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RF BASED SPEED CONTROL SYSTEM FOR VEHICLES

P Veera Swamy[1]
Asst.Professor, Dept. of E.C.E
Dhanekula Institute of Engineering and Technology Vijayawada-India

Jannu Chaitanya[2]
Lecturer,Dept of ECE
Dhanekula Institute of Engineering and Technology Vijayawada-India

K Jaya Sai Keerthi[3]
student of Dept. of E.C.E Dhanekula Institute of Engineering and Techology Vijayawada-India

K Venkata Sai Kumar[4]
student of Dept. of E.C.E
Dhanekula Institute of Engineering and Technology
Ganguru, Vijayawada

K Lalitha Devi[5]
student of Dept. of E.C.E
Dhanekula Institute of Engineering and Technology
Ganguru, Vijayawada

K Rajesh Khanna[6]
student of Dept. of E.C.E
Dhanekula Institute of Engineering and Technology
Ganguru, Vijayawada

Abstract—In this evolving World, people are driving very fast and accidents are occurring frequently, so we lost our valuable life by making small mistakes while driving (e.g., school zones, hills areas, highways) and collision between the vehicles. In order to avoid such kind of accidents and to alert the drivers and to control their vehicle speed in such kind of places, the highway department has placed the signboards. But sometimes it may not be possible to view that kind of signboards and there is a chance for accident. So to intimate the driver about the zones and the speed limit automatically, it is done by means of using RF technology. The main objective of this project is to design a RF based speed control system meant for vehicle's speed control and monitors the zones which can run on an embedded system. Smart Display and Control (SDC) can be custom designed to fit into a vehicle's dashboard and displays information on the vehicle. The project is composed of two separate units−zone status transmitter unit and receiver (speed display and control) unit, a ultrasonic sensor. Once the information is received from the zones and sensor, the vehicle's embedded unit automatically alerts the driver, to reduce the speed according to the zone, it waits for few seconds and otherwise vehicle's SDC unit automatically reduces the speed and the sensor detects the obstacle by measuring the distance to avoid collision between vehicles.

***Key Words*—Arduino Uno, ATMega328 microcontroller, RF transmitter and receiver module, HC-SR04 Ultrasonic sensor**

1. INTRODUCTION

ROAD facilities are a major concern in the developed world.

Recent studies show that one third of the number of fatal or serious accidents are associated with excessive or inappropriate speed, as well as changes in the roadway (e.g., the presence of road-work, unexpected obstacles). Reduction of the number of accidents and mitigation of their consequences are a big concern for traffic authorities, automotive industries and transport research groups. There are many solutions given to the road authorities and one of such solutions is advanced driver assistance support(ADAS) [5], in this process visual signals which are generated by the vehicle to communicate with the driver for the possibility of collisions [1]. Well these arrangements have been made accessible in the today's vehicles and automobiles. By implementing this, higher safety will be obtained with more number of sensors and automatic driving controls. For achieving the same, we can make use of RF technology. The technology is most effective in any type of weather conditions [4]. It transmits radio signals between two devices. For many applications, the medium of choice is RF since it does not require line of sight. The RF communications incorporate a transmitter and a receiver. There are of various types and ranges. Some can transmit up to 500 feet. RF modules are typically fabricated using RF CMOS technology.

The proposed paper discusses about to reduce the vehicle speed limit by using RF transmitter and receiver module. The Transmitter is mounted on the Road Side at Speed Sign Board and it is responsible to transmit the maximum allowable speed limit of that road to receiver (on vehicle). This will be transmitting the data continuously regardless presence of the vehicle with a range of up to 200m. The Receiver system is embedded with the vehicle system. It comprises of RF receiver, Arduino Uno ATMega328 microcontroller, Ultrasonic sensor, LCD display and Buzzer

2. PROBLEM STATEMENT

As we see in today's world number of vehicles on road are increasing at alarming rate. With the increase in number of vehicles, safety concern also increases for both people inside the vehicle and outside the vehicle. World Health Organization (WHO) had conducted various surveys for road fatalities based on number of vehicles, inhabitants and total fatalities globally due to road accidents [4]. India, USA and China are struggling with Road Accidents problem. So, it has been decided to minimize this problem as low as possible by incorporating our knowledge and skills.

