EasyChair Preprint

№ 5047

Road Accident Prevention Using Alcohol Detector And Accelerometer Module

Ahmar Azam and Kshitij Singh

February 26, 2021

Road Accident Prevention Using Alcohol Detector And Accelerometer Module

Ahmar Azam
Electronics and Communications
Sharda University
(of Affilaition)
Gautam Buddha Nagar, India
2017002707.ahmar@ug.sharda.ac.in

Kshitij Kumar Singh
Electronics and Communications
Sharda University
(of Affilaition)
Gautam Buddha Nagar, India
2017010555.kshitij@ug.sharda.ac.in

Abstract - **Our research paper aims to represent our project that makes driving safer for humans and proposes a panacea to avoid road accidents that have been a vital issue of concern. Even though the world has fast-tracked in technological development of vehicle design, road lane designs, and management, accidents do occur. Timely detection of accidents or immediate actions with emergency healthcare of victims by providing information to hospitals and police stations about the accident can play a vital role in ensuring the safety of humans and in the efficient management of traffic.**

Index Terms - Vehicle Tracking, Microcontroller, GPS, GSM, Arduino UNO, Alcohol Sensor.

I. INTRODUCTION

Amidst the recent mind-boggling traffic and taking into account the mindset of the present generation, drunk-driving is the leading cause of road-accidents these days. Undoubtedly, there are several other factors such as weather conditions, animal crossing, fatigue, over-speeding, overtaking, etc which contribute to the same yet drunk-driving tops the table. The unstable condition of drunken drivers leads them to make rash decisions on highways and roads thereby, putting the lives of road users and drivers in danger. According to the statistics, the total number of deaths caused by road accidents each year has reached 1.25 million per year in which our country India tops the list. It faces the highest number of accidents and accidental fatalities in the world. The maximum number of accidents are reported in the transport sector, on-road as well as railways. We have seen a steeply increasing graph of accidental deaths during the year 2000-2015 with a massive rise of 50% in the year 2010 as compared to the year 2000. The Planning Commission of India states a total yearly economic loss of 2.5% of India's Gross Domestic Product (GDP) due to a rise in the number of road fatalities. According to the Ministry Of Road Transport And Highway, Law Commission of India, and National Crime Records Bureau, one serious road accident occurs every minute in the country and, an average of 16 people die every hour on Indian roads. The World Health Organization reports of 2018 state that the total number of road fatalities in India in the year 2015 is 2,38,562, the number of reported traffic deaths is 1,37,572 with the estimated road traffic death rate per 1,00,000 population being 16.6. In India, the ministry of road transport and highways have been trying hard towards the improvement of road safety through different technologies and engineering measures to narrow down road accidents. The problem is also being tackled by issuing laws against the drivers breaching the driving safety protocols. The traffic police have been ensuring road safety with the use of alcometer and, by installing cameras at different places yet, it is not sufficient as effective monitoring of drunken drivers through manual means is still a challenge for the police officers. The reason for this is the natural inability of human beings to be omnipresent as well as omniscience within the same space and time. Every manual effort and step towards curbing drunk driving is limited and insufficient in itself. Therefore, an automatic alcohol detection and acceleration control system is the need of the hour that functions without the restriction of time and space. In quest of a solution here, we have tried to provide a system that allows drunk driving detection inside the vehicle itself. Our system uses an alcohol sensor with Arduino Nano. A GSM (Global System for Mobile Communications) modem is used for SMS(Short Message Service) notification. GPS (Global Positioning System) is used for location along with an LCD(Liquid Crystal Display) display and also a CPU(Central Processing Unit) fan to demonstrate as a vehicle motor. Time and again, the system checks the alcohol content of the driver. It first allows the user to configure admin numbers into the system and, if the system detects that the driver's alcohol content is above the permissible limit, the sensor inputs trigger the processor about the issue by providing respective voltage. It now sends notifications in the form of SMS to both the registered users/authorities to inform about the issue. The system also stops the motor, thereby demonstrating the engine locking of the vehicle. Thus the system tends to detect and prevent drunk driving incidents on roads automatically.

