OVER SPEED VIOLATION MANAGEMENT OF A VEHICLE THROUGH ZIGBEE

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***Abstract*- 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. 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 which he can retrieve the data stored at any time. Increase in the count of violation increases the penalty amount which can be collected in toll gates located nearby.**

Keywords- GSM, LCD, Over-speed violation management, PIC 16F877A microcontroller, Traffic rules, ZigBee

I. INTRODUCTION

Speed control is in the need of the hour due to the increased rate of accidents reported in our day-to-day life. During 2011, in India a whole of 4, 97,686 road accidents were reported which is a result of lack of speed control and violating the road rules [9]. 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 points are calculated. A message is sent to the remote station so that an immediate action can be taken. Speed limit information is sent through Zigbee which uses wireless mode of communication, proves to be effective.

II. LITERATURE SURVEY

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 [4]. Intelligent speed adoption implemented in "Pay as you speed" [3] monitors speed and finds the position of a vehicle. ISA has registrations about speed limit in various places, informs speed limit and alerts if speed exceeds limit. A GPS/GPRS unit is provided and attached with a memory card in which figures are stored as digital speed map. Based on features, sign detection is carried on speed boards and has a radial symmetry detector to detect speed limit signs on a graphics processor. Digital speed limit signs are detected in which frequency of signs may vary. System even detects when GPS satellites lose its satellite communication [7]. Road surveillance system using solar power for speed violation detection has a portable camera system. Wireless communication is employed for data transfer between system and remote system [6]. Wireless sensor network uses MicaZ motes & Tiny wireless measurement system for identifying the speed. Traffic routing is done by estimating density of mote [5]. Vehicles installed with RFID tags will pass through readers which accesses the speed of vehicle in free way. Many toll gates are linked through remote centre for the motorist would pay one to reach destination [8].

Incentives are given for the drivers who maintain the speed limit which is based on monitoring through GPS and provide a way of income for these drivers, as insurance premium gets increased [2]. In determining the best driver and to evaluate his performance, factors taken into consideration are fuel consumption, reduced accidents and obeying the road rules. These data collected can be used for future development and planning. Performance appraisal is evaluated using GPS and performance measurements are suggested for the drivers [1].

III. OVERVIEW OF WORKING MODEL

The system consists of a transmitter and a receiver as shown in figure 1 and 2. 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 6 zones namely: (i) School zone (ii) Hospital Zone (iii) Steep Curves Ahead (iv) Bridge Works Ahead (v) Hair Pin Bend Ahead (vi) Accident Prone Area Ahead. The speed limit of different zones may range from 30 km/hr to 40 km/hr.

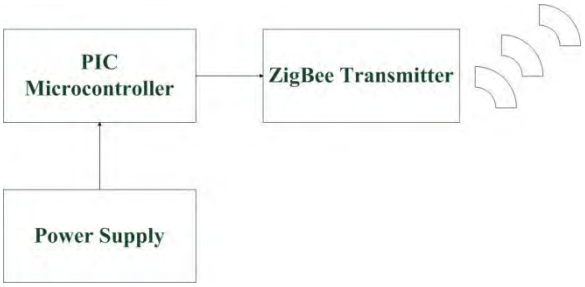

Fig.1. Block diagram of Transmitter section

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 [10], 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.

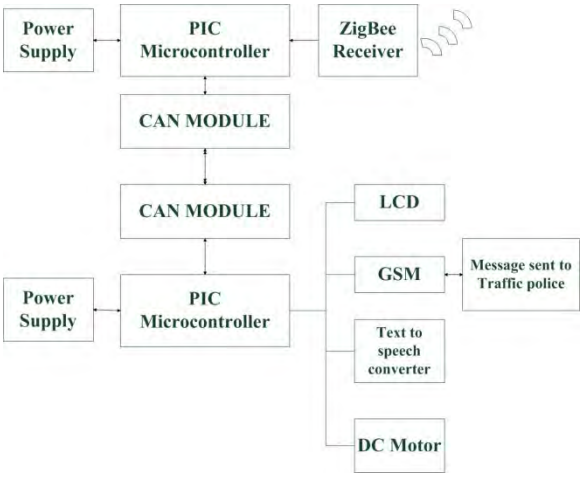

Fig. 2. Block Diagram of Receiver section

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 acoustic warning is given to reduce speed when it's about to exceed the limit.

