

# Automatic Speed Control of Vehicles Using RFID

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**Abstract**— This paper aims at automatically controlling the speed of vehicles at speed restricted areas such as schools, hospital zones etc. Nowadays the drivers drive vehicles at high speed even in speed limited areas without considering the safety of the public. The traffic police are not able to control them with full effect. Also it is not practical to monitor these areas throughout. This paper paves way for controlling the speed of the vehicles within certain limit in restricted zones without interruption of the drivers. An RFID is used for this purpose. The RFID reader is attached along with the vehicle and the RFID Tag with these Zones. These tags are programmed to send a coded signal when the reader comes in proximity. Whenever the vehicles enter into these zones their receivers will receive this code and the speed of the vehicles is controlled automatically with the help of the micro controller unit present inside the vehicle. The tags are placed at the beginning and the end of the regions for which the speed should be reduced.

**Index Terms**— Motor Driver Unit, Opto-coupler, Proximity module, RFID (Radio Frequency Identification Device).

## I. INTRODUCTION

Most of the road accidents in India occur due to over speed and rash driving of vehicles on public roads. The rate of accidents has increased as more vehicles come on to ground. To control and monitor the speed of vehicle on public roads the respective departments of government has taken necessary step. But it is not doing enough. Presently the motor vehicle departments have been provided with laser speed detectors. But a man has to be there on road, which is not an ideal way for monitoring. Also the laser tracker is very costly.

The thread for this paper was derived from the above mentioned points. Here in this paper, we tried to develop a system to track the speed of the vehicle in a much simpler, economical way. This system has to work 24x7 automatically. The first idea was to use laser module, but finding it costly it was dropped. Later we found out that IR transceivers will help in achieving the goal, which is very simple to construct and very cheap, but it works only if the line of sight is maintained which was the main reason it was dropped. Finally we found that RFID module can fulfill our requirements with its key features as more economic, high reliability etc.

In this paper, by using RFID module as its main component, automatic speed control of our vehicle can be achieved. RFID tag is fixed on the different sign boards and RFID reader on the vehicle. When the reader comes in the speed limit area, speed is controlled automatically.

## II. RFID

Radio Frequency Identification, or RFID, is a rapidly-emerging identification and logging technology. Whether or not you have come across RFID systems in your work, you have probably encountered RFID in your daily life,

perhaps without even being aware of it. At their simplest, RFID systems use tiny chips, called "tags," to contain and transmit some piece of identifying information to an RFID reader, a device that in turn can interface with computers[2].

To begin understanding RFID, think of a conventional Point-of-Sale barcode reader scanning grocery barcodes. In its simplest form, an RFID system is much the same: it also can identify a package. However, unlike barcodes, RFID tags don't need a direct line of sight: within limits, we can now scan an unpacked skid of boxes. Next, think of RFID tags as mini databases, or as barcodes that can be written to, and that can accumulate information as they travel. At this point, RFID diverges qualitatively from bar coding, giving it great new potential.

In an RFID system, RFID tags are "interrogated" by an RFID reader. The tag reader generates a radio frequency "interrogation" signal that communicates with the tags. The reader also has a receiver that captures a reply signal from the tags, and decodes that signal. The reply signal from the tags reflects, both literally and figuratively, the tag's data content. The reply signal is created as passive "backscatter" (to use the radio term) [3].

### a. How RFID Works

A Radio-Frequency Identification system has three parts:

- A scanning antenna
- A transceiver with a decoder to interpret the data
- A transponder - the RFID tag - that has been programmed with information.

The scanning antenna puts out radio-frequency signals in a relatively short range. The RF radiation does two things:

- It provides a means of communicating with the transponder (the RFID tag) AND
- It provides the RFID tag with the energy to communicate (in the case of passive RFID tags).

This is an absolutely key part of the technology; RFID tags do not need to contain batteries, and can therefore remain usable for very long periods of time (maybe decades).

The scanning antennas can be permanently affixed to a surface; handheld antennas are also available. They can take whatever shape you need; for example, you could build them into a door frame to accept data from persons or objects passing through [4].

When an RFID tag passes through the field of the scanning antenna, it detects the activation signal from the antenna. That "wakes up" the RFID chip, and it transmits the information on its microchip to be picked up by the scanning antenna.

In addition, the RFID tag may be of one of two types. Active RFID tags have their own power source; the advantage of these tags is that the reader can be much farther away and

still get the signal. Even though some of these devices are built to have up to a 10 year life span, they have limited life spans. Passive RFID tags, however, do not require batteries, and can be much smaller and have a virtually unlimited life span.

