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An Vehicle Based Embedded System for Road Safety

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Abstract: This project is based on Road traffic safety. Efforts to enhance road security have been under way for a long time and majorly affected the road safety record. A notable reduction in danger practices, for example, alcohol-impaired driving or non-wearing of safety belts authenticates this. At that point likewise such a large number of road related accidents still reason too many victims and their families consistently. According to the World Health Organization (WHO), more than a million children are killed in road accidents each year, all over the world. New vehicles over the world, will be outfitted with cutting edge well being systems to help the driver to make the correct move, and if necessary, to control the vehicle in basic circumstances. The features included in this paper are Vehicle Speed Control in school Zone and also controlling the speed of the vehicle in different zones such as bridges, highways, cities and suburbs. It also includes Horn Control of Vehicle in No Honking Zone such as hospitals, public libraries, courts and schools. It also includes Alcohol detection to detect drunken driving and collision avoidance.

Keywords- Road Safety, Speed Control, Horn Control, Collision Avoidance, Alcohol Detection.

I. INTRODUCTION

Road traffic injuries and deaths terribly affect people, groups and nations. Around 1.24 million individuals globally die each year because of road car accidents—that is about 3400 deaths per day. Road traffic injuries are the main cause of death all inclusive among individuals matured 15–29 years [1]. Improper road infrastructure, failure to follow the speed limits, an increase in drinking and driving habits are among the major factors contributing to deaths from road crashes, WHO said in its report on 'Decade of Action for Road Safety 2011-2010' [2]. The motivation behind the project Travolution is an attempt to make an embedded system to bring a positive difference in the field of road safety and road discipline. The project blocks some major causes of road accidents such as breaking traffic signals, collision of vehicles and drunken driving. It also has a major objective as speed control in different areas and horn control in horn prohibited zones.

Vehicle Speed Control in Variable Zone- The speed of the vehicle is controlled in different areas such as flyovers, bridges, highways, schools, cities and suburbs.

Horn Control of Vehicle in No Honking Zone- Controlling unwanted disturbances in horn prohibited zones such as hospitals, public libraries, courts, schools etc.

Alcohol Detection- To detect the percentage of alcohol and prevents the vehicle from moving if it exceeds the threshold value.

Collision avoidance- The road accidents can be avoided by detecting the obstacles.

GSM Module- An alert message is sent to the authorized person of the vehicle regarding the event of alcohol detection and obstacle detection.

The vehicle can be controlled via Bluetooth. It is of crucial significance to screen and approve the road transportation security, comprehensive checks on drivers, vehicles and well being forms.

II. SYSTEM ARCHITECTURE

In this work, the sensors and ICs used are- encoder and decoder module, Transmitter-Receiver module, ARDUINO Controller, motor driver, MQ3 sensor, ultrasonic sensor, GSM Module, Bluetooth and LCD Display.

A. Hardware Details

1) *HT12E Encoder:* HT12E Encoder is used for remote control applications. It is an integrated circuit of 2 ^{12} series of encoders. They are commonly used for radio frequency applications. HT12E encoder can be used to

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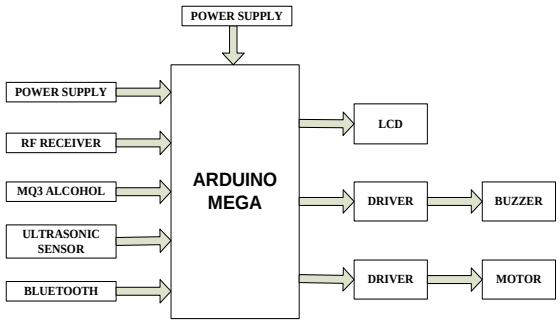
interface RF and infrared circuits. It converts 12 bit parallel data into serial output. Through an RF transmitter, 12 bit parallel data can be encoded into serial data for transmission.



2)

3) Fig1: Block Diagram of Arduino Board

4) *HT12D Decoder:* HT12D Decoder is most commonly used for remote control applications. Using this decoder, we can transmit 12 bit of data serially. It converts 12 bit serial input into parallel data. The data received by an RF receiver and the serial addresses are decoded into parallel data and sends this data to output data pins. When no errors or unmatched codes are found, the input data code is decoded.