II. LITERATURE REVIEW

[1]. Rahul Chaudhary and Govind Yadav talk about the successful implementation of the GSM system which eases the task of getting the location of a vehicle in latitude and longitude format. This paper helped me in setting the

framework for a cost-effective, highly accurate, and user-friendly approach by using the Google Map feature. However, the major drawback is that Google Maps does not have up-to-the-minute information on unexpected c onditions, such as damaged roads, blocked by street fairs, or altered by some recent construction work. At times, it is difficult to track remote locations.

[2]. Ni Ni San Hlaing, Ma Naing, San San Nain explained the complete functioning of the hardware using flowcharts and block diagrams. The details about the central control system, Arduino UNO, and the elaborative explanation of the user-defined functions in the programmable code was thoroughly elucidated. Arduino finds track and LCD displayed tracking.

[3]. The article by Nova Explore Publications threw light on the MQ-3 Alcohol Sensor. The technical specifications of the sensor is provided below in the table below.

Parameter Name	Sensor type	Detection gas	Concentration	Voltage	Load resistance (R_L)	Heater resistance (R_H)	Sensing resistance (Rs)	Slope	Temp humidity
	Semiconductor	Alcohol gas	0.04-4mg/l alcohol	±5.0V	Adjustable	31Ω ±3 Ω	2KΩ-20KΩ (in 0.4mg/l alcohol)	200-1000ppm	20±2; 65%±5%RH

On the sensor, the port 1, 2 and 3 and 4 represent the output, GND, VCC and test-pin respectively. Moreover, the engine locking system was elaborated using the concept of DC Motors. Once the alcohol level exceeds, the motor stops. The DC motor is connected to pin 9 on the microcontroller. The sensor's accuracy is proved by using a deodorant perfume to stimulate its response to alcohol concentration level. According to the calculations, the alcohol sensor is 95.75% accurate which shows that errors do creep in. This is the only drawback as in such cases it might lead to false alarms.

[4]. The limitations of using MQ3 based system was explained by Prof. Dr. D.G.Jha and Swapnil Buva. If the driver wears a mask or covers his mouth, the amount of breath exhaled will not be enough to trigger the action. Covering the sensor will result in the same. Moreover, open windows cause disturbance to the sensor which then results in inefficient functioning.

[5]. The NCAEAS paper provides an outline of the background survey related to vehicle tracking and control systems and, the full-fledged development process of the tracking system. The design focuses on the software and hardware technologies used. The software stimulations and its working is also being discussed in detail.

[6]. A Survey on Vehicle Monitoring System mentioned the real-life applications of these projects. It proves to be beneficial for travel agencies and people handling the transport business wherein the activities of the consumer can be tracked. It focuses on the security of the passengers which ultimately results in more comfort and makes the company feel secured. Not to mention it reduces life risks, accidents and is also helpful for timely detection of the same.

III. HARDWARE MODULE

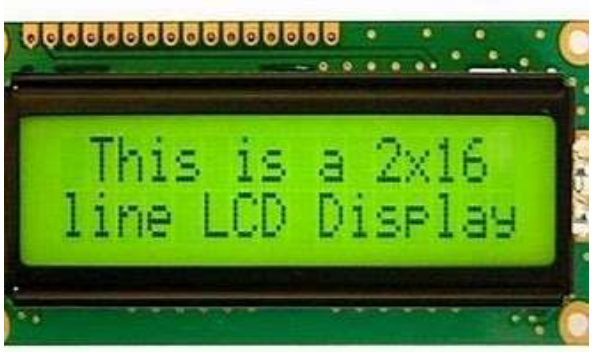
1.Alcohol sensor: This sensor is suitable for detecting alcohol concentration on your breath, a bit like a usual breathalyzer. It is highly sensitive to alcohol and shows minute behavioral changes towards benzene. The sensor provides an analog resistive output supported alcohol concentration. When the level of alcohol is beyond a permissible limit, the sensor's conductivity is higher alongside the gas concentration rising. To convert the change of conductivity to correspond output signal of gas concentration, a simple electro circuit serves the purpose. It is highly preferred as it could be used to detect alcohol with different concentrations, is available at a low cost, and is suitable for various applications.