Fig.3. Output showing the school Zone with speed limit

If driver still doesn't reduce the speed, violation is registered and the microcontroller keeps track of all violations stored in it. 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.

IV. IMPLEMENTATION AND RESULTS

The Hardware connections of the overall implementation is shown in figure 4.The microcontroller used is PIC 16F877A which acts as a kernel, belongs to mid-range family with in-built ADC (Analog to Digital Conversion). ZigBee CC2530 transceiver is used to send and receive data. Low power consumption which is a highlight in ZigBee makes it suitable to stand alone in real time for long period of time compared to other wireless protocols. Point-to-point communication is the communication between a sender and a receiver and Multi-point communication can have more than one transmitter and receiver, and it may vary depending on our need. We are connecting a 18 pin MCP 2515 CAN controller to the PIC Microcontroller having a data rate of 125Kbps. MCP 2551 is interfaced with MCP 2515 to implement the CAN physical layer is shown by a diagram in figure 5. The integration of various values are done by CAN controller using CAN bus protocol. The speed of the speedometer is acquired by the CAN bus and checked with the programming by the microcontroller. The Programming algorithm checks for the exceeded speed, which is the difference between the speed limit and the vehicle speed.

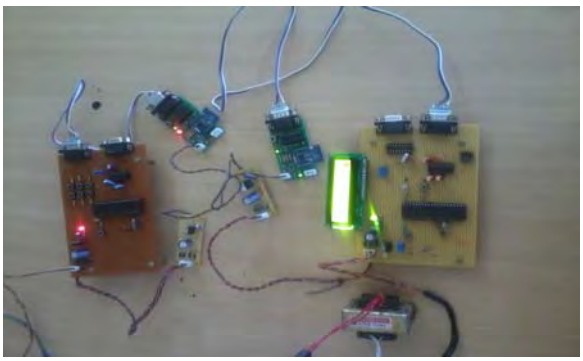

Fig.4.Transmitter and Receiver implementation

Message is sent to the traffic police through GSM with the details about vehicle no and the violated speed which is shown in figure 7. The flow of control is shown in figure 6 which explains the overall control logic. The speed limit is acquired as an input variable. Current speed of the vehicle is compared with the speed limit and appropriate action is taken based on the result of conditional execution, which the GSM modem is sending SMS to traffic police.