5) *RF TX/RX Module:* The RF Module is suitable for long range applications because signals through RF can travel through larger distance. Hence it is better than Infrared Radiation Module. The frequency that the RF module operates varies from 30 KHz-300GHz. The data is transmitted at the rate of 1Kbps-10Kbps. The transmitted data and received data operate at the same frequency.

6) *MQ3 Alcohol Sensor:* This sensor is used for detecting alcohol concentration. This sensor is highly sensitive and has a fast response time. It produces an analog output based on the percentage of alcohol detected.

7) *Ultrasonic Sensor:* This sensor uses ultrasonic waves to measure the distance. It emits an ultrasonic wave and receives the wave reflected back from the target. The time between the emission and reception is used to measure the distance.

8) *Motor Driver:* Motor driver is used to run motors. These circuits are the current amplifiers which act as a bridge between the controller and the motor in a motor driver. These drivers are used to control the speed of the vehicle.

B. Design Details

The model consists of two sections - Transmitter and Receiver Section. Transmitter module can be fitted on the roadside sign board and Receiver module will be placed on the car. Following are the circuit diagram details:

RX TX module is required to transmit the data. In this circuit, 433 Mega Hertz frequency transmitters are being used. There are 4 pins:

1. Antenna- There is a built in antenna
2. Data Pin-To receive Data for transmission
3. Ground pin-connected to ground
4. VCC - 3 Volts Power Supply

a. *Encoder:* HT12E Encoder is used to send data and it has 4 data lines. On Data Lines, 4 switches are connected. This will generate the data which will be decoded on vehicle. There is a TE pin which is active low, when this pin goes low, transmitter is enabled. The data out pin is connected to data pin of TX. Here pulse stream is generated and given to TX. This stream will have 8 bit address and 4 bit data.

b. *Receiver Module:* The ATmega328 has 32 KB (with 0.5 KB used for the boot loader). It has 2 KB of Static RAM and 1 KB of Electronic Erasable Programmable ROM (which can be read and written with the EEPROM library). To receive the data from the road side transmitter, RF Receiver is needed. RX and TX will have same 4 pins.

HT12D decoder IC is used. The data received from RF RX is given as input to the Data In pin of the Decoder. VCC is connected to 5 Volts. Valid Tone Pin goes high on receiving data. The data will be displayed on LCD

Alcohol sensor MQ3 is connected to P1. Sensing plate controls the sensitivity through a variable resistor. The electron current flow will be generated when the gas ions fall on the sensing plate. This electron current flow will be given as voltage which will be sensed by the controller. Valid Tone Pin goes high on receiving data.

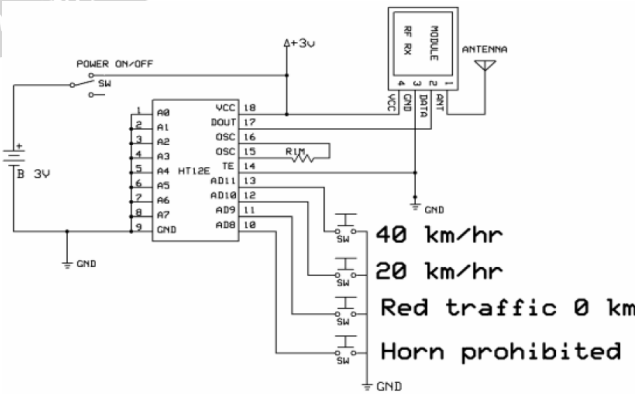


Fig2: Transmitter Circuit

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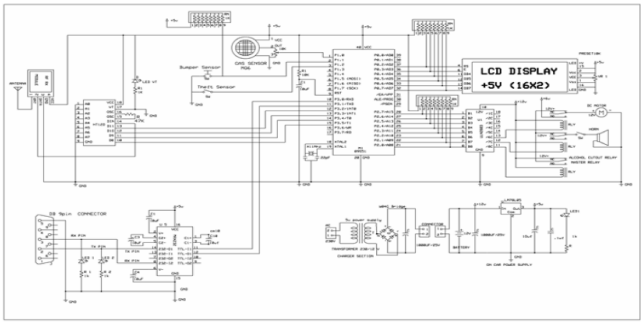

Fig3: Receiver Circuit

III. ARDUINO SOFTWARE

The Arduino Software (IDE) is used to program the Mega 2560 board. The ATmega2560 on the Mega 2560 comes pre-programmed and new code can be easily uploaded since it consists of a boot loader so new hardware programmer need not be used. The communication is through STK500 protocols. The boot loader can be bypassed and the microcontroller can be programmed through the ICSP (In-Circuit Serial Programming) header using Arduino ISP.

