

Alcohol Detection with Ignition Control System Using Gps and Gsm

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ABSTRACT: This paper outlines the design and development of an intelligent system to counteract alcohol-impaired driving. The system presented here combines an alcohol sensor to measure the driver's BAC, a microcontroller to process sensor signals and control the ignition of the vehicle, a GPS module to provide location tracking, and a GSM module to facilitate remote communication. If a BAC reading above a predetermined safety limit is detected, the system automatically deactivates the vehicle's ignition so that it cannot be started or safely stopped. In the meantime, the GPS module transmits the vehicle's location via the GSM network to an authorized agency or emergency contact, allowing for prompt intervention. 1 The integrated approach can greatly improve road safety by eliminating drunk driving risks as well as facilitating prompt assistance in such a scenario.

Keywords: Alcohol detection- MQ3 Alcohol Sensor- Arduino UNO Microcontroller - DC Motor - Buzzer -GPS Module - GSM SIM 800L Module- LCD Display -Engine Locking System.

1. Introduction

Driving after consuming alcohol remains a significant threat to public safety worldwide, leading to numerous preventable accidents, injuries, and fatalities each year. Despite ongoing efforts through legislation, education, and law enforcement, the problem of drunk driving persists. To directly tackle this critical issue, there is a growing need for technological solutions that can actively prevent impaired individuals from operating vehicles. This paper introduces an innovative "Alcohol Detection with Ignition Control System Using GPS and GSM" designed to address this challenge. The core functionality of this system involves the real-time detection of a driver's alcohol level using an in-vehicle sensor. If the detected alcohol concentration exceeds a pre-set safety limit, the system automatically intervenes by disabling the vehicle's ignition, thus preventing the vehicle from starting or safely bringing it to a halt. Furthermore, the integration of a Global Positioning System (GPS) module

enables the tracking of the vehicle's location, and a Global System for Mobile communications (GSM) module allows for immediate communication of this location, along with the alcohol detection alert, to designated authorities or emergency contacts. This combined approach offers a proactive and responsive mechanism to significantly enhance road safety and mitigate the dangers associated with alcohol-impaired

1.1 Statement of Study:

The aim of the project is to design a system that can be used for the purpose of getting a message alert to the mobile if there is any driver trying to drive while he is drunk, and ignition locking so that the driver can't drive the vehicle when they are drunk

2. Literature Review:

Driving under the influence of alcohol is a global concern, significantly contributing to road

accidents and fatalities. Over the years, researchers and engineers have explored various technological solutions to address this problem, leading to the development of alcohol detection systems for vehicles. This literature survey examines the evolution of such systems, focusing on alcohol sensors, microcontrollers, ignition control mechanisms, IoT integration, and existing challenges. Marita Lynagh, et al., "Reducing alcohol-related harm: the untapped potential of pre-hospital care workers", *International Journal of Emergency Medicine*, vol. 2, issue 4, pp. 237-240, Dec 2009.

R. C. A. Naidu, et al, An advanced trouble intimation and automatic prior notification system of locomotives and its conditions," *International Conference on Computational Techniques in Information and Communication Technologies (ICCTICT)*, New Delhi, pp. 292-296, 2016. In this research, we proposed an enhanced Arduino UNO-based alcohol detection method for use in a car's ignition locking system. The output is transformed into a readout that represents the breath alcohol level of the breath sample using a microcontroller.

The integration of Global Positioning System (GPS) technology in vehicle safety systems is well-established for applications such as navigation, fleet management, and emergency services (Brown, 2010). In the context of alcohol detection, GPS can provide crucial location information in the event of an incident or attempted operation by an impaired driver, facilitating rapid response from authorities or emergency contacts (Chen et al., 2017)

Similarly, Global System for Mobile communications (GSM) technology offers a robust platform for wireless data transmission, enabling remote monitoring and control of vehicle systems (Garcia & Lee, 2013). In the domain of vehicle safety, GSM has been utilized for sending alerts in case of accidents, vehicle theft, and unauthorized usage (Silva et al., 2019). Combining GSM with an alcohol detection system allows for immediate notification to designated parties when an impaired driving attempt is detected, along with the vehicle's precise location obtained through GPS.

