are increasing day by day, this project could be a ground breaking road safety model if implemented well. This project aims to completely "nullify" the rash driving habits of people.

II. COMPONENTS USED

- *Arduino Mega 2560*

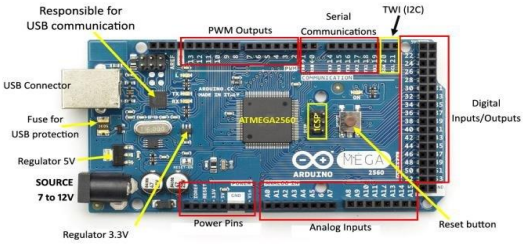

FIG 2.1- ARDUINO MEGA 2560

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board micro-controllers and micro-controller kits for building digital devices. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/ output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (For prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The micro-controllers can be programmed using C and C++ programming languages.

- *RF Module*

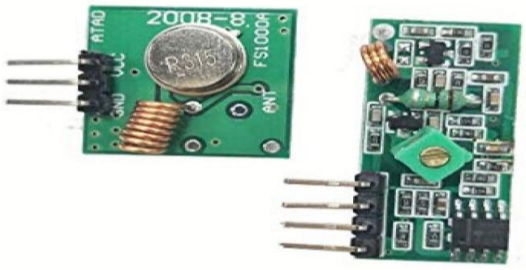

Fig 2.2 - RF MODULE

RFID stands for Radio Frequency Identification by means of radio signals. It is a form of wireless communication that uses radio waves to ideantify and track objects. RF module can realize a contactless and unique identification of things for short and long ranges. RFID consists of two modules i.e. Transmitter and Receiver. In our

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project we have used Far field RF module which works in the range of 100-1000m.

- *Motor Driver L293D*

Fig 2.3 - Motor driver L293D

L293D is a typical Motor driver or Motor Driver integrated circuit which is used to drive direct current on either direction. It is a 16-pin IC which can control a set of two DC motors simultaneously in any direction.

- *Alcohol Sensor*

Fig 2.4 - Alcohol Sensor

An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage is an output reading. The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breathalyzers.

III. CONCEPT AND OPERATION

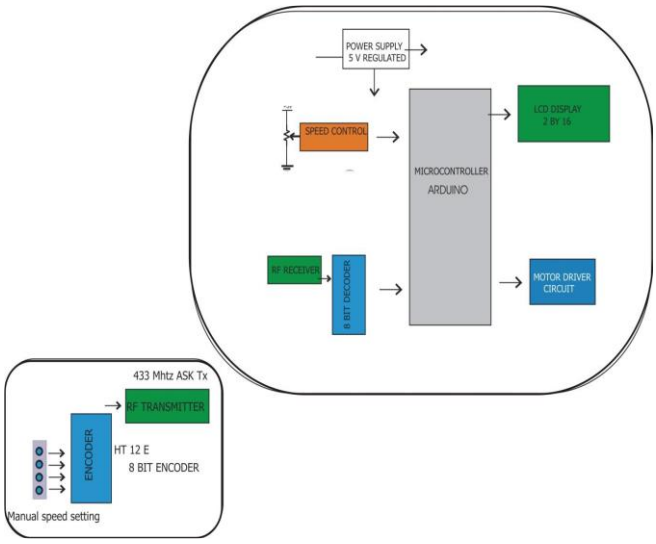

Fig 3.1- Block Diagram

The following project will be concerned with the speed control of a vehicle using RF transmitter and receiver with the integration of obstacle detection and accident prevention with the help of alchol sensor.

The transmitter has to be installed in required places where the speed limit of the vehicle has to be checked such as – Hospital, School, Highways, Government official buildings, U-Turns etc. The transmitter will transmit signal and the receiver has to be installed within the vehicle for speed controlling purpose. Whenever the vehicle is within the transmitter zone the speed of the vehicle is decreased to some cutoff and kept constant until the vehicle moves out of the transmitter zone.Driver will not be able to exceed the speed limit even if he accelerates the car to its full potential.

