

# Over Speed Violation Management and Control of Vehicle Based on Zigbee

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**Abstract**— an intention to work on the topic of this nature is emanated from the interest to explore alternative technological solution to achieve effective speed control. 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. In the present day scenario traffic rules are frequently violated by the drivers and over speeding occur due to bad driving behavior. So, a driver assistance system is provided to prevent over speeding, violation of road rules and also to display alert messages. The proposed system has an alerting, recording and reporting system for over speed violation management. The Zigbee transmitter sends the speed limit of the particular lane entered by the vehicle and also gives alerts like “road works”, “steep slopes”, “school zone” in the form of acoustical messages and also in LCD. The receiver unit placed in the vehicle receives the messages and sends to the microcontroller. When speed of the vehicle nears the speed limit it displays the warning and if exceeds the limit, the microcontroller records the violated speed and time. The LCD displays the lane speed limit and shows the number of times, speed was violated. At the same time our system will control the speed, if vehicle user does not slows down the speed to that of particular zone speed limit. System will keep on counting the no. of times speed exceeded, record of which sent to the control room. Increase in the count of violation increases the penalty amount which can be collected in toll gates located nearby. Ultimately driver’s behavior can be improved here. A GSM module sends message to the nearest traffic personnel immediately after a violation occurs. An authenticated device is also provided, which can be operated only by the traffic police in whom he can retrieve the data stored at any time.

**Keywords**—Detecting speed, monitoring, Automatic speed control, violation management, Zigbee, GSM, PIC microcontroller (16F877A)

## INTRODUCTION

Traffic management on the road has become severe problem of today's society because of growth of the urbanization, industrialization and population; there has been a tremendous growth in the traffic. 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 [1]. 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 [2]. 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 [3]. 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 [4].

