

Accident Prevention and Intelligent Safety System for Smart Vehicle

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ABSTRACT

We are living in an era of technological advancement, which gives us advancement in almost everything, especially in transportation we came long way ahead. Now a day we have the means of transport which can able to attain speeds which we could only dreamt of achieving earlier, with this advancements people are driving carelessly which attracts more accidents very often. People lost their valuable life because of some silly mistakes. To save the precious human life it's necessary for taking extreme measures and also advancement in the safety technology used in vehicles. While driving some accident sensitive area (school zone, hills area, and highways) in order to avoid accidents and to alert the drivers and to control their vehicle speed in such places the highway departments have placed the signboards. But sometimes it may not possible to view that kind of signboards and there is a chance for accident. The proposed paper makes use of smart zone based vehicle speed control using RF and accident prevention system. Whenever the vehicle is within the zone, the vehicle speed is controlled by transmitting and receiving the signal. Once the vehicle entered into a speed sensitive area its speed is decreased to some cutoff and kept constant until the vehicle moves out of the zone, and then vehicle can get accelerated by itself.

Keywords: Speed Control, RF, Embedded System, Accident prevention.

INTRODUCTION

Road facilities are main concern in the modern world. According to Mr. Willie D. Jones in the IEEE SPECTRUM magazine (September 2001), a person dies in a car crash every second. If we study the accident cases, then behind every accident there are five main reasons for driver injury or death.

- Over speeding
- Driver is drunk
- Driver suffers from Drowsiness
- Seat belt is not wired
- No vehicle to vehicle communication.

Reduction of the number of accidents and mitigation available in commercial vehicles today and future of their consequences are a big concern for traffic authorities, the automotive industry and transport research groups. Road accidents are human tragedy. High human suffering and monetary cost is involved in terms of untimely

deaths injuries and potential income loss. In the proposed system a dynamic system is designed which avoids all the five reasons of accident. In case of over speeding in a speed limit zone area speed is going to limit to a certain cutoff value. If a driver is drunk then vehicle won't start until he or she is not able to drive, the system restricts driving without seatbelt also alarm a buzzer if driver suffer drowsiness, and when the vehicle will turn suddenly an indicator message will be sent to surrounding vehicles.

II.LITERATURE SURVEY

The total number of vehicles registered in India is shown in Table 1. These data shows that total number of vehicles is increasing per year by a huge margin. The annual increasing rate of vehicles are 10%, however, these numbers are probably bit overrated as personal vehicle owners register their vehicles and pay the road tax once when they buy the vehicle and are not required to pay an annual tax. Due to this, a large number of vehicles remain on the official record although they are not in use any more. Recent estimates suggest that the actual number of vehicles in use may be about 60-70% of the official number thus the accident rates also increases.

Table1 Growth in vehicle per year

Year	Total Vehicle
2014	189491
2015	208562
Growth/Year%	10

The number of road traffic fatalities and the population of India from 2005 to 2015. The total number of fatalities increased at an average rate of about 4% per year in the period 2005-2015 and the rate has increased to 8% per year since then. The number of fatalities per million populations was around 79-83 in the period 2005-2015 and has increased to 101 since then. Traffic fatalities per unit population has been taken as an indicator of the health burden of road traffic crashes on society at the city, regional, or national level. Therefore, traffic fatalities per unit population can be taken as a rough indicator of risk faced by individuals. Over the past few years he risk of being involved in a fatal road traffic crash has obviously been increasing for Indian citizens. While some of this increase can be attributed to increase in the number of motor vehicles per capita in India, however, increasing vehicle ownership need not result in increased fatality rates if adequate safety measures are implemented.

Table 2 Road traffic fatalities in India

Year	Fatalities	Fatalities/million persons
2005	77,000	81
2006	79,900	82
2007	82,000	83
2008	78,900	79

2009	80,900	79
2010	84,059	80
2011	84,430	79
2012	91,376	84
2013	98,254	89
2014	105,725	94
2015	114,590	101

[2]. Vehicle drivers are requested to collect dynamic visual information on such matters as other vehicles and traffic signals, and static visual information including traffic signs, and to maneuver the vehicles accordingly. However, traffic signs and other static visual information are more likely to be overlooked than dynamic visual information during maneuver.

[3]. The main motive behind this paper is to reduce these reckless accidents for which we propose a system that governs and controls the speed of the vehicle without any direct inconvenience to the driver. There are instance where the speed of the automobile is beyond the expected speed limit or the driver doesn't obey the traffic signals. Thus we are using RF technology.

We researched a lot over which RF module to be used and came to the conclusion that passive tags would not be feasible as it can't store multiple IDs and as a relatively less range thus we are using active RF module and basic microcontroller.

[9]. The main objective here is to design a smart display controller meant for vehicle's speed control and monitoring the zones, which can run on an embedded system. Smart display and control (SDC) can be custom designed to feed into a vehicle's dashboard, and display information on the vehicle.

III. BLOCKDIAGRAM

The block diagram representation is as shown in **fig: 1** and **fig: 2** consist of two parts

- ⇒ Road side module.
- ⇒ Vehicle side module.

Road side module

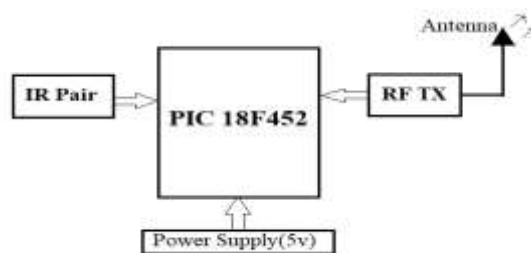


Fig: 1 Block diagram of road side module

PIC 18F452-PIC 18F452 is a controller unit for road side section which takes a data from IR pair if it is true then sends data by RF transmitter. It requires 5v supply for working.

