International Journal of Current Engineering and Technology
E-ISSN 2277 – 4106, P-ISSN 2347 – 5161

Available at http://inpressco.com/category/ijcet

Research Article

Overspeed Vehicular Monitoring and Control by using Zigbee

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Accepted 30 June 2015, Available online 03 July 2015, **Vol.5, No.4 (Aug 2015)**

Abstract

Now a days traffic rules are frequently violated by the drivers and over speeding occur due to bad driving behavior. Objective of the study is to design and develop a new system that can effectively detect speed violations on the road and supports the driver to obey traffic rules while driving by maintaining the speed according to the speed limit prescribed by particular zone. The proposed system has an alerting, recording and reporting system for over speeding vehicles. It will use Zigbee technology. The main advantage of this system is that if over speeding vehicles don't get controlled manually, and then system gets ON and will get controlled automatically.

Keywords: *Zigbee, GSM, PIC microcontroller, Automatic speed control, Over speeding vehicles, monitoring*

1. Introduction

In today's fast moving world, As the rate of accidents is increasing day by day, speed of vehicles should be controlled as much as possible. Most of the accidents reported in India are results of lack of speed control and violating the road rules. For this reason, different speed limits are put to decrease accidents. Unfortunately, drivers usually do not take these speed limits seriously and ignore them (Wahid A, 2010). Again with growth in traffic, there is occurrence of bundle of problems too; these problems include traffic jams, accidents and traffic rule violation at the heavy traffic signals. This in turn has an adverse effect on the economy of the country as well as the loss of lives (Rajat & Nirbhay 2007). So problem given above will become worst in the future. Traffic congestion and tidal flow management were recognized as major problems in modern urban areas, which have caused much thwarting for the ambulance. Moreover road accidents in the city have been incessant and to bar the loss of life due to the accidents is even more crucial (K. Athavan 2012). Increasing the capacity of the roadways is expensive and, in some areas where land is scarce, is not an option. Improving the efficiency of the current transportation system through the implementation of advanced technologies may alleviate traffic congestion and decrease the vehicle crash-related fatality rate. Real-time traffic surveillance is one of the most important components of this approach (Masoud Hamedi 2012). Road accidents can be prevented by adopting measures such as Traffic management, improving quality of road infrastructure and safer vehicles. To Ensure decline in accidents and to improve road safety, speed control techniques such as speed control in school and college zones by using RF transceiver, automatic braking systems, Camera based detection, RFID technology based detection are implemented. The existing techniques still doesn't able to reduce the number of accidents. Hence there is a need to implement Intelligent Speed Adaptation (ISA) in which violation management provides efficient monitoring, registering and reporting system of speed of the vehicle which exceeds the limit. The driving behavior of the driver is monitored based on which penalty amounts are calculated. A message is sent to the remote station where an immediate action can be taken. Speed limit information is sent with the help of Zigbee which uses wireless mode of communication, proves to be effective (Rubini. R 2013).

2. Literature Survey

A system of Lasers and Detectors to detect the presence of objects and determine their speed is disclosed. Throughout the earlier years many devices and technologies has been used to provide road safety and accordingly to reduce accidents occurring due to speed violation braking of road rules. One project presented system comprising traffic violation or event detection recording and processing system includes both wide angle and narrow angle cameras. The cameras capture images of traffic in monitoring region. The narrow angle camera obtains information relating to vehicle number plate and driver and the wide angle camera obtains images of the vehicle and red light as evidence of violation. Speed violation is determined by non intrusive speed detection systems such as Doppler

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Radar or Laser system (Ciolli 2005). Traffic violation enforcement typically has been and is an increasingly costly, inefficient and labor intensive, labor limited and frequently ineffective process. Limited police resources are assigned across numerous competing duties and priorities, leaving relatively few police personnel for traffic enforcement where violators greatly outnumber the sparsely distributed enforcers. Over the years, devices have been introduced to improve the detection, documentation and prosecution of traffic violation. The use of Radar and Laser devices to detect and record vehicle speed began in 1950's,first with fixed ,manned service at the roadside or in makeshift tower structures erected in median. Later the speed detection device was mounted on the police vehicle, initially for stationary use and subsequently for mobile use permitting detection and pursuit by the same officers (Charles Adams 2002). One more paper discussed a kind of vehicle accident detection system. RF transceiver is also used to send the accident information. The RF transmitter module interfaced with the microcontroller will transmit the accident information to the nearby Emergency Service Provider (Rajesh Kannan 2010). Most recently unmanned fixed systems for detection and documentation of speeding and red light running have been installed to monitor all traffic continuously (Charles 2002).

