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AUTOMATIC CONTROL IN VEHICLES

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***Abstract*— "Automatic control in vehicles" is a unique speed governor for vehicles at specified zones. This system ensures that the car will travel at or below the speed limit specified at designated areas. Transmitters are installed at the entry point of specified zones, primarily on the speed sign boards to reduce project implementation cost. The Transmitter consists of an encoder and a RF transmitter module with 433 MHz carrier frequency and ASK modulation which transmits the speed limit of that area. The Receivers are installed in all vehicles. A Receiver consists of a decoder, RF receiver module and a micro controller '89S51' along with sensors viz. Alcohol sensor, collision sensor and theft sensor. Upon the detection of drunken driving or collision the car decelerates to a stop. The Receiver has a GSM module which sends the message to the respected mobile user upon the event of collision, theft and drunk driving. In the microcontroller, the speed of the vehicle is compared to the speed limit of that area and the speed is then accordingly controlled.**

Keywords— RF module (Radio Frequency), ECU (Engine Control Unit), GSM (Global System Mobile Communication)

I. INTRODUCTION

Road accidents are rampant nowadays. Most of these road accidents are caused because the vehicles are driven at high speeds even in the places where sharp turnings and junctions exist. Reduction of number of such accidents is the main step needed to be taken. Many systems have been developed to prevent these road accidents.

India world No 1 in road deaths

Poor Record: 13 Die Every Hour, 1.14 Lakh A Year

Dipak Kumar Dash | TNN

A TOLL TOO HIGH

1,14,590 people died in road accidents in India (2007), highest in world. That's 13 deaths every hour

89,455 people died in road accidents in China (2006), the second highest in world

Highest Deaths in India: Truck Occupants 22%; Two Wheelers 19%; Buses 11%; Pedestrians 9%

- Over 1.2 million die each year on world's roads
- Sweden, Japan & Australia have safest roads with fatality rates between 3.4 and 5.4 deaths per 1 lakh
- Over 90% of world's road fatalities are in low- and middle-income countries, which have only 48% of world's registered vehicles
- 50% deaths are of pedestrians, cyclists and bikers
- Key causes for accident deaths: Speeding; drink-driving; no helmet, seat-belt and child restraints

KILLER STATES Road Deaths in '000: Andhra Pradesh 13.7; Maharashtra 13.7; Uttar Pradesh 12.5; Tamil Nadu 12.0

New Delhi: In a dubious distinction for the country, the World Health Organization has revealed in its first ever Global Status Report on Road Safety that more people die in road accidents in India than anywhere else in the world, including the more populous China.

Calling road fatalities an "epidemic" that will become the world's fifth biggest killer by 2030, the report said while the rich nations had been able to lower their death rates, these were sharply on the rise in the third world. It said 90% of deaths on world's roads occur in low and middle-income countries (21.5 and 19.5 per lakh of population, respectively) though they have just 48% of all registered vehicles.

The statistics for India are chilling. At least 13 people die every hour to road accidents in the country, the latest report of the National Crime Records Bureau (NCRB) reveals. In 2007, 1.14 lakh people in India lost their lives in road mishaps—that's significantly higher than the 2006 road death figures in China, 89,455.

Road deaths in India registered a sharp 6.1% rise between 2006 and 2007. However, road safety experts say that the real numbers could be higher since many of these accident cases are not even reported.

"There is no estimate of how many injured in road accidents die a few hours or days after the accident," points out Rohit Baluja, member of the UN Road Safety Collaboration and Commission of Global Road Safety representing Asia.

The report, based on 2006 and 2007 statistics collected from 178 participating countries, said globally over 1.2 people die in road accidents every year and 20-25 million people suffer non-fatal injuries.

Baluja said both central and state governments, while pushing for construction of more highways and roads, were doing precious little to make them safe. "We don't have scientific traffic engineering which forms the basis of road safety improvement practiced in US and UK since 1930s. This still remains a matter of consultancy in India as we are yet to have our own traffic engineering wings," Baluja adds.