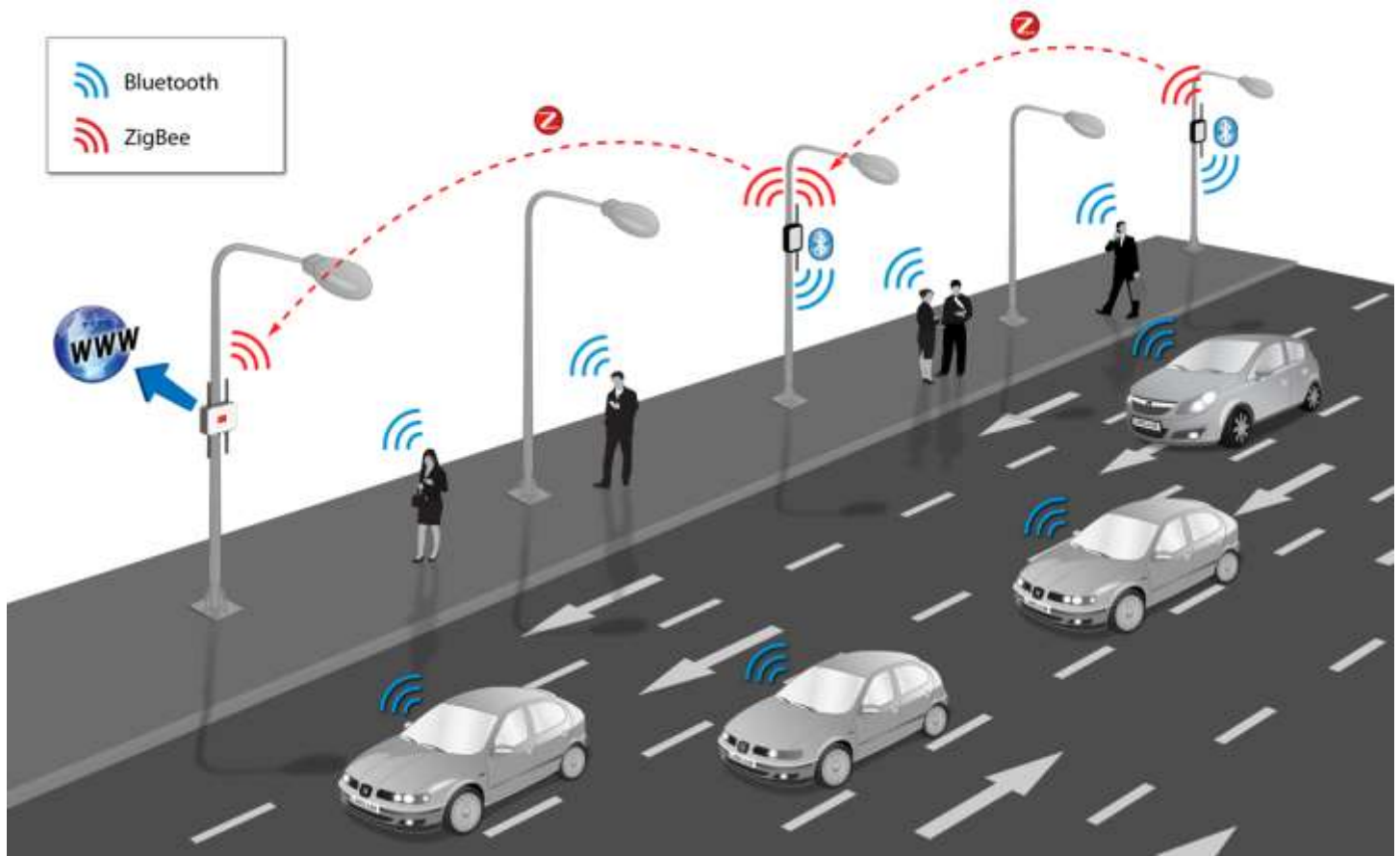


Figure 1. Speed violation management and control of vehicle

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 by reducing the no of revolutions of dc motor.

## LITERATURE SURVEY

Through out the earlier years many devices and technologies has been utilized to provide road safety and accordingly to reduce accidents occurring due to speed violation for example Radar technology, average speed safety cameras etc. After doing literature review in the area of accident detection and prevention of traffic rules' violation, various applications provided a solution i.e. we get to know that there are various techniques available for detection of speed violation and accident, like RF transceiver, Automatic braking systems, Camera based detection, RFID technology, GPS module. One project presented system comprising two major design units i.e. Drivers are warned by sending traffic messages to them as loud speaker messages. Speed of vehicle, finding location by GPS & other parameters are stored in a database. The routes are represented as a Google map. It has a system which consists of traffic sign detection and recorder for managing violations The use of GPS and GSM interfacing with microcontroller shortens the alarm time to a large extent and locate the site of accident accurately. When a vehicle meets with an accident immediately vibration sensor will detect the signal or if a car rolls over, and Micro electro mechanical system (MEMS) sensor will detects the signal and sends it to controller. Microcontroller sends the alert message through the GSM MODEM including the location to police control room or a rescue team. By means of satellite navigation system, first aid rescuers can accurately locate the place with maximum error controlled by 10 meters, so that they can save the injured people as soon as possible [5]. 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. This information is received by the RF receiver module

at the 'service provider' control room in the locality. 1862. The service provider can use this information to arrange for ambulance and also inform police and hospital [6]. The limitation of this method is that the installment of repeated receivers on the road at a very short interval because the RF transceiver module used has a range up to 100 meters under ideal conditions. RFID based system prevent road accidents. In RFID based embedded system for prevention of road accidents, the system uses N number of RFID tags to transmit general area information and RFID reader in vehicle. Whenever vehicle meets with an accident, the system reads the area information from RFID tags placed on the road and transfers this information to the specific numbers stored in database using GSM module [7][8]. NHTSA, 1992-“Beyond the limits a law enforcement guide to speed enforcement [9]. The limitation of this method is that the installment of N number of RFID tags on the road to transmit general area information. System even detects when GPS satellites lose its satellite communication [10]. The smart display and control is composed of two separate units: Zone status Transmitter unit and Receiver (speed Display and Control) Unit. According to this system, whenever a person sits in driver seat of the vehicle, the system checks for various parameters with the driver [11].

## 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.

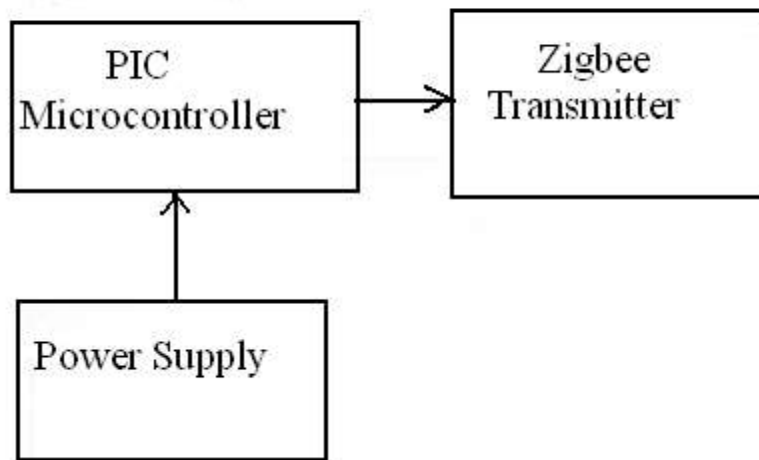


Figure 2. Block diagram of Transmitter section

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 withstand a temperature up to 125 degree Celsius, communication between two CAN controllers as separate modules are implemented. First sub-module is kept 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. This CAN controller 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 data 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 get 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.

