Automatic Engine Locking System Through Alcohol Detection

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Abstract—This initiative involves designing and implementing an automatic engine locking system for four-wheelers, utilizing an ultrasonic sensor and Arduino Uno for alcohol detection. This system has been well designed by embedding hardware and software. It helps in alcohol drowning, drugs**,** inflammable gas leakages which are detected by MQ3 sensor. If the driver is drunk while driving this sensor will detect the alcohol in his breath and stops the engine so that the car will not accelerate any further. So here we propose an innovative system as it eliminates such cases. The best part is reaction is quicker and unwanted situations as it alerts us. Preferring small size is an advantage fits into any devices or machines. As alcohol is detected and engine has been locked this module will also send the message to near civils forces and owner. This project helps in reducing road accidents efficiently.

I. INTRODUCTION

Current events show that many road accidents are caused by drunk driving. The drunk driver is mentally unstable and often drives recklessly on the highway, posing a threat to pedestrians on the road, including the driver's own life. The seriousness of dangerous driving across national borders. With laws currently in place in India against drunk driving, fines can be imposed to deter drunk driving. However, it can be difficult for police and security personnel to track drunk drivers because the public cannot be at the scene at the same time. Any effort to target drunk drivers at the border is hampered by the limited resources of law enforcement agencies.

The Indian Statistical Department reported thousands of road accidents in 2016. The safety factor comes from the presence of a drunk driver before driving. A study conducted by the World Health Organization in 2008 revealed that approximately 50-60% of road accidents are caused by alcohol consumption. WHO also published data on road deaths.

In 2013, 1 million people died in road accidents worldwide. The death rate per 100,000 people is higher in low- and middle-income countries (24.1% and 18.4% based on the data collected). Rate admitted to drinking alcohol while on duty. This suggests that almost all drivers, especially businesspeople and heavy vehicles, are likely to drink and drive at levels that could lead to accidents. The Indian government has set the legal limit for blood alcohol concentration (BAC) at 30 mg/100 mL, and any BAC above this limit is considered unfit to drive. The blood alcohol content (BAC) is the amount of alcohol in the blood. It is measured in grams of alcohol per liter of blood or milliliters of alcohol per milliliter of blood (mg/ml, used in most European countries). When the blood alcohol level is between 0.4 and 0.6, the driver may feel dizzy/confused or disoriented, and it is generally unsafe to drive in these conditions. Also, a blood alcohol level of 0.7-0.8 can cause serious damage to the driver's brain, body and soul. The driver was not able to drive at the time. Although it is still unsafe to have a blood alcohol level (BAC) between 0.2 and 0.3, there are recommendations for drivers. Therefore, there is a need to develop a system that will reduce traffic accidents caused by drunk driving.

II. LITERATURE SURVEY

ChToday, the number of drunk driving and traffic accidents is increasing, mostly due to the driver losing control of the vehicle. Approximately 31% of passenger deaths in the US are caused by drunk drivers. In 2021, 13,384 people lost their lives in preventable accidents. The average number of deaths over a 10-year period was 10,850. Using a vehicle interlock device in conjunction with a breathalyzer test can reduce accidents caused by drunk driving. An engine immobilizer system combined with alcohol detection equipment can be very useful for law enforcement. It provides security solutions for cars and other vehicles. While it is not possible for someone to stop drinking alcohol in a short time, there are many ways to reduce a person's cravings and make them feel less stressed. One solution is to use alcohol detection and engine immobilization. When a driver tries to drive while under the influence of alcohol, the MQ3/BAC sensor detects the presence of alcohol. When the alcohol level exceeds a certain threshold, a signal is sent to Arduino UNO. According to these signals, the engine will be disabled. This measure is expected to reduce accidents caused by drunk driving, thus reducing the risk of death, injury and property damage caused by drunk driving. This article provides a comprehensive study of various alcohol detection and engine immobilizer systems using

Arduino. Numerous devices were detected in each system. [1]