In fact, the report shows while only 3,298 people died in road accidents in UK in 2006, in case of US it was 42,642.

▸ Speed kills: AP, Maha top, P 11

Fig 1.1: Newspaper cut-out of article on road deaths

One of them is Cruise control system (CC) that is capable of maintaining speed defined by the driver and its later evolution version Adaptive Cruise Control (ACC) [3] that keeps the vehicle at safer distance from the preceding vehicle. But these systems have no capability to detect the curved roads where the speeds of the vehicles have to be lowered to avoid the accidents. Later curve warning systems (CWS) have been developed to detect the curved roads by using Global Positioning System (GPS) and the digital maps obtained from the Geographical Information Systems (GIS) [4] to assess threat levels for driver if approaching the curved road quickly. But these maps need to be updated regularly and are not useful if there are unexpected road diversions or extensions etc. Here we propose a dynamic model where the system controls the speed of the vehicle according to the data in the frame that is transmitted by the RF transmitter fixed to the nearby poles as shown in Figure 2.

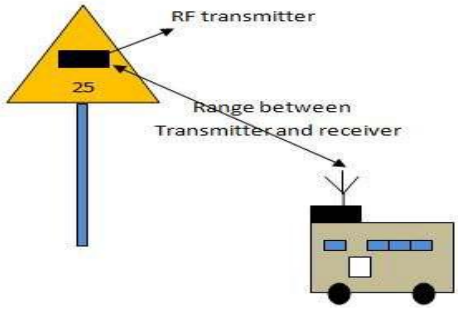

Fig 1.1: Traffic Signal posts equipped with RF transmitter (left side)
Automobile equipped with the RF receiver (right side)

II. MATHEMATICAL ANALYSIS

To have a theoretical study on our design, we consider an Atmel's AVR microcontroller [6] with an operating frequency range of 16MHz and wireless module as AT86RF230.

AT86RF230 [6] is a 2.45GHz radio transceiver. It can operate in the temperature range of -40 degree centigrade to 85 degree centigrade. AT86RF230 in the transmitter section will be either in the transmission state or sleep state and theAT86RF230 in receiver section will be in the Receiving state. Let the vehicle equipped with our architecture is moving at100 km/hr. Let the receiver can detect the frame at 30m away from the transmitter .From the above considerations, the vehicle will be in the range of transmitter for minimum time period of 1080milliseconds. This can be deduced from the formula Distance = speed * time.

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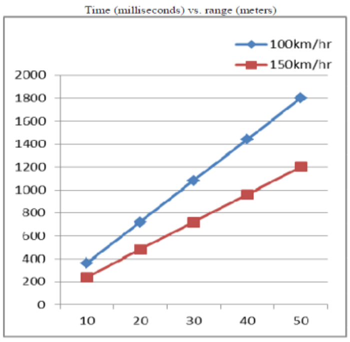

Fig. 3. Time for which the vehicle will in the range of transmitter for different ranges of Transmitter

Figure 3 shows time (milliseconds) for which the vehicle will be in the range of transmitter at two different speeds. Datasheets of AT86RF230 shows that transition time from transmission state to sleep state takes 1.1milliseconds and from the sleep state to transmission state takes 48 micro seconds. It takes 224 micro seconds to transmit a frame of 1 byte. Since the frame size in the proposed design is 7 bytes it takes 1.792 milliseconds to transmit the frame. Now the time for which the transmitter can be in the sleep state is calculated by subtracting the sum of transmission time for the frame, transition times from transmission state to the sleep state and vice versa from the time for which vehicle will be in the range of transmitter.

Here, 1080 * 10 exp 3 – (1.1 + 1.792 + 0.048) = 1077.06 milliseconds. That is, the transmitter can be in the sleep state for minimum period of 1077.06 milliseconds. If the transmitter is in sleep state for more time then, there are more chances of optimizing the power.

