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SMART DRIVER SAFETY AND ACCIDENT ALERT SYSTEM BY USING GPS-GSM & ESP8266/NODEMCU

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ABSTRACT

This project presents a comprehensive vehicle safety system that integrates multiple sensors and technologies to monitor the driver's condition and the vehicle's status. The system includes a tilt sensor to detect accidents, an eye blink sensor to monitor the driver's attention, an alcohol sensor to detect drunk driving, a GPS module to track the vehicle's location, and a GSM module to send alerts to emergency services or designated contacts. The system is controlled by an ESP8266 microcontroller, which processes data from the sensors and activates alerts and controls as needed. The ESP8266's Wi-Fi capabilities enable real-time data transmission and remote monitoring, enhancing the system's functionality and effectiveness. The system aims to reduce the risk of accidents and improve road safety by providing timely alerts and interventions. The project demonstrates the potential solutions for enhancing vehicle safety and driver well-being.

I.INTRODUCTION

1.1 INTRODUCTION:

In this era, the number of vehicles is increasing day by day and so are accidents rate were rapidly increasing, resulting in large numbers of deaths due to them. Two-wheeler vehicles are among the most affected. Most of such accidents cause's deaths due to lack of immediate medical help which cannot be observed on less populated urban roads, rural roads and highways. A system that detects an accident and alerts the known can help in faster medical aid, thus comes the idea of "crash alert"

The Indian Ministry of Statistics reported thousands of road accidents in 2016. Though the report declared speed violation is the foremost reason for these accidents, it will safely be inferred that almost all of the cases are because of

driver's unstable condition caused by drivers becoming drunk before they drive. The investigation done by the Planet Health Organization in 2008 shows that concerning 50%-60% of traffic accidents square measure associated with drink driving. Moreover, WHO information on road traffic deaths disclosed 1.25 million traffic deaths were recorded globally in 2013 with the low- and middle-income countries having higher fatality rates per a 100K population (24.1% and 18.4% respectively), particularly business and serious duty trucks drivers interact in drink- driving For BAC level from 0.4 to 0.6, drivers feel dazed/confused or otherwise disoriented,

ACCIDENT DETECTION SYSTEM is a way to help road users. As we already know in 2020 the number of deaths due to vehicle user accidents is 3692. This shows usa significant increase compared to the previous year. as an engineer I have thought of a way to reduce accidents by building a system that can detect accidents. WHO information on road traffic deaths disclosed 1.25 million traffic deaths were recorded globally in 2013 with the low- and middle-income countries having higher fatality rates per a 100K population (24.1% and 18.4% respectively) and it's typically not safe for a driver to drive a vehicle beneath such condition. Also, BAC level for 0.7 to 0.8 makes a driver's mental, physical and sensory functions to be severely impaired. At this stage, a driver is inactive and incapable of driving.

The importance of such a system is particularly high for commercial drivers, long-distance travelers, and public transport systems, where fatigue and alcohol influence are major risk factors. By implementing this intelligent accident prevention system, we can help in saving lives, reducing injuries, and minimizing vehicles damages. The impact of accidents is very imposing on the mind of people as it causes fatal injuries and even deaths. India has the second largest road network in the world approximately over 3 million kilometers. These roads largely contribute to the Indian economy. Despite of the advantages of roads, it is revealed in an Indian government report that 1,34,000 people died due to road accidents in the year 2010. India contributes 10% of road accidents worldwide An estimation of 2,75,000 people are seriously injured on road every year. Vehicle damages

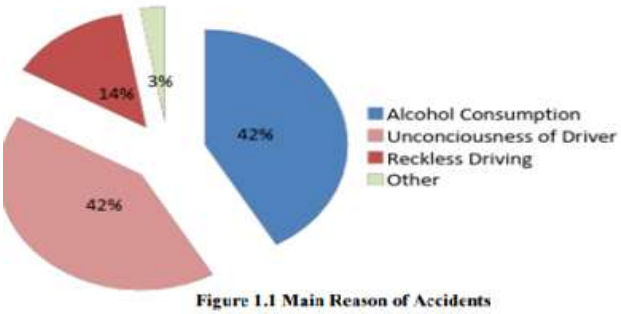


Figure 1.1 Main Reason of Accidents

1.2 BACKGROUND

In this study, several angle measures will be examined. What are the challenges that develop, notably influencing the impact received, network, and function, and how well can this system detect impact determines the effectiveness of the market suspension by examining whether it is affordable, fits the standards, and functions properly. Despite recent improvements attributed to graduated driver licensing, young drivers ' high rates of traffic crashes, injuries, and fatalities, and the high monetary costs of crashes are clearly unacceptable. Young people today are driving in a more complex traffic environment than ever before. There are more cars, more congestion, more complex intersections, and roadways, and today's drivers are considered by many to be more rude, aggressive, and distracted. Despite safer vehicles and roadways, driver behavior remains frustratingly less than ideal. Traffic enforcement alone can never adequately control driver behavior officers cannot be always in all places. Novice drivers are influenced by the complexity of this environment as well as the many other factors in their lives.