2.GSM Module: SIM900 GSM module is preferred for this project for communication between the accident detector and alert system and mobile phone. It is a tri-band work on various frequency range (EGSM 900 MHz, DSC 1800 MHz and PCS 1900 MHz). We have only used Rx pin of the GSM module and Tx pin of the Arduino pin to make communication between GSM mobile and Arduino UNO.

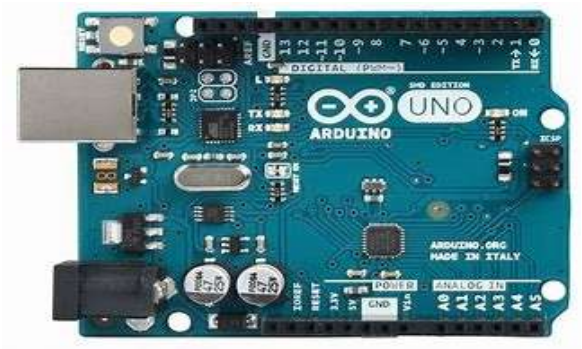
3.Global Positioning System: It is a navigational system that uses a network of 24-32 satellites to determine the coordinates of the site of the accident. GPS offers the ability to locate and track a subject, pinpointing longitude, latitude, ground speed, and course of direction using the

mathematical principle called trilateration,. The satellites are positioned in orbits about an altitude of 12,000 miles from the earth's surface which sends microwave signals which are in turn collected by GPS receivers. The collected information is then used to calculate the distance using velocity and time which need to be covered to reach the victim.

4.Liquid Control Display(LCD): The LCD module used in this project is 16×2 alphanumeric type displays alphabet, number, and special characters. LCD interface with an Arduino in 4-bit mode by connecting higher bit data line of LCD (pin 11, 12, 13 and 14) to digital pin (pin 8, 9 10 and 11) of Arduino as shown in the circuit diagram. Similarly, pin 12 and pin 13 of the Arduino is connected to RS and E pin of LCD. The RW pin of LCD is grounded to perform write operating on LCD to perform a write operation on LCD. The advantage of using an LCD is that it is economical, easily programmable, and has no limitation of displaying even custom characters, animation, etc.



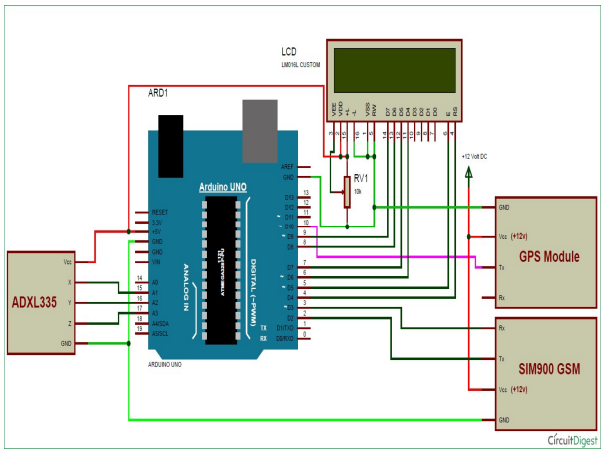
5.Arduino Microcontroller: This is the central control unit for the project accident detector and alert system and is a complete microprocessor system built on a single integrated chip. It gathers information from the alcohol sensor module and the GPS sensor module processes it and displays the output on the LCD. It also terminates the power supply to the ignition system and sends a message alert to the registered mobile.



