International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 6 June 2023, pp: 693-699 www.ijaem.net ISSN: 2395-5252

Iot Based Automatic Collision alert and Preventing System

P.Poornima, L.Manasa

Assistant Professor, Dept.of CSE, Mahatma Gandhi Institute of Technology
Student, Dept. of CSE, Mahatma Gandhi Institute of Technology

Date of Submission: 14-06-2023 Date of Acceptance: 24-06-2023

ABSTRACT: Accidents are considered one of the most destructive phenomena.Though there are many different reasons behind accidents, most accidents occur due to drunken driving and driver's unawareness. Also, there seems to be a problem reaching the spot of accidents in time ofa lack of awareness.The implementation of Internet of Things(IoT) technologies can serve as a viable solution to decrease the occurrence of accidents. In this paper, a smart system is described to prevent the user from driving when drunk and notifies the individuals accordingly when an accident occurs.The system contains an Alcohol sensor that helps us detect if the driver is drunk.The vehicle has a safety feature that warns and disables the engine if the driver is excessively intoxicated. Whenever an accident takes place in uncertain conditions, the vibration is more than its normal level, the vibration sensor detects the vibration frequency and transfers the GPS data from the GPS module and the alert message with the location of the accident will be quickly sent to a registered emergency contacts of the driver by the help of GSM module.

KEYWORDS: GPS module, GSM module, Alcohol Sensor, Vibration sensor

I. INTRODUCTION

Nowadays, the rate ofaccidentshas increasedrapidly. Dueto employment, theusage of vehicles like cars, and bikes have increased, and because of this reason, accidents can happen due to drunk and drive. Approximately 1214 road accidents occur every day. By statics 30% of cases were fatal accidents, 27% grievous injuries, 36% minor injuries, and 7% noninjury accidents are revealed [8]. There are many people in need of medical assistance due to road accidents. But there is a delay in a medical emergency because of the poor network.Hence, there is a high requirement for automatic collision alert and preventionsystems. A car safety system is planned to facilitate safety for car users. A significant number of car accidents are caused by drivers who operate a vehicle under the influence of alcohol. In the event of an accident in a non-residential area or on a highway, the priority is to provide immediate medical assistance to the injured through ambulance services. So, it is also necessary to include accident detection as well as location detection, and this info is given to the closest ambulance/police emergency service center/family members with the help of wireless media like SMS (Short Message Service) [7]. This can help to reduce the number of accidents that occurs due to alcoholic drink consumption; additionally, find the precise place wherever an accident occurred.

II. EXISTING SYSTEM

This idea proposal has been introduced at the start of the modern age of mobile phones. With the introduction ofGPS sensorsin themobile, securityapplications basedonGPS were proposed. Next, they suggested the use of specialized hardwaredevices that can be connected to mobile phones [6].Though, it had the disadvantage of actually buying extra hardware with more money. Due to the significant advancements made in mobile phone technology over the last decade, and the addition of new sensors during development, it is now possible to avoid the use of additional hardware. The current implementation of the application described in this paper is limited to only a few countries. However, if information about the application is shared with the emergency services, as well as with the relatives and friends of potential users, the efficiency of the application could be greatly increased.

A. Drawbacks of the Existing System are:

The live system will not function properly if any of the following conditions are present during a crash:

•The automatic system or phone is disconnected or damaged.

•There is no GPS signal available at the time of the crash.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 6 June 2023, pp: 693-699 www.ijaem.net ISSN: 2395-5252

•There is insufficient cellular signal strength to upload crash details,

III.PROPOSED SYSTEM

The main objective of thispaperis topreventaccidents from occurring due to drunken driving. The system automatically detects if the driver is drunk by using an alcohol sensor(MQ-3 Gas Sensor)and the engine stops functioning [3]. Certainly, if the accident happens due toother cases,the system is designed to providethe spontaneousmessage andexact locationto registered mobile numbers Automatic accident detection and alert system are introduced. The core component of the system is the Arduino, which facilitates communication between different devices within the system. When an accident occurs, the vibration sensor is triggered and sends a message through the GSM module to the registered number [4]. The GPS system is utilized to pinpoint the location of the accident [10].

IV.DESIGN METHODOLOGY

Design Methodology includes Block Diagram,System Architecture, and Working of Collision Alert and Preventing System.

A. BLOCK DIAGRAM

The Block Diagram of the Collision Alert and Preventing System includes different components like Arduino, Vibration Sensor, Alcohol Sensor, GPS Module, GSM Module, LCD Module and DC Motor and it also includes the flow of connections [9].

