Design and Development of Automatic Speed Reduction System and Adjustment of Ground Clearance

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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. It is not possible for the off-road vehicle to run at high speed on its standard ground clearance provided considering the city obstacles and on-road cars to run over the rough terrain Automatic Speed Reduction System and Adjustment of Ground Clearance Department of Mechanical Engineering Page 3 with its lower ground clearance. To obtain the good performance at high speed and low speed it is necessary to build one system which can vary the ground clearance. This can achieved by changing the suspension height so that the chassis height can be adjusted with respect to the speed and the quality of roads.

Keywords: Speed Reduction System, Adjustment of Ground Clearance

I. INTRODUCTION

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 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.

Road conditions are not similar at all places, it changes with application, environment and climate. In city at different sectors like school, hospital there are speed breakers of different dimensions. At certain condition road goes straight without any pits else we found irregularity. Most of the people buy only one four wheeler which they use that at all this condition. Hence it's necessary to give some standard ground clearance to the vehicle. But still there are obstruction while driving the car on highway and in city.

II. PROBLEM STATEMENT

1) Automatic speed reduction control of vehicle by detecting the accident prone zone and our car as a road safety device, it will reduce the speed at the incidence of accident and avoid the accident
2) In adjustment of ground clearance sensor detect the obstacle and adjust the ground clearance.

III. LITERATURE REVIEW

A. Design optimization of ground clearance of domestic cars. Stability and performance is also parameter of ground clearance. If we allow the vehicle for the low ground clearance then it helps to give less drag force simultaneously it consumes less fuel resulting less pollution. The experiment is carried out in wind tunnel with the help of notch back car model. The result shows that the positive lift force reduces with increasing height of ground clearance. the RFID and ECU techniques which are used to control the speed of the vehicle. The 80% of accident are caused by the human error. When the RF transmitter is turned on, the data set by the user is encoded and sent to the Receiver module. smart zone-based vehicle speed control using RF and Obstacle Detection and Accident Prevention system. Whenever the vehicle is within the zone, the vehicle speed is controlled by receiving the signal,

B. CONCLUDINGREMARKS

From above literature we concluded that,

1) Automatic speed reduction and adjust the ground clearance by using various sensors.
2) Use of RF sensor the speed of vehicle is controlled below set speed.
3) Use of pneumatic cylinders for adjust the ground clearance.
4) Use of ultrasonic sensor the obstacle is detected and give signals to the system.

IV. COMPONENT SETUP

A. RFID Technology

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.1.

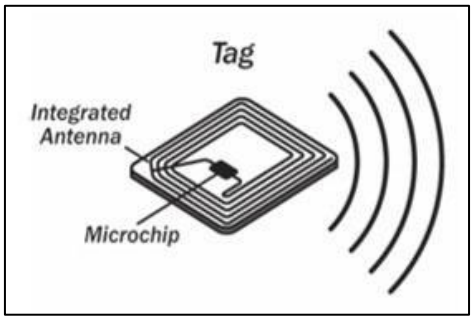


Fig. 4.1: RFID Tag

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. In active 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. 2.

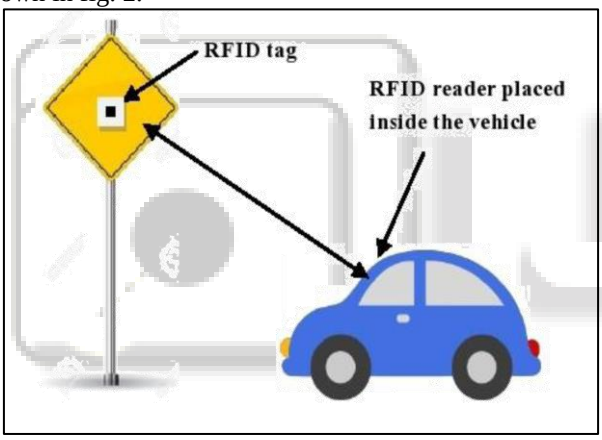


Fig. 4.2: Speed limit sign board posts equipped with RFID tag And RFID reader

B. 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 . This is shown in fig.4.3 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.