The Arduino Software (IDE) can be easily programmed and uploaded pressing upload button. The boot loader has a shorter time out due to the lowering of DTR.

IV. LITERATURE SURVEY

In Kalpana seelam [1] proposed system, the author handles some real reasons for road accidents, for example, breaking traffic signals and drunken driving. It additionally has a noteworthy target of practicing road discipline, for example, speed control in various zones and horn control in horn restricted zones. This system presents Vehicle Speed Control in Variable Zone-in this element; speed of the vehicle is controlled in various territories, for example, flyovers, bridges, highways, schools and cities. Horn Control of Vehicle in No Honking Zone-Controlling undesirable unsettling influences in horn denied zones, for example, hospitals, public libraries, courts, schools and so on. Since speed plays an important part while driving, utilizing the idea of TRAVOLUTION, author proposed a system which incorporate the innovation of Arduino with a specific end goal to make the traveler's trip more protected and secure.

In D Bindu Tushara [3] proposed system, wireless SMS alert system is utilized which distinguishes the event of a accident and sends a SMS to the enlisted mobile number using GSM. This system will identify conceivable impact and avert it. The proposed work shows a proficient usage of security system for the moving vehicles utilizing SMS ready system. The system utilizes microcontroller which makes it unique than other alternate systems.

In Y M Jagadeesh [4] proposed system, authors has given another idea which will empower the activity light to change from red to green in view of traffic density. This paper is concerned about the advancement and usage of Sensor based Traffic Light System with Dynamic Control which thus lessens the Average Trip Waiting Time (ATWT). The system comprises of IR sensors, Low Power inserted controllers, comparators and capacity gadget. In this project the author concentrated on improvement of wise activity light controller in a city utilizing IR sensors and controllers. The system design comprises of a few infrared sensors set at both ends of the road to identify the density of the activity line.

V. PROPOSED METHOD

The safe system approach is being accepted by various countries in the world through the National Road safety plans and the strategies for individual states and territories. These methodologies regularly expect to build up a road transport system that is better ready to oblige human mistake by demonstrating a safe working condition. Following are the targets of the proposed work:

A. Vehicle speed control in Variable Zone: In this feature, speed of the vehicle is controlled in different areas such as flyovers, bridges, highways, schools, cities and internal areas.

Fig4: Vehicle Speed Control

B. Horn control of vehicle in no honking zone: Unwanted disturbances in horn prohibited zones such as hospitals, public libraries, courts, schools etc.

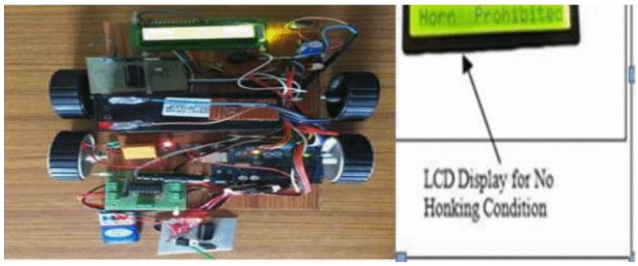

Fig5: Horn Control

C. Red light traffic control: In this feature the vehicle is controlled on traffic signal, when signal is red the vehicle is automatically stopped.

D. Alcohol detection: The alcohol sensor prevents the ignition key from working if the driver breathes into it and a significant quantity of alcohol is detected.

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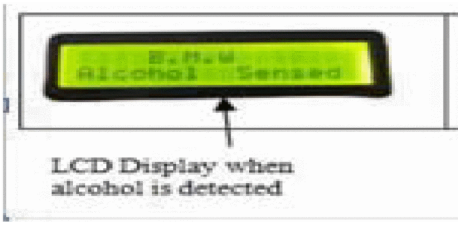

Fig6: Alcohol Detection

VI. CONCLUSION

In this paper we have gone through various road safety techniques available .The proposed module can be used to implement for the vehicles in order to avoid the road accidents. With this prototype, a cost effective embedded system can be implemented which will help in reducing road accidents by following traffic rules. Since speed plays an important role while driving, by using the concept of TRAVOLUTION, which include the technology of Arduino the passenger's journey will become even more safe and secure.

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