3. Proposed system Architecture

The system consists of a transmitter and a receiver as shown in figures. The transmitter module is fixed at pre-determined lanes/areas. Speed limit and traffic signs are pre-programmed in microcontroller. This information is transmitted as wireless signals through Zigbee. This module is experimented with zones namely: School zone, University zone, Hospital Zone, Steep Curves Ahead , Bridge Works Ahead ,Accident Prone Area Ahead. The speed limit of different zones may range from 30 km/hr to 50 km/hr.

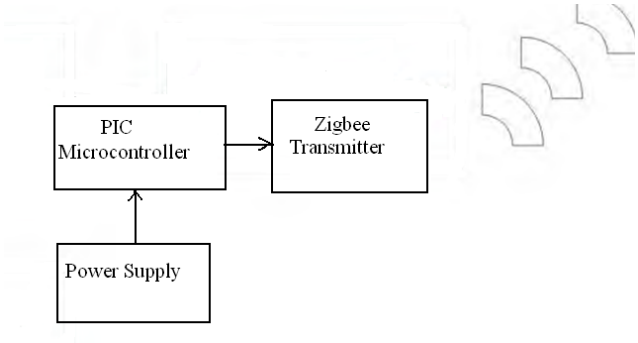


Figure 1 Block diagram of Transmitter section

The receiver module is placed inside the vehicle. The receiver module is divided into two sub-modules; because the heat generated inside vehicle near dash board can be dangerous to the sensitive components like Zigbee, GSM. Since CAN controller can withhold a temperature up to 125 degree Celsius, communication between two CAN controllers as separate modules are implemented here. First sub-module is placed near the rear view mirror, which consists of the microcontroller, Zigbee receiver and the CAN controller. Wireless signals are received by the Zigbee and sent to microcontroller, which in turn sends to the CAN controller which again communicates with another CAN placed in the second sub-module kept near the dash board. Data obtained by the CAN controller is sent to the microcontroller. The current speed of the vehicle is obtained from the speedometer by the CAN controller and this speed is also sent to the microcontroller. The microcontroller compares the current speed with speed limit and a decision is taken here. The difference between the speed limit and the current vehicle speed is monitored continuously and a warning is displayed in LCD as shown in figure 3 and also a warning is given to reduce speed when it's about to exceed the limit. If driver still doesn't reduce the speed, speed is controlled here automatically by our system and number of times speed violated and controlled is registered and the microcontroller keeps track of all violations stored in it. If the count of violation and thereby control reaches to more than three then penalty amount will got increasing again .Reporting system is implemented for speedy action. SMS is sent to the traffic police by the GSM, which contains the details of the vehicle number and the violated speed difference made by them. Penalty amount is decided by the traffic personnel and it may be collected in nearby Toll gates or in other places.

