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Real Time Alcohol Detection in Vehicles Using Breathalyzer Sensor

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ABSTRACT:

The "Programmed Engine Locking System by Automatically Detecting Drunken Drivers" is a smart vehicle safety solution designed to prevent drivers under the influence of alcohol from operating a vehicle. The system incorporates a MQ-3 alcohol sensor to continuously check the driver's breath for alcohol levels, with an Arduino Nano serving as the central controller. If the detected alcohol level exceeds a predefined threshold, the system either prevents the vehicle from starting or locks the engine if the vehicle is already in motion. Additionally, the system incorporates a GPS module (NEO-6M) and a GSM module (SIM800L) to send real-time location data and an alert message to the vehicle owner, providing the car's coordinates and registration details. This project demonstrates an effective method to enhance road safety by preventing drunk driving, utilizing low-cost, readily available components. The system not only ensures that intoxicated drivers cannot start or operate the vehicle but also provides a means for tracking the vehicle's location, making it a practical tool for vehicle safety.

Keywords: Breathalyzer sensor, road safety, microcontroller unit, real-time alcohol detection, and sensor integration.

Introduction:

Driving while intoxicated continues to be one of the leading causes of road accidents worldwide. In many countries, legal measures and penalties have been imposed to curb this issue; however, technology can provide additional safeguards to prevent drunk driving before it leads to fatal accidents. This project proposes an innovative, automated engine locking system that measures the amount of alcohol in the driver's breath and takes proactive measures to prevent preventing the car from being operated while inebriated. The system integrates several key technologies, including an Arduino Nano microcontroller, a GPS module, a MQ-3 alcohol sensor (NEO-6M), and a GSM module (SIM800L). It is designed to monitor the amount of alcohol consumed by the driver continuously. When the amount of alcohol in the driver's breath beyond a certain level, the system either stops the car's engine from starting or, if it is already running, immediately locks the engine to stop the vehicle. The way the system operates is as follows: The driver's breath is continually sampled by the MQ-3 alcohol sensor. If alcohol is detected before the engine is started, the system prevents it from starting. In cases where alcohol is detected while the vehicle is in motion, the system stops the engine immediately, mimicking an engine lock. Upon detecting alcohol, the GSM module receives a signal from the Arduino, which then retrieves the position of the vehicle using the GPS module and notifies the owner of the vehicle. The message includes the current latitude and longitude coordinates of the vehicle and its registration details. The goal of this project is to create a dependable, affordable system that may be implemented in vehicles to reduce the chances of drunken driving incidents. The MQ-3 alcohol sensor, known for its sensitivity to ethanol, is central to the system's operation. The processing unit is the Arduino Nano, coordinating the sensors and modules to execute the system's functions. The real-time tracking provided by the GPS and GSM modules increases the system's usefulness and alerting capabilities, allowing vehicle owners to take action when necessary. By integrating these components, the system offers a robust solution for preventing drunk driving. The design makes sure that no one who is intoxicated may operate the vehicle, either when it is starting up or when it is in use. Additionally, the technology gives car owners piece of mind by instantly alerting them to the location of the vehicle, enabling them to find it and take necessary action. This project not only addresses the problem of drunk driving but also offers a scalable solution for improving road safety. A wide range of customers, including families, fleet owners, and taxi services, can utilize the system because it is simple to install in cars and other vehicles. By preventing alerting vehicle owners in real drunk driving incidents.

The goal of this project is to create a complete system that can identify the amount of alcohol in a driver's breath and stop a car from starting if the blood alcohol content (BAC) is higher than the allowed amount. The microcontroller unit (MCU), which processes the data and interfaces with the vehicle's ignition system, is connected to a breathalyzer sensor. If the BAC exceeds the legal threshold, because the system stops the car from starting, the driver is unable to operate the vehicle while intoxicated. For drivers and other road users to be safe, the accuracy and dependability of the system are essential.

Methodology:

The research methodology outlines the systematic process followed to design, develop, implement, and evaluate the "Programmed Engine Locking System by Automatically Detecting Drunken Drivers." The methodology is divided into various stages, from component selection and system design to testing and evaluation.

Three steps are involved in system development: choosing components and creating the architecture; assembling and calibrating the hardware; and utilizing the Arduino IDE to create the software to control the system's operations. Finding and selecting the necessary components, such as the Arduino Nano microcontroller, MQ-3 alcohol sensor, GSM module, and GPS module, is the first step in ensuring compatibility and optimal performance. In order to precisely detect alcohol levels, the second step is putting the hardware parts together and calibrating the MQ-3 sensor. At the conclusion of the software development phase, the Arduino Nano needs to be programmed using the Arduino IDE in order to process inputs from the alcohol sensor, control the engine, and communicate with the GSM and GPS modules to send location information and alarms.

System integration, testing and validation, and data collecting and analysis are all part of the project's last phases. To guarantee smooth communication between the Arduino Nano, alcohol sensor, DC motor, and communication modules, system integration comprises integrating the components of the software and hardware. To ensure that the system meets its objectives, functional, performance, and reliability testing are all part of the testing phase. To evaluate the system's functionality, identify any flaws, and enhance its performance data gathered during testing will be examined.

