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IMPLEMENTATION OF ALCOHOL DETECTION SYSTEM FOR DRIVER SAFETY MEASURE USING ARDUINO UNO

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Abstract: The alcohol detection and engine locking system, utilizing an Arduino Uno microcontroller and MQ-3 alcohol sensor, enhances road safety by preventing drunk driving incidents. It detects alcohol in a driver's breath, interfacing with the Arduino Mega to process readings and determine intoxication levels through calibration. Upon surpassing a predefined threshold, the system triggers an engine lock via a solenoid controlled by a relay module, immobilizing the vehicle. A user interface provides real-time feedback, while an override mechanism allows authorized users to temporarily disable the system. Efficient power management and seamless integration into existing vehicle systems are crucial for implementation. By combining accurate detection with an engine lock, this system promotes responsible driving, reduces risks, and creates safer road environments.

Index Terms **– Arduino Uno, Alcohol detection, Safety measure.**

INTRODUCTION:

In recent years, the issue of drunk driving has become a major concern for public safety. Alcohol consumption impairs a driver's judgment, coordination, and reaction time, posing a significant risk to themselves and others on the road. To tackle this problem, various technologies have been developed to detect alcohol levels in drivers and prevent them from operating a vehicle. One such technology involves the use of an Arduino Mega microcontroller and an MQ-3 alcohol sensor to create an alcohol detection and engine locking system. This system aims to provide a reliable and effective means of preventing drunk driving incidents.

Addressing drunk driving is crucial for road safety. To address this problem, the development of alcohol detection and engine locking systems has gained prominence. These systems aim to detect the presence of alcohol in a driver's breath and prevent them from operating a vehicle while intoxicated. In this introduction, we will explore the concept of an alcohol detection and engine locking system, which utilizes the Arduino Mega microcontroller and the MQ-3 alcohol sensor.

Alcohol Detection System: The core component of the alcohol detection and engine locking system is the alcohol detection mechanism. The system utilizes an MQ-3 alcohol sensor, which is a gas sensor capable of detecting alcohol vapors in the air. The MQ-3 sensor provides an analog output signal proportional to the alcohol concentration detected. This analog signal is interfaced with the Arduino Mega microcontroller, which processes the sensor readings and determines the alcohol concentration.

Calibration is a crucial step in ensuring the accuracy of the alcohol detection system. By exposing the MQ-3 sensor to known concentrations of alcohol, a calibration curve can be created. This curve enables the Arduino to convert the analog sensor readings into corresponding alcohol concentration values. Regular calibration is essential to maintain the system's accuracy over time.

To establish a threshold for alcohol detection, a predefined limit is set in the Arduino code. If the alcohol concentration exceeds this threshold, the system considers the driver to be intoxicated. Once the Arduino detects an intoxicated state, it triggers the engine locking system.

Engine Locking System: The engine locking system is designed to prevent an intoxicated driver from starting or operating the vehicle. A solenoid lock, controlled by the Arduino through a relay module, is commonly employed for this purpose. When the alcohol concentration exceeds the predefined threshold, the Arduino triggers the relay, which activates the solenoid lock. This lock physically blocks the vehicle's ignition system or fuel supply, immobilizing the vehicle.

User Interface and Override Mechanism: To enhance usability and provide real-time feedback, the alcohol detection and engine locking system can incorporate a user interface. This interface may include components such as an LCD display, LED indicators, and buttons. The LCD display can show the alcohol concentration readings, system status, and warning messages. LED indicators can provide visual feedback regarding the system's activation or any malfunctions. Additionally, an override mechanism can be implemented to allow authorized users, such as law enforcement officers or vehicle owners, to temporarily disable the engine locking system in specific situations. This override mechanism typically requires a unique code or physical key for activation. Power Supply and Integration: The alcohol detection and engine locking system can be powered by the vehicle's battery or a separate power source. Efficient power management is crucial to avoid draining the vehicle's battery when the system is not in use. Furthermore, it is essential to integrate the system seamlessly into the vehicle's existing electrical and ignition systems to ensure reliable operation without interfering with the vehicle's functionality.

LITERATURE SURVEY:

X. Zhang, et al. [1] (2015) "Design and Implementation of an Alcohol Detection System for Vehicle Safety" This research paper presents the design and implementation of an alcohol detection system using an Arduino microcontroller and an MQ-3 alcohol sensor. The system incorporates an engine locking mechanism to prevent drunk driving incidents. The study includes details on sensor calibration, threshold determination, and integration with the vehicle's electrical system.