1.3 PROBLEM STATEMENT:

"Accidents and fatalities on the road are a significant concern worldwide, Due to the lack of precise location information, emergency assistance is frequently delayed after an accident. This delay can be a very serious situation because it could mean life or death. Additionally, accident victims are unable to speed dial emergency services since there is a good chance that they will be hurt during the collision and unable to do so, or that their phone will be shattered or lost in the aftermath of the collision. In addition, the general public, particularly the younger generation, does not comprehend the value of safe driving practices and has a tendency to drive carelessly.

1.4 Specific Problems Addressed:

1. Driver distraction and drowsiness
2. Drunk driving
3. Vehicle accidents and fatalities
4. Delayed or ineffective emergency response

1.5 OBJECTIVES:

The project is implemented to achieve the following objectives which are:

1. Develop an intelligent vehicle safety system that can detect and respond to potential hazards in real-time.

2. Improve road safety by reducing the risk of accidents and fatalities.

3. Provide timely alerts and interventions to prevent accidents.

4. Enhance emergency response times and effectiveness.

II.LITERATURE SURVEY

1. Alcohol Detection Systems:

Previous research has utilized MQ-series sensors, particularly the MQ-3 sensor, to detect the presence of alcohol in the driver's breath. Studies indicate that integrating such sensors with a microcontroller can effectively prevent vehicle ignition if alcohol levels exceed a defined threshold. (Kumar et al., 2018)

2. Drowsiness Detection Techniques:

Driver fatigue is a major cause of road accidents, especially during night travel. Systems using IR sensors, eye-blink detection, and EEG-based monitoring have been implemented to detect signs of drowsiness. Eye-blink sensors have shown considerable accuracy in detecting sleepiness based on blink rate and eyelid closure duration. (Patel & Rana, 2019)

3. Accident Detection and Alert Systems:

Tilt sensors and accelerometers have been widely used for detecting vehicle overturning or sudden impacts. When paired with GSM modules, these systems are capable of sending real-time SMS alerts to emergency contacts. (Sharma et al., 2020)

4. GPS Integration for Location Tracking:

GPS modules like Neo-6M provide accurate coordinates of the vehicle's location. Many projects have used GPS to send a Google Maps link via GSM in the event of an accident, significantly reducing emergency response time. (Singh et al., 2021

5. IOT and Smart Transport Systems:

With the rise of IoT, researchers are moving towards cloud-based monitoring, where data from vehicles is sent to central servers or apps for tracking. However, for standalone systems, GSM remains the most reliable method for sending alerts in areas with limited internet access.

III.PROPOSED SYSTEM

This chapter is dedicated to the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques.

The Smart Driver Safety and Accident Prevention System monitors driver behavior using embedded systems and IoT. It detects drowsiness, distractions, and over speeding through sensors the system processes data using embedded-c and triggers alerts via a buzzer or mobile notifications. The methodology includes research, hardware-software integration, and real-time testing. The system undergoes validation under different conditions to ensure accuracy. Deployment involves installing the system in vehicles and optimizing performance. Future improvements may include and cloud data analysis employed,

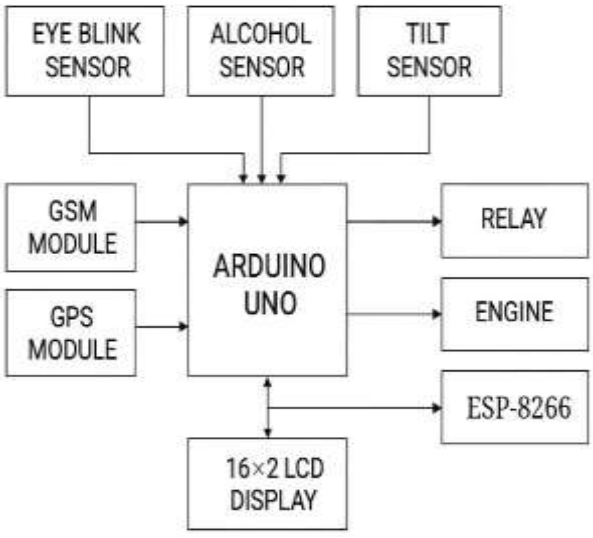


Fig: 3.1.1 BLOCK DIAGRAM

WORKING PRINCIPLE:

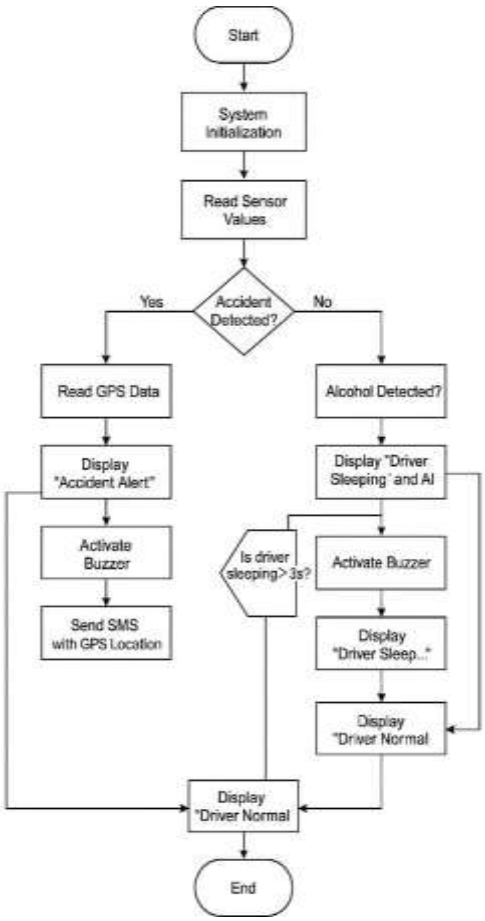
The smart driver safety and accident alert system by using gps-gsm & esp8266/nodemcu is designed to monitor the real-time condition of a vehicle and the behavior of the driver using various sensors such as tilt, alcohol, and eye blink sensors. The system begins with initialization, where all modules including sensors, GPS, GSM, display, and buzzer are set up for operation. It continuously reads data from the sensors to check for any abnormal conditions. If an accident is

detected through a tilt or vibration sensor, the system immediately reads the GPS data, displays an "Accident Alert" message on the screen, activates a buzzer to notify nearby individuals, and sends an SMS with the GPS location to a predefined contact using the GSM module.

If no accident is detected, the system proceeds to check for alcohol presence using the alcohol sensor. If alcohol is detected, it displays a warning message such as "Driver Sleeping", and triggers the buzzer as an alert. Additionally, the system checks the driver's alertness using an eye blink sensor. If the driver's eyes remain closed for more than 3 seconds, it identifies this as drowsiness, activates a buzzer, and displays a "Driver Sleep..." warning message. If no drowsiness is detected, it shows "Driver Normal" on the display. This process runs continuously, ensuring the driver remains in a normal state or that immediate actions are taken in case of any emergency.

The system uses a cardio notification method to ensure alerts are properly delivered through audio (buzzer), visual (display messages), and communication (SMS) means. These multi-layered notifications provide both in-vehicle and remote alerts to help prevent accidents and ensure timely assistance in emergencies.

Flow chart:



IV.RESULTS

The real time view of smart driver safety and accident alert system by using Gps-Gsm & Esp8266/node mcu system as shown in below.

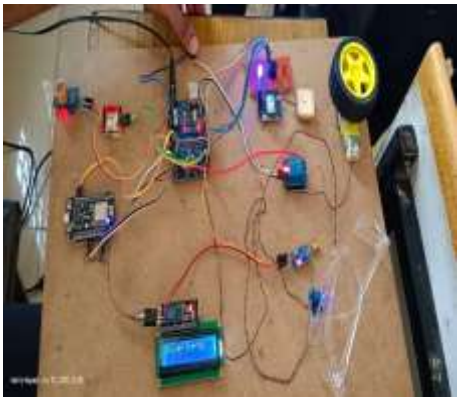


Fig 6.1 prototype model of hardware

- Initial condition driver normal for the system

Fig 6.2 Driver normal condition display in LCD

- When the driver comes to sleeping condition then detecting by sensor and stops the vehicle moment

Fig 6.3 Driver sleep condition with msg notification display in LCD

- When the vehicle faces any accident the that sensor by the tilt sensor and we using GSM and GPS modules send alert message near the emergency contacts.