3. LITERATURE SURVEY

A. RF Based Smart Zone Vehicle Speed Monitoring and Control System [1]

Eshan Pathak, Tushar Sharma, Ashutosh, Shubhra Dixit argued about the use of RF technology for speed limiting the vehicles in appropriate zones. And the system would be fully operational in all the conditions and in any weather situations. This can be the great step in securing the life of the driver and the persons travelling with them. As the data from the transmitter is transmitted to the receiver installed in the vehicles from the zones to lower the speed of the vehicles.

B. RF Module Based – Speed Check and Seatbelt Detection System [4]

Himesh Gupta, Aditya Pundir, O. P. Sharma in this paper, they use RF module. This system is a combination of Speed Controlling circuit and Seat belt Detection circuit. The transmitter will generate a signal to receiver in case of over- speeding and after 10 seconds the engine will stop. In addition to this, it also keeps checking whether Driver and Co-Driver (if present) wearing the seatbelt or not.

C. Highly safe driving control system for model vehicles using different kinds of sensors and one-way wheels [3]

Takeshi Kasuga, Satoshi Yakubo in this paper, they presents a highly safe driving control technique using different kinds of sensors and one-way wheels to avoid the rear-end collision and sudden stop of the model vehicle. Moreover, if the wheel races even if a fault occurs at any motor and then the rotation of the axle stops, a safe driving can be maintained.

4. PROPOSED MODEL HARDWARE DESCRIPTION

A. RF module

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter and receiver both operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through antenna connected at pin4. The transmission occurs at the rate of 1Kbps – 10Kbps. The transmitted data is received by an RF receiver [1]. HT12E encoder is built within the transmitter which encodes the parallel data for transmission and HT12D decoder is built within the RF receiver for decoding the serial data.