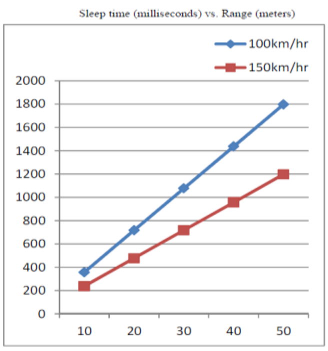

Fig. 4. Sleep times of the RF transmitter for its different ranges.

Figure 4 shows the time (milliseconds) for which the transmitter can be in sleep state for different ranges of transmitter at two different speeds of vehicle. Whenever the receiver receives the frame, it switches from receiving state to sleep state and the vehicle enters in to active mode during the Active mode, the receiver made to transit into sleep state so that the it does not receive the same multiple frames and at the same time power is also optimized.

III. IMPLEMENTATION

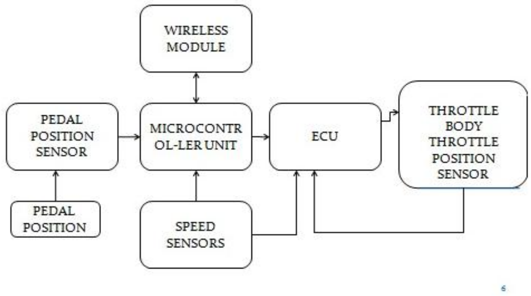

Fig. 5. Block dig of present circuit

In general, the speed of the vehicle varies according to the accelerator's Pedal position. The variation in the Pedal position is fed to the Electronic Control Unit (ECU).ECU determines the position of the throttle based on the accelerators pedal position and the inputs received from the other sensors [3]. Adjustment of throttle position causes the change in the variation of vehicles speed. Whereas in the proposed automatic vehicle speed controller model accelerator pedal position is specified in the data packet given to the microcontroller unit and then it is fed to the Electronic Control Unit. If the vehicle is in the active mode, microcontroller[1],[2] transfers the manipulated pedal position to the ECU that will not increase the vehicle speed greater than the maximum speed This model is shown in above figure.

Sensor MQ3 is used for sensing alcohol and push buttons are used for sensing collision and theft. These sensors are interfaced with the microcontroller. On the reception of a signal from the above sensors, the microcontroller uses the GSM module to send a signal to the RTO and stops the car.

Fig. 6. Alcohol sensor

Fig. 7. Theft Sensor

Fig. 8. Collision Sensor

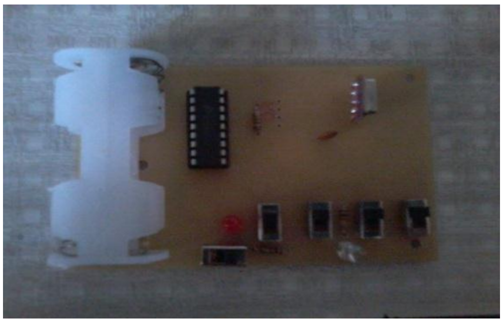

Fig. 9. Transmitter circuit

The Transmitter consists of an encoder and a RF transmitter module with 433 MHz carrier frequency and ASK modulation which is connected to an encoder HT12E. The Transmitter transmits the speed limit of that area by sending a start bit, stop bit, 8 address bits and 4 data bits. All signals are defined in the microcontroller at the Receiver.

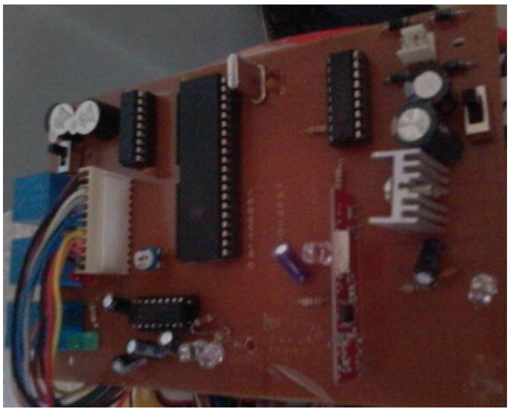

Fig. 10. Receiver Circuit

The Receiver consists of a decoder HT12D, a RF receiver module and a micro controller '89S51' along with sensors viz. Alcohol sensor, collision sensor and theft sensor. The Receiver has a GSM module which sends the message to the respected mobile user upon the event of collision, theft and drunk driving. In the microcontroller, the speed of the vehicle is compared to the speed limit of that area and the speed is then accordingly controlled. Upon the event of drunken driving and collision the car decelerates to a stop.

