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Autonomous Speed Control of Over Speeding Vehicles Using Radio Frequency

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ABSTRACT: This paper presents Autonomous speed control of over speeding vehicle using Radio Frequency. The main objective is to design a controller and a display, meant for vehicle's speed control and to monitor the zones, which can run on an embedded system. Display & Control can be custom designed to fit into a vehicle's dashboard, and display information on the vehicle. The proposed system is composed of two separate units: Zone status transmitter unit and receiver (speed display and control) unit. Whenever the vehicle is within the transmitter zone, the vehicle speed is controlled by receiving the signal, i.e.., every time the vehicle speed is decreased by some cut off and kept constant until the vehicle moves out of the transmitter zone, and then the vehicle can get accelerated by itself. The IR sensor detects the speed of the vehicle and sends the information to Micro controller. Micro controller interacts with motors through driver IC to take appropriate directions to prevent accidents.

KEYWORDS: RFID (Radio Frequency Identification), ECU (Engine control unit), RF(Radio Frequency), Over speed,

I. INTRODUCTION

80% of road accidents are caused by human error say senior police officials, according to a news report. Incidentally,. The number of accidents for 1000 vehicles in India is as high as 35 while the figure ranges from 4 to 10 in developed countries. The seriousness of running a red light traffic signal and speed violation on highways can be seen from the statistics given in fig.1.1

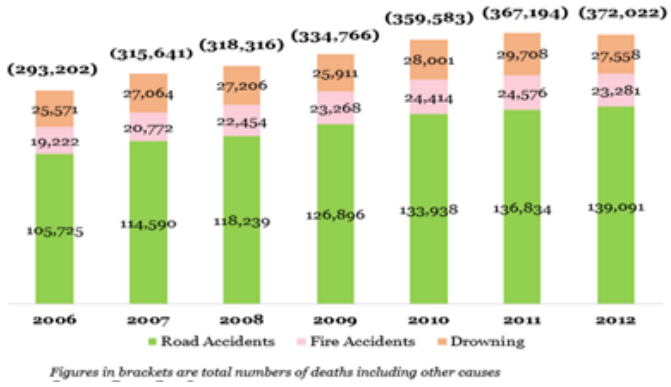

Fig 1.1: Statistics report on total number of road accidents

The report, based on 2006 and 2012 statistics collected from 178 participating countries, said globally over 1.2 million people die in road accidents every year and 20-25 million people suffer non-fatal injuries.

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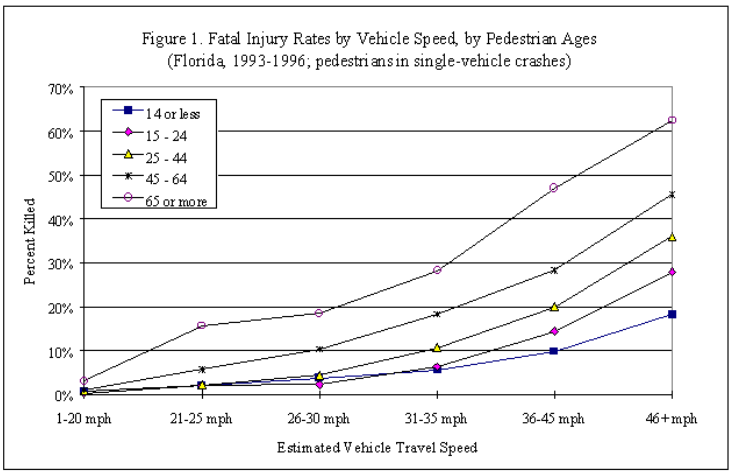

Fig 1.2: Graph showing the increase in fatality w.r.t. to speed

Within age groups, fatality rate increases sharply with increasing vehicle speed, as is illustrated in Figure 1.2 Overall, pedestrians age 65 and older are more than 5 times more likely to die in crashes than pedestrians age 14 or less, and the likelihood of death increases steadily for ages in between. For vehicle travel speeds above 45 mph, pedestrians above age 65 die in about 5 of 8 crashes.

II. LITERATURE SURVEY

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 instances where the speed of the automobile is beyond the expected speed limit or the driver does not 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 cannot store multiple IDs and has a relatively less range thus we are using active RF module TWS 434 and RWS 434 for our proposed system. The module has a range of 500 meters and fits within our application range. The basic 8051 family of microcontroller is enough for our application and thus we are using 89S52 Microcontroller which has 4 ports, two are used for Input and the rest 2 for output. Initially we decided to use two motors for our application but the proposed system works well on only one motor. We are using a 300 watt motor which is driven by Motor driver L293D. Our system requires speed to be displayed and we are using 16x2 LCD screen along with IR module to determine the speed.