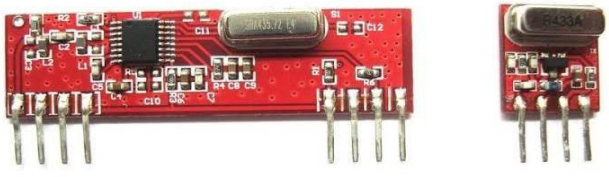

Fig 1. Physical Overview of RF Module

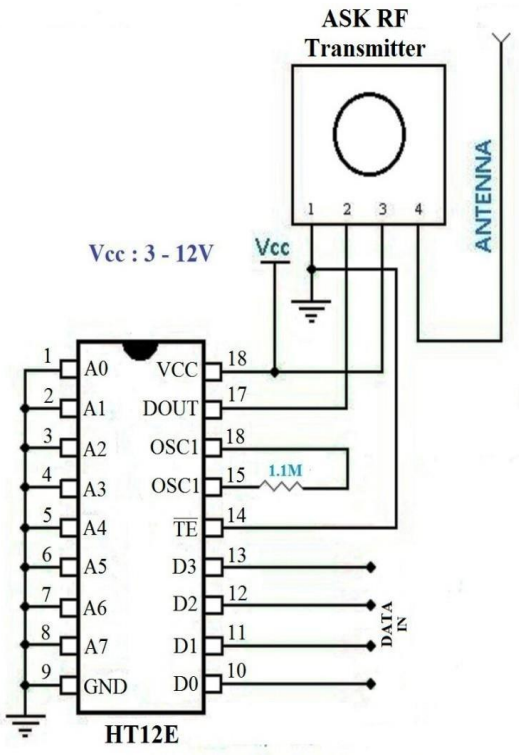

Fig 2. HT12E encoder Pin Description with RF Transmitter

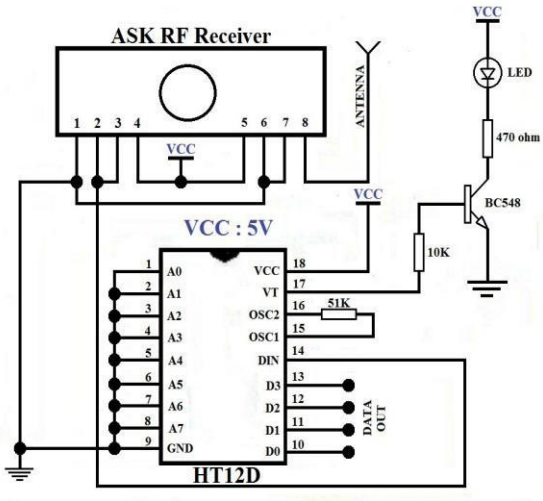

Fig 3. HT12D decoder Pin Description with RF Receiver

B. Arduino Uno ATMega328 microcontroller

The Arduino Uno [9] is a microcontroller board based on the ATMega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller and is simply connect to a computer through USB cable or power it with a AC-to-DC adapter or battery to get started.

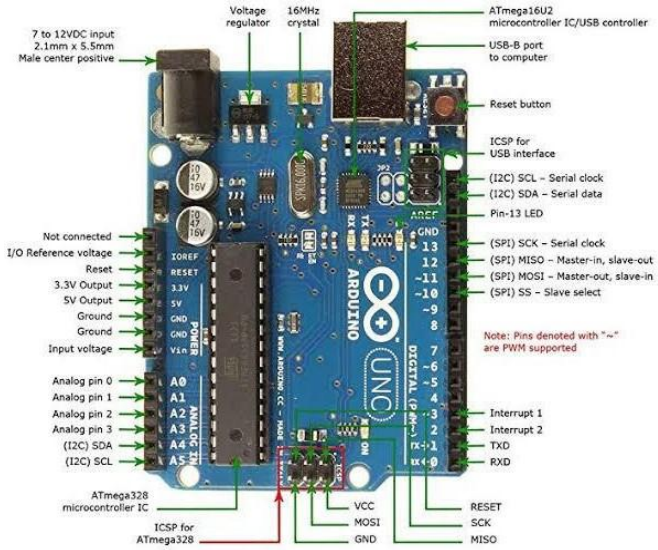

Fig 4. Physical Overview of Arduino Uno ATMega328 microcontroller

The ATMega328 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATMega328 achieves throughputs close to 1MIPS per MHz. It has 23 general purpose I/O lines, 32 general purpose working registers, 1 KB EEPROM, 2 KB SRAM, 32 KB Flash memory and 3 timers/counters.

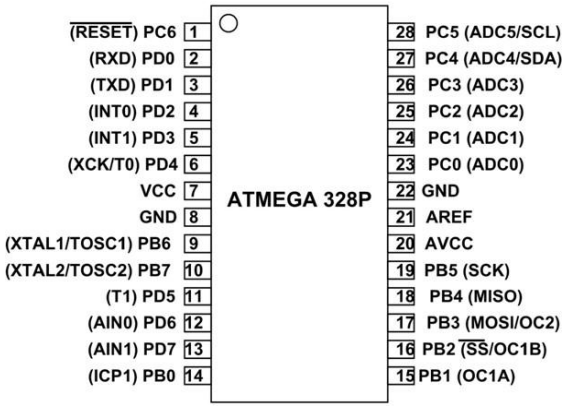

Fig 5. Pin Description of ATMega328 microcontroller

A. HC-SR04 Ultrasonic Distance Sensor

An ultrasonic distance sensor is an instrument that measures the distance to an object using ultrasonic sound waves. It uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. It works by sending out a sound wave at a frequency above the range of human hearing. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse [2-3]. An ultrasonic distance sensor consistsof 4 pins, VCC, TRIG, ECHO and GND. TRIG and ECHO pins of this sensor are designed for transmitting and receiving ultrasonic waves respectively.

