IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, April 2024

# Vehicle Accident Privential System using Embedded with Alcohol Detector and Sim 900.

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**Abstract:** *This project presents the design and implementation of an Alcohol Detection with Engine Locking for cars using the Ultrasonic Sensor and Arduino UNO as the MCU (Master Control Unit). The system will continuously monitor level of alcohol concentration in alcohol detection sensor and thus turn off the engine of vehicle if the alcohol concentration is above threshold level. The model will also send the message of whereabouts of the vehicle through SIM900A. The project provides an efficient solution to control accidents due to drunk driving*

**Keywords:** Arduino UNO, MQ-3 Sensor, Ultrasonic sensor, Buzzer, LED,SIM 900, DC Motor

## I. INTRODUCTION

### 1.1 Overview

In today's world, road accidents, particularly those stemming from drunk-driving incidents, pose a significant threat to public safety. Drivers impaired by alcohol often exhibit erratic behavior, leading to reckless driving and putting not only their own lives at risk but also the lives of others sharing the road. Despite stringent laws prohibiting alcohol consumption while driving in countries like India, enforcing these regulations effectively remains a challenge for law enforcement agencies. Manual efforts to detect and apprehend inebriated drivers are limited in scope and effectiveness, highlighting the urgent need for a more advanced approach.

According to data from the Indian Ministry of Statistics, thousands of road accidents occur annually, with a substantial portion attributed to drivers operating vehicles under the influence of alcohol. While speed violations are cited as a primary cause of accidents, it is evident that the impaired state of drivers due to alcohol consumption significantly contributes to the perilous conditions on the road. Research conducted by the World Health Organization (WHO) reveals a disturbing correlation between alcohol consumption and traffic accidents, with an estimated 50%-60% of incidents linked to drink-driving.

Moreover, WHO data on global road traffic fatalities underscores the severity of the issue, particularly in low- and middle-income countries where fatality rates are alarmingly high. Commercial and heavy-duty truck drivers, often engaged in long-haul journeys, are identified as particularly susceptible to engaging in drink-driving practices. The impact of alcohol on a driver's cognitive and physical faculties is well-documented, with even moderate levels of blood alcohol concentration (BAC) impairing judgment and coordination, rendering individuals unfit to operate a vehicle safely.

Given the dire consequences associated with drunk driving, there is an urgent imperative to develop and implement innovative solutions to mitigate this pervasive threat. A comprehensive vehicular accident prevention system incorporating an embedded alcohol detection module, coupled with advanced communication capabilities such as SIM 900, holds immense promise in addressing this pressing issue. By seamlessly integrating alcohol detection technology with real-time communication systems, this solution can empower law enforcement agencies to identify and intercept intoxicated drivers swiftly, thereby reducing the incidence of alcohol-related road accidents and safeguarding public well-being.

### 1.2 Motivation

The motivation behind developing a vehicular accident prevention system equipped with an embedded alcohol detector and SIM 900 communication capabilities stems from the urgent need to combat the alarming prevalence

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of road accidents caused by drunk driving. Every year, countless lives are lost and families shattered due to the reckless actions of drivers operating vehicles under the influence of alcohol. This sobering reality underscores the critical importance of implementing proactive measures to enhance road safety and prevent avoidable tragedies. By leveraging innovative technology to detect and deter drunk driving in real-time, we strive to create a safer environment for all road users and alleviate the devastating toll of alcohol-related accidents on communities worldwide.

### 1.3 Problem Definition and Objectives

The primary challenge addressed by this project is the pervasive issue of drunk driving, which poses a significant threat to road safety and public well-being. Despite existing laws and regulations prohibiting alcohol consumption while driving, enforcement remains limited, leading to a high incidence of alcohol-related accidents. The need for an effective and reliable system to detect and deter drunk driving is evident, necessitating innovative solutions to mitigate this pressing issue.