III. TECHNOLOGY USED

A. RFID

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader.
The advantage of RFID is its low cost for tags and can be attached to the speed limit sign board easily. Apart from this the tags have an ID code generator which is modulated and sent to the reader. This improves security, transmission & detection of data.

RFID reader is placed in the car which detects the tag within a particular range. The tags placed here contain specific information. The tags which we use here are active tags (turns on only with the power supply).These are tags which

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contain a particular unique code corresponding to the speed on the speed-limit sign boards. This particular reference speed to which the vehicle's speed has to be reduced to is transmitted by this tag to the RFID reader.

B. Engine Control Unit (ECU)

An engine control unit (ECU) is a type of electronic control unit that controls a series of actuators on an internal combustion engine to ensure optimal engine performance. It does this by reading values from a multitude of sensors within the engine bay, interpreting the data using multidimensional performance maps (called lookup tables), and adjusting the engine actuators accordingly. Before ECUs, air-fuel mixture, ignition timing, and idle speed were mechanically set and dynamically controlled by mechanical and pneumatic means.

Functions of an ECU:

1. Control of Air/Fuel Ratio
2. Control of ignition timing
3. Control of idle speed
4. Control of variable valve timing

A special category of ECUs are those which are programmable. These units do not have a fixed behaviour and can be reprogrammed by the user.

Thus receiving a set of instructions to the ECU can control the components of the car which are responsible for deceleration of the vehicle.

IV. BLOCK DIAGRAM

The modules in the proposed system are: RF transmitter consisting of a power source, an Encoder and RF transmitter and Receiver module consisting of RF receiver circuitry connected to the microcontroller through a RF decoder for establishing wireless communication. DC motors are interfaced with the motor driver which controls the motors according to the information provided by the controller, The IR sensor is connected to controller for speed indication which is displayed on the LCD screen.

A. Transmitter Module ***B. Receiver Module***

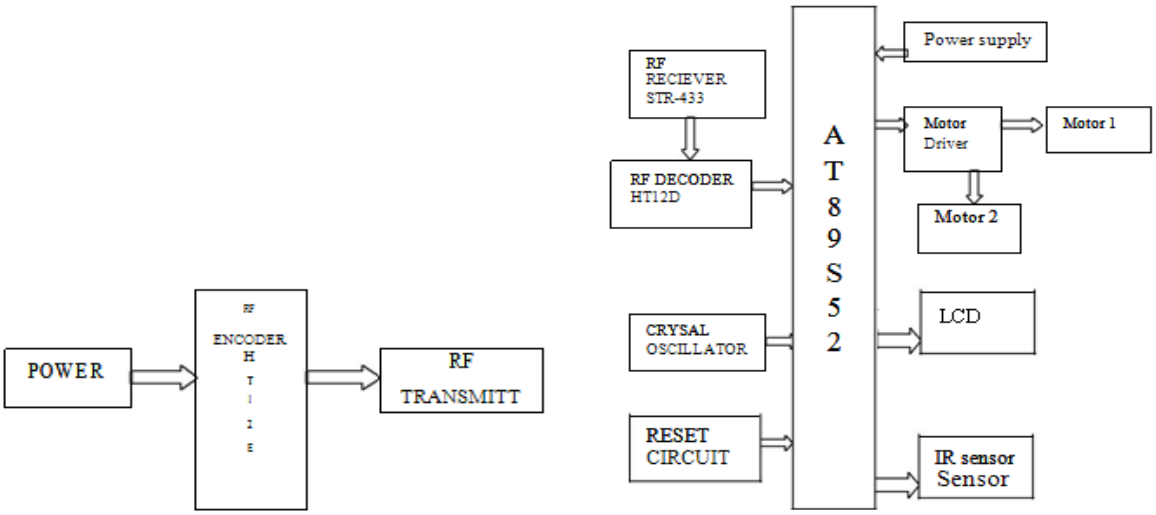

Fig 4.1 Transmitter & Receiver Module

V. PROPOSED SPEED CONTROL MECHANISM

We suggest two methods as shown below to control the speed of the vehicle. In case a red light signal situation occurs the speed is reduced to zero, else it is reduced to the speed limit specified on the roads.

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The start switch used here acts as an ignition switch which starts the engine. There are 3 main conditions that govern the speed control of the vehicle.

- First condition- is when the ECU is in switched OFF. This means that the RFID reader is out of the range of the tag which in turn suggests that no red light traffic situation or speed limit condition is imposed. During this time full supply goes to the Pump and Injector circuit of the vehicle
- Second condition- the ECU is ON but the vehicle isin a speed limit range. In this case, the reader encounters a speed limit transponder and the ECU sends a control signal to the relay and POT control which in turns control the pumps and the injector circuit and thus there is a limited supply to pump and injector circuit.