IR Pair- IR pair is a sensing device for a vehicle which detects s vehicle when it cuts a IR rays.

RF TX-The data of a speed limit zone is not directly transmitted to the vehicle it is first encoded in analog format by an IC HT12E then it is transmitted using amplitude shift keying (ASK).

Vehicle side module

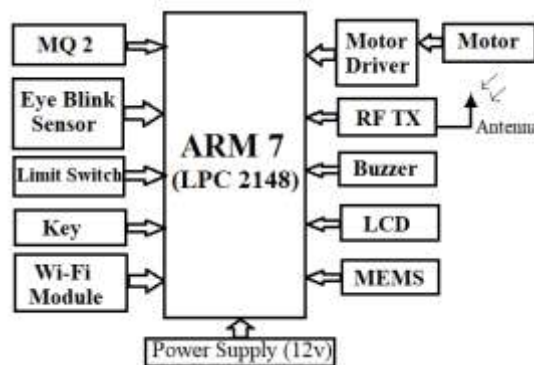


Fig: 2 Block diagram of vehicle side module

This work is aimed at producing a cost effective smart, secured and safe vehicle system. A prototype model is built as shown. It comprises

1. ARM-7 module – In the project we are using LPC2148. It acts as the major controller unit of the system. Input of various sensors like IR, alcohol sensor, drowsiness sensor, and seatbelt key is given to ARM7 unit on which it processes according to the programming and gives output. It needs 12V to drive the ARM7 module.
2. MQ2-MQ2 is a gas sensor. We are using it as alcohol sensor which is place near a staring wheel of a vehicle which can easily sense the alcohol in vicinity of it.
3. Drowsiness Sensor- Eye blink sensor is nothing but a simple IR pair which tracks the motion of eye regularly and detects the drowsiness.
4. MEMS- MicroElectroMechanical System is a technology which is able to gather information from the environment by measuring thermal, magnetic, optical, chemical, biological, or mechanical phenomena.
5. Wi-Fi Module (ESP8266) - The ESP8266 is a Wi-Fi microchip with full TCP/IP stack and microcontroller capability.
6. Motor Driver (L293D)-it is motor driver IC which permits the motor direction control in various directions.
7. Key-key is a simple sensor for seat belt detection.
8. Limit Switch- Limit switch is like a controller of a vehicle which controls the movement of prototype vehicle.
9. Motors-Motors are act as a wheel of a prototype vehicle.

10. Buzzer- Buzzer is an acoustic indication device which informs the driver in emergency.
11. RF RX – Radio frequency receiver receives the command signals from the road side module, which is then decoded to original format by an IC called as HT12D.

IV. WORKING

Speed Control

The IR pairs are placed in the speed limit zones like school, colleges, Hospitals or a dangerous point on a highway whenever the vehicle enters in the speed limit zone an IR pair cut of then it senses that the vehicle is entered in speed limit zone and controls the speed according to the zone speed limit.

Alcohol Sensor

The projects involve the alcohol detection using an alcohol sensor MQ2. Sensitive material of MQ2 gas sensor is SnO₂ which with lower conductivity in clean air. When the target alcohol gas exists, the sensor's conductivity gets higher along with the gas concentration rising. The driver or the user can convert any changes in conductivity to an equivalent output signal of gas concentration through a simple circuit. When a driver is drunk and tries to sit on a driver seat then the alcohol sensor MQ2 detects the presence of alcohol and blow the buzzer and unless and until the alcoholic person is replace by a normal person the car wouldn't ignite.

Seat Belt Detection

Normally we wear seatbelt over chest and there is physical contact in human body and seatbelt when seatbelt is wear the key mounted on a seatbelt got pressed which sends a control command signal to a controller and the microcontroller understand the a person is wearing the seatbelt and start the vehicle.

Drowsiness Detection

IR sensor is used in this project to measure and controls the eye blink. Infrared rays are transmitted in driver's eye using IR transmitter. The reflected infrared rays of eye are received by the IR receiver. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low, if continuous high output is getting for five to six times then controller is going to know the driver suffers from drowsiness. This to know the eye is closing or opening position. This output is give to logic circuit to indicate the alarm.

Vehicle to Vehicle Communication:

Sometimes the driver changes the lane suddenly, so all the vehicles which are surrounding that vehicle are not aware of it and accident happen. To avoid this problem this project provides vehicle to vehicle communication using MEMS technology and Wi-Fi module. For Wi-Fi module we are using ESP8266 with Uart. When the driver makes any sudden turn the turning motion is detected using MEMS and the indication message will be sent to all the other vehicles surrounding the turning vehicle using Wi-Fi module.

V. ADVANTAGES

- ⇒ This project decreases the rate of accidents in the highways.
- ⇒ Traffic management can be maintained by reducing accidents and traffic jams can be avoided.
- ⇒ Low cost and easy to implement.
- ⇒ Can cover maximum area in a zone.
- ⇒ This can be implemented with other wireless technologies for adding more stuff.
- ⇒ This can be uses in driving guidance systems and automatic navigation system

VI. APPLICATIONS

- ⇒ Real time traffic control
- ⇒ It can be implemented in automated systems for wireless control.
- ⇒ Controlling the horn of the vehicles across schools, hospitals etc

VII. CONCLUSION

It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. To separate the data from the signal upon reception, the data to be sent is encoded within the transmitted signal. The decoded data can then be used to perform specified tasks. Secondly, using highly advanced IC" s and with the help of growing technology the project has been successfully implemented A low-cost and simple system to ensure the safety of passengers and pedestrians. It certainly provides a hope for bringing down the alarming rate of road accidents

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