RFID tags can be read in a wide variety of circumstances, where barcodes or other optically read technologies are useless.

- The tag need not be on the surface of the object (and is therefore not subject to wear)
- The read time is typically less than 100 milliseconds

Large numbers of tags can be read at once rather than item by item.

### III. WORKING

Passive RFID tags are kept at the beginning and end of speed limit zones. When a vehicle enters the speed limit zone the RFID reader installed in the vehicle detects the tag which is placed on the speed limit indicator at the beginning of the speed limit zone. Now the reader has the 12 digit code which is transferred by the tag. This 12 digit code indicates the speed limit which is to be maintained in that region. Once the reader gets this code, it is then transferred to the control unit, here PIC16F877 microcontroller, for processing.

When the microcontroller gets this 12 digit code, it compares this with the 12 digit codes which are already saved in the database of the micro controller. If the code matches with any of the codes in the database, then the micro controller knows that it is a valid code. Also it knows the speed limit which is to be maintained in the zone indicated by the tag. Then the speed of the vehicle is varied accordingly.

In this paper, the drive of the vehicle is provided by a 12 V dc motor. The speed of the motor is controlled using Pulse Width Modulation (PWM) technique. During normal operation the speed of the motor is controlled by an accelerating unit. The accelerating unit used here is a variable resistance. As the resistance of the accelerator unit varies the DC reference voltage given to the pulse width modulator also varies thereby changing the width of the output pulses.

Pulse width modulation is the technique in which the width of the output pulse is varied by varying a dc voltage reference which is given as one of the inputs to a comparator [5]. The other input is a saw-tooth voltage waveform. The width of the output pulses decreases or increases as the dc reference voltage level increases or decreases respectively.

This pulse produced by the PWM is given to the motor driver unit for controlling the speed of the motor. When the pulse width is large, the speed of the motor increases and when the pulse width is small, the speed of the motor decreases. The motor driver unit is a MOSFET switch which turns on and off depending on the gate voltage. When the gate voltage is high the MOSFET turns on connecting the motor to the power source and ground and when the gate voltage is low the MOSFET turns off. The high and low voltage at the gate is obtained by the pulse from the PWM. Hence for larger pulse

widths the motor is connected to the power source for longer duration, making the effective dc voltage input to the motor high. Hence, the speed of the motor increases. When the pulse width is small, the MOSFET switch is turned on for only a short period, and hence the motor is connected to power source for only a short duration. Now the effective voltage input to the motor is low and the speed of the motor decreases.

The motor used in this paper is a 12 V dc motor. Also the MOFET switch which acts as the motor driver is a high power device. Hence it requires high power to drive the motor unit. But the pulses used for driving the motor are produced by the PWM in the microcontroller. The microcontroller is a low power device which can produce a maximum of 5 V output. If this low voltage output is connected directly as input to the high power circuit, it will not work properly. Also if the low power circuit is connected to the high power circuit directly, it can damage the low power circuit. Hence for isolating the low power and high power circuits an isolator is used. Here we are using an opto-coupler (TLP250) as the isolator. It uses low power signals as input and produces corresponding high power signals as output. Since it is coupled using light waves, there is no electrical contact between the two circuits hence providing the necessary protection [5].

Hence during normal operation the accelerator unit controls the speed of the motor. When a tag is detected and identified, the microcontroller has to limit the speed of the vehicle to the speed indicated by the RFID tag. In this paper, we have employed two different methods for the speed control of the DC motor- a closed loop method and an open loop method.

#### A. Closed loop control

In the closed loop speed control method, the speed of the motor is constantly monitored using proximity sensors. The proximity sensor is an IR Transceiver unit which measures the number of rotations of the wheel connected to the motor. The wheel has reflectors attached to its surface. When the reflector comes in line of sight with the IR transceiver, a pulse is produced. By measuring the number of pulses produced by the sensor we can calculate the speed of the motor. By increasing the number of reflectors kept on the wheel we can measure the speed of the motor much faster. The speed thus measured by the sensor is then converted to the required unit and is compared with the speed obtained from the RFID tag. If the speed of the motor is greater than the speed limit of the zone, then the speed of the motor is decreased to the speed indicated by the tag [4]. If the speed of the motor is less than the speed limit of the zone, then the speed of the motor is increased or decreased depending on the accelerator position.