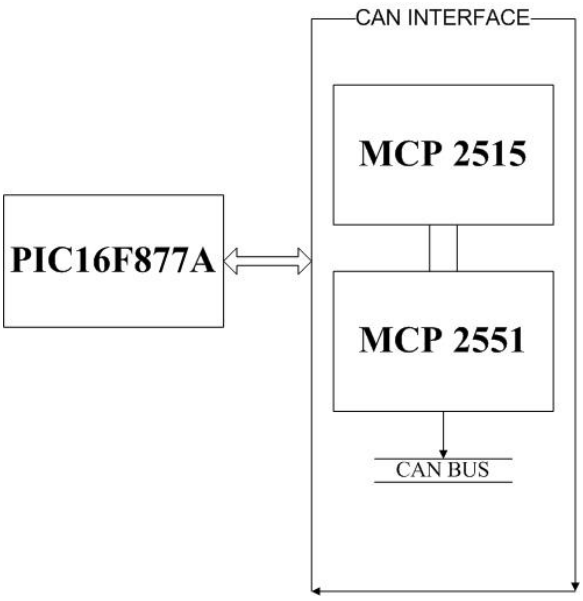

Fig.5.Interfacing CAN with PIC microcontroller

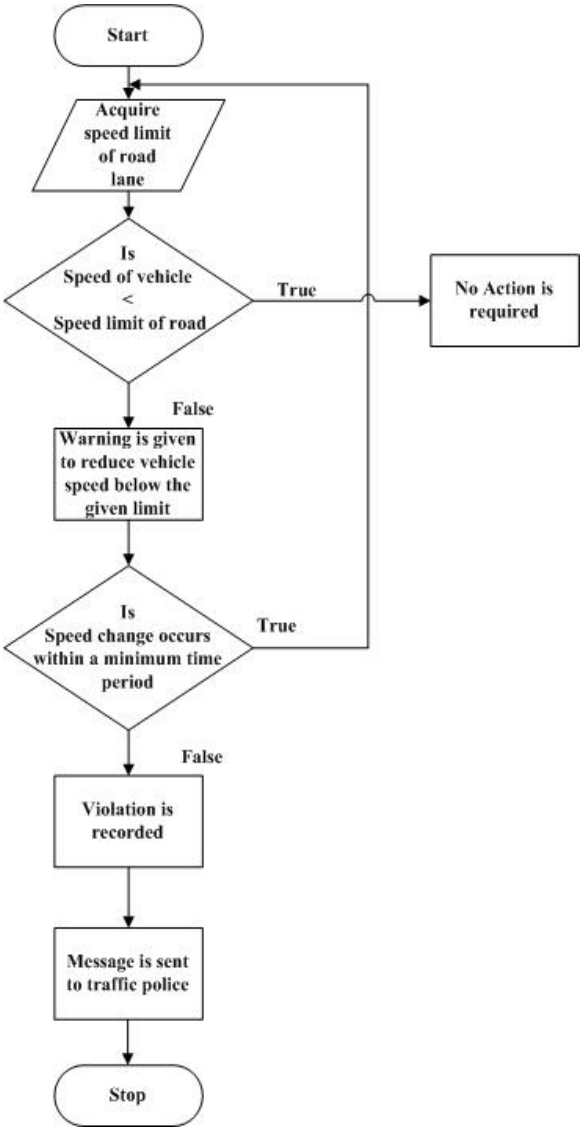

Fig.6. Flow of control

V. APPLICATION

- This implementation will be very useful for traffic personnel to regulate the speed control
- Traffic signs and information about alerts can be intimated to the vehicle users
- Insurance schemes can be implemented based on the driving behavior
- Comparing earlier implementations, this is a low cost method which is practically feasible

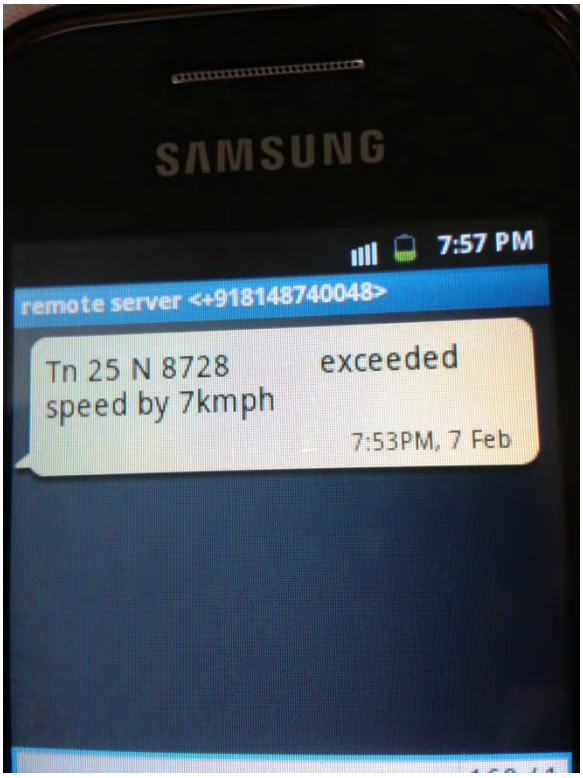

Fig.7. Message received through GSM

VI. CONCLUSION

The project succeeded in implementing a system to reduce the traffic violations. The driver is made aware of his driving behaviour and violations made so that careful and conscious driving can be achieved. Repeated violations lead to increase in penalty amount which effects in reduction of violations by the vehicle user. Wireless transmission is achieved with the help of Zigbee, which provides low cost transmission of data. GSM modem sends SMS to the remote station about violation. Traffic signs and other messages can be intimated to the user of vehicle which greatly helps in maintaining traffic and also to follow road rules.

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