

# Arduino Based Embedded System In Cars For Road Safety

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## ABSTRACT

Road accidents are one of the world's major public health and injury prevention problems. According to the World Health Organization (WHO), more than a million children are killed in road accidents each year, all over the world. The motivation behind this work is an attempt to make an Arduino based embedded system which makes the passenger's journey even safer and more secure. This paper handles the road discipline such as speed control in different areas and horn control in horn prohibited zones. 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- Control horn disturbances in horn prohibited zones such as hospitals, public libraries, courts, schools and Alcohol detection to detect drunken driving.

Security in travel is primary concern for every one. This Project describes a design of effective alarm system that can monitor an automotive / vehicle / car condition in traveling. This project is designed to inform about an accident that is occurred to a vehicle to the family members of the traveling persons. This Project presents an automatic vehicle accident detection system using GPS and GSM modems. The system can be interconnected with the Alcohol detection, and alert the owner on his mobile phone. This detection and messaging system is composed of a GPS receiver, Microcontroller and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude.

## I. INTRODUCTION

Road traffic crashes are one of the world's largest public health and injury prevention problems. According to the World Health Organization (WHO), more people die on roads in India than anywhere else in the world [1] At least 13 people die every hour in road accidents in our country; the latest report of the National Crime Records Bureau reveals [1]. In 2007, 1.14 lakh people in India lost their lives in road mishaps

[2]. 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 2011-2020' [2]. Currently Road safety systems are available in high end luxury cars such as Audi, Mercedes Benz etc. to name a few. Example: OnStar Corporation provides subscription-based communications, in-vehicle security, hands free calling, turn- by-turn navigation, and remote diagnostics systems throughout the United States, Canada and China Turnby-Turn Navigation, and Roadside Assistance.

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 tackles some major causes of road accidents such as breaking traffic signals and drunken driving. It also has a major objective of exercising road discipline such as speed control in different areas and horn control in horn prohibited zones.

This paper presents 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 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- The alcohol sensor prevents the ignition key from working if the driver breathes into it and a significant quantity of alcohol is detected.

## II. OVERVIEW

World Health Organization's , first ever Global Status Report on Road Safety reveals that 90% of deaths on the world's roads occur in low and middle income countries (21.5 and 19.5 per lakh of population, respectively) though they have just 48% of all registered vehicles. India has the second largest road network in the world with over 3 million km of roads of which 60% are paved. These roads make a vital contribution to the India's economy. According to a government report, road accidents in India killed 1,34,000 people in 2010 (an average of 336 a day). Accidents due to drunken driving are a major problem in India. The problem is unrecognized and hidden due to lack of good quality research data. A study conducted by Alcohol & drug Information Centre (AIDC), India revealed that around 40% of the road accidents have occurred under the influence of alcohol.

Young male drivers are at a high risk of such accidents. Though some efforts are being taken to reduce the Road Accidents due to drunken driving, considering the gravity of the situation it is

important to change strategies and mechanisms with foresight and effective implementation. Alcohol is a depressant drug that Slows down the activity of the brain Contains absolutely no nutrients Does not help to relieve tension, induce sleep or solve problems.

## III. LITERATURE SURVEY

This Project presents an alcohol detection and vehicle accident detection system using GPS and GSM modems. The system can be interconnected with the car alarm system and alert the owner on his mobile phone. The Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem A GSM modem is interfaced to the MCU. The GSM modem sends an SMS to the predefined mobile number and informs about this accident. This enable it to monitor the accident situations and it can immediately alerts the police/ambulance service with the location of accident.

### Block diagram

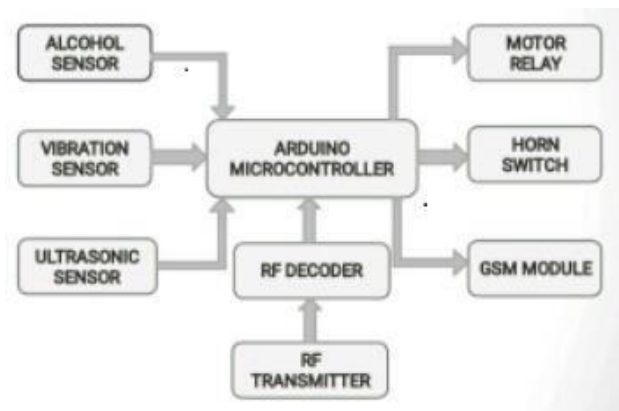


Figure 1

### Hardware Components:

1. Arduino Microcontroller
2. Alcohol sensor
3. Vibration Sensor
4. Ultrasonic sensor
5. RF txr and RF Decoder
6. Motor Drive

7. Horn Switch
8. GSM Module

#### Software Tools:

1. Arduino IDE
2. Embedded C

### IV. BLOCK DESCRIPTION

1) Arduino Microcontroller: The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. Power : The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source. The FTDI FT232RL chip on the Nano is only powered if the board is being powered over USB. As a result, when running on external (non-USB) power, the 3.3V output (which is supplied by the FTDI chip) is not available and the RX and TX LEDs will flicker if digital pins 0 or 1 are high. Memory The ATmega168 has 16 KB of flash memory for storing code (of which 2 KB is used for the bootloader); the ATmega328 has 32 KB, (also with 2 KB used for the bootloader). The ATmega168 has 1 KB of SRAM and 512 bytes of EEPROM (which can be read and written with the EEPROM library); the ATmega328 has 2 KB of SRAM and 1 KB of EEPROM.

2) HT12E encoder: HT12E encoder is an encoder integrated circuit of 212 series of encoders. They are paired with 212 series of decoders for use in remote control system applications. It is mainly used in interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and data format. Simply put, HT12E converts the parallel inputs into serial output. It encodes the 12 bit parallel data into serial for

transmission through an RF transmitter. These 12 bits are divided into 8 address bits and 4 data bits [5]. HT12E has a transmission enable pin which is active low. When a trigger signal is received on TE pin, the programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium. HT12E begins a 4-word transmission cycle upon receipt of a transmission enable. This cycle is repeated as long as TE is kept low. As soon as TE returns to high, the encoder output completes its final cycle and then stops.

3) HT12D Decoder: HT12D Decoder is a decoder integrated circuit that belongs to 212 series of decoders. This series of decoders are mainly used for remote control system applications, like burglar alarm, car door controller, security system etc. It is mainly provided to interface RF and infrared circuits. They are paired with 212 series of encoders. The chosen pair of encoder/decoder should have same number of addresses and data format. In simple terms, HT12D converts the serial input into parallel outputs. It decodes the serial addresses and data received by, say, an RF receiver, into parallel data and sends them to output data pins. The serial input data is compared with the local addresses three times continuously. The input data code is decoded when no error or unmatched codes are found. A valid transmission is indicated by a high signal at VT pin.

4) RF TX/RX Module: The transmitter/receiver (TX/RX) pair operates at a frequency of 433 MHz. The transmission occurs at the rate of 1Kbps - 10Kbps. The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter

5) MQ3 Alcohol sensor: This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration.

6) Relay Contactor: Relays necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be

controlled by one signal. A type of relay that can handle the high power required to directly control an electric motor is called a contactor.

7) 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.

8) GSM Module: This is an ultra compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded applications. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mmx24mmx3mm, SIM900A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design.

## V. CONCLUSION

With this prototype, a cost effective embedded system has been successfully implemented which helps in curbing road accidents and flouting of traffic rules while also providing security for the vehicle. Since speed plays a crucial role while travelling, using the concept of Safety, which include the technology of Arduino the passenger's journey will become even more safe and secure.

## APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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