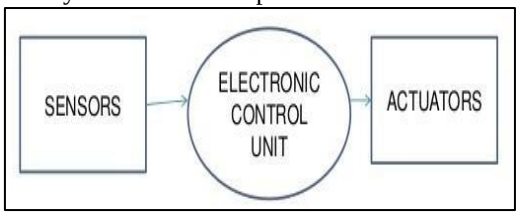


Fig. 4.3: Block diagram for Electronic Control Unit.

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.

C. Ultrasonic sensor:

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

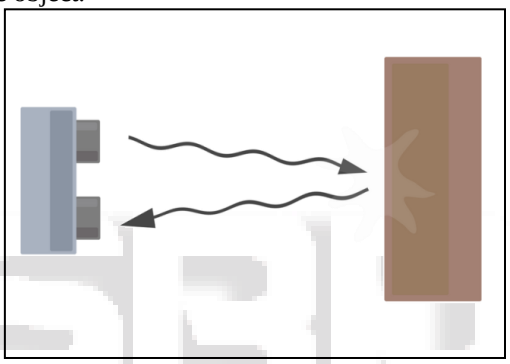


Fig. 4.4: basic ultrasonic sensor operation

Since it is known that sound travels through air at about 344 m/s

D. Pneumatic cylinder

Pneumatic cylinder(s) (sometimes known as air cylinders) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion.

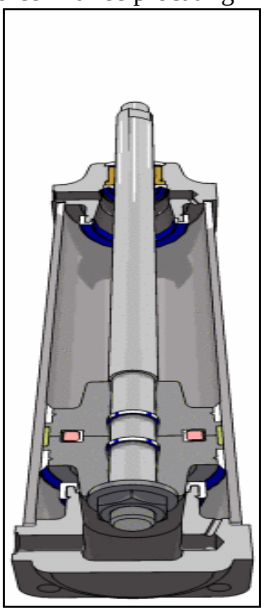


Fig. 4.5: pneumatic Cylinder

E. SOLENOID VALVE

A solenoid valve is an electrically activated valve, typically used to control the flow or direction of air or liquid in fluid power systems.