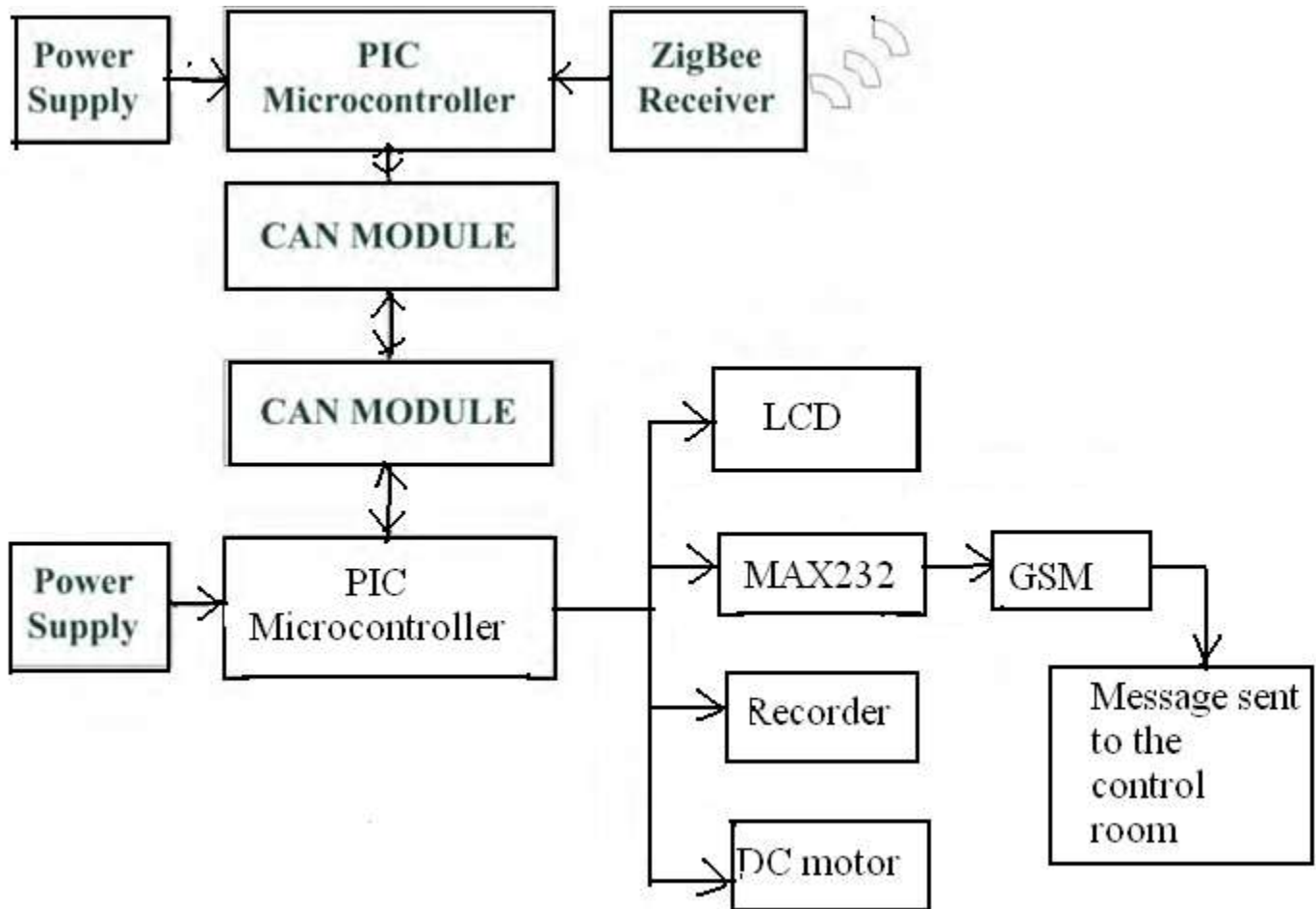


Figure. 3. Block Diagram of Receiver section

## COMPONENT DESCRIPTION

1. PIC microcontroller - 10-bit, up to 8-channel Analog-to-Digital Converter (A/D) Analog Comparator module with Two analog comparators Programmable on-chip voltage reference(VREF) module Programmable input multiplexing from device inputs and internal voltage reference Comparator outputs are externally accessible
2. GSM Module (GSM) – Its a popular wireless standard for mobile phones in the world. GSM module allows transmission of Short message service (SMS) in text mode.
3. ZigBee- It is based on an [IEEE 802.15.4 standard](#). Though its low power consumption limits transmission distances to 10–100 meters line, depending on power output and environmental characteristics, ZigBee devices can transmit data over long distances by passing data through a [mesh network](#) of intermediate devices to reach more distant ones. ZigBee is typically used in low data rate applications that require long battery life and secure networking ZigBee networks are secured by 128 bit [symmetric encryption](#) keys
4. High-Speed CAN Transceiver- Supports 1 Mb/s operation Implements ISO-11898 standard physical layer requirements Suitable for 12V and 24V systems

