INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY

RESEARCH ARTICLE

Vehicle Accident and Alcohol Detection System using IoT Platform

G A E Satish Kumar[1], J Swetha Priyanka[2]*, A Sai Deepthi[3]

1 Professor, Department of E.C.E, Vardhaman College of Engineering, Hyderabad, Telangana, India
2 Assistant Professor, Department of E.C.E, Vardhaman College of Engineering, Hyderabad, Telangana, India
3 B.Tech. Student, Department of E.C.E, Vardhaman College of Engineering, Hyderabad, Telangana, India

OPEN ACCESS

Received: 12-05-2022
Accepted: 01-09-2022
Published: 17-10-2022

Citation: Satish Kumar GAE, Swetha Priyanka J, Deepthi AS (2022) Vehicle Accident and Alcohol Detection System using IoT Platform. Indian Journal of Science and Technology 15(39): 2004-2010. https://doi.org/10.17485/IJST/v15i39.1018

* **Corresponding author**.

swethapriyanka1823@gmail.com

Funding: None

Competing Interests: None

Copyright: © 2022 Satish Kumar et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Published By Indian Society for Education and Environment (iSee)

ISSN
Print: 0974-6846
Electronic: 0974-5645

Abstract

Objective: This study is focused to safeguard the human life from road accidents with imparting assistive technology. Also to meticulously estimate the accident location**.Method**: A device is developed to detect the vehicle driver alertness and alarming system by considering the blood –alcohol concentration level. The device is equipped with electro mechanical vibration sensing device to detect the primary stage of accident and activates the Global positioning system (GPS) and Global system for mobile communication (GSM). This device sends the location of the accident to the hospitals and to the needy people to safeguard the lives. **Findings:** An Algorithm is developed to improve the accuracy of the device in order to save the human life. Module is developed to sense and for communication. The developed device is tested at various test conditions and received reliable results to implement for real time applications.

Keywords: Accelerometer; Electromechanical; Microcontroller; GPS Modem; GSM

1 Introduction

Security in automobile is imperative. Driver alertness is significant. Continuous monitoring of the driver alertness is depending on the different constrains. Physical and psychological balance is one important parameter in spite of safety is considered. Physically challenged and psychologically disturbed person driving may hurt with accidents. Keeping in mind both physical fitness and psychologically good state may not resist certain accidents owing to intake of more alcohol.

A person in drunken state is not recommended for vehicle driving. Drunken driving is impacting on personal attitude and inability to judge the vehicles and obstacles coming on the way. The accident death rate per year is increasing in Europe at 10,000. 34.1% road accidents in China are due to drunken driver only. The blood-alcohol concentration levels are legally accepted within the limits of 0.01 % and 0.08%. But, crossing the upper range value of 0.08% may leads to serious accidents. This is significantly alarming. This paper is focused to detect the drunken condition of the vehicle driver and energize both passengers and vehicle driver with alarming signals.

Lifesaving is more significant during vehicle accident. Immediate cease of blood from wounds and critical care is essential. So, the alert mechanism equipped with the vehicle will convert the conventional vehicle into a smart vehicle [1]. Installing Global positioning System (GPS) and global system for mobile communication (GSM) to the vehicle will add immediate attention of the health care persons and shipment process to intensive unit may save the human life and eventually decrease the death rate [2]. GPS System is more versatile device in all climate conditions. And specifies a meticulous navigation system to identify the accident location. An electro mechanical system used to detect the vibrations of the vehicle. These vibrations cause to enable the GSM and GPS systems via a controlling device [3]. An alert message will be transmitted to the nearby hospital and to needed attendees.

The authors of the research report [4] describes a novel type of automatic signaling system that is currently in use in western China. This article describes the device's premise, as well as a detection method for detecting the occurrence of accidents. This device can be used in a variety of vehicles. It checks for false alarms while the vehicle is in normal driving mode and puts the sled through its paces by simulating a vehicle head-on collision to see if an accurate accident is identified and what type of accident it is.

The purpose of the writers in [5] that excessive speed is one of the leading causes of car accidents. Many lives could have been saved if emergency services had been alerted to the incident that occurred and acted immediately. The navigation system has become an integral part of any vehicle's system. This paper proposes using a GPS receiver to monitor a vehicle's speed, detect an accident based on the monitored speed, and send the position information to an Alert Service Department. Using a Microcontroller Unit, the GPS will monitor a vehicle's speed and compare it to the previous speed every second. It presumes an accident has transpired when the speed falls below the specified speed. The GPS- assisted accident location, along with the operating speed and time, will indeed be broadcasted via the GSM network. As a direct consequence, the lifesaving organization will be able to show up on time and save a worthwhile human life.