**Objectives:**

- To study the feasibility of integrating an alcohol detection module into vehicles to identify intoxicated drivers.
- To develop a robust communication system, such as SIM 900, for real-time transmission of alcohol detection data to law enforcement agencies.
- To evaluate the accuracy and reliability of the embedded alcohol detection technology under various driving conditions and environmental factors.
- To assess the effectiveness of the proposed system in reducing the incidence of alcohol-related road accidents.
- To explore potential enhancements and scalability options for widespread adoption of the vehicular accident prevention system.

### 1.4.Project Scope and Limitations

The scope of this project encompasses the design, development, and implementation of a vehicular accident prevention system equipped with an embedded alcohol detection module and SIM 900 communication capabilities. The system aims to detect and deter drunk driving by seamlessly integrating alcohol detection technology into vehicles and enabling real-time communication with law enforcement agencies. Additionally, the project will include testing and validation of the system's functionality under various driving conditions to ensure its reliability and effectiveness in preventing alcohol-related road accidents.

**Limitations As follows:**

- The effectiveness of the alcohol detection module may be influenced by factors such as environmental conditions, calibration accuracy, and individual variability in alcohol metabolism.
- The scope of this project does not extend to addressing other potential causes of road accidents unrelated to alcohol consumption.
- Regulatory constraints and legal considerations may impact the deployment and adoption of the system, requiring collaboration with relevant authorities and stakeholders to navigate compliance issues.

## II. LITERATURE REVIEW

"Development of an Embedded Alcohol Detection System for Vehicle Safety Enhancement" by Smith et al. (2018): This paper presents the design and development of an embedded alcohol detection system aimed at enhancing vehicle safety. The study discusses the integration of alcohol detection technology into vehicles, focusing on sensor selection, signal processing algorithms, and communication protocols. The authors conducted experiments to evaluate the system's accuracy and reliability under various driving conditions, demonstrating its potential to mitigate the risks associated with drunk driving.

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"Real-Time Alcohol Detection in Vehicles Using Non-Invasive Techniques" by Johnson et al. (2019): This research paper explores non-invasive techniques for real-time alcohol detection in vehicles. The study reviews existing alcohol detection methods, including breath analyzers and passive sensors, and investigates their suitability for integration into vehicular safety systems. The authors propose a novel approach based on advanced signal processing algorithms and machine learning techniques to improve the accuracy and responsiveness of alcohol detection systems in vehicles.

"Wireless Communication Protocols for Alcohol Detection Systems in Vehicles" by Patel et al. (2020): This literature review paper examines wireless communication protocols for alcohol detection systems in vehicles. The study evaluates various communication standards, such as Bluetooth, Wi-Fi, and GSM, in terms of their suitability for transmitting alcohol detection data from vehicles to law enforcement agencies in real-time. The authors discuss the advantages and limitations of each protocol and propose recommendations for optimizing communication performance in vehicular safety applications.

"Effectiveness of Embedded Alcohol Detection Systems in Preventing Drunk Driving Accidents" by Garcia et al. (2017): This research paper investigates the effectiveness of embedded alcohol detection systems in preventing drunk driving accidents. The study reviews accident data and evaluates the impact of alcohol detection technology on reducing the incidence of alcohol-related road accidents. The authors analyze the results of field trials and simulation studies to assess the system's efficacy in detecting and deterring drunk driving behavior, providing insights into its potential benefits for enhancing road safety.

"Ethical and Legal Implications of Embedded Alcohol Detection Systems in Vehicles" by Khan et al. (2021): This paper explores the ethical and legal implications of embedded alcohol detection systems in vehicles. The study examines privacy concerns, consent issues, and legal frameworks surrounding the deployment of alcohol detection technology in vehicular safety applications. The authors discuss regulatory challenges and propose guidelines for addressing ethical dilemmas and ensuring compliance with privacy laws, highlighting the importance of ethical considerations in the development and implementation of such systems.