Block Diagram:

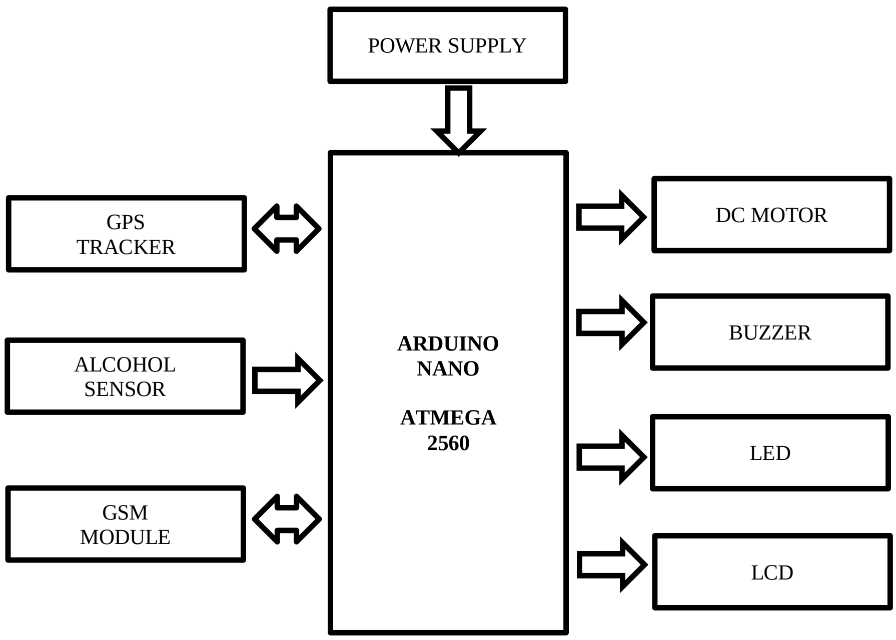

Figure 1: Block Diagram of System

Figure 1 show the block diagram for the proposed system. The ATMEGA 2560 microcontroller from the Arduino Mega board is utilized in this project. Every part is integrated into this microcontroller. Since the MQ-3 alcohol sensor acts as the microcontroller's input by detecting alcohol in the driver's breath and sending information to the microcontroller for additional action. The block diagram shows that an output from the microcontroller has links to an LED, LCD, buzzer, DC motor, and ignition lock.

Objective:

The principal aim of this study is to develop and execute a "Programmed Engine Locking System by Automatically Detecting Drunken Drivers" using an Arduino Nano microcontroller, GPS module (NEO-6M), GSM module (SIM800L), and MQ-3 alcohol sensor. By identifying the amount of alcohol in the driver's breath and taking preventative action to protect the driver, passengers, and other road users, the system seeks to stop drunk driving.

- **Design and creation of a vehicle alcohol detecting system:** Develop a robust system that continuously monitors the driver’s breath for alcohol concentration using an MQ-3 sensor Ensure that the system can accurately detect alcohol levels and respond accordingly to prevent the vehicle’s engine from starting or lock the engine if it is already running.

- **Engine control based on real-time alcohol detection:** Implement a control mechanism that stops the car from starting if alcohol is found When it is time to start. Develop a secondary control mechanism that stops or locks the engine during operation if alcohol is detected while the vehicle is in motion, simulating an engine lock scenario to prevent further driving.

- **Integration of GSM and GPS modules for real-time location tracking and alerting:** Integrate the GPS module to capture the vehicle's Real-time location (latitude and longitude) when alcohol is detected. Install a GSM module to provide the owner of the vehicle with an SMS alert that includes the vehicle's current location and details, ensuring that the owner is notified promptly if a potential drunk driving incident occurs.

- **Enhancement of vehicle security and safety features:** Create a system that prevents a drunk driver from operating a car by combining Engine immobilization and alcohol detection. Give automobile owners up-to-date information on the location and condition of their vehicle in real time, along with a way to intervene if driving is risky or forbidden.

- **Enhancement of vehicle security and safety features:** Develop a system that combines Alcohol detection with engine immobilization to ensure that a driver under the influence of alcohol cannot operate the vehicle. Provide vehicle owners with real time updates on the car's status and location, offering a mechanism for intervention in case of unauthorized or unsafe driving. Main objective of project to detect Alcohol in breath to prevent drunken driving accidents. Enhance road safety by preventing drunken driving Develop accident detection system with ignition lock for safety driving. Automatically switch off car ignition if driver is drunk.

Results:

The Real-Time Vehicle Alcohol Detection System By keeping drunk drivers off the road, the Breathalyzer Sensor project effectively improves road safety. The system efficiently detects alcohol in a driver's breath using the MQ-3 sensor, and if the detected quantity over the predetermined threshold, it promptly initiates a response. The microprocessor cuts off the vehicle's ignition system by activating relays if intoxication is detected, making it impossible for the driver to start or continue driving. The sensor's 5-meter detection range enables early intervention before the driver gets into the car, enhancing safety precautions even more.

By identifying alcohol in a driver's breath and acting quickly, the project "Real-Time Alcohol Detection in Vehicles Using Breathalyzer Sensor" effectively illustrates a dependable way to stop drunk driving. The system makes use of a MQ-3 sensor, which has a fast response time and can detect alcohol with accuracy up to 5 meters away. The microprocessor analyzes the data and activates a relay mechanism to stop the car when alcohol levels are discovered above a predetermined threshold, prohibiting drunk drivers from operating a motor vehicle. The system also incorporates a GPS module that notifies the relevant authorities of the vehicle's location, improving road safety by facilitating prompt action. These characteristics work together to make the gadget a useful instrument for lowering the number of drunken driving accidents. This system is very advantageous for deployment in smart cities and villages because to its quick response, high sensitivity, and real-time notifications, which help to improve traffic management and make roads safer.

Conclusion:

By detecting alcohol in a driver's breath, a suggested device lowers the chance of accidents by stopping the car, using an effective MQ-3 sensor, microcontroller, and relays. The system features a long-duration alcohol sensor that can detect from a 5-meter range, and its fast response times make it effective in preventing drunk driving. In addition to stopping intoxicated drivers, the device uses a GPS module to notify authorities of the vehicle's location, making it a valuable road safety feature that can be implemented in smart cities or villages.

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