The study [6] deals with technology and infrastructure advancements to provide solution to prevent road accidents. According to this project, the microelectronic system (MEMS) sensor detects the signal when the car is involved in an accidentp Arduino processes the data. The Sim card transmits an Arduino alarm signal containing the location of the police control or the Rescue command. The police can then use the GPS module that has received the data to track the whereabouts. After that, examine the region and take the necessary actions. The scope of this study is to automatically identify an unfortunate incident as well as report the precise location of the occurrence to the closest community medical facility.

The authors of the paper [5] suggested the use of auto alarm app's accelerometer to detect dangerous driving. It is used as a crash detector or to identify vehicle rollover during or after a crash. The accelerometer detects signals that are used to identify major collisions. If the car has an accident or rolls over, the vibration sensor can able to sense the signal and delivers it to the ATMEGA 8A controller in this article. A GSM alarm message is sent from the microcontroller to the police control center or the rescue crew. After, collecting the information, the police can now use GPS to track the location. Then, after agreeing to the place, complete the appropriate steps. In the event of an accident, the driver can turn off the warning message using the provided switch, as long as no one was injured or life was in danger. To avoid spending the recovery team's period. A vibration sensor is used to measure an emergency.

A substantial amount of research has been done in the literature [7] to meet the issue of reduced reconditioned alternatives for detecting and notifying vehicle accidents through the use of smartphone applications It has designed a mobile device-based crash notification system that detects accidents using accelerometer and GPS data. This device takes a long time to deliver an accident message [8]. It provides a technique for detecting an accident based on the vehicle's location and informing the driver of the accident through SMS. This system only has one sensor, which is the vehicle's position, which might lead to fraudulent accident reports.

The authors of [9] recommend a system that uses gravitational pull, tempo, and loudness to identify a mishap When a case of emergency alert is received, a web server sends a Text message to the case of the emergency telephone. This scheme is perhaps the most equivalent to our proposed model because it employs a few of the same sensors. The system's major flaw is the threat of misreporting a disaster at slower revs, so when a scheme is unable to decide if the client is in the vehicle.

The authors of [10] presented a new technique that uses the accelerometer to detect a collision and sends information to the emergency dispatch server via GSM messaging. This system, once again, relies solely on a single sensor to detect the collision. It proposes a GPS-based system for detecting and tracking vehicle accidents. Drive on Transitions discern an accident and send the location to a consumer mobile number via GSM.

2 Methodology

A suitable system is proposed (Figure 1) that tracks alcohol concentration as well as traffic accidents. The MQ03 sensing module would able to detect the presence of alcohol and delivers the information to ThingSpeak through the internet, along

with a whistle sound. The device recognizes accident victims using vibration sensors and sends out alert messages along with instructions to nearby hospitals.

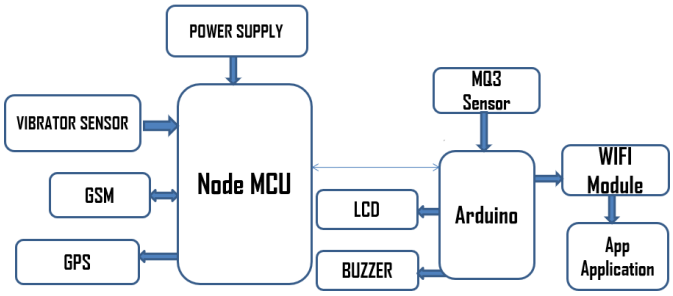

Fig 1. Block Diagram of Proposed Design

2.1 Hardware Implementation

This system device automatically detects alcohol concentration and accidents on the road. The MQ03 sensor will detect the presence of alcohol and also sends the measurement results to ThingSpeak over the internet and make a whistle sound. Vibration is used by the device to detect accident victims. It also transmits alert messages and directs location to nearby hospitals.

One important factor considered during the process is that the selection of hardware components corresponds to the cumulative budget of the project which is one of the critical problems. There are a few options for the processing system. Nevertheless, because of their minimal price, small size, and most of all, ability to accomplish necessary duties, embedded systems are now more competent for successful execution.

Today's market provides a diverse range of microcontrollers. But nevertheless, Node MCU and Arduino were carefully chosen because they include all of the requisite configurations for this scheme, including an analog/digital converter, wireless communication modules (Bluetooth and WiFi), and the required quantity of digital output.