The suggested approach aims to create an alcohol-activated ignition lock, which would prevent a vehicle from being driven while intoxicated. This device incorporates a Breathalyzer that checks for alcohol in the driver's breath, and if it senses any, the car's engine will not start. The ignition setup will feature a Breathalyzer that the driver needs to blow into prior to igniting the engine. If the driver's Blood Alcohol Content (BAC) exceeds a certain limit, the vehicle will not start, and the engine will remain locked. Driving under the influence is a leading factor in road accidents and fatalities, and this initiative aims to lower such incidents. This technology can protect many lives and reduce injuries by stopping intoxicated individuals from driving. The expected cost-effectiveness, ease of use, and dependability of the system bolster its ability to decrease the dangers of drunk driving. [2]

In today's world, a lot of accidents occur because of driving under the influence of alcohol and feeling sleepy. These accidents lead to more fatalities and financial damage. Sleepiness can happen due to long periods of driving and high stress at work, which can lead to people dozing off while driving. To tackle these types of accidents, we are putting into action this system that uses blink sensors and M Q3 alcohol sensors. The information from these sensors will be sent to an Arduino, which will control the vehicle based on the driver's alertness and alcohol consumption. The sensors will detect how sleepy the driver is, and the alcohol sensor will identify if the driver has consumed too much alcohol. If it goes above a set limit, it will activate a buzzer and immobilize the vehicle. This approach aims to significantly decrease accidents caused by drunk driving and fatigue. [3]

III. Methodology

This Automatic alcohol testing using GPS and GSM is designed to prevent drunk driving by checking the driver's alcohol level and automatically stopping the engine if the alcohol level is above the limit. To achieve this, the system uses sensors, microcontrollers, GPS modules, GSM modules and locking mechanisms. The process involves designing and producing hardware and software, integrating them with the vehicles engine and electronics, and testing and operating the systems to ensure accuracy, reliability and ease of use. The project aims to reduce the frequency of drunk driving and other accidents with the methodology it develops, provide important information and insights to law enforcement and policymakers, and create an accurate, reliable and easy-to-use system.

IV. Proposed System

The concept of automatic motor vehicle registration via wine detection has been combined with GSM (Global System for Mobile Communications) and GPS (Global Positioning System) technology urine to enhance its function and safety. The system uses a breathalyzer integrated into the car's dashboard or steering wheel to detect the driver's blood alcohol content (BAC). If the blood alcohol content is above the threshold (e.g. 0.08%), the system automatically shuts down the engine, preventing the vehicle from starting or continuing the road. The system is connected to a GSM module that sends an instant notification to the phone number to alert the vehicle owner or relevant authorities of an attempt to drink and drive. In addition, the GPS module tracks the vehicle's location in real time, so that when an alcohol-related crime occurs, the relevant departments can quickly locate the vehicle and aid. The integration of GSM and GPS increases the safety and reliability of the system, preventing drivers from easily evading alcohol detection, while also providing immediate action and control. This approach offers a solution that provides instant communication and location tracking while reducing drunk driving incidents.

V. IMPLEMENTATION

The automatic engine immobilizer, which uses GPS and GSM for alcohol detection, is implemented through a combination of hardware and software. The hardware components consist of an inhaler, a microcontroller, a GPS module, a GSM module, and a lock motor, which are combined to form the system. The software was developed using programming languages such as C++ or Python, and its algorithms are designed to process data from the breathalyzer sensor to determine whether the driver's alcohol level has exceeded the restriction. The system is then tested and validated to ensure that it works properly and meets specific needs and standards.

Architecture Diagram:

Automatic alcohol test engine immobilization system using GPS and GSM consists of alcohol tester, microcontroller, GPS module, GSM module, engine immobilization mechanism, power supply and database. The system diagram shows the interaction of these elements. When the driver blows into the breathalyzer, the sensor sends data to the microcontroller, the microcontroller processes the data and sends a signal to the engine immobilizer when the alcohol content exceeds the limit. Is limited. Meanwhile, the GPS module tracks the location and speed of the vehicle, while the GSM module sends a warning to the police and the vehicle owner. The data stores information about the vehicle and the driver, while the electronics power the system. The design process generally ensures the integration of components to prevent drunk driving and ensure road safety.