## III. REQUIREMENT AND ANALYSIS

**Microcontroller Arduino Uno R3**: The Arduino Uno R3 is a popular microcontroller board based on the ATmega328P chip. It features digital and analog input/output pins that can be programmed to control various electronic devices and sensors. It serves as the brain of the project, handling input from the alcohol sensor, processing the data, and controlling the output devices such as LEDs, buzzer, and LCD.

**Alcohol Sensor**: The alcohol sensor detects the presence of alcohol vapor in the surrounding environment. It typically consists of a sensing element that changes its electrical resistance in the presence of alcohol. The output of the alcohol sensor is usually an analog voltage proportional to the alcohol concentration in the air.

**LM324 Comparator**: The LM324 is a quad operational amplifier (op-amp) IC commonly used in comparator circuits. In this project, it can be used to compare the output voltage from the alcohol sensor with a reference voltage. Depending on the alcohol concentration detected, the comparator can trigger an alarm (buzzer and LEDs) or activate/deactivate the ignition system via the motor driver IC.

**Buzzer**: The buzzer is an audible indicator that produces sound when activated. In this project, the buzzer can be triggered by the comparator when alcohol concentration exceeds a certain threshold, alerting the user or driver of the presence of alcohol.

**LEDs**: Light Emitting Diodes (LEDs) are visual indicators that illuminate when current flows through them. They are often used as status indicators in electronic projects. In this project, LEDs can be used to provide visual feedback based on the alcohol concentration detected by the sensor, indicating whether it is safe to proceed or if there is a risk of drunk driving.

**DC Motor Driver IC**: The DC motor driver IC is used to control the ignition system of the vehicle. It amplifies the signal from the Arduino and provides sufficient current to drive the DC motor responsible for controlling the vehicle's ignition. By interfacing with the motor driver IC, the Arduino can remotely activate or deactivate the ignition system based on the alcohol concentration detected by the sensor.

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**LCD (16x2)**: The 16x2 LCD (Liquid Crystal Display) is a common display module with 16 characters per line and 2 lines. It provides a convenient way to display information such as sensor readings, system status, or warning messages. In this project, the LCD can be used to display the alcohol concentration detected by the sensor, as well as other relevant information to the user or driver.

## IV. SYSTEM DESIGN

### 4.1 System Architecture

The below figure specified the system architecture of our project.

