

# Review of Automatic Speed Control of Vehicle using RFID Technology

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**Abstract** – Most of the road accidents occur due to over speeding and traffic violation. Running vehicle disregarding the red light has become a major problem now a day. Due to increasing number of vehicles on the road, monitoring traffic violation manually has become tedious and too complicated. Reckless driving causes serious causality and even death. The rate of road accident is going on increasing and has become a major area of concern. To reduce the rate of road accident we propose a system which controls the speed of vehicle automatically in any critical zone, without major inconvenience to driver.

Here, we review a model based on RFID technology. One RFID reader inside the vehicle reads the RFID tag placed either at speed limit signboard or at traffic light. A controlling module in the vehicle then takes the decision and control the speed accordingly.

**Index Terms** - ECU (Electronic/Engine Control Unit), Driver assistance systems, RFID (Radio Frequency Identification).

information that is potentially useful to drivers in that locality such as schools, hospitals, under construction roads etc. It is difficult to keep an eye out for road signs while driving.

Many Driver Assistance systems for speed control of vehicle have already been developed so as to avoid accidents [2]. These are Cruise control system (CC) that is capable of maintaining pre-defined speed. Adaptive Cruise Control (ACC) which keeps the automobile at pre-defined safer distance from the preceding vehicle. Curve Warning Systems (CWS) detect the curved roads. But all these systems are not able to control the vehicle speed automatically if driver doesn't respond.

Here we propose a dynamic model where the vehicle speed will be controlled and governed based on the information it receives. The key technology used in our model is RFID (Radio Frequency Identification).

## I. INTRODUCTION

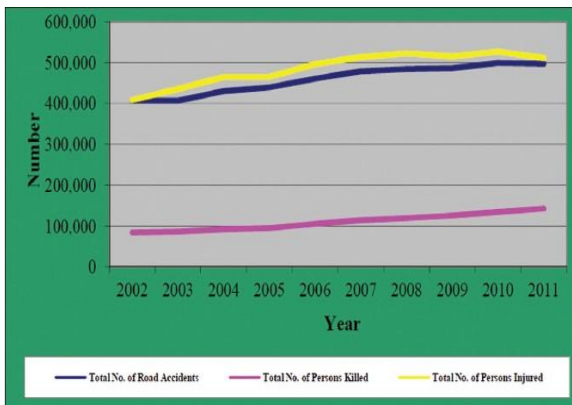


Fig 1: Statistics report on total number of road accidents

Fig. 1 gives the statistics of the number of road accidents year wise. From the figure it is clear that the number of road accident increases every year which is our main concern. Out of various reasons speed is the main reason behind accidents [1].

Apart from the traffic rule violation, one of the major causes of road accidents is overlooking of sign boards which are generally installed near the road to alert the driver about some critical locations. For example: Cautionary road-signs are installed in hazardous areas such as railway crossings, sudden bends, steep ascents and descents etc. Informative road-signs provide directions, locations and other

## II. RFID TECHNOLOGY

In the recent years, RFID technology is being incorporated to commercial transportation, highway toll collection system is an example of RFID based system. Reason for its gaining popularity is low cost tag which can be installed on the sign boards easily. Tag generates an ID code which is sensed by the reader. This ensures security of data.

An RFID system contains one emitter or tag which is attached to traffic lights or sign boards. They contain specific codes for different information. Other element of the system is RFID reader which is installed inside the vehicle. Reader senses and detects the tag ID [3][4][5]. This is shown in fig. 2.

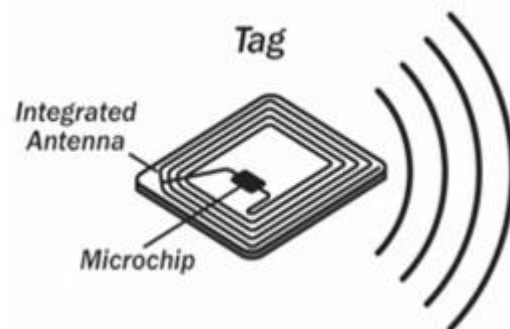


Fig 2: RFID tag

RFID tags are of two types, viz., passive tags and active tags. Passive tags do not contain any power source. These are activated when it comes within the range of the reader. Active tag turns on only if there is power supply. These tags emit identification signals regularly within span of few seconds.

There are two different possibilities of using these tags: First possibility is when tag is attached to traffic light. Only active tags, as shown in fig. 3, will be used here because active tags turns ON when it is given a supply voltage. We connect active tag in series with the Red light. Whenever there is a Red light traffic signal situation, that is, if the traffic signal turns red it also supplies power to the active tag at the same time. The tag remains inactive as long as Red light is OFF that is if there is a Green or Yellow traffic signal. When Red light turns ON the reference speed in this case is considered to be 0 Km/hr. This information of Red light is sent to the reader through specified code.