As for recording the sensing of the vibrations for accident detection and sensing alcohol, standard sensors are needed which are the vibrator sensor and MQ-03 Sensor. The MQ-03 senses the gas like H2, alcohol, LPG, etc, but it is mainly called an alcohol sensor, the simplest manner to talk with the sensor module through the I2C interface. Concerning the alarm system, Several LEDs but also buzzers are being used in order to inform people about:

- When an accident occurs or if alcohol percentage is sensed, it indicates with a buzzer sound.
- When an error occurs in the system.

2.2 Software Implementation

The interface is designed to be unobtrusive by mimicking by improving the accuracy of detecting alcoholics and saving the lives of passengers in the car in the event of an accident. It does not require user feedback. For Example, by combining the MQ-03 alcohol sensor with the car ignition system, it can easily improve alcohol detection. Using a GSM module and a GPS module, accident detection in a car can be easily be obtained. The technology sends a message to the close 108 (Ambulance) Service center with the accident location whenever any state of affairs is established by a car crash or collision from any viewpoint. The flowchart (Figure 2) is a simple graphic that depicts how the user interacts with the prototype and how each of its primary functionalities fits into the main process loop.

2.2.1 Crash or Collision Detection

Car crash sensors are also used to detect collisions that occur in any direction in other types of accidents. The vibrator sensor is placed in each of the car's four corners to evaluate whether any of the vehicle's body pieces have been damaged. When a collision is detected on any side of the car, the vibrator sensors send signals to the microcontroller, allowing it to decide that an accident has occurred. As a result, it sends an emergency message with the accident location to the nearest police station and determines whether the person inside the car is alive. Furthermore, no information will be forwarded to the nearest medical emergency center if a human is alive. If no movement is detected, it will notify the nearest medical emergency hospital.

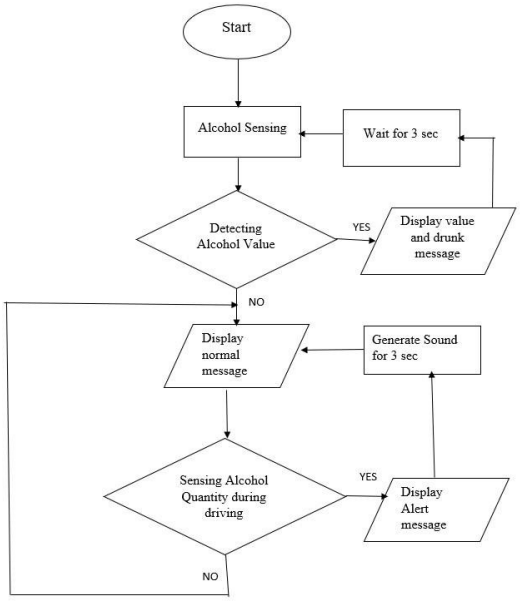

Fig 2. Accident or crash detection

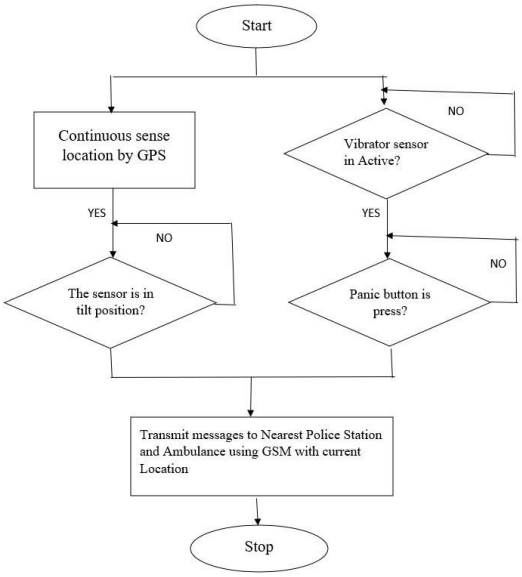

Fig 3. Alcohol detection flow

2.2.2 Alcohol Detection

The MQ-03 sensor, which detects alcohol vapor or air, is used here. If the driver of the car consumes alcohol, the sensor detects it. This signal is provided by the sensor to the Arduino. This system's heart is the Microcontroller. It is the overall circuit's CPU. If the driver is inebriated, the vehicle will not start (relay is turned off) and will wait for the driver to be replaced. If the driver is not intoxicated, the system will allow the vehicle to be started (relay is on). If the driver is drunk while driving, the system will display an alert message and a buzzer will sound (Figure 3).