Additionally, a couple of more functions are going to be incorporated such as automatic breaking of vehicle using IR sensors before zebra crossing when the signal is ON and GSM based penalty system for exceptional vehicles.

Fig 3.2 - Virtual Representation of our Project

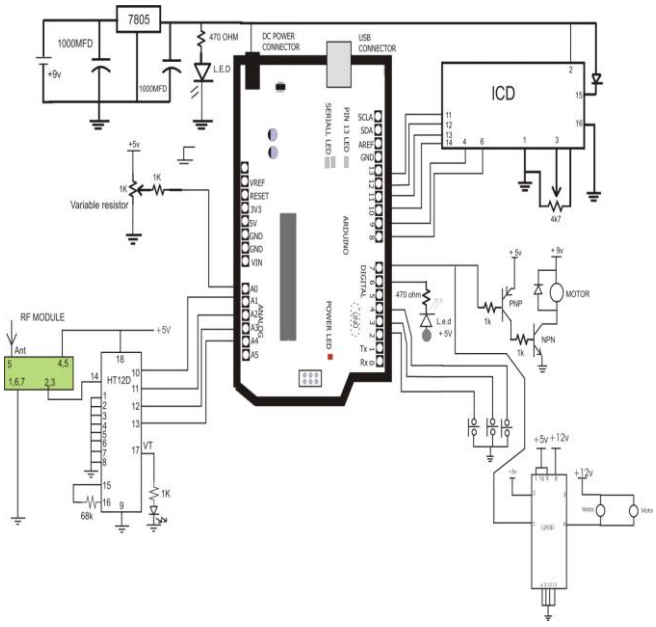

Fig 3.3 – Arduino connections with motor driver and RF module

IV. DESIGN METHOD AND IMPLEMENTATION

Various Algorithms has been used for car speed control according to data transmission. The RF transmitting circuit consist of a RF transmitter module. We used virtual Wire library for which encoder was not needed. The voltage regulator circuit is obtains power from a 12 volt(1 A) battery which provides the motor with unregulated 12 volt supply and whereas arduino, motor driver and the receiver module receives a 5 volt regulated supply. DC motors are interfaced through a motor driver to arduino which provides the parameters based on the pre-programmed code.

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```
#include<LiquidCrystal.h>

LiquidCrystal
lcd(13,12,11,10,9,8);
int motor=6;
int accel=A0;
int d1=A1;
int d2=A2;
int d3=A3;
int d4=A4;
int speedx,limit;
int ACC;
int currentSpeed=-1;

void setup() {

 Serial.begin(9600);
 pinMode(d1,INPUT);
 pinMode(d2,INPUT);
 pinMode(d3,INPUT);
 pinMode(d4,INPUT);
 pinMode(7,INPUT);

 pinMode(motor,OUTPUT);

 lcd.begin(16,2);
 lcd.setCursor(0,0);
 lcd.print("Car Speed RF");
 delay(2000);
 lcd.clear();
 lcd.setCursor(0,0);
 lcd.print("Acc:000 Lim:000");
 lcd.setCursor(0,1);
 lcd.print("FinalSpeed :000");

}

void loop() {

  Serial.print(currentSpeed);
  Serial.print("  ");

Serial.println(analogRead(A0));

  limit=100;
  //if(digitalRead(7)==HIGH)
  //{
  if(digitalRead(d1)==LOW)
    limit=20;
  else
if(digitalRead(d2)==LOW)
    limit=40;
  else
if(digitalRead(d3)==LOW)
    limit=60;
  else
if(digitalRead(d4)==LOW)
    limit=80;
  //}

 ACC=analogRead(accel)/10.23;
  lcd.setCursor(4,0);
  lcd.print(ACC/100);
  lcd.print((ACC/10)%10);
  lcd.print(ACC%10);
  lcd.setCursor(12,0);
  lcd.print(limit/100);
  lcd.print((limit/10)%10);
  lcd.print(limit%10);

  if(ACC>limit)
    ACC=limit;
  lcd.setCursor(12,1);
  lcd.print(ACC/100);
  lcd.print((ACC/10)%10);
  lcd.print(ACC%10);