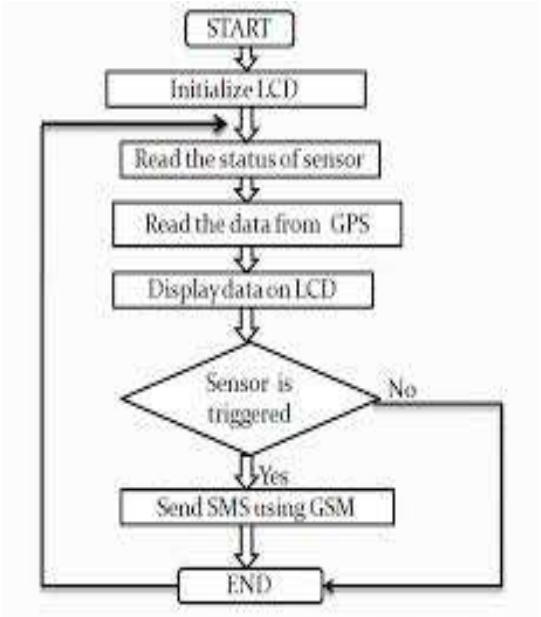
6.Accelerometer: It is a mechanical system for pre-detection of accidents which might take place and at whatever point the accident happens, it will be recognized and, a flag is sent to the controller board. Its working principle is to measure the changes in vibration, inclination, and acceleration, thereby notifying the driver when the position of the vehicle deviates from the normal.

IV. FUNCTIONALITY:

Once we are ready with our hardware and the code is being fed to the Arduino, we can install it in our vehicle and power it up. Whenever an accident takes place, the car gets tilted and the accelerometer changes its axis values. The Arduino then reads the values and checks if any changes have occurred in any axis. In case of any change, the Arduino reads the coordinates by extracting $GPGGA String from GPS module data and sends a warning message to the predefined number with the location coordinates of the accident place. The message also contains a Google Map link of the accident location so that the victim can be easily tracked and a warning of ALCOHOL DETECTED is also being sent. When we receive the message and click on the link we are redirected to the Google map and, then we can see the exact location of the vehicle. The speed of the vehicle is also displayed on the LCD panel.



The flowchart of the complete functioning is shown below:



V. FUTURE IMPROVEMENTS

The abovementioned solutions are either dependent on some hardware such as sensors that have to be present in the car or require a smartphone to be present within the vehicle. Although the use of such hardware turns out to be a more cost-efficient approach, it has the drawback of being destroyed in the accident and hence giving false or no readings at all. Therefore, a competent solution that does not depend on any hardware device or sensor is required for the prevention of traffic accidents. Further improvisations include installing a vision system for recording the activities of the driver. The recorded information then can be used by the controlling authority for monitoring the traffic and safety rules. It can be upgraded by mounting the wireless transmitter on cars which is helpful for enhanced communication vehicle to vehicle.

VI. CONCLUSION

The vehicle tracking system is getting popular day by day, not only in metropolitan areas but also in small towns. The system is completely integrated and, it makes it possible for the user to track their vehicle very easily at any time and from anywhere. Our project presents a vehicle accident detection and alert system with an SMS feature. The proposed vehicle accident detection system can track geographical information automatically and sends an alert SMS regarding the accident. It provides emergency responders with crucial information at the earliest possible time. This way by reducing the time between when an accident takes place and when it is detected, we can reduce mortality rates. It further creates awareness regarding drunk-driving as the information of the driver is immediately sent to the concerned authority. Thus, our approach towards the problem provides a cost-effective and decent solution to prevent on-road accidents.