#### B. Open loop Control

In the open loop control, the speed of the motor is not measured. Instead the accelerator position is identified and the expected speed of the motor is obtained. This is then compared with the speed limit obtained from the tag. If the speed from accelerator is greater than the speed limit, then the

speed of the motor is brought to the speed indicated by the tag. For that, the input to the PWM is compared with the speed limit. If the limiter speed is greater than PWM input, then the PWM input is increased in steps. If the PWM input is greater than the limiter speed, then the PWM input is decreased in steps. Now if the speed from the accelerator is less than the speed limit of the zone, then the speed of the motor is varied with respect to the accelerator position.

Here the PWM input is varied in small steps so that the speed variation is smooth. For each step the microcontroller has to check for each of the conditions mentioned above. In our prototype for the closed loop control, we have placed only eight reflectors. Hence there is a delay while measuring the speed using sensor which in turn causes a delay in the speed control as the speed has to be monitored in every step. This delay can be eliminated to a very large extend by using encoders. Encoders are small wheels having a large number of holes (reflectors) (about 1000 holes) on them. Hence pulses are produced at much higher frequencies in the sensor, which enables the speed measurement of the motor at a faster rate, thus eliminating the delay [5].

The closed loop control is more efficient than the open loop control as it is more reliable and based on actual data than calculated or assumed data. The closed loop control gives more accurate and smooth speed control as compared to open loop control.

**C. Circuit Diagram**

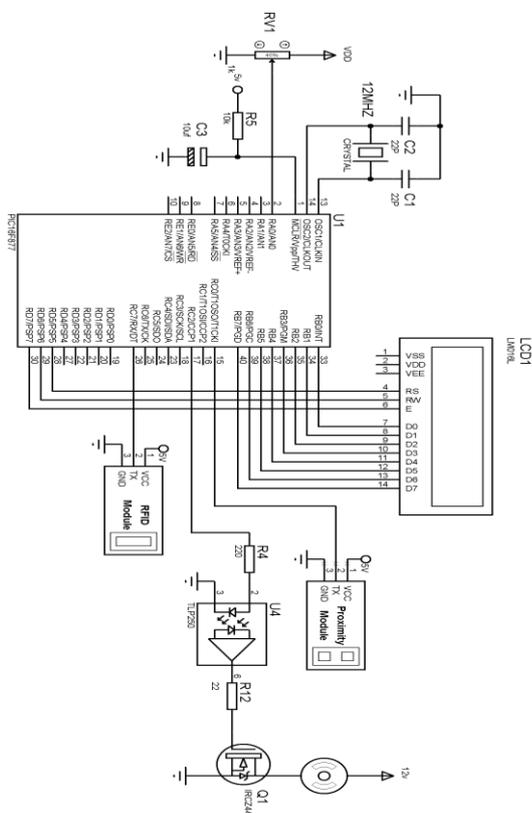


Fig.1.Circuit diagram

**IV. CONCLUSION**

The paper has an RFID tag which indicates the vehicle when it enters a speed limit zone. Hence by using the proximity sensor to monitor the speed of the vehicle and accelerator unit to control the speed, the speed of the vehicle can be maintained in the limited speed without the intervention of the driver. If this can be implemented effectively rash driving and over speeding in the speed limit zones can be reduced to a large extend, thus decreasing the total number of road accidents in our country.

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**REFERENCES**

- [1] Kumari Nimmi , Ruby Kumari,Pragati Bag, “Wireless Motor Speed Control Using Rf Sensor,” Dept. Of Elect & Telecommunication, Bharath University Chennai-73.
- [2] Joshué Pérez \*, Fernando Seco, Vicente Milanés, Antonio Jiménez, Julio C. Díaz And Teresa De Pedro, “An RFID-Based Intelligent Vehicle Speed Controller Using Active Traffic Signals”.
- [3] Preeti, Sandeep Dogra, Rashmi Jain, “DC Drives: Microcontroller Based Control”.
- [4] Sudip K. Mazumder, “Rotor Position Feedback Over An RF Link For Motor Speed Control”, Senior Member, IEEE, Rongjun Huang, Student Member, IEEE, and Kaustuva Acharya.
- [5] Ateeth Kumar Thirukkuvulur1, HariKrishna Nandagopal2, Vigneesh Parivallal,” Intelligent Vehicle Control Based On Identification Of Road And Traffic Signal Operated RFID Transponders, International Conference On Advances In Electrical and Electronics Engineering (ICAEE’2012) Penang, Malaysia.

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