2.1 Scope of Literature:

As before, we were not aware of impaired driving avoidance, but here in our project, we are focusing on avoiding the drink and drive using the most popular GSM and GPS technology, and an MQ3 alcohol sensor

3. Proposed Work Explanation:

This proposed work outlines the development and implementation of an intelligent vehicle safety system designed to prevent drunk driving and enhance vehicle security. The system integrates alcohol detection, ignition control, GPS tracking, and GSM communication capabilities to provide a comprehensive safety solution.

3.1 Block Diagram:

To practically implement the above features, the arrangement of various devices in our system is as shown in the following block diagram.

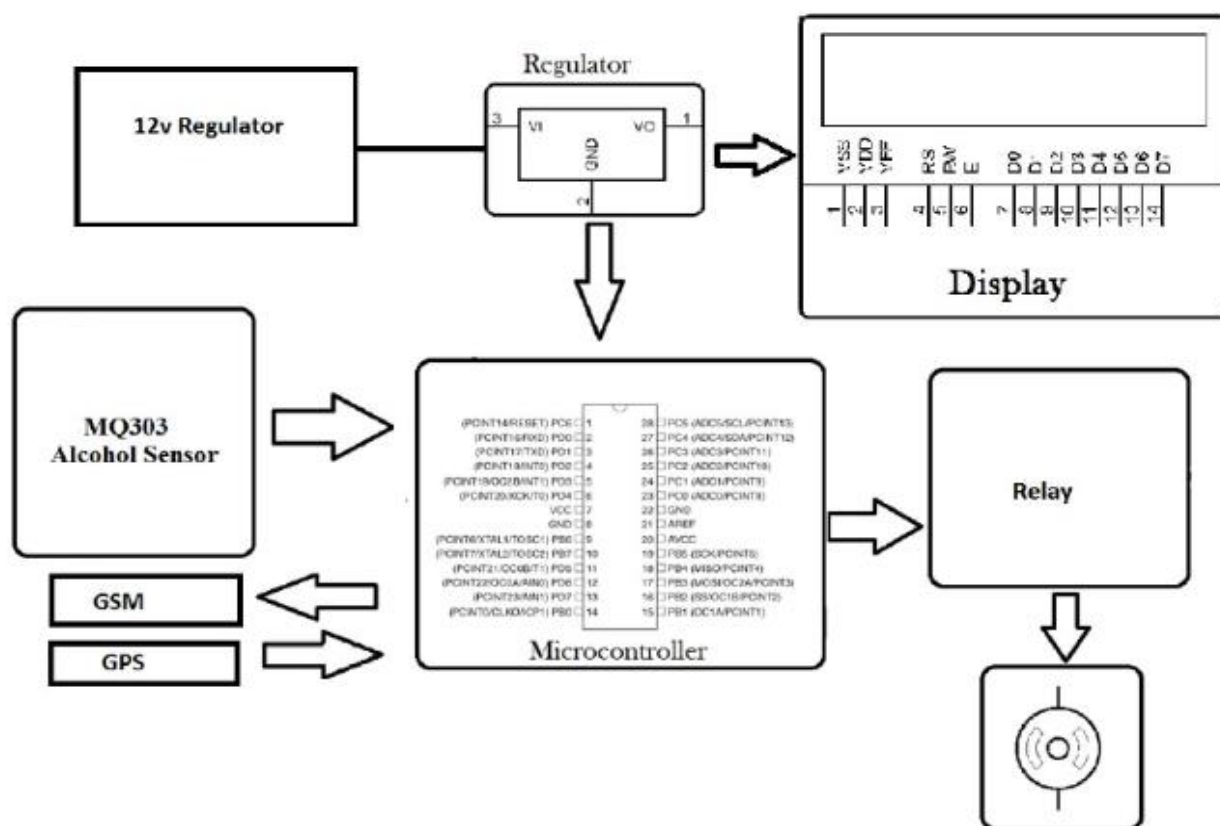


Figure 1: *Block diagram of the proposed system*

3.1.1 Block Diagram Description:

The alcohol detection system with ignition control, integrated with GPS and GSM capabilities, operates through a coordinated interaction of several key modules. The system initiates with the Alcohol Sensor detecting the driver's breath alcohol content and transmitting a corresponding electrical signal to the central Microcontroller Unit. This microcontroller, the system's core, processes the sensor data against a pre-defined safety threshold. Based on this evaluation, the microcontroller governs the Ignition Control Unit, which acts as an electronic switch to either enable or disable the Vehicle Ignition System, thereby preventing the engine from starting if the alcohol level is too high.