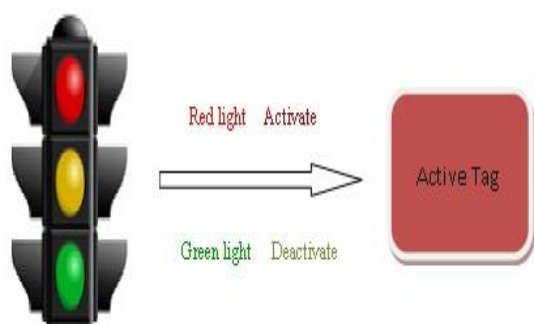


Fig 3: Tag activates during red light

Second possibility is when tag is connected to speed limit boards on the side of the road. Here we can use active or passive tags depending on the intensity of traffic. These tags contain a particular unique code corresponding to the speed on the speed-limit sign boards. This particular code ID referring to the speed to which the vehicle's speed has to be reduced is transmitted by the tag to the RFID reader. This is shown in fig. 4.

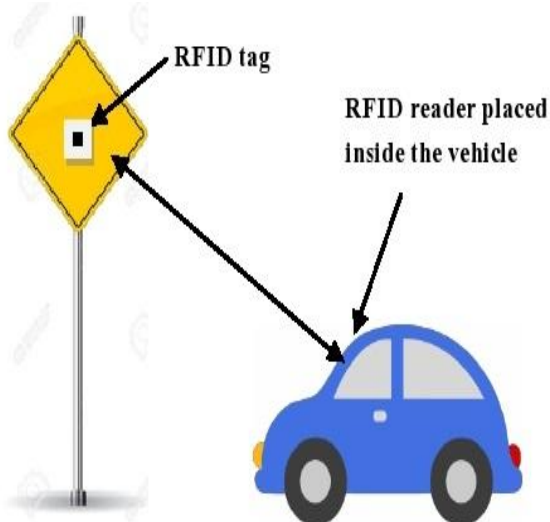


Fig 4: Speed limit sign board posts equipped with RFID tag (left side) Automobile equipped with the RFID reader (right side)

### III. ECU (ENGINE CONTROL UNIT)

An engine control unit (ECU) is a type of electronic control unit incorporated in the vehicle that controls a series of actuators on an internal combustion engine to ensure optimal engine performance<sup>[4]</sup>. This is shown in fig. 5. ECU does this by reading values from different sensors within the engine bay, interpreting the data and adjusting the engine actuators accordingly. For the vehicles when facility of ECU has not been incorporated, the speed control of vehicle is made by controlling air-fuel mixture and ignition timing. Vehicle speed is mechanically set and dynamically controlled by mechanical and pneumatic means.

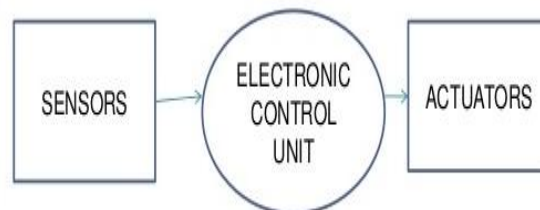


Fig 5: Block diagram for Electronic Control Unit

ECU is an electronic circuit based on embedded on printed circuit board. Microcontroller is the most important component of ECU and it is programmed to execute entire control action. ECU is small and occupies less space than mechanical control system. ECU makes controlling of different block of vehicle easy and effortless. ECU takes input from multiple sensors, interpret the signal and command the respective actuators to take required action. For example, Pedal position sensor senses the movement of pedal and sends this signal to ECU which in turn controls the amount of air-fuel mixture [6].

### IV. FLOW CHART

The flow chart, as shown in fig. 6, shows organised process of our entire model based on RFID technology. Here, we are considering four different conditions, as shown in table 1. For each condition there is a unique ID/code which has been encoded in the tag. There are different speed limits for different conditions/IDs.

Tag number	Specified Speed limit (Kmph)	Condition (zone)
101	0	Red light, Railway crossing
102	10	School, Hospital, Institutions
103	25	Curve road, sudden bends
104	30	Under constructing roads

Table 1: The above table shows the speed which should be maintained at different zones

### V. BLOCK DIAGRAM & WORKING PRINCIPLE

In this model, as shown in fig. 7, all the vehicles should be equipped with the automatic control system unit. This includes an RFID reader, a microcontroller, an LCD screen, a buzzer and an ECU.