Figure 1: Block diagram of Collision Alert and Preventing System

The above Figure 1, shows the block diagram of the Collision Alert and Preventing System. Arduino Uno takes input from Vibration Sensor, Alcohol Sensor, and GPS Module and gives output to Buzzer and LCD.

B. HARDWARE MODULES

Hardware Modules used in Collision Alert and Preventing Systems are Arduino, GPS, GSM, Alcohol Sensor, Vibration Sensor, LCD Module, Buzzer, and DC Motor.

ARDUINO

The Arduino UNO is a popular open-source microcontroller board designed by Arduino.cc and utilizes the ATmega328P microcontroller. It comes equipped with both digital and analog input/output pins (I/O). The board features 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header [5]. Programming for the Arduino UNO is done through the Integrated Development Environment (IDE), which can be used both online and offline. The Arduino serves as the primary control unit to detect and alert in the event of an accident. It collects the data from vibration sensors, alcohol sensor GPS, and GSM modules, alerts the user, and reflects the output either in the display system or through a message.

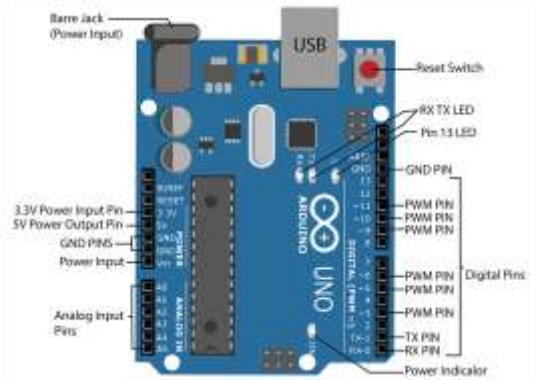

Figure 2: Arduino

The above Figure 2, shows the Structure of Arduino. It collects the data from various sensors in the system.This device detects the vibrations from a vehicle and uses this information to determine if an accident has occurred. The Arduino microcontroller collects data from other modules and uses a GSM module to send a message to a receiver.

GPS (GLOBAL POSITIONING SYSTEM) MODULE

GPS is an abbreviation for Global Positioning System, a technology that can determine the precise longitude and latitude of any point on

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 6 June 2023, pp: 693-699 www.ijaem.net ISSN: 2395-5252

Earth, along with the exact Universal Time Coordinated. In our paper, we use a GPS module to track the location of an accident.

Figure 3: GPS Module

The above Figure 3, shows the GPS Module.This device receives real-time location coordinates from a satellite every second, along with the time and date. Specifically, we use the SIM28ML GPS module to find the location of the vehicle. The GPS receiver fetches the location information and sends it to the Arduino [4]. The Arduino then transmits this information to a pre-saved contact via a GSM module. The GPS operates at a frequency of 1575.42 MHz, and the output of the GPS module is in NMEA format, which includes real-time location data.

GSM (GLOBAL SYSTEM FOR MOBILE COMMUNICATION) MODULE

The GSM standard was created by the European Telecommunications Standards Institute (ETSI). A GSM module is a chip or circuit that enables the communication between a mobile device or computer and a GSM or GPRS system.

Figure 4: GSM Module

The above Figure 4, shows the GSM Module.To enable communication between GPS, GSM, and a designated mobile number, we use the GSM SIM900 module [4]. The SIM900 module is a tri-band device that operates within the frequency range of 900MHz to 1900MHz, including EGSM900 MHz, PCS 1900 MHz, and DSC 100 MHz. The receiving pin of the GSM module and the transmitting pin of the GPS module facilitates communication between the modules and the mobile phone.

VIBRATION SENSOR

The vibration sensor module is used to sense vibrations or sudden modulations. The vibration sensor module provides a digital output in the form of a HIGH/LOW logic signal, depending on the specific module being used**.**

Figure 5: Vibration Sensor

The above Figure 5, shows the Vibration Sensor.Whenever the vibration sensor detects any vibrations, it will send a HIGH logic signal to the microcontroller [2]. At the point when there is no vibration distinguished, the vibration sensor yield will be 0 (low voltage), generally, its yield will be 1(high voltage). At the point when the vibration is high, it may be expected as the accident has happened. The vibration sensor operates by utilizing the piezoelectric effect, which involves measuring changes in force and acceleration.Sensitivity ranges from 10mV/g to 100Mv/g. the working voltage is 3.3v to 5V.