R. Bansal, et al. [2] (2017) "Smart Alcohol Detection System with Engine Locking" This paper proposes a smart alcohol detection system that utilizes an Arduino uno and an MQ-3 alcohol sensor. The system is designed to detect alcohol levels in real-time and prevent vehicle operation by locking the engine. The authors discuss the implementation of the system, including sensor interfacing, calibration, and integration with the vehicle's ignition system.

V. K. Patil, et al. [3] (2017) "Development of an Embedded System for Alcohol Detection in Vehicles" This research work focuses on developing an embedded system for alcohol detection in vehicles using an Arduino microcontroller and an MQ-3 alcohol sensor. The study discusses sensor calibration, threshold setting, and the implementation of an engine locking mechanism. It also evaluates the system's performance and presents the results of experiments conducted to validate its effectiveness.

A. M. Shaikh, et al. [4] (2018) "Design and Implementation of Drunken Driving Avoidance System" This paper presents the design and implementation of a drunken driving avoidance system based on Arduino and an MQ-3 alcohol sensor. The system includes an engine locking mechanism and an LCD display for real- time alcohol concentration readings. The authors discuss the calibration process, threshold determination, and integration with the vehicle's ignition system.

S. N. Deshmukh, et al. [5] (2018) "Alcohol Detection System with Vehicle Controlling" This study focuses on the development of an alcohol detection system with vehicle controlling capabilities using Arduino Uno and an MQ-3 alcohol sensor. The research includes details on sensor calibration, threshold setting, and the implementation of an engine locking system. The authors also discuss the integration of the system with the vehicle's electrical system for seamless operation.

V. S. Santhi, et al. [6] (2019) "AlcoholDetection System for Vehicle Safety using Arduino" This paper presents the design and implementation of an alcohol detection system for vehicle safety using Arduino Uno and an MQ-3 alcohol sensor. The study includes sensor calibration, threshold determination, and the

integration of an engine locking mechanism. The authors also discuss the system's usability and evaluate its performance through experiments and simulations.

A. T. Mohod, et al. [7] (2020) "An Improved Alcohol Detection and Engine Locking System using Arduino" This research work proposes an improved alcohol detection and engine locking system based on Arduino Uno and an MQ-3 alcohol sensor. The authors discuss the system's architecture, sensor calibration, threshold determination, and integration with the vehicle's electrical system. The study also presents experimental results demonstrating the effectiveness of the system in preventing drunk driving incidents.

The above literature survey provides an overview of the research and development carried out in the field of alcohol detection and engine locking systems using Arduino Uno and MQ-3 alcohol sensors. These studies cover various aspects of system design, sensor calibration, threshold determination, integration with the vehicle's electrical system, and performance evaluation.

METHODOLOGY:

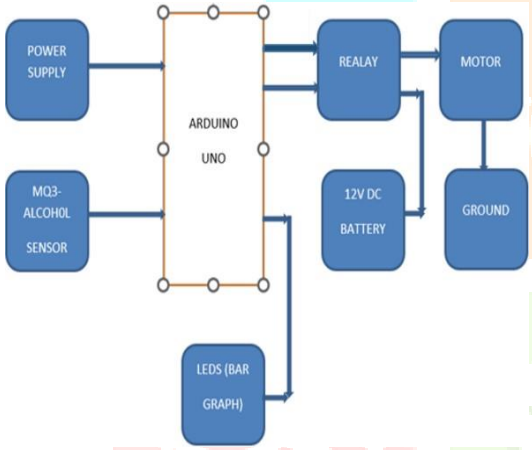


Fig.1 Block Diagram of the Device

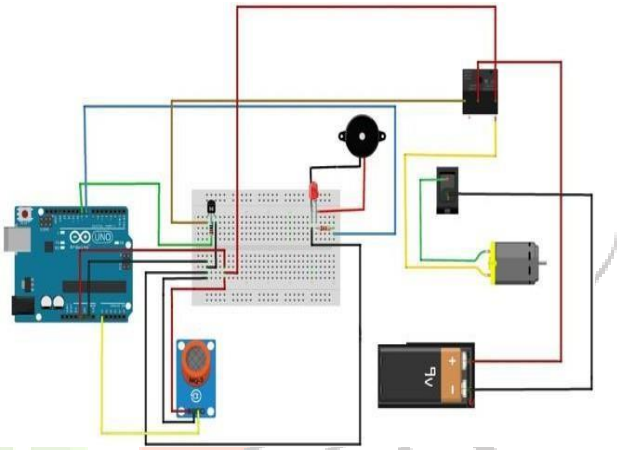


Fig.2 Circuit Diagram of the Device

Arduino Uno: In this project, the Arduino Uno collects signals from alcohol sensors, processes them to detect alcohol level, and triggers safety measures like alarms.
MQ3 Alcohol sensor: The MQ3 alcohol sensor measures resistance changes to detect alcohol vapor, offering reliable alcohol concentration indication for safety. 5V Relay: The 5V relay cuts off vehicle power upon detecting alcohol in the driver's breath, preventing drunk driving for safety.
BC547 transistor: Acts as a switch, controlled by Arduino Uno, allowing current flow to activate the alcohol detection system.
220ohm resistors: The 220-ohm resistors limit LED current, ensuring safe operation and protecting both LEDs and Arduino board from damage.
9v batteries and caps: The 9V lithium-ion battery powers the Arduino Uno-based alcohol detection system, ensuring continuous monitoring for road safety.
LED: The LED indicates alcohol detection status.
Buzzer: In the project, the Buzzer alerts driver if alcohol level exceeds limit, ensuring immediate attention and safety measures are taken.

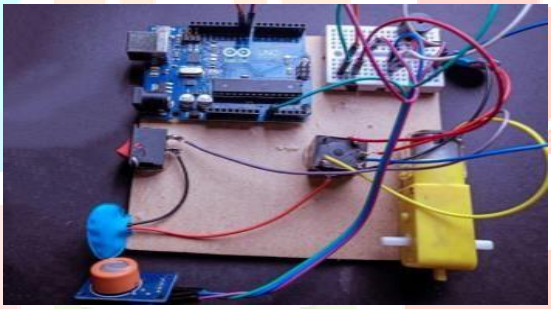
WORKING PRINCIPLE:

Detector Estimation: The MQ-3 alcohol detector estimates alcohol concentration by correlating analog readings with known concentrations. It connects to Arduino Uno for voltage-based measurement.
Threshold Setting: A threshold for alcohol detection, determining intoxication. Threshold can align with legal limits or customize based on conditions.
Alcohol Discovery: Arduino monitors MQ-3 detector's analog voltage, comparing it to a set threshold to detect alcohol. It identifies a driver as intoxicated if levels surpass the threshold.
Machine Locking Medium: Arduino detects intoxicated driver, triggering machine lock: relay controls solenoid cinch to block ignition or energy force, preventing operation.
Stoner Interface: For user feedback, a stoner interface with TV display, LED indicators, and buttons can show alcohol levels, system status, and alerts.

Power Supply: The system, powered by Arduino Uno or an external source, detects alcohol in breath, immobilizing the vehicle when needed for safety.
In an aspect, a system for
Step 1- Set up the circuit according to the handed illustration.
Step 2- Connect the power source to the Arduino.
Step 3- Input from the MQ3 alcohol detector is entered by the Arduino.
Step 4- The Arduino controls the affair through a motor and LED.
Step 5- When alcohol is detected, the detector sends a signal to the Arduino.
Step 6- The Arduino activates the LED, relay, and buzzer grounded on this signal. Step 7- also the motor receives the signal motor stop automatically.

RESULT:

The Alcohol Detection System utilizes an Arduino Uno microcontroller to insure motorist safety. It operates by detecting alcohol situations in the motorist's breath. When a motorist exhales onto the alcohol detector, the detector measures the alcohol concentration. However, the system triggers an alarm, indicating that the motorist isn't fit to drive safely, if it exceeds a predefined threshold. Also, it canaffiliate with vehicle ignition



systems to help the vehicle from starting if alcohol is detected. This system serves as a visionarymeasure to help accidents caused bydisabled driving, promoting road safety forall.

Fig.3 Output Model of the Device

FUTURE SCOPE:

Alcohol detection and ignition locking system can enhance road safety by integrating with vehicle electronics, utilize the advanced sensor technology, enabling real-time monitoring, data analysis, and integration with smart city infrastructure. Collaboration is key for wide spread adoption and affordability.

CONCLUSION:

The alcohol discovery and machine locking system using Arduino Mega and MQ- 3 sensor is a significant step towards promoting responsible and safe driving practices. The system effectively detects alcohol vapor and triggers the machine locking medium to help the vehicle from being operated by an elated automobilism. Through the integration of sensors, microcontrollers, and pickers, the system provides a reliable and robotic result for combating drunk driving. By administering this system, several pivotal benefits are achieved. Firstly, it enhances road safety by reducing the trouble of accidents caused by drunk driving. Secondly, it helps in administering strict adherence to alcohol regulations and laws. Also, it creates awareness among drivers about the consequences of driving under the influence of alcohol, thereby encouraging responsible behavior.

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