2.2.3 Emergency Panic Button Detection

In any other emergency situation, medical emergency services are required. As a result, we have used the panic button function for this purpose. This button sends an emergency medical assistance message to the nearest ambulance or health care facility

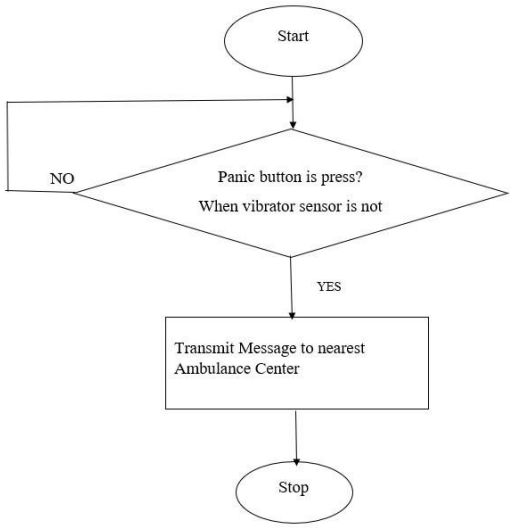

Fig 4. Panic detection flow

based on the user's current location (Figure 4).

3 Results and Discussion

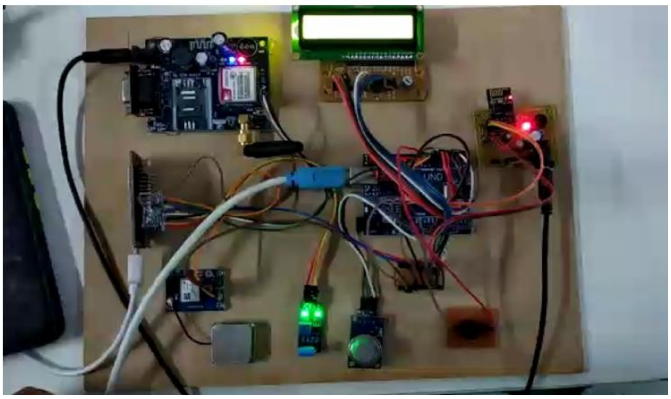

Fig 5. Photo of the developed Rescue system

This is the proposal's hardware implementation. As soon as the device is powered on, the" Accident/ Alcohol Detection Monitoring System" is displayed on LCD Display. The user application shows the current location as in the maps by making use of google maps.

When a driver initiates a car then the system located in the car activates. The vibrator sensor present in the system detects crash or collision vibrations. Based on the level of the vibrations the system confirms it as an accident detected. If an incident is encountered, a warning message is sent to nearby locations or hospitals in order to rescue the member using the directory's encrypted.

Figure 6 shows the alert message received to the concerned person or police station when an accident occurs. The alert message contains the live location of the accident occurs. The next picture clearly shows the exact location on google maps with directions. This message is sent to nearby police stations and hospitals. So, a person can easily be recused.

The Output in LCD is shown in the Figure 7. When first started, it will show a welcome message as "Accident/Alcohol Monitoring System". The LCD screen is set to cycle through 3 screens. The first screen says with message "Accident Detected" shows in the first picture. It shows a movement is captured by the Vibrator sensor. The second screen is the alcohol status of a

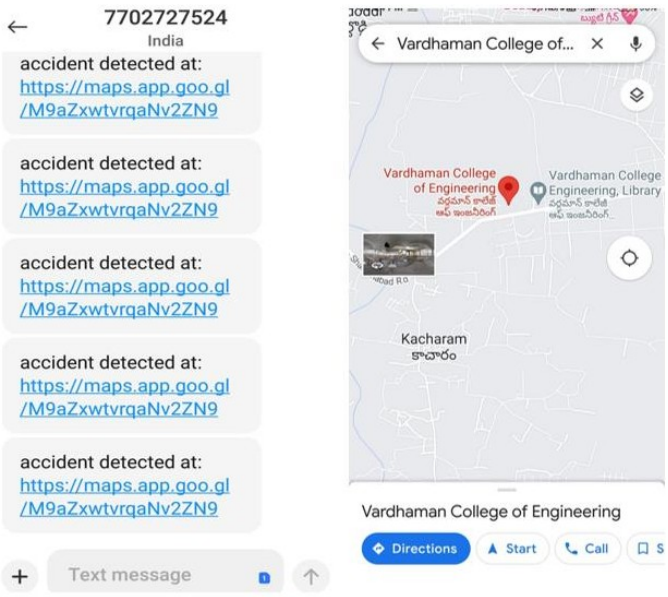

Fig 6. Live location of the person

Fig 7. Output Displays on LCD

person indicating whether a person in the driver seat is normal or drunk.

