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Alcohol Sensing with Engine Locking System and Communication Using GPS Gsm Technology

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***Abstract*— This project presents the development of a smart vehicle safety system designed to enhance road safety, discourage drunk and rash driving, and reduce the chances of vehicle theft. The system integrates multiple components to monitor and respond to unsafe driving conditions. An MQ3 alcohol sensor is used to detect the presence of alcohol in the driver's breath. If the alcohol level crosses a safe threshold, the system sends an alert and prevents the engine from starting. To identify rash driving, the system uses accelerometers and gyroscopes to track the vehicle's motion. If abnormal or risky movements are detected, the engine is automatically locked to avoid potential accidents. Additionally, a GPS module continuously tracks the real-time location of the vehicle. In case of emergencies, accidents, or theft, the system shares the vehicle's location with pre-registered contacts or authorities. By combining these features, the system helps ensure safer driving, faster emergency responses, and better vehicle security.**

I. INTRODUCTION

In recent times, one of the leading causes of road accidents is drunk driving. When drivers consume alcohol, their judgment and motor skills become impaired, resulting in poor decisions on the road that can risk not only their lives but also the lives of others. Monitoring such behavior effectively remains a challenge for traffic police and road safety officials. To address this, researchers have focused on developing reliable systems to detect and prevent drunk driving. This project introduces a prototype safety system that detects alcohol presence and controls the engine accordingly. The system is built using an Arduino Uno microcontroller, which is connected to an alcohol sensor, an LCD display, and a DC motor to represent the vehicle's engine.

India, being one of the most populated countries in the world, faces serious challenges related to road safety. With thousands of lives lost annually in road accidents—many due to drunk driving—this issue is becoming a growing social concern. The proposed system is designed to help reduce these incidents. It detects the level of alcohol inside the vehicle using a sensor. If a low level is detected, the system sends an SMS alert to pre-registered emergency contacts. In the case of a high alcohol level, the system immediately disables the engine and sends the vehicle's location along with the alert message to selected contacts.

Additionally, the project uses a GSM module and GPS technology to send real-time data to authorities or concerned individuals. Alcohol impairs the central nervous system and affects the driver's ability to steer the vehicle, even at a Blood Alcohol Concentration (BAC) of just 0.05%. In public transport scenarios, a buzzer can be activated to alert passengers if alcohol is detected. This awareness can help prevent accidents and save lives. By combining these features, the system aims to promote safer roads by discouraging drunk driving and enabling faster responses during emergencies.

II. LITERATURE SURVEY

Much of the research and work has been done In the field Of ALCOHOL SENSING WITH ENGINE LOCKING SYSTEM AND COMMUNICATION USING GPS AND GSM TECHNOLOGY

1. Juha Hyyppa et al. (2009)
Proposed a method for map updating and change detection using vehicle-based laser scanning, which is useful for intelligent transportation and navigation systems.

2. Tessa Tielert et al. (2010)
Explored traffic-light-to-vehicle communication to optimize fuel usage and reduce emissions, supporting the idea of real-time data sharing in vehicles.

3. Chi-Man Vong et al. (2011)
Developed a framework using RFID and traffic lights for emission control, offering an automated way to monitor vehicle behavior in cities.

4. Yuxiang Sun, Nan Wu et al. (2012)
Focused on creating a driving support system for electric vehicles using image processing, contributing to road safety and driver assistance systems.

5. N. P. Jain, P. N. Jain, T. P. Agarkar (2012)
Implemented a GSM-based real-time multi-parameter monitoring system for ICU patients, demonstrating how GSM can be used effectively for alerts and remote monitoring.

6. Mehaseb Ahmed Mehaseb et al. (2013)
Characterized WSN application traffic for integration within IoT, supporting efficient data communication for sensor-based systems like alcohol detection.

7. Chi-Man Vong, Pak-Kin Wong, ZiQian Ma, Ka-In Wong (2014)
Proposed an IoT-based system using RFID and spanning tree algorithms to manage vehicle emissions in cities, highlighting smart solutions for environmental control.

8. Bill Montgomery (2015)
Outlined the extended benefits of IoT beyond traffic and lighting optimization, reinforcing the wide use of IoT in vehicle safety systems.

9. M. SuryaDeekshith Gupta, Vamsikrishna Patchava, Virginia Menezes (2015)
Used Raspberry Pi and IoT for healthcare monitoring, demonstrating the device's adaptability for real-time safety and monitoring applications in vehicles.

10. Swati Rajesh Parekar, Manoj M. Dongre (2015)
Designed an intelligent streetlight system using GSM technology, which shows how GSM can control and automate systems remotely, similar to engine locking.