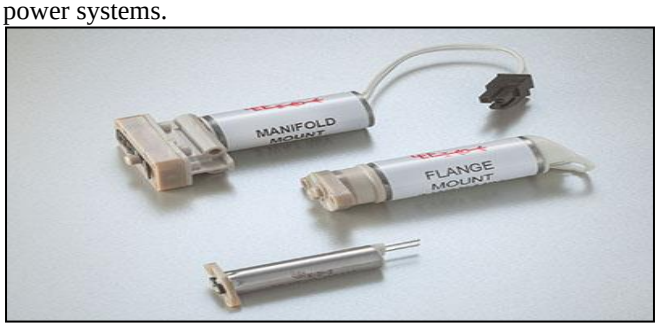


Fig. 4.6: solenoid valve

V. FLOW CHART DEPICTING PROCESS OF SPEED CONTROLLING VEHICLE

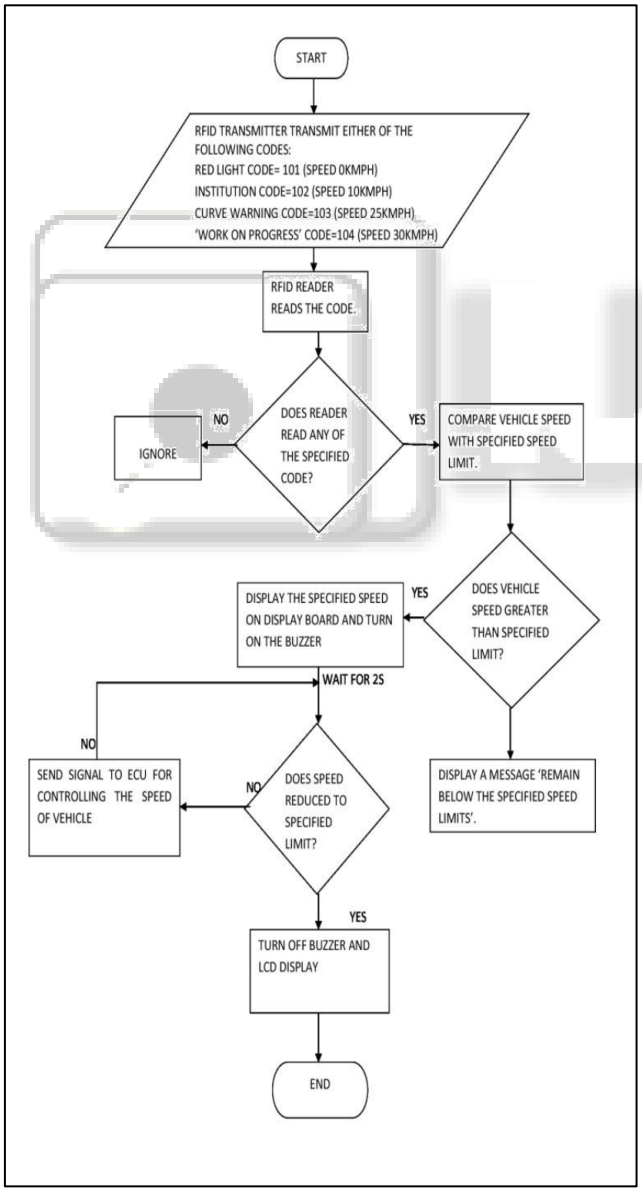


Fig. 5.1: Flow chart depicting process of controlling vehicle.