VI. WORKING

The RF transmitting circuit consist of a RF transmitter module TWS434 TX interfaced with HT12E encoder and the user can select the ID using binary logic .The voltage regulator circuit is obtains power from a 8 volt(1 A) battery which provides the motor with unregulated 8 volt supply and whereas micro controller, motor driver, LCD and the receiver module receives a 5 volt regulated supply. The IR sensor is used to determine the speed of the DC motor, which sends the speed of the wheel to the microcontroller and displays it on the LCD display which is compared The controlling device of the whole system is a Microcontroller to which RF receiver module is RWS 434 RX interfaced with HT12D is connected; DC motors are interfaced through a motor driver. The IR sensor is used to determine the speed of the DC motor. When the RF transmitter is turned on, the data set by the user is encoded and sent to the Receiver module. The receiver module decodes the data and sends it to the AT89S52 micro controller to compare the data embedded in the controller. If the speed of the DC motor is less than the limit zone, the Microcontroller compares the data received from the IR sensor and data received from the RF transmitter. Then commands the motor driver to take no actions and the speed of the DC motor remains same. If the speed exceeds the set speed limit, the Microcontroller instructs the motor driver to limit speed according to the zone thus preventing accidents.
The representation below shows how the proposed system can be implemented

Fig 6.1 Over speeding Vehicle approaching Speed limit zone

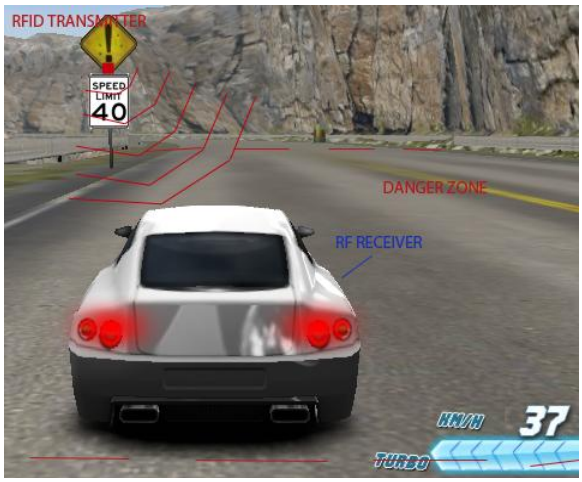

Fig 6.2 Speed of vehicle controlled as it enters Speed limit zone

VII. RESULT

We conducted test to determine the most efficient angle, height and distance at which the tag can be installed.

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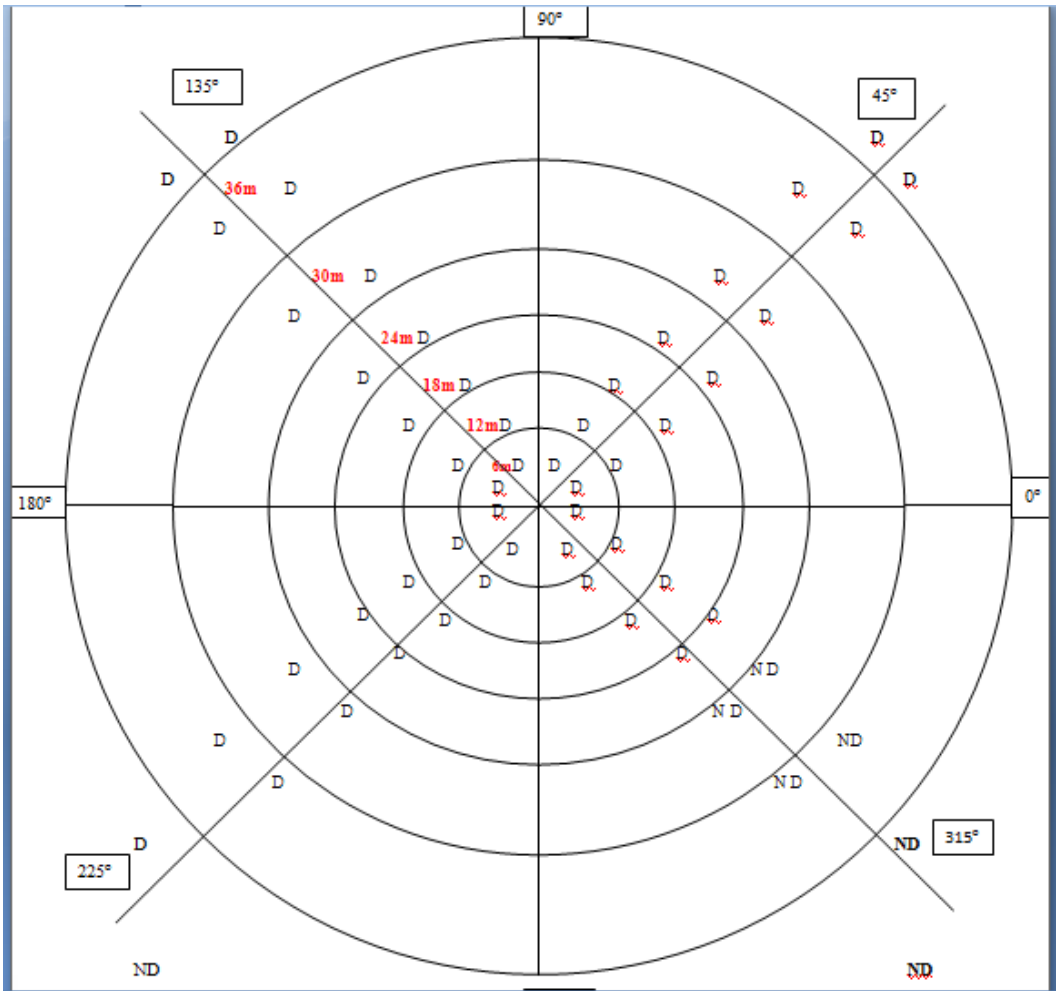