Fig 6.4 Alcohol Alert condition with msg notification display in LCD

- Before start the engine of vehicle the alcohol sensor detecting. when the driver takes alcohol motor(engine) not started.

Fig 6.5 Alcohol detected condition with msg notification display in LCD

- CADIO software dashboard and units.

Fig 6.6 cadio app dash board

V.CONCLUSION & FUTURE SCOPE

5.1 CONCLUSION

Conclusion:

The Smart Driver Safety and Accident alert system by using gsm -gps is an innovative and effective solution that integrates multiple sensors and modules to address major causes of road accidents—driver drowsiness, alcohol consumption, and sudden impacts or collisions. The primary objective of this system is to improve road safety by providing real-time monitoring, timely alerts, and automated notifications in case of emergencies. This system, developed using Arduino, GSM, GPS, and a range of sensors, has demonstrated strong functionality and reliability during prototyping and testing phases.

The alarming increase in road accidents due to fatigue, drunk driving, and inattentiveness highlights the urgent need for advanced safety systems. Our project effectively fills this gap by combining several key safety features into a single embedded system. One of the most important aspects of this system is its ability to detect driver drowsiness using an eye blink sensor. When the driver's eyes remain closed for more than a certain period (such as 3 seconds), the system activates a buzzer and displays a warning on the LCD screen, such as “Driver Sleep...” This early intervention can potentially save lives by preventing the driver from falling asleep while driving.

Additionally, the system detects the presence of alcohol using an MQ3 gas sensor. When alcohol is sensed in the driver’s breath, the system responds with an alert—“Alcohol Detected”—and halts vehicle functionality to prevent it from being operated in an unsafe condition. This real-time restriction is essential in discouraging drunk driving and ensuring that intoxicated individuals do not take control of the vehicle.

Another critical function is accident detection. Using a tilt or vibration sensor, the system monitors for sudden movements that indicate a crash. If an accident is detected, the GPS module reads the vehicle’s coordinates, and the GSM module sends an SMS containing the location to pre-defined emergency contacts. The LCD displays an “Accident Alert!” message to notify any nearby individuals. This real-time GPS-based notification system plays a crucial role in improving emergency response times and could significantly reduce fatalities and injuries by ensuring quick medical assistance.

Throughout the project development, all modules—including sensors, LCD display, buzzer, GSM, and GPS—were successfully interfaced with the Arduino. The system worked effectively in various simulated conditions. The display messages, buzzer alarms, and SMS alerts confirmed that each component of the system was functioning as intended. The prototype has been tested in real-time scenarios and has proven to be a reliable and practical solution for vehicle safety.

In conclusion, this project demonstrates a robust and intelligent safety mechanism that can be installed in vehicles to minimize road accidents. It offers a cost-effective and easily deployable solution for both personal and commercial vehicles.

5.2 FUTURE SCOPE

The Smart Driver Safety and Accident alert system by using gsm-gpsSystem presents a strong foundation for enhancing road safety

through embedded technology. While the current prototype effectively addresses key concerns such as drowsiness, alcohol detection, and accident alerts, there are several areas where this system can be further enhanced for better performance and wider applicability.

One major area of future development lies in the integration of Artificial Intelligence (AI) and Machine Learning (ML) techniques. By incorporating camera-based systems and AI algorithms, the system can more accurately monitor facial expressions, eye movement, head posture, and other behavioral cues to detect fatigue and distraction more reliably. This would significantly improve the accuracy of drowsiness detection compared to traditional sensors.

Another potential improvement is the addition of a real-time mobile application that provides users, family members, or fleet managers with live updates regarding the driver's status and location. Cloud connectivity can also be introduced to store data on driver behavior, routes, and incident history, allowing for future analysis and performance tracking.

Furthermore, integration with vehicle ignition systems can be considered, where the vehicle will not start unless all safety checks (alcohol detection, alertness, etc.) are passed. This would further ensure that unfit drivers are prevented from operating the vehicle. The system can also be adapted for electric vehicles and autonomous cars by incorporating advanced communication protocols like CAN (Controller Area Network).

As the technology becomes more compact and affordable, this system can be widely implemented in public transportation, commercial fleets, and even private vehicles. Collaboration with automobile manufacturers could help in making this system a built-in safety feature in future vehicles.

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