If the person's consumption of alcohol level is low or the concentration is less than 1 mg then it displays as normal. It shows the alcohol status of a person in the driver seat is normal or drunk.

Figure 8 shows the alcohol level. When a person who is driving consumes alcohol it detects the level. If it is more than 1 mg is shown as Drunk or else it shows as normal.

At varying concentrations from 0.04 mg/L to 4 mg/L, this microelectronics sensor module identifies the presence of adolescent substance gas. which is ideal for use in breathalyzers. Your microcontroller only needs one analog input pin to connect to the sensor's simple analog voltage interface. The range is between And 0 10

4 Conclusions

The device is developed to estimate the Blood-Alcohol Concentration (BAC) levels and location of the accident place. MQ3 Sensor is able to detect the BAC levels with no deviations. Fig.7 represents the BAC level is 1.37 which is excessive value when compared with the higher BAC limit. This leads to improper judgment and driving alertness, results serious accident. Fig.6 shows various states of the vehicle and detection of the BAC levels with no deviation. The meticulous detection of the parameters

Fig 8. Alcohol Concentration in Thing speak app.

will improve the safety measurements of the vehicle. The location of the accident is detected with GPS is shown in Fig.5. Exact location of the accident indication may save the life of a human being. This Assistive technology can be implemented in real time applications may save the human life.

Further, this technology can be implemented with Machine learning algorithm to predict the accident chances and to curtail the accident before it happens.

5 Acknowledgement

The authors sincerely thank the Head, Dr. GAE Satish Kumar, Department of Electronics and Communication Engineering, Vardhaman College of Engineering, Hyderabad for his help in reviewing of the manuscript and constructive suggestions made at various levels of the research work and also thank the management for providing the facilities to carry out this research work at #3021 Lab (Center of Excellence for IoT).

References

1) Alvi U, Khattak MAK, Shabir B, Malik AW, Muhammad SR. A Comprehensive Study on IoT Based Accident Detection Systems for Smart Vehicles. *IEEE Access*. 2020;8:122480–122497. Available from: https://doi.org/1109/ACCESS.2020.3006887.
2) Celaya-Padilla JM, Romero-González JS, Galvan-Tejada CE, Galvan-Tejada JI, Luna-García H, Arceo-Olague JG, et al. In-Vehicle Alcohol Detection Using Low-Cost Sensors and Genetic Algorithms to Aid in the Drinking and Driving Detection. *Sensors*. 2021;21(22):7752–7752. Available from: https://doi.org/10.3390/s21227752.
3) Panwar SK, Solanki V, Gandhi S, Gupta S, Garg H. Vehicle accident detection using IoT and live tracking using geo-coordinates. *Journal of Physics: Conference Series*. 2020;1706:012152–012152. Available from: https://doi.org10.1088/1742-6596/1706/1/012152.
4) Soner S, Litoriya R, Pandey P. Integrating Blockchain Technology with IoT and ML to Avoid Road Accidents Caused by Drunk Driving. *Wireless Personal Communications*. 2022;125(4):3001–3018. Available from: https://doi.org/10.1007/s11277-022-09695-x.
5) Vani CV, Vijithra AJ, Vasan MK, Kavimani BK, Prasath VK, Hariharan J. Alcohol Detection Using Automation. *ECS Transactions*. 2022;107(1):17563–17570. Available from: https://doi.org/10.1149/10701.17563ecst.
6) Kinage V, Patil P. IoT Based Intelligent System For Vehicle Accident Prevention And Detection At Real Time. *2019 Third International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)*. 2019;p. 409–413. Available from: https://doi.org/10.1109/I-SMAC47947.2019.9032662.
7) Kinage V, Patil P. IoT Based Intelligent System For Vehicle Accident Prevention And Detection At Real Time. In: 2019 Third International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC). IEEE. 2019;p. 409–413.
8) Reddy RVS, Kumari PA. Internet of things (IoT) based multilevel drunken driving detection and prevention system using Raspberry Pi 3. *International Journal of Computer Science and Information Security (IJCSIS)*. 2020;p. 131–137.
9) Jang SWW, Ahn B. Implementation of Detection System for Drowsy Driving Prevention Using Image Recognition and IoT. *Sustainability*;12(7):3037–3037.
10) Hema D. Smart Helmet for Industrial Workforce - A Review Paper. *International Journal for Research in Applied Science and Engineering Technology*. 2019;7:600–604. Available from: https://doi.org/10.22214/ijraset.2019.6104.