D-Detected
ND-Not Detected

Fig.7.1 The above table shows the range of RF module at various angles.

We placed the Transmitter in the center and carried out readings within the 40 meter radius.
From the experiment we determine that the receiver could detect the transmitter from 0° to 270° efficiently up to 36 meter. Thus we can place the Tag on signals as well as speed limit sign board assuming the height of the board is ~3 meters at any angle.

VIII. FUTURE SCOPE

The above prototype can be installed in vehicles which will reduce the speed automatically when the vehicle is about to collide or is nearby another vehicle by implementing the transmitter and the receiver module in individual vehicle. Incase the representation is shown in the figure below.

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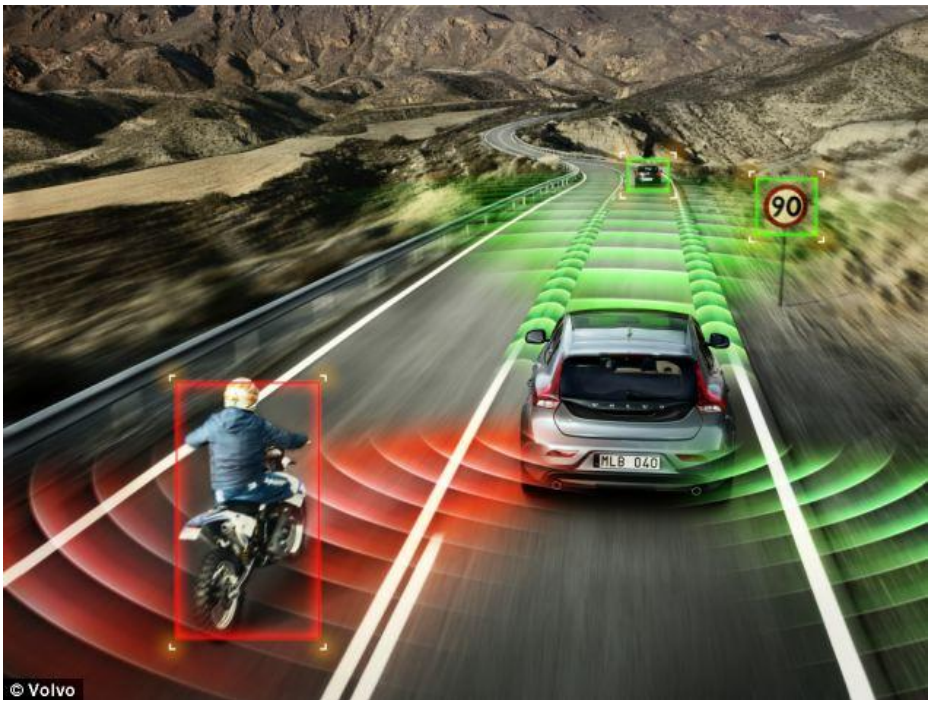

Fig 6.1 Proposed system implemented in individual module.

VII. CONCLUSION

This paper explains the smart vehicle control based on the RFID technology. It has explained how transponders and readers can be used to communicate with the vehicle thereby providing autonomous vehicle control with the ECU. The simulation technique for speed control has been given which is installed in almost all the upcoming vehicles. Thus we hope this can revolutionize the traffic management and avoid accidents caused due to over speeding in the near future.

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