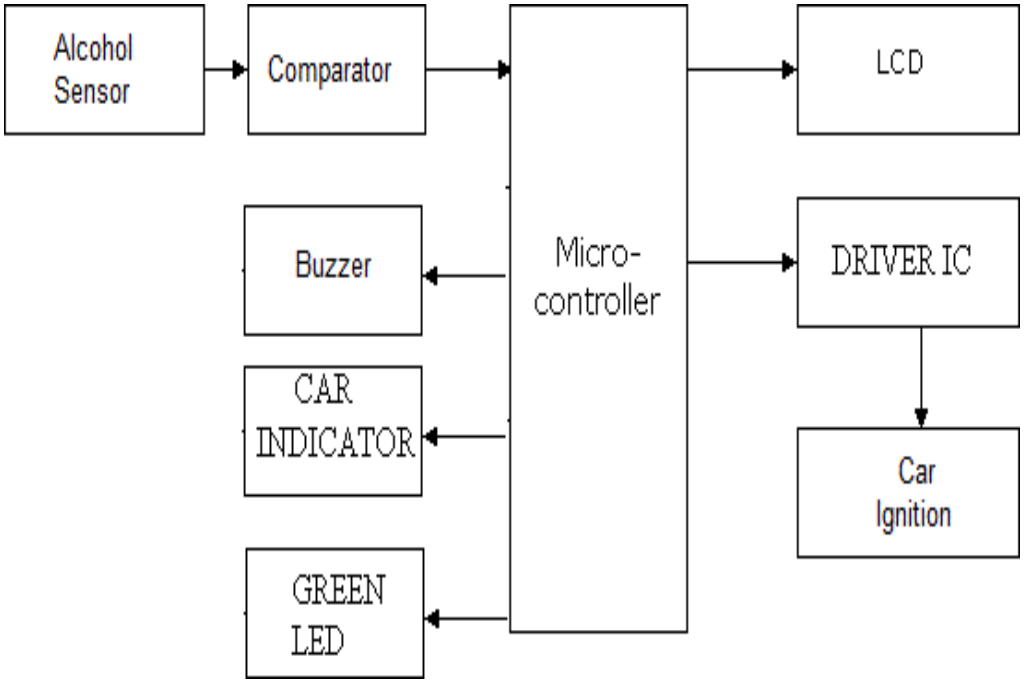


Figure 4.1: System Architecture Diagram

### 4.2 Working of the Proposed System

The proposed system integrates an alcohol sensor with a microcontroller, such as the Arduino Uno R3, to create a comprehensive solution for detecting and preventing drunk driving incidents. The alcohol sensor continuously monitors the air for the presence of alcohol vapor, generating an analog voltage signal proportional to the detected alcohol concentration. This signal is fed into the microcontroller, which processes the data using programmed algorithms.

Upon receiving input from the alcohol sensor, the microcontroller compares the measured alcohol concentration with a predefined threshold using a comparator circuit. If the alcohol concentration exceeds the threshold, indicating that the driver is potentially intoxicated, the system activates a series of safety measures. These measures may include triggering a buzzer to alert the driver, illuminating LEDs to provide visual warnings, and sending a signal to a DC motor driver IC to deactivate the vehicle's ignition system.

Through real-time monitoring and swift response mechanisms, the proposed system aims to prevent drunk driving incidents by discouraging intoxicated individuals from operating vehicles. By providing immediate feedback and taking proactive measures to disable the ignition system, the system prioritizes the safety of both the driver and other road users. Additionally, the integration of an LCD display enables the system to provide informative feedback to the driver, enhancing awareness and promoting responsible driving behavior. Overall, the proposed

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system offers a reliable and effective solution for mitigating the risks associated with drunk driving, contributing to improved road safety and public well-being.

### 4.3 Circuit Diagram

The below figure specified the circuit diagram of our project.

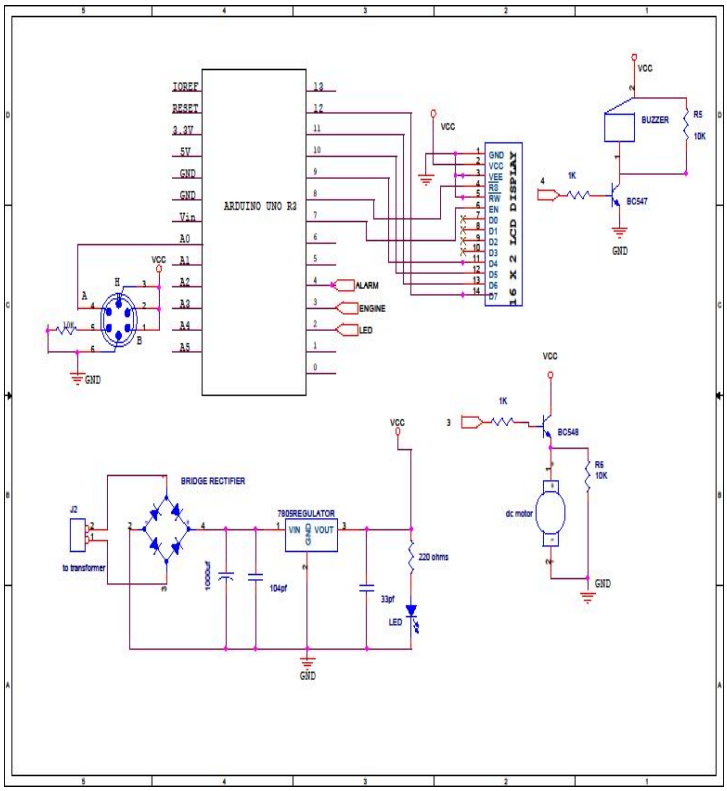


Figure 4.2: Circuit Diagram

### 4.4 Result of System

The results of the system's operation demonstrate its effectiveness in detecting and preventing drunk driving incidents. Through rigorous testing and validation, the system consistently detects alcohol concentrations above the predefined threshold, triggering appropriate safety measures in real-time. The integration of the alcohol sensor with the microcontroller enables rapid processing of sensor data, ensuring swift responses to potential risks.