  //analogWrite(motor, 255-
(ACC*2.55) );

  if(currentSpeed==-1)
   currentSpeed=ACC;

  if(currentSpeed!=ACC)
   {
    if(currentSpeed>ACC)
      for(int
i=currentSpeed;i>ACC;i--)
       {
        lcd.setCursor(12,1);
        lcd.print(i/100);
        lcd.print((i/10)%10);
        lcd.print(i%10);
        analogWrite(motor,
255-(i*2.55) );
        delay(15);
       }
    if(currentSpeed<ACC)
      for(int
i=currentSpeed;i<ACC;i++)
       {
        lcd.setCursor(12,1);
        lcd.print(i/100);
        lcd.print((i/10)%10);
        lcd.print(i%10);
        analogWrite(motor,
255-(i*2.55) );
        delay(15);
       }
    currentSpeed=ACC;
   }
}
```

Fig 4.1 - Arduino code for the program.

Arduino is connected with RF receiver and motor driver circuit along with LCD display to display the real time speed whenever the car moves in the safety zone of transmitter.

V. Significance in Application Perspective

- It won't allow the driver to drive outside permissible limits when in an accident prone area like around schools, hospitals, U-turns etc. It will convert these accident prone areas to safety zones.
- This safe zone will ensure a certain speed limit of the vehicles so that these vehicles are forced to drive within or below a minimum speed limit whenever they are within that range.
- This model could help monetarily in two ways:
  1. It will require less number of policemen to look for the safety of the roads.
  2. Fine will not be imposed against the wish of the people unlike before where people were forced to pay huge penalties for driving out of speed limit unknowingly in accident prone areas.

VI. Result

We have tried to build up a model which not only will ensure the safety of the people but will also contribute to the road safety infrastructure of our country. Our project exquisitely controls speed of the vehicles in some special selected zones where the speed limit of the vehicle is to be set by the governing authority.Though there is still some scope of improvement in this project where we will try to remove the drawbacks such as frequency distortion and attenuation of transmitter signals and integrating our project further with latest technologies like IOT and machine learning. We believe correct implementation of this model would benefit both the government and its people.

VII. Conclusion

This model could be put to use at different places where there is a need for road safety like around schools, hospitals government buildings etc. We often see that speed breakers are constructed at various places to reduce vehicle speeds. With time, speed breakers are regarded less as a safety feature but more as a hindrance in the way of lovely road experience. Companies are trying state of the art engineering to provide world class suspension and robust shock absorbers. This is a straight away breach of right to lives of fellow commuters on road. Due to simplistic and economical design of our model it will ensure a smooth driving experience for all the daily commuters.

Also, Our government had tried various preventive measures to check this menace of over speeding but situation is not getting controlled. Therefore, we have made this model as a detentive measure to combat over speeding and solving one of the major issues of road safety.

VIII. Future Improvement Scope

- *Automatic Breaking System*

In future integration can be done in this project by adding some more safety measures like Automatic breaking of the cars before zebra crossing when the signal is ON. This will allow the pedestrians to cross the roads without getting their path blocked by the vehicles. Also, it will cease the need for placing cameras on the signals to stop the cars before zebra crossing which will make it more economical.

- *GSM Based Penalty System*

Some penalty based mechanism can be recommended in this project through which exception cases such as police vehicles, ambulance and vehicles in emergency can be exempted from speed control inside safety zones.

- *Speed Detection using GPS.*

An autonomous integrated system can be attached with the vehicle that can locate its position from the available map of the city and decide by itself about the highest speed limit for any particular road or highway.

- *Automatic regulation of Speed limit*

Some more advance features can also be added that will enable a vehicle to detect speed limits of roads and highways from signboards along the road.

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