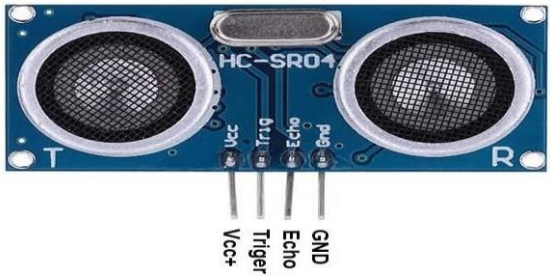

Fig 6. Physical Overview of HC-SR04 Ultrasonic Sensor

5. BLOCK DIAGRAM

The Block Diagram consists of Arduino ATMega328 microcontroller, Wireless RF Module - RF Transmitter and RF Receiver, HT12E encoder, HT12D decoder, LCD display, Buzzer, DC Motor, Ultrasonic distance Sensor.

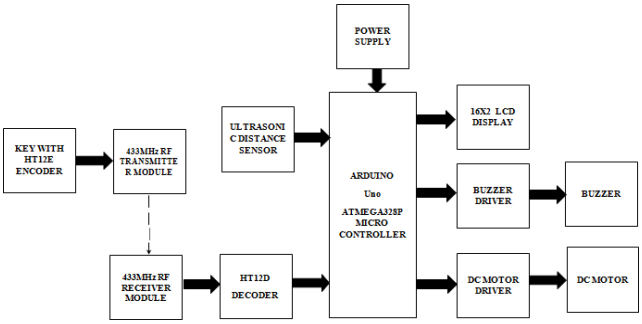

Fig 7. Block Diagram Of Proposed System

6. WORKING

The system has 2 units–zone transmitter unit and receiver unit. The transmitter unit is placed at sign board near road side and the receiver unit is embedded with the vehicle. Both RF transmitter and RF receiver operates with same frequency i.e., 433 MHz. This whole setup is done in some restricted areas (e.g., school zones, hill stations, highways, curved roads). When the vehicle enters into the restricted areas, then the transmitter sends the encoded serial data up to 100 feet to the receiver through antenna. The receiver receives the serial data or information and sends the decoded data to Arduino Uno ATMega328 microcontroller [9]. The signal is basically analog in nature that will be converted into digital and the micro controller is able to process the signal. The process of signal conversion is done by using amplitude shift keying(ASK) modulation technique. Now the vehicle speed limit is compared with the zone speed limit and it is reduced according to the zone by intimating the speed limit to the driver on the LCD display with sounding the buzzer. If the driver does not respond to it, then this system automatically controls the speed of the vehicle. Another advantage of this system is to avoid collision between vehicles by measuring the distance up to 15 feet using HC-SR04 ultrasonic distance sensor [3-4]. All this process is run by using Arduino IDE software.

7. Practical Implementation And Results

This is the required system implementation that we have developed for reducing the accidents through speed controlling of the vehicle based on RF Technology.

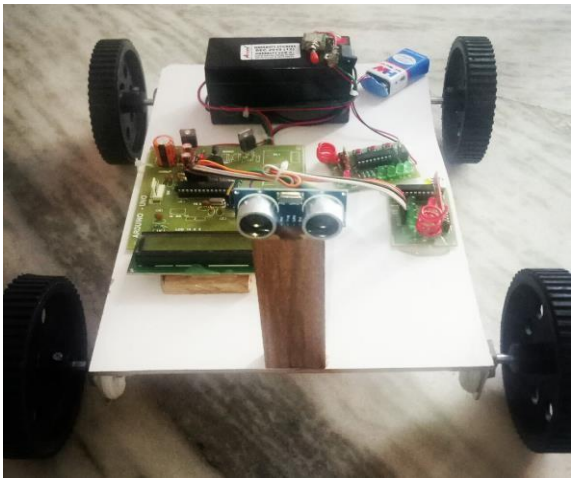

Fig 8. Physical Overview of RF based speed control system model

When the Vehicle enters into Over bridge area, it's speed is controlled to 40KMS speed.

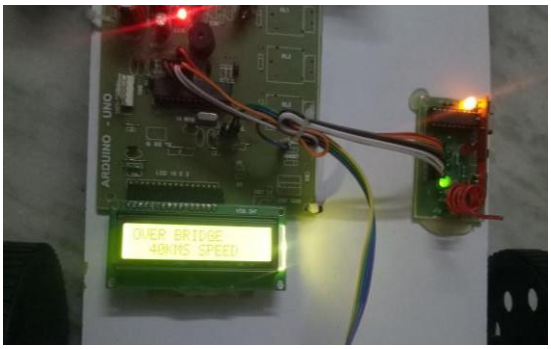

Fig 9. Speed Control at Over Bridge

When the Vehicle enters into Hairpin Bend area, it's speed is controlled to 30KMS speed.

