International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 06 | June-2016 www.irjet.net p-ISSN: 2395-0072

Autonomous monitoring of the automobile parameters for road safety

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Abstract - *The number of people dying in road accidents is increasing day by day. It is very important to bring in autonomous system to prevent accidents. Accidents occur due to various reasons. It could be due to over speed, ill health of the driver, bad condition of the vehicle etc. In this paper we present a scheme to monitor the automobile parameters like speed, tyre pressure, driver's health condition etc., autonomously from the safety stand point. The main aim is to design a digital controller that can monitor number of parameters using RFID technique in real time. Here in this work we demonstrate this scheme with one parameter namely the speed of the automobile. The speed of a vehicle will be monitored in real time and reduce the same if the speed crosses a set limit. This is achieved by building an embedded module with a Display and Control unit, customized to fit into an automobile dashboard. ARM 7 microcontroller is used as the main hardware and 'Embedded C' is used for coding. Field trials give expected results out of the proposed scheme.*

Key Words: RFID, Automobile, Speed limit, ARM 7, Danger zone

1. INTRODUCTION

The report is in reference to 2013 and 2015 information collected from 178 collaborating countries, throughout the globe, over a million humans die in road accidents each and every year and 20-25 million human obtain injuries. The major reason has been found to be the over speed of the automobiles. Prevention is constantly higher than therapy. The speed of the automobiles will be monitored and reduce the same if speed crosses a set limit. This would be achieved by building an embedded module with a Display and a Control unit, customized to fit within vehicle's dashboard.

The proposed module comprises of two separate units namely Zone transmitter unit in danger zone (accident zone) and receiver unit in the running vehicle. Whenever the vehicle moving within the accident (transmitter) zone found to cross the road speed limits, the vehicle speed is controlled by the proposed system and the driver will not have any control over the throttle. The control of the driver over the throttle is restored once the vehicle comes out of the accident zone. The entire project works on the signals sent and received by RFID technology tag .The current speed of vehicle is sent to ARM microcontroller and the ARM microcontroller sends out the control signal to reduce the fuel flow to the carburetor to reduce the speed to the prefixed speed. This will be done with the relay arrangement. The Embedded C will be used for the software part. This automation built into an automobile will help in reducing the accidents, and increasing the fuel economy. This system will be compact and low-price

1.1 Methodology: the description for existing and proposed methodology is given below.

a. Existing method: in this method Adaptive cruise control (ACC) which has radar sensor measures the distance to the vehicle in front and its relative speed and uses this information to gather the position of the vehicle in is in same or different lane. ACC is thus able to adapt the vehicle speed to match the speed of the vehicle travelling in front and maintain the safe distance from it by radar sensor [6]. But there is no speed control mechanism in real time near the hospital zone/ school zone.

b. Proposed method: here we develop two separate modules transmitter module and the receiver module. Transmitter / Zone transmitter unit in danger zone and receiver in the running vehicle. Whenever the vehicle moving within the accident (transmitter) zone found to cross the road speed limits, the vehicle speed is controlled by the proposed system and the driver will not have any control over the throttle. The control of the driver over the throttle is restored once the vehicle comes out of the accident zone. The entire project works on the signals sent and received by RFID tag-reader.

2. Literature Survey: Throughout the earlier years many devices and technologies has been utilized to provide road safety and accordingly to reduce accidents occurring due to speed violation for example Radar sensor [6], average

speed safety cameras etc. After doing literature review in the area of accident detection and prevention of traffic rules violation, various applications provided a solution i.e. we get to know that there are various techniques available for detection of speed violation and accident, Camera based detection, GPS module, blink sensor etc., [5] to identify fatigue symptoms of the drivers after that they control the speed of that automobile so that accidents can be avoided. The base paper describes module that has an alerting and reporting module for speed violation management [1]. Limitation of this method is that the speed violation information is sent to nearby traffic personnel immediately after violation but speed is not controlled in real time. Hence we overcome this method by RFID technique and control the speed of the vehicle in the danger zone autonomously.