VI. BLOCK DIAGRAM & WORKING PRINCIPLE

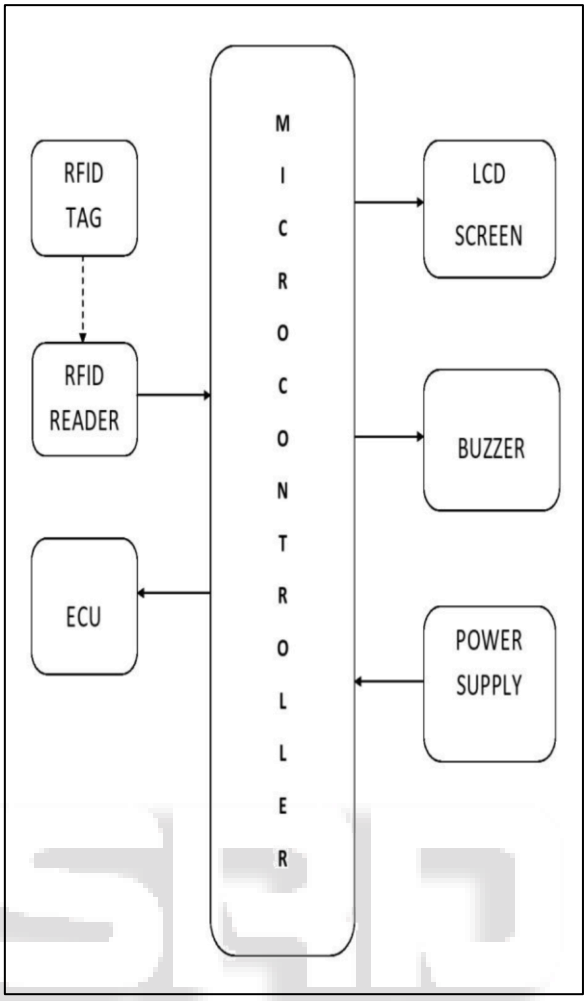
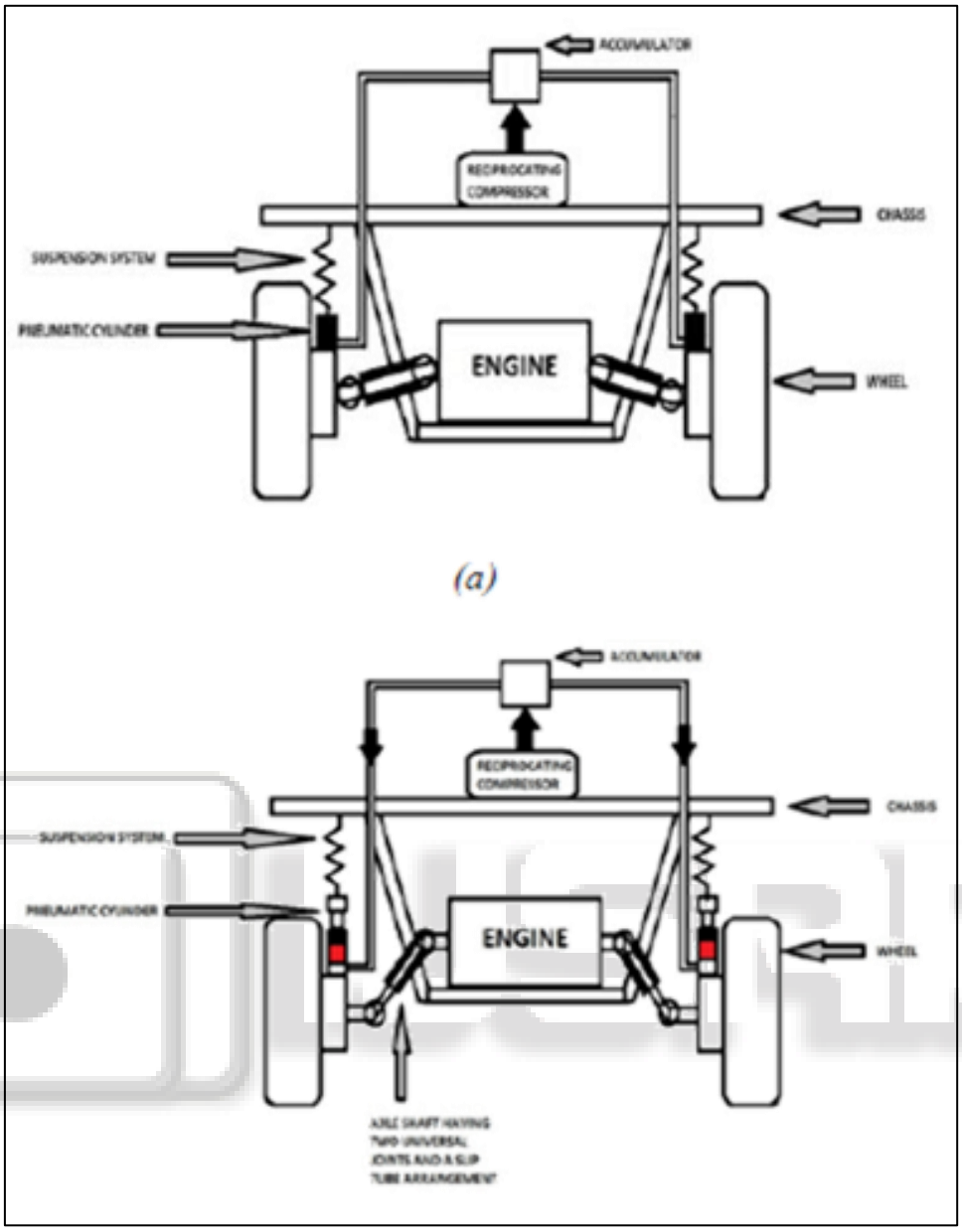


Fig. 6.1: Block Diagram.

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, 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.

VII. PROPOSED LAYOUT



VIII. RESULT

The flow chart, as shown in fig. shows organized process of our entire model based on RFID technology. Here, we are considering four different conditions, as shown in table 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

Fig. 8.1: The above table shows the speed which should be maintained at different zones.

IX. CONCLUSION

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

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