Simultaneously, the GPS Module continuously acquires the vehicle's geographical coordinates and relays this location data to the Microcontroller Unit. In the event of a failed ignition due to excessive alcohol or other pre-programmed

triggers, the Microcontroller Unit utilizes the GSM Module to transmit alert messages, potentially including the vehicle's GPS location, via the GSM Network to designated Authorized Users or a Monitoring Center. A dedicated Power Supply Unit, drawing from the vehicle's battery, ensures stable operation of all electronic components.

3.2 Circuit Diagram:

A circuit diagram for an alcohol detection system with ignition control, GPS, and GSM is a visual representation illustrating the electronic components and their interconnections. It outlines how the alcohol sensor's data is processed by the microcontroller to control the ignition relay, while the GPS module provides location information, and the GSM module enables remote communication for alerts and tracking. This diagram serves as a blueprint for building and understanding the system's electronic functionality.

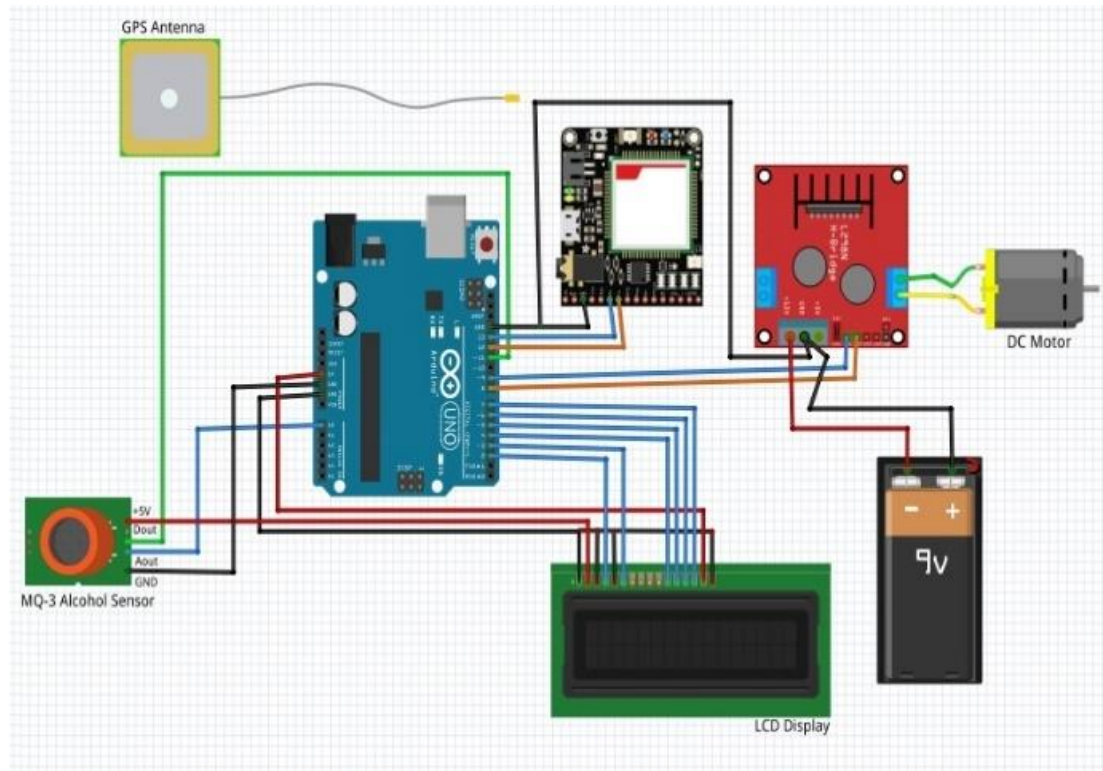


Figure 2: *Circuit Diagram*

3.3 System Architecture:

The system architecture for an alcohol detection system with ignition control, integrated with GPS and GSM, can be visualized as a layered structure with distinct modules working in concert. Here's a breakdown of the architecture.

3.3.1 Sensing and Input Layer:

Alcohol Sensor: This is the primary input, responsible for detecting the alcohol content in the driver's breath. It converts the detected alcohol level into an electrical signal (analog or digital).

GPS Module: This module receives signals from GPS satellites and outputs the vehicle's geographical coordinates (latitude, longitude, altitude, etc.).