ALCHOL SENSOR (MQ-3 GAS SENSOR)

The Alcohol Gas Sensor MQ3 is an affordable semiconductor sensor capable of detecting the presence of alcohol gases at concentrations ranging from 0.05 mg/L to 10 mg/L. The sensor's sensitive material is SnO2, which exhibits lower conductivity in clean air [3]. As the concentration of alcohol gases increases, the conductivity of the material increases accordingly. It has a high sensitivity to alcohol and has good resistance to disturbances due to smoke, vapor, and gasoline.The sensitivity can be adjusted by the potentiometer-sensitive material of The MQ3 gas sensor sensitive material is SnO2, which exhibits lower conductivity levels in the absence of gas or in clean air. It has a fine sensitivity range of around 2 meters.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 6 June 2023, pp: 693-699 www.ijaem.net ISSN: 2395-5252

Figure 6: Alcohol Sensor

The above Figure 6, shows the Alcohol Sensor (MQ-3). When the target alcohol gas exists, the sensor's conductivity is higher along with the gas concentration rising, the use of a simple electro-circuitconvertsthe change of conductivity to the corresponding output signal of gas concentration.

Note: The minimum alcohol content limit varies from country to country. The Blood Alcohol Content (BAC) limit is exceedingly stringent in India. The allowed BAC in India is 0.03% per 100 ml of blood. If you are found to have a higher blood alcohol concentration (BAC) while operating a vehicle, you will be penalized in accordance with the law.

LCD MODULE

LCD stands for Liquid Crystal Display.An LCD module with 16x2 alphanumeric types is utilized to exhibit numbers, alphabets, and special characters.

Figure 7: LCD (2*16) Module

The above Figure 7, shows the 2*16 LCD Module. Using the higher bit data lines of LCD pins such as pins 11,12,13 and 14 are interfaced to digital pins of Arduino such as pins 2,3,4,5 in 4-bitmode [11]. RS and E pins of LCD are connected to pins 6 and 7 To perform the write operation on LCD the read/write pin is connected to the ground. Whenever an accident or drunken driver is detected, it is displayed in the LCD Module.

BUZZER

The alarm system employed utilizes a buzzer that signals the detection of both alcohol and accidents.

Figure 8: Buzzer

The above Figure 8, shows the Buzzer. When the magnetic field is turned on, the coil pulls the pliable ferromagnetic disk towards it, and when the magnetic field is switched off, the disk returns to its original position. By sending an oscillating signal through the coil, the buzzer generates a varying magnetic field that causes the disk to vibrate, resulting in the production of sound from the buzzer.

DC MOTOR

DC motors are electrical machines that transform electrical energy into mechanical energy**.**

Figure 9: DC Motor

The above Figure 9, shows the DC Motor. Their operating principle is based on the fact that when a current-carrying conductor is placed in a magnetic field, it experiences a mechanical force [3].

C. SYSTEM ARCHITECTURE AND WORKING

The architecture of the Collision Alert and Preventing System describes how the sensor data follow the sequence of events and produces the ultimate result of accident alert and alcohol alert.

ACCIDENT DETECTION AND ALERT SYSTEM

Whenever an accident takes place in uncertain conditions, the vibration is more than its normal level (High).The vibration sensor detects the vibration frequencyandgives an alert to the Arduino [2].

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 6 June 2023, pp: 693-699 www.ijaem.net ISSN: 2395-5252

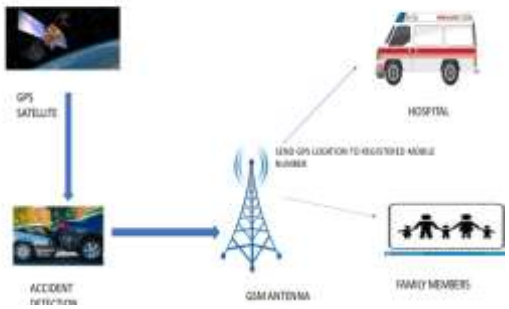

Figure 10: Overview of working of Accident Detection and Alert System

The above Figure 10, shows the overview ofthe working process of the Accident Detection and Alert System. Whenthe Arduino receives an alert from the vibration sensor that the accident is detected. Arduino collects data from GPS Module and transfers that data, and then thealert message with the location of the accident will be quickly sent to the registered emergency contacts of the driver with the help of the GSM module [4].

PREVENTION- ALCOHOL DETECTION AND ALERT SYSTEM

Whenever the alcohol concentration is more than the threshold then the alcohol sensor conductivity increases, thus alcohol is detected andthen "DRUNK" is displayed in LCD Module.

Figure 11: Overview Of Working of Alcohol Detection and Alert System

The above Figure 11, shows the Overview of the working process of the Alcohol Detection and Alert System, that is Prevention of the accidents is shown.Whenever the alcohol is detected, the Buzzer is activated and the DC motor goes to the off state.The threshold taken in this paper is 3 mg/L for flexibility. But the actual threshold in the real-time system will be 30 mg of alcohol per 100ml of blood.When the alcohol consumption level is greater than the threshold,which is identified by the using alcohol sensor(MQ-3) the Arduino takes data from the MQ-3 gas sensor and sends the alert using Buzzer [3].