## 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.

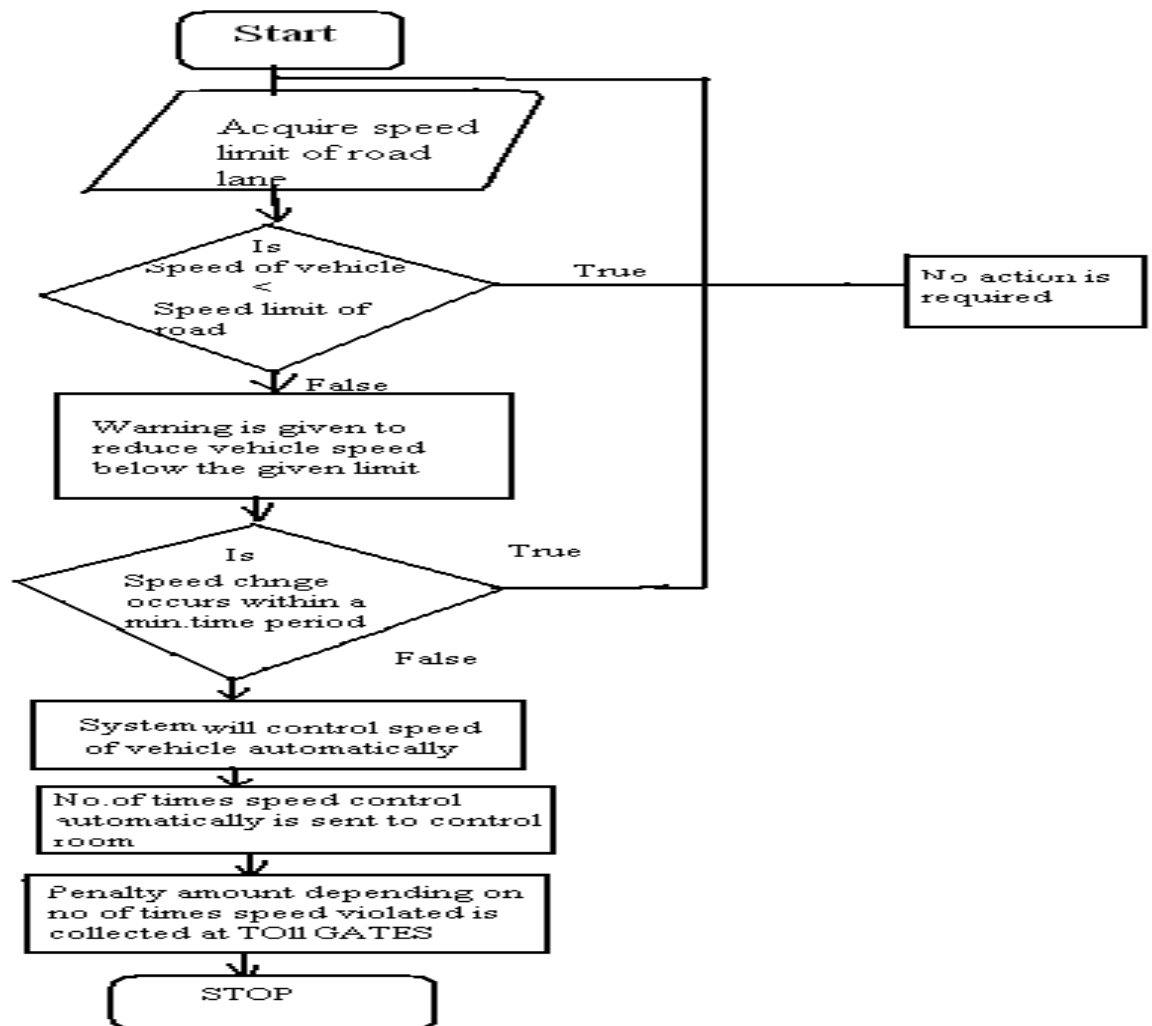


Figure 4. Flow of system

### ACKNOWLEDGMENT

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### 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 measures a speed of vehicle and gives warning to the driver when the speed is near the upper 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 automatically reduce the speed by decreasing the no of revolutions of dc

motor automatically 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. 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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