3.3.2 Processing and Control Layer:

Microcontroller Unit (MCU): This is the central processing unit of the system. It performs the following critical functions:

Data Acquisition: Reads the alcohol sensor data and the GPS module data.

Data Processing: Analyzes the alcohol sensor readings, compares them to a predefined threshold, and processes GPS data.

Decision Making: Determines whether to enable or disable the ignition based on the alcohol level.

Control Signal Generation: Sends control signals to the ignition control unit and the GSM module.

Communication Management: Handles data exchange with the GPS and GSM modules.

User Interface Control (Optional): Manages visual and auditory alerts.

3.3.3 Actuation and Output Layer:

Ignition Control Unit (Relay): This acts as an electronic switch in the vehicle's ignition circuit. It receives control signals from the MCU to either allow or prevent the flow of current to the starter motor.

GSM Module: This module facilitates wireless communication over the cellular network. It transmits alert messages (e.g., SMS) containing information about a failed ignition attempt and the

vehicle's location to authorized users or a monitoring center.

User Interface (Optional): This provides feedback to the user through visual indicators (LEDs), audible alerts (buzzer), or a display, indicating system status or alcohol detection

3.3.4 Communication and Monitoring Layer:

GSM Network: The cellular network infrastructure that carries the alert messages.

Authorized User/Monitoring Center: The recipients of the alerts, who can receive information about potential drunk driving attempts and the vehicle's location. They might use a mobile phone or a dedicated monitoring platform.

3.3.5 Inter-Layer Communication:

The Alcohol Sensor and GPS Module send data to the Microcontroller Unit.

The Microcontroller Unit sends control signals to the Ignition Control Unit and the GSM Module.

The GSM Module communicates with the GSM Network, which then delivers alerts to the Authorized User/Monitoring Center.

The Microcontroller Unit interacts with the optional User Interface to provide feedback to the driver.

3.3 Recent Work:

Recent work in the field of alcohol detection with ignition control systems using GPS and GSM continues to focus on enhancing accuracy, reliability, and integration with broader vehicle safety and monitoring systems. Here's a summary of some recent trends and developments, keeping in mind the current date.

1. Integration with Advanced Driver-Assistance Systems (ADAS)

2. Enhanced Sensor Technology
3. Focus on Real-time Monitoring and Intervention
4. Integration with IoT and Cloud Platforms
5. Development of Driver Alcohol Detection System for Safety (DADSS)
6. Regulatory Interest and Standardization

In summary, recent work in this area demonstrates a shift towards more advanced sensor technologies, continuous monitoring, seamless integration with other vehicle systems, and connectivity through IoT. The ultimate goal remains to create reliable, unobtrusive, and widely adoptable systems that significantly reduce the incidence of drunk driving and enhance road safety

3.4 System Operations:

The microcontroller reads the voltage situations that are known to retain a digital nature, The Arduino Uno board generally has 8 channels, the tackle is 10 bits, which have so far yielded results as digital figures following processing Analog voltage on a leg. The element is original to the cargo of input voltages that range from 0- 5V, with the output values ranging from 0- 1023 volts to supply 5 volts of voltage in a cycle for each 1024 units. The system will initially ensure that the motorist is fastened using the safety belt, and if the seat belt isn't worn, the system won't confirm the other conditions, such as alcohol discovery, and if alcohol is not detected, it'll go to the next stage. Check whether the motorist is consumed alcohol. If the alcohol presence is the detector values are transmitted to the Arduino, by means of which the Arduino drives the machine of the vehicle. And communication to the current position of the vehicle will be sent to the family or friend.