3. Block diagrams of the project: This proposed solution comprises of two hardware sections. One in the accident Zone and the other one installed in the automobile. The block diagrams of the transmitter and receiver units are given in this chapter with all the explanation and the details of the hardware components used.

3.1 Transmitter module: The transmitter module is shown in Fig 3.0 this consists of an active RF tag with a transmitter.

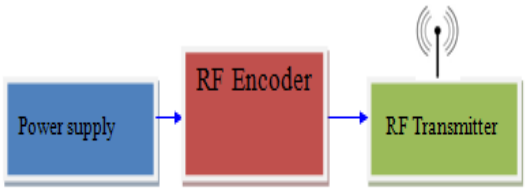

Fig 3.0: Transmitter Block

3.2 Receiver module: The signal sent out by the RF tag has to be read by the RF reader which is on board of the vehicle. The block diagram of the RF reader and other parts to control the speed is sown in Fig 3.1

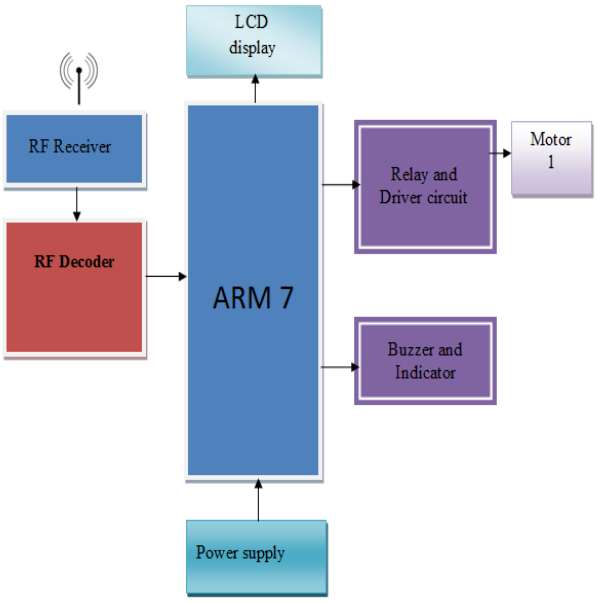

Fig 3.1: Receiver module

WORKING: The RF transmitter circuit consists of the RF transmitter module interfaced with RBC27 TX. The voltage regulator circuit is obtained from a 8V (1A) battery which will provide the motor with8 volt supply and whereas ARM microcontroller, motor driver, LCD and the receiver modu1e receives a 5V regulated supply. The controlling device of the complete system is ARM 7 microcontroller to which RF receiver module is interfaced with RBC27 RX is connected; DC motors which are interfaced via a motor driver. When the RF TX is turned on, the data which is set by the user is encoded and information would be transmitted to the Receiver module. The receiver module decodes the data and sends it to the ARM microcontroller to compare the data embedded in the controller. If the speed of DC motor is less than that of the limit zone, the ARM 7 compares the data received 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 is greater than that of the set speed limit, the ARM 7 microcontroller controls the motor driver to limit speed based on the zone, thus by preventing accidents. The representation below shows how the proposed module that can be implemented

4. TECHNOLOGY USED:

Hardware and software tools used in this project

4.1 Hardware: The heart of the hardware block of the project is the microcontroller and the RFID tag & readers are used. An active RFID tag is used to enhance the distance of response. It requires a power supply with a

battery backup as this proposed facility has to be available 24x7.

4.2 ARM7:16 to 32bit ARM7 TDMI-S microcontroller in LQFP 64 package of 40 kilobytes of static RAM and 512 kilobytes of flash memory via on chip boot loader software. Embedded ICERT offer real-time debugging with the on-chip Real Monitor software and high-speed tracings of instruction execution.

4.3 RFID: Radio-frequency identification technology is the wireless technology which uses electromagnetic fields for transferring the data for automatically identifying the tags which are attached to automobiles. The tags of RFID will contain information such as electronically stored details. Few tags that are powered with e1ectromagnetic induction which is from magnetic fields and this will be produced across the reader of RFID.