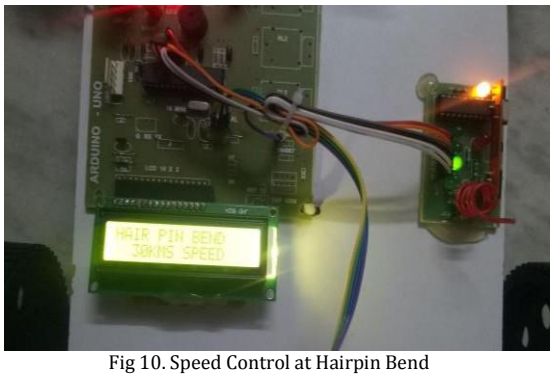

Fig 10. Speed Control at Hairpin Bend

When the Vehicle enters into School Zone, it's speed is controlled to 20KMS speed.

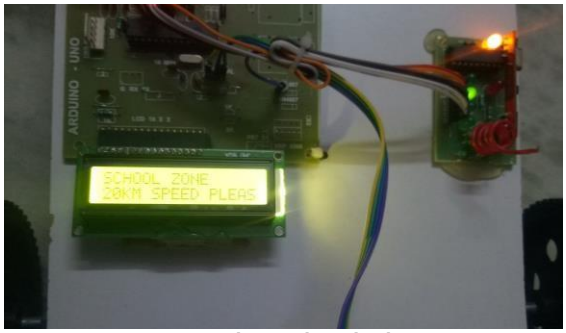

Fig 11. Speed Control at School Zone

When the Vehicle enters into Danger Zone, it gets stopped..

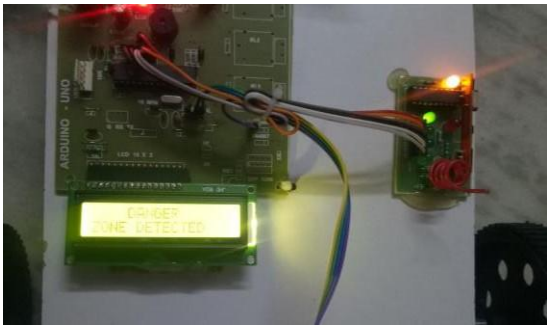

Fig 12. Speed Control at Danger Zone

When the Vehicle detects any object, it is intimated to the driver by measuring the distance to the target using Ultrasonic distance sensor.

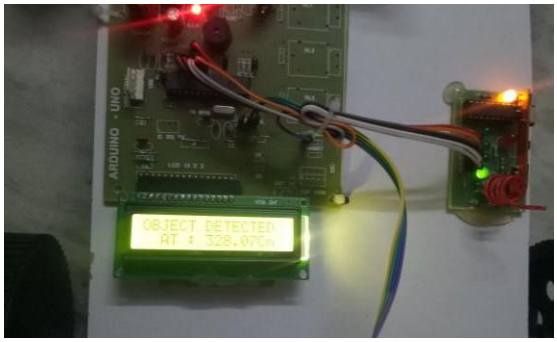

Fig 13. Collision avoidance through Obstacle Detection

8. Conclusion

In this paper, we discuss about the work that in today's global world accidents are rapidly increasing. So to reduce the accidents, our proposed system is the best solution. This project alerts drivers to control speed for appropriate places and intimates the obstacle position [9]. Because of using RF technology, the system works in all type of weather conditions [1]. This system can be more effectively used for any kind of automobiles such as bikes, cars, lorries, buses etc.

9. FUTURE SCOPE

We can modify the system with the help of GPS to identify the zones, GSM module to inform the details of user to their dear one's. We can also modify this with efficient braking system in associations with air flow control to the carburetor.

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