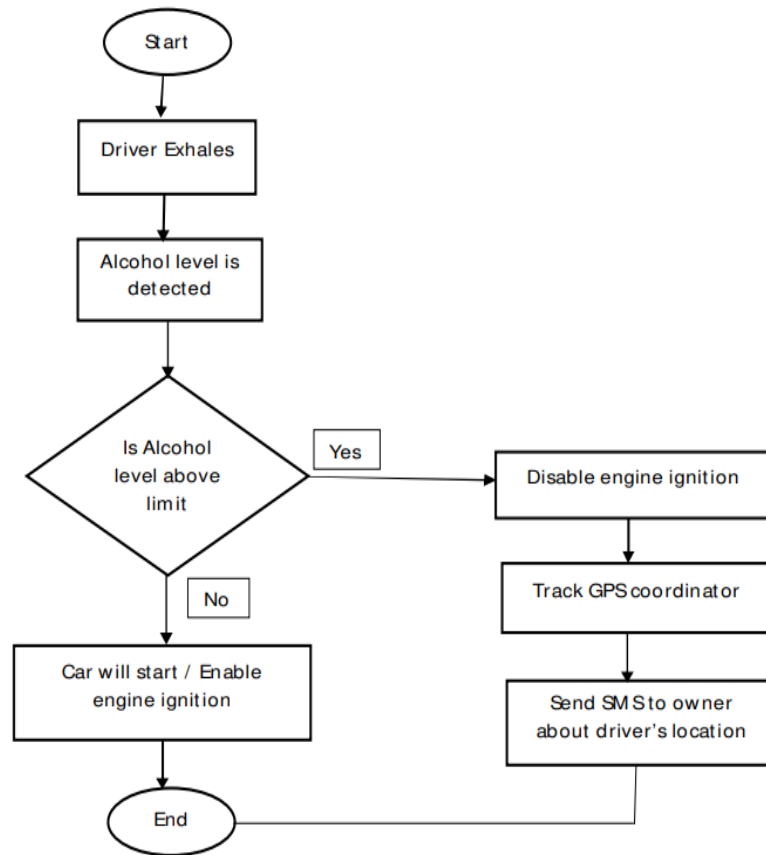


Figure 3: Flow chart

4. Result and Discussion:

An alcohol detection system linked to a car's ignition, GPS, and phone communication aims to significantly improve road safety and vehicle security. If it works well, it should stop drunk drivers from starting their cars, track vehicle locations, and immediately alert designated people if someone tries to drive drunk or in other emergencies. This could lead to fewer accidents and better vehicle management. However, we need to ensure the alcohol sensors are accurate in all weather, that people accept using the system and can't easily bypass it, and that the system doesn't drain the car battery or compromise privacy. Despite these challenges, this technology offers a real chance to make our roads safer by preventing drunk driving and providing valuable security features.

4. Conclusion:

The integration of alcohol detection, ignition control, GPS tracking, and GSM communication

presents a powerful and multifaceted solution to combat drunk driving and enhance vehicle safety. By preventing impaired individuals from operating vehicles, providing real-time location information, and enabling immediate alerts, these systems hold significant promise for reducing alcohol-related accidents, saving lives, and fostering a greater sense of responsibility on the roads. Ongoing advancements in sensor technology, seamless integration with vehicle systems and IoT platforms, coupled with increasing regulatory interest, suggest a future where such intelligent safety measures become more prevalent, contributing to a safer transportation ecosystem both in Madurai, Tamil Nadu, India, and globally. While challenges related to accuracy, user acceptance, and privacy need careful consideration, the potential benefits of these integrated systems in mitigating the devastating consequences of drunk driving are undeniable and warrant continued research, development, and thoughtful implementation.

References:

1. P. Ramya; B. Palaniappan, Year: 2017, “Alcohol Detection Using MQ-3 Sensor with Arduino”, International Journal of Engineering Development and Research (IJEDR), Vol: 5(2), pp. 784– 787.
2. B. Oyeyemi, Year: 2019, “Road Traffic Crashes in Nigeria: Trends and Preventive Strategies”, Federal Road Safety Corps (FRSC), Nigeria. Provides statistics and discusses existing strategies to reduce accidents, highlighting the need for advanced systems.
3. Abhishek Gupta; Jitendra Sharma; Palash Jain; Pankaj Kumar; Nikhil Anand; Nitesh Garhwal, year: 2016, “Embedded Automobile Engine Locking System Using GSM & GPS Technology”, International Journal of Engineering and Management Research (IJEMR) Vol: 6, No: 2, pp.117– 122.
4. Ipseeta Nanda; Rajesh De, Year: 2022, “Automatic Engine Lock System Through Alcohol Detection In Virtual Environment”, Information Management and Computer Science (IMCS), Vol: 5, No: 1, pp.23– 27.
5. SV Altaf; S. Abhinay; E. Ansari; Md Kaunain; R. Anwer, Year: 2017, “Alcohol Detection and Motor Locking System”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol: 6(2), pp. 989– 993.
6. JH Bindu; GA Reddy; P Anoosha; KAV Vinolini, Year: 2015, “Programmed Engine Locking System by Automatically Detecting Drunken Drivers”, International Journal of

Innovative Research in Science, Engineering and Technology, Vol: 4(11), pp.11344– 11348.