4.4 DC MOTOR: The L293 and L293D are devices have high-current quadruple half-H drivers. The L293 provide up to 1A to drive bidirectional currents at voltages 4.5 Volt to 36 Volts. The L293D provides up to 600 mA of bidirectiona1 currents at voltages 4.5 to 36 Volts. These devices drive inductive loads such as relays, bipolar stepping motors and solenoids, and also other high-voltage /high-current loads in +ve supply applications.

5. SOFTWARE: Keil uVision4 a cross compiler which is developed by ARM Ltd., is used for the development of the embedded software. It also supports debugging for ARM 7, ARM 9 and Cortex-M based microcontroller devices. For the building applications or compiling source code, software tools like compiler, assembler, linker etc., are required. When developing embedded applications are concerned, certain things should be considered regarding compilers. When the developing applications for native architecture i.e., target system is same as the host architecture on which applications are developed, native compilers can be used. Cross compilers are used if target system is different from host architecture. This flow chart used to code the control circuit program is given in fig 5.1

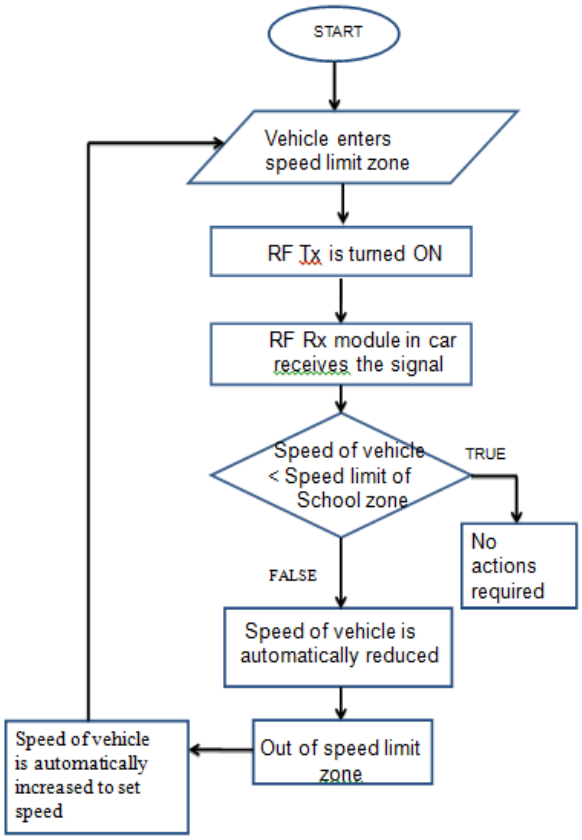

Fig 5.1. Flow chart for the Control software

6. CONCLUSION: In certain zones the road safety is very important and most of the road accidents take place because of high speed. So we have come out with a proposal to control the speed of automobiles running in such zones and this proposed project is implemented using RFID tags and readers. The RFID reader which is mounted on board of an automobile recognizes the safety zone by tapping the signal from the tag in the low speed zone. The associated electronics built around a Microcontroller will help in disabling the driver's control on the throttle. As it makes use of an ARM 7 Microcontroller, flexibility and reliability of the project are enhanced.

Accidents can be prevented at least in the speed restricted areas such as school and hospital zones and the restricted areas are controlled automatically rather than manually the proposed on-board module is portable & easily adaptable to any commercial car with minima1 modification

This write up gives a proper explanation as to how transponders & readers can be used to communicate with the vehicles thereby providing autonomous vehicle

control with the ECU. By using other sensors, other parameters connected with the automobile may be monitored. Thus we hope this can revolutionize the traffic management and avoid accidents caused due to over speeding in future.

6.1 FUTURE SCOPE: The reliable autonomous speed control vehicle module and safety warning systems is still a long way to go. With the increasing wireless connectivity, safety warning of vehicle is rapidly turning into reality and the features like advanced driver assistant system and sensing technology on automated vehicle can reduce the accidents.

The future research on vehicles controlling the speed autonomously is on a short-term basis and this can lead into a promising future developments.

Thus we hope this can revolutionize the traffic management and avoid accidents caused due to over speeding in future.

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