Test Case Id	Description	Input	Expected Output	Remarks
TC1	Alcohol Detection Above Threshold	Use the MQ3 sensor to simulate more alcohol than the threshold value.	Alcohol detection system. Engine lockup occurred and the situation was reported to the authorities and the vehicle owner. Activates buzzer and LED indicator.	Pass
TC2	Alcohol Detection Below Threshold	Use the MQ3 sensor to simulate less alcohol than the threshold value.	The System does not trigger engine locking mechanism, no notifications sent or alarms activated.	Pass
TC3	Battery Failure	Detached power supply reenacts the battery disappointment.	No functionality occurs.	Pass
TC4	Real-Time alerts	Present liquor in real-time amid vehicle operation	Quick location and activating of motor locking and alarms.	Pass

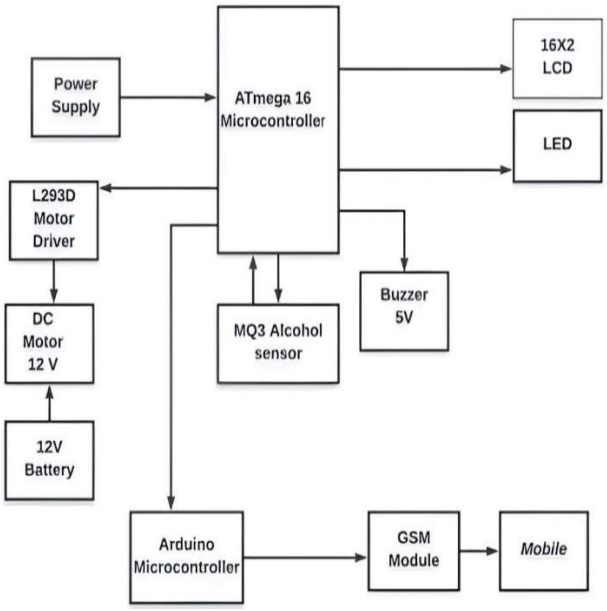

Fig 1: System Architecture

Test Cases:

VI. RESULTS AND DISCUSSION

A. Alcohol Detection and Engine Immobilization Systems:

These systems basically work based on alcohol monitoring sensors, which often use the breathalyzer method or an alcohol vapor sensor to evaluate the driver's breath or the atmosphere inside the vehicle. If the alcohol concentration exceeds a certain limit (usually according to legal regulations), the system activates a device that immobilizes the engine, preventing the vehicle from starting or operating. The purpose of this automatic response is to minimize accidents caused by drunk driving, which is the leading cause of traffic fatalities worldwide. The main advantage is that it protects both the driver and other road users by preventing drunk driving. However, the biggest challenge of these systems is to ensure accurate and reliable alcohol detection. Changes in environmental factors such as humidity, temperature, or air quality can cause false detections, i.e. false positives and false negatives, which can impair system functionality. In addition, it is essential that the system reliably measures alcohol levels in a variety of driving situations to prevent unnecessary engine clogging.

B. GSM for Real-Time Alerts and Communication:

The GSM function stands for Global Mobile Communication System, and this system can provide instant communication between the vehicle and external parties. If alcohol is detected,

an alert is sent via SMS or an automated phone call to pre-selected contacts such as family, authorities or managers. This instant communication function makes the system more effective in providing immediate feedback and enhancing accountability. For example, if a driver tries to start the vehicle while intoxicated, the GSM function can alert the necessary people to prevent potential misuse. In addition, GSM technology can be used to transmit diagnostic information or performance reports to the vehicle owner or fleet manager. This allows you to monitor system health and obtain useful information about system usage.

C. GPS Integration for Location Tracking:

The GPS component of the system tracks the vehicle's location in real time. If alcohol is detected and the engine is shut off, the GPS system can transmit the vehicle's exact coordinates to pre-configured contacts (e.g. emergency services, family members, or fleet managers).
This is especially useful in situations where the driver needs assistance, or authorities need to intervene if alcohol-related violations are suspected. GPS data is also invaluable for fleet management, allowing companies to track the location of vehicles and ensure drivers are following safety rules. In addition, the system can help to quickly recover stolen or damaged vehicles, making the entire system more versatile.