VII. REFERENCES

[1] Dada Emmanuel Gbenga, Hamit Isseini Hamed1, Adebimpe Adekunle Lateef, Ajibuwa Emmanuel Opeyemi - Alcohol Detection System of Drunk Drivers [Nova Journal of Engineering and Applied Sciences Volume -06, Issue - 01, September-2017]

[2] Rahul Chaudhary, Govind Yadav, Ayaz Ahmad Ansari, Raghvendra Nath Dubey, Prof.LavkushTiwari, Prof. Vineet Saran - GPS TRACKER &ALCOHOL DETECTOR WITH ENGINE LOCKING SYSTEM USING GSM[International Research Journal of Engineering and Technology (IRJET), Volume -06, Issue - 05, May-2019]

[3] Driver Behavior Monitoring through Sensors and Tracking the Accident using Wireless Technology", [IJCA (0975–8887), Volume 102, page no.2 Sep 2019]

[4] Ni Ni San Hlaing, Ma Naing, San San Nain - GPS and GSM Based Vehicle Tracking System[International Journal of Trend in Scientific Research and Development (IJTSRD), Volume - 03, Issue - 04, May-Jun 2019]

[5]. Prof. Dr. D.G.Jha, Swapnil Buva - Alcohol Detection in Real-Time To Prevent Drunken Driving [IOSR Journal of Computer Engineering (IOSR-JCE), e-ISSN: 2278-0661,p-ISSN: 2278-8727, PP 66-71]

[6]. Mr. Anurag Rajendra Bharadkar, Mr. Mukesh Kumar Hansraj, Mr. Shubham Devidas Harshe, Ms. Pooja Keshav Walke, Ms. Sneha Gangadhar Ghule - GPS Based Vehicle Tracking and Engine locking System[National Conference on Advances in Engineering and Applied Science (NCAEAS), Volume 04, Issue 03, Jan 2018]

[7]. Baby D Dayana, Shipra Sinha, Apurv Jha, Padmini Yadav - Automatic Alcohol Detector Car Control Panel[International Journal of Engineering and Advanced Technology (IJEAT), Volume - 09, Issue - 01, ISSN: 2249 – 8958, October 2019]

[8]. D.Kavitha, T.G.Deepika, A.Devapriya, N.Divya Bharathi. - A Survey on Vehicle Monitoring System[International Journal of Scientific Development and Research (IJSDR), Volume - 02, Issue - 04, April 2017]

[9]. Leo Louis - WORKING PRINCIPLE OF ARDUINO AND USING IT AS A TOOL FOR STUDY AND RESEARCH[International Journal of Control, Automation, Communication and Systems (IJCACS), Volume - 01, Issue - 02, April 2016]

[10].R.Ramani,S.Valarmathy,Dr.N.SuthanthiraVanitha, S.Selvaraju, M.Thiruppathi, R.Thangam3 - Vehicle Tracking and Locking System Based on GSM and GPS[I.J. Intelligent Systems and Applications, 2013, 09, 86-93, Date of Issue: DOI: 10.5815/ijisa.2013.09.10

[11] Lea Angelica Navarro, Mark Anthony Diño, Exechiel Joson, Rommel Anacan, Roberto Dela Cruz Electronics Engineering Department, Technological Institute of the Philippines- Manila Manila, Philippines-Design of Alcohol Detection System for Car Users thru Iris Recognition Pattern Using Wavelet Transform[2016 7th International

Conference on Intelligent Systems, Modelling and Simulation]

[12] MUGILA.G, MUTHULAKSHMI.M, SANTHIYA.K, Prof.DHIVYA.P- SMART HELMET SYSTEM USING ALCOHOL DETECTION FOR VEHICLE PROTECTION[International Journal of Innovative Research in Science Engineering and Technology (IJIRTSE) ISSN: 2395-5619, Volume – 2, Issue – 7. July 2016]

[13] Babor, AUDIT: The alcohol use disorders identification Test: Guidelinesfor use in primary health care. 1992, Geneva, Switzerland: World Health Organization.

[14] Cahalan, D., I. Cisin, and Crossley, American Drinking Practices: A National Study of Driving Behaviour and Attitudes. 1969, Rutgers University Press: New Brunswick, NJ. https://www.researchgate.net/publication/305674408_Smart_traffic_light_control_system