IV. FLOWCHART

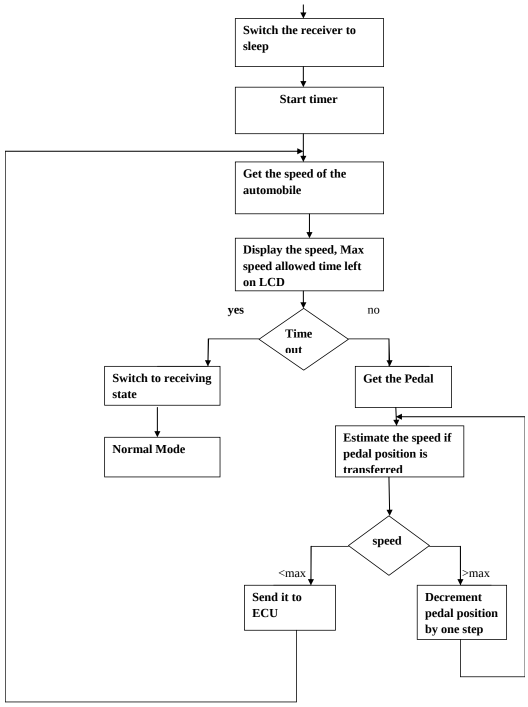

Fig. 11. Flowchart schematic of operation in Active mode

In Active mode of operation microcontroller unit continuously studies the speed of the vehicle. To control the speed of the bike according to the limits we have developed the fuzzy logic [4][5]. If the speed of the vehicle is above the Maximum speed limit, then it sends the digital signal to the ECU such that speed of the vehicle will be decreased. When the accelerator pedal is moved to increment the speed, microcontroller calculates the speed that would be reached on the new pedal position. If the speed is greater than the maximum speed limit then it denies excess speed and gives appropriate signal to the ECU. See figure 4 for Flow Chart in Active Model.

V. CONCLUSION

This projects main aim is to bring more safety for pedestrian and drivers by introducing a system by which the speed of a vehicle can be controlled. We have introduced a miniature model of speed a controlled car which can be further improved upon by doing more research on a viable model wherein the above system can be used in an electric as well as fuel car at a very cost effective price.

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REFERENCES

[1] Embedded systems, Rajkamal, TaTa McGraw-Hill Publishing Company Limited, 2003.

[2] An embedded software premier, David E.simon, Pearson Education, 1999.

[3] http://www.aa1car.com/ this website contains technical articles, books and manuals that help us find what's wrong with our vehicle and what needed to fix it.

[4] Sugeno, M.; Nishida, M. Fuzzy Control of Model Car. Fuzzy Sets system. 1985, 16, 103-113.

[5] http://www.atmel.com/dyn/resources/prod_documents/doc 8154.pdf this documents contains the description of atmelmega16A microcontroller.

[6] http://www.atmel.com/dyn/resources/prod_documents/doc 5131.pdf this document contains the details of AT86RF230 wireless module.

[7] International Journal of Computer Application (0975-8887) Volume 35-No.9, December 2011 by U.Jyothi Kameshwari (Research scholar) K.L University, M.Satwik (student), A. Lokesh(student), G.Venkateshwara Reddy(student) K.L University, India.

[8] White paper-'European Transport Policy for 2010: Time to decade': European Commission : Brussels, Belgium, December 9,2001.

[9] Ioannou, P. A; Chien, C.C. Autonomus Intelligent Cruise Control. IEEE Trans . Veh. Technol. 1993, 42, 657-672.

[10] Milanes,V.: Onieva, E.; Perez, J. ; de Pedro, T; Gonzalez, C. Control de Velocidad Adaptivo Para Entornos Urbanos Congestionados, Rev.