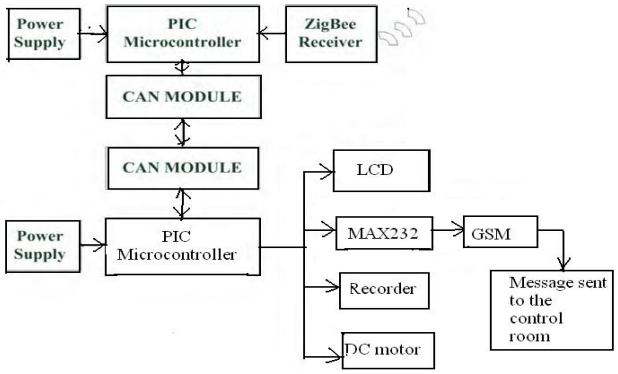


Figure 2 Block Diagram of Receiver section

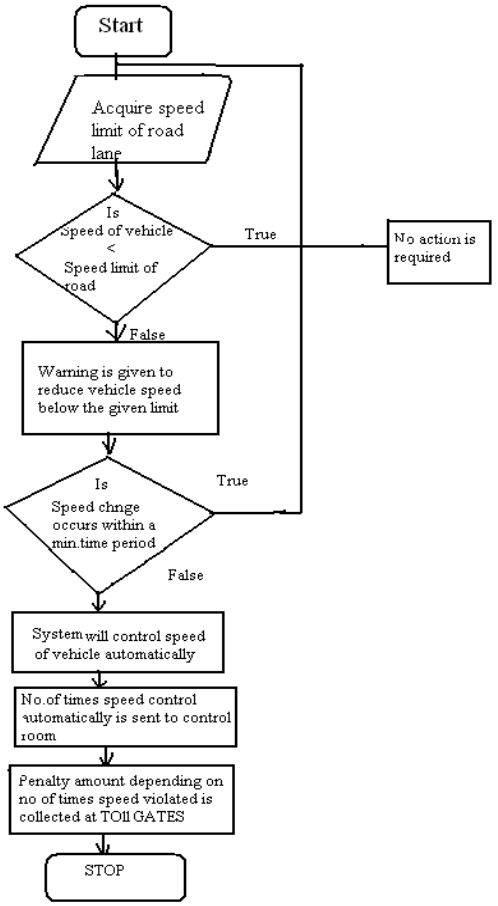
Key features of this design includes

1. The Zigbee transmitter sends the speed limit of the particular lane, present speed of vehicle is compared with the speed limit, and if it's exceeded then it should be controlled by the user.
2. If it's not controlled manually then our system itself will control over speeded vehicle automatically.

4. System Software Design

The software used for the development of system is Proteus 7.8 with the C program language been used. The Flow Chart of the system is shown in the figure. If

the speed of the vehicle exceeds the reference speed limit, the system will display some warnings for the rider on a screen which can be modified and processed to give sound messages. If the speed of the vehicle is not reduced under the speed limit, the system will send a message to a control room through GSM which will be a computer containing a database. SMS message contains the name of zone, vehicle number, date, time and speed of the vehicle. If speed is not controlled manually then it will get controlled automatically.



5. Result and Conclusion

This project is designed to solve the problem of over speeding of vehicles due to bad driving behavior at university campus, Hospital zones, or any private sectors. This device takes a speedometer reading for a speed of vehicle and gives warning to the driver when the speed is near the upper speed limit of any particular zone speed limit. Then user should reduce the vehicle speed to that of particular lane speed, but if he/she don't do so then our system will reduce the speed and at the same time no. of times speed exceeded will get recorded, if count reaches to three then extra penalty amount will get received at toll gates by police men who is having all related information of the driver got through GSM.

Fig above shows simulation snapshot on proteus software. For project demonstration robot is designed having 4 dc motors and chassis. Means robot is just like vehicle or car. Speed of which is controlled with the PWM technique.

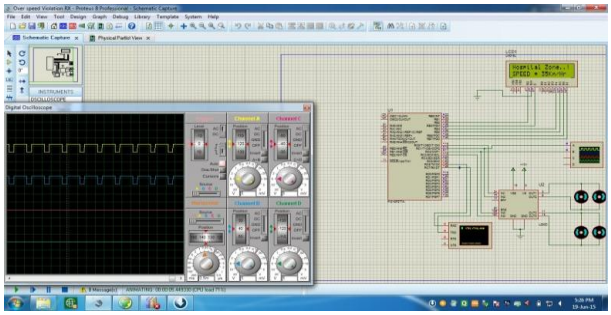


Figure 3 Simulation of the system

Speed control by using PWM: The idea of speed control is to switch the motor ON and OFF at varying speeds, let us say we have a 12 V DC motor and we applied a constant 12V signal to that motor, the motor would run in its full power (full speed).Now, assume we apply a 50% duty cycle signal to the motor (at several KHz frequency),the motor will turn On and Off continuously and the effective voltage applied to the motor is 6V,this would decrease the motor speed by the half, and the motor would be running at 50%of its full power. Varying the duty cycle of the applied signal would cause the speed to vary, a 0% duty cycle signal would turn off the motor, and a 100% one would run the motor at its full speed

Here, there is provision of manual speed control for that one switch is provided if switch is pressed means user has controlled speed of vehicle by using breaks and if not system speed control will be there.

Table 1 Performance of the System

Manual control	Zone	Remark
Yes	National Highway	No Control No Message sent to control room
	Hair pin bend zone	
	Accident prone	
	Steep curve	
No	National Highway	Automatic control Message will be sent
	Hair pin bend zone	
	Accident Prone	
	steep curve	

It will ultimately help us to improve bad driving behavior of driver, Traffic management, road safety, violation management. A solution is provided here to monitor cars everywhere without assigning a policemen and wasting man force on such issues. The Drivers are made aware of their driving behavior and violations made so that careful and conscious driving can be achieved. Repeated violations results to increase

in penalty amount which will help in reduction of violations by the vehicle user. Wireless transmission is achieved with the help of zigbee, which provides low cost transmission of data.

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