V. IMPLEMENTATION AND RESULTS

Implementation and Results of the Collision Alert and Preventing System include a flowchart and final outputs.

A. IMPLEMENTATION

The Implementation section describes the flowchart of the paper and also about software that is required to run the code.

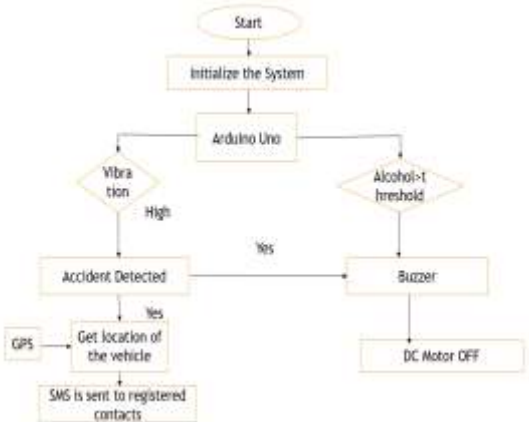

Figure 12: Flowchart of Collision Alert and Preventing System

The above figure 12, shows the flowchart of the Collision Alert and Preventing System [1]. When the vibration is high the accident is detected and the buzzer is triggered. The location of the vehicle is identified through GPS and it is sent to a registered mobile number using GSM.When the Alcohol level is more than the threshold the buzzer is triggered and the engine is stopped automatically.

The Implementation of IOT Based Automatic Collision Alert and Preventing System involves the execution of the code in Arduino IDE.

- Download the Arduino IDE software
- Connect the Arduino USB cable to the Arduino
- Choose the port:"COM3(Arduino uno)" and write your code(sketch) and save it.
- Compile the Sketch(code) without any errors
- Upload the code using the Upload button (right arrow).

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 6 June 2023, pp: 693-699 www.ijaem.net ISSN: 2395-5252

Figure 13: Arduino IDE Software

The above Figure 13, shows the Arduino IDE(Integrated Development Environment).The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions, and a series of menus [12]. It connects to the Arduino hardware to upload programs and communicate with them.The icons displayed on the toolbar are New, Open, Save, Upload, and Verify.

B. RESULTS

The results section explains the various results of the System under different conditions.

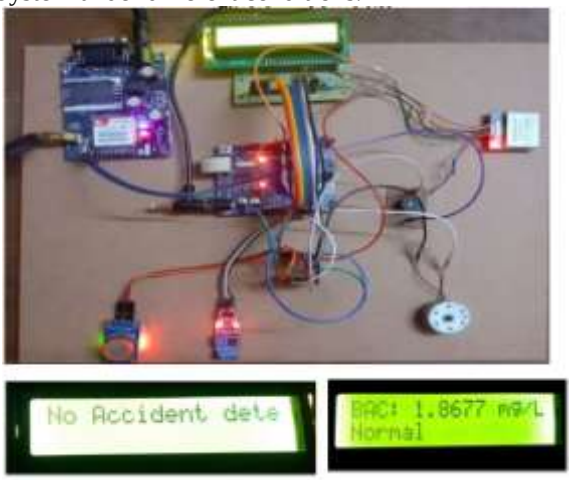

Figure 13: Results of initial condition when the power supply is switched ON

The above figure 13, shows the initial results when the regulated power supply is switched on are explained. Initially, the vibration is low so LCD will show the result as “No Accident is detected”.Since the alcohol is not detected the LCD will display “ BAC Normal “.

Figure 14: Resultsof LCD and GSM (also GPS) when an Accident is detected.

The aboveFigure 14, showsthe results of Accident (Collision) detection are shown.When an accident is detected the LCD will display Accident detected and Finding location,sending SMS.The location data is taken from GPS and then the GSM module will sendan SMS of the Accident detected along with the location to the registered mobile number.

Figure 15: Results of Alcohol Detection

The above Figure 15, shows the results of alcohol detection. When the alcohol content is greater than the threshold(3mg/L here)the alcohol is detected, then LCD displays a DRUNK message and the DC motor is turned OFF.