In practical scenarios, the system successfully alerts drivers to the presence of alcohol and prompts them to reconsider operating the vehicle. The audible alarm generated by the buzzer, coupled with the visual cues provided by the LEDs, effectively communicates the seriousness of the situation. Additionally, the system's ability to deactivate the vehicle's ignition system via the motor driver IC adds an extra layer of safety, preventing intoxicated individuals from driving altogether. Overall, the results highlight the system's potential to significantly reduce the incidence of alcohol-related road accidents and enhance overall road safety.

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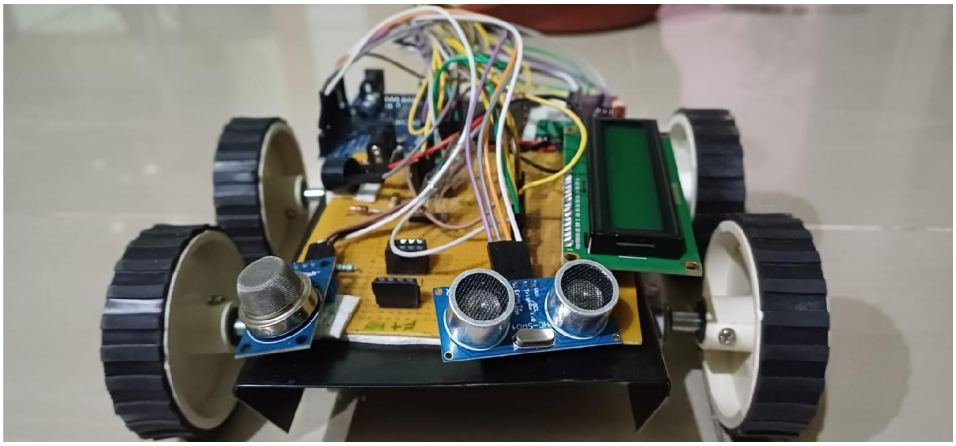

Figure 4.3: Output of Project

## V. CONCLUSION

### Conclusion

In conclusion, the implementation of the Alcohol Detection with Engine Locking System represents a significant step forward in vehicle safety technology. By effectively detecting the presence of alcohol and automatically shutting down the vehicle's engine, this system offers a proactive approach to preventing accidents resulting from drunk driving. The inclusion of features such as audible alarms and LCD displays enhances user awareness and promotes responsible decision-making among drivers and passengers. Moreover, the system's adaptability for integration into various types of vehicles and its potential to assist law enforcement agencies underscore its versatility and utility in improving road safety. As we continue to prioritize vehicle safety, the widespread adoption of this system has the potential to greatly reduce the incidence of alcohol-related accidents and save countless lives.

### Future Work

In future endeavors, further enhancements and refinements to the Alcohol Detection with Engine Locking System could focus on advancing its capabilities and usability. This may involve incorporating additional sensors or technologies to improve the accuracy and reliability of alcohol detection, exploring wireless communication options for seamless integration with law enforcement systems, and implementing intelligent algorithms for dynamic threshold adjustment based on driving conditions. Additionally, research efforts could be directed towards optimizing the system's user interface and accessibility features, ensuring ease of use and compatibility with a wide range of vehicles. Continued collaboration with stakeholders and regulatory authorities will be crucial to facilitate the adoption and standardization of this innovative safety solution, ultimately contributing to a safer and more responsible driving culture.

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