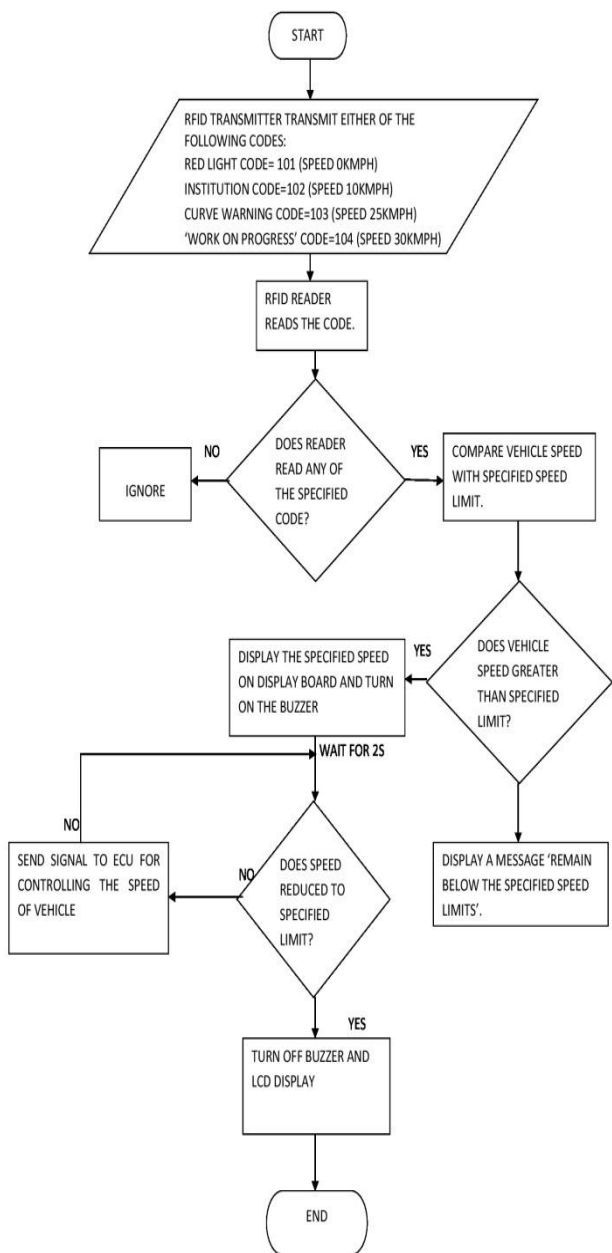


Fig 6: Flow chart depicting process of controlling vehicle

All the tag numbers or the tag code IDs is already saved in the database microcontroller of the reader section which is installed in the vehicle. When the microcontroller gets the code ID, it knows which zone the vehicle is entering and what should be the speed which should be maintained by the vehicle in this zone. Appropriate action will taken either by the driver or automatically by the vehicle system

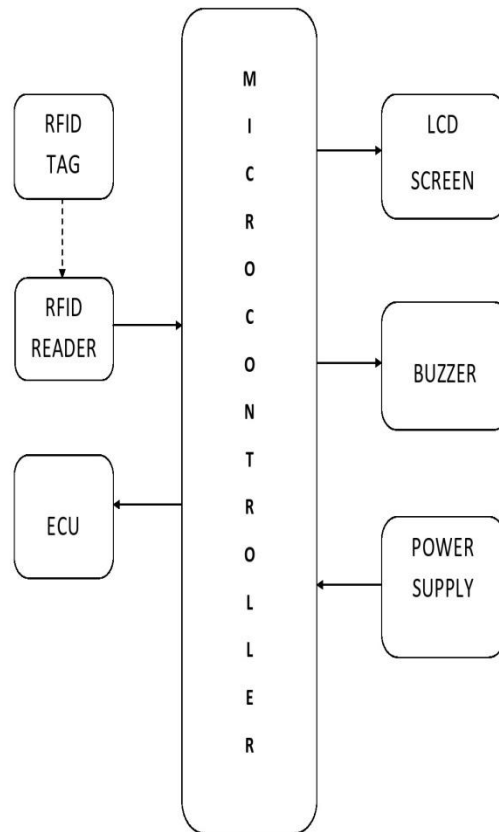


Fig 7: Block diagram

Tags are installed at the beginning of speed limit zone and at traffic signal. When a vehicle enters the speed limit zone or if there is a red light at traffic signal, RFID reader installed in the vehicle detects the tag code. This code indicates the speed which is to be maintained at that area. Reader transfers tag code to microcontroller. When microcontroller gets the code it compares this code ID with the codes which are already saved in database of microcontroller. If match is found, the code ID is valid. Microcontroller knows the speed limit which is to be maintained in the zone. Microcontroller compares the speed of the vehicle with the specified speed limit. If vehicle speed is lower or equal to the specified speed limit, microcontroller displays a message to remain below the specified speed limit on LCD screen. But if vehicle speed is more the buzzer turns ON and driver is asked to reduce the vehicle speed down to the specified limit. If no action is taken by the driver within a specified time (2 seconds in our system), the microcontroller will send necessary signal to the ECU of the vehicle to reduce the speed automatically down to the specified speed limit.

If speed is reduced to the specified limit buzzer and display will be turned off. When vehicle reaches outside the tag

range, microcontroller removes the control over the vehicle and entire control is transferred back to the driver.

## VI. CONCLUSION

This paper explains the intelligent vehicle control based on the RFID technology. RFID system alerts the driver about the speed limit zone. If the driver is inattentive the speed of the vehicle can be maintained in the limited speed without the intervention of the driver. The system can prevent the road accidents in critical zones. It also reduces the traffic rule violations. Main motive for designing this system is to avoid accidents and alert the drivers about speed limit for safe travelling. It is used to govern and regulate the speed of the vehicle in hospital, school and work zones. Accidents can be prevented which are caused by the negligent driving or speeding by the driver. Thus saves many valuable lives.

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