VI. CONCLUSION AND FUTURE SCOPE

CONCLUSION

The proposed system has the capability to detect accidents and assess their severity. It promptly notifies the nearest medical assistance center to provide emergency medical aid to the victims. An accident is determined using a vibration sensor, and the communication between the system modules is facilitated by Arduino. Through GSM and GPS modules, messages are sent to the closest medical center. Additionally, the system sends a notification to the friends and family of the accident victim. To alert nearby drivers and pedestrians about the incident, a buzzer is included to seek their assistance. This intelligent system not only aims to prevent individuals from driving under the influence of alcohol but also promptly informs relevant parties when an accident occurs. By utilizing an alcohol sensor, the system can detect whether the driver is intoxicated or not. If the driver's intoxication level

exceeds the set threshold, the vehicle issues a warning and disables the engine. Considering the increasing relevance of Collision Alert and Preventing Systems, this paper strives to develop an affordable solution for the benefit of society.

FUTURE SCOPE

Future enhancements can be made to the proposed system through the development of hardware implementations, interfacing additional sensors, and the creation of software algorithms. These enhancements aim to further improve the safety and functionality of the system.One potential enhancement is the implementation of a solution for emergency vehicle speed control. By integrating this feature, the system can actively regulate the speed of the vehicle during emergency situations, helping to prevent accidents caused by excessive speed. Another enhancement could involve incorporating a wheel grasp detector that utilizes gravity sensors. This detector would identify instances where the wheels lose grip on the road surface, enabling the system to take appropriate measures to regain control and prevent accidents.Monitoring additional parameters like overheating or LPG gas leakage is another valuable enhancement. By adding sensors to monitor crucial parameters such as engine temperature and detecting potential leaks of LPG gas, the system can provide timely alerts and take preventive actions to avoid hazards.Furthermore, integrating the system with the vehicle's airbag system can significantly enhance occupant safety. By working together, the system can detect potential collisions and trigger the airbags, mitigating the risk of occupants striking interior objects like the steering wheel or window.By implementing these future enhancements, the proposed system can provide advanced safety features and contribute to a safer driving experience for individuals. These developments aim to enhance the overall functionality and effectiveness of the system, promoting road safety and preventing accidents.

REFERENCES

[1]. ACCIDENT DETECTION AND ALERT SYSTEM G. Siri*1, G. Priyanka*2, B. Divya*3, G. Sameera*4, Ms. M. Pallavi*5, International Research Journal of Modernization in Engineering Technology and Science,2022.

[2]. Accident Monitoring and Detection System in Vehicles , Reena Rosilin Raj. I 1, Balamurugan.B2, Ebenazer Paul.J3, Hakash.S41 Assistant Professor/ Department of ECE, DMI College of Engineering, Tamilnadu 6001232,3,4UG Students/ Department of ECE, DMI College of Engineering, Tamilnadu 6001239.

[3]. Alcohol Detection and Engine Locking System International Journal from Innovative Engineering and Management Research (IJIEMR) 2022.

[4]. Automatic Vehicle Accident Detection and Messaging System Using GPS and GSM Module.

[5]. A low cost and user-friendly vehicle crash alert system using Arduino February 2021IOP Conference Series Materials Science and Engineering 1055(1):012061 DOI:10.1088/1757-899X/1055/1/012061, August 2019, International Journal of Engineering Trends and Technology.

[6]. C KGomathy andVGeetha. Article:ARealTime AnalysisofServicebased using MobilePhoneControlled VehicleusingDTMFforAccidentPrevention. International Journal of Computer Applications 138(2):11-13, March 2016. Published by Foundation of Computer Science (FCS), NY, USA,ISSN No: 0975-8887.

[7]. Purva Javale, Shalmali Gadgil, Chinmay Bhargave, Yogesh Kharwandikar, Vaishali Nandedkar, "Accident Detection and Surveillance System using Wireless Technologies", IOSR Journal of Computer Engineering (IOSR-JCE), pp 38-43, Volume 16, Issue 2, March-April 2014.

[8]. The Statistics Portal [online] Available: https://www.statista.com/statistics/330695/number-of-smartphone-usersworldwide/(1)

[9]. Vehicle Accident Automatic Detection and Remote Alarm DeviceJuly 2012International Journal of Reconfigurable and Embedded Systems (IJRES) 1(2):49 DOI:10.11591/ijres.v1.i2.pp49-54.

[10]. Vehicle Accident Detection And Reporting System Using Gps And Gsm." by AboliRavindraWakure, ApurvaRajendraPatkar, IJERGS April 2014.

[11]. YaoJinn, The discussion of Road Traffic Safety Countermeasures System[J]. Private Science and Technology, 2010.

[12]. Working Principle of Arduino and Using it as a Tool for Study and Research, July 2018 DOI: 10.5121/ijcacs.2016.1203Conference: International Journal of Control, Automation, Communication and Systems (IJCACS).