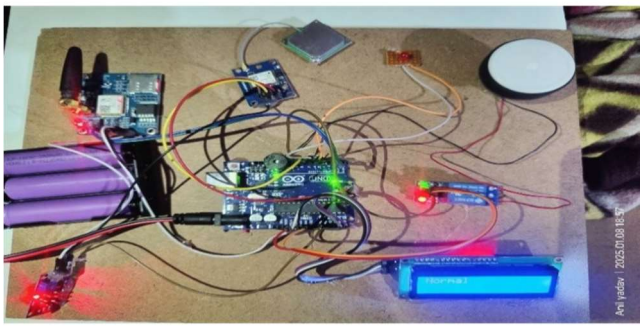

Fig 2: Normal State(Alcohol not detected)

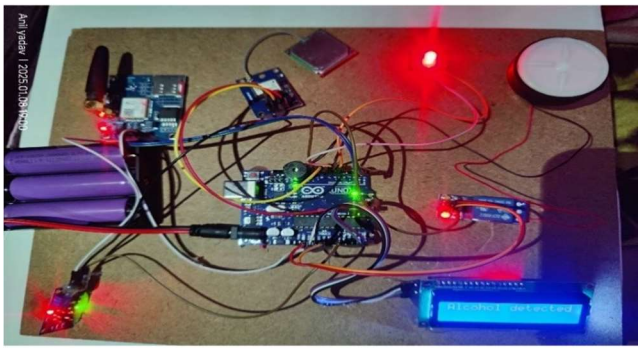

Fig 3: Alcohol detected (engine off & red LED alert)

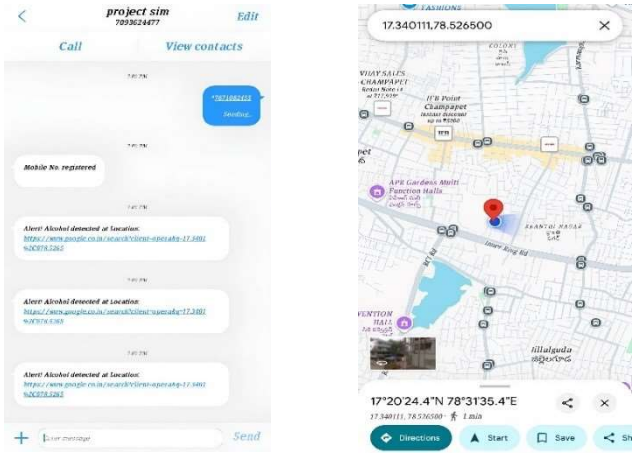

Fig 4: Sending Alert & Location to Registered Mobile NO

VI. CONCLUSION AND FUTURESCOPE

The automatic engine immobilization triggered by alcohol detection through GPS and GSM technology presents a strong and novel approach to improving road safety by stopping drunk driving. This system merges sensors for alcohol detection with GPS and GSM components, which not only disable the vehicle's engine upon detecting alcohol but also transmit immediate alerts to specified contacts (like law enforcement, family members, or fleet operators) along with the exact location of the vehicle via GPS. This combination adds an extra level of safety and responsibility, making certain that intoxicated drivers cannot use the vehicle and enabling prompt action during emergencies. However, despite its promise, issues such as ensuring the system's precision, reducing false alarms, and thwarting attempts to bypass the technology need to be tackled for it to be more broadly implemented. The outlook for automated engine locking via alcohol detection using GPS and GSM technology is optimistic and varied. As sensor technology improves, the accuracy and responsiveness of

this system may increase, reducing the chances of incorrect results. Moreover, incorporating these systems into commercial vehicle fleets could significantly improve safety, making certain that drivers follow safety protocols and allowing companies to oversee and manage their vehicles more efficiently. There is also an opportunity to link this system with smart city frameworks, which would facilitate real-time traffic oversight and better collaboration with local governmental bodies. Future developments may include more secure and privacy-focused methods for storing data, safeguarding personal information gathered by the system while still meeting public safety needs. With technological progress, broad adoption of this system could contribute to a worldwide decrease in traffic incidents related to alcohol, particularly if it is made a legal requirement, leading to a safer and more responsible driving culture. further improved, and the platform would become more secure—especially for important messages.

Group Video/Voice Chat: Although the current version emphasizes text-based communication, the platform would advance if it supported group video or voice calls. Using WebRTC and other real-time video communication technologies would enable in-person interactions, increasing the platform's adaptability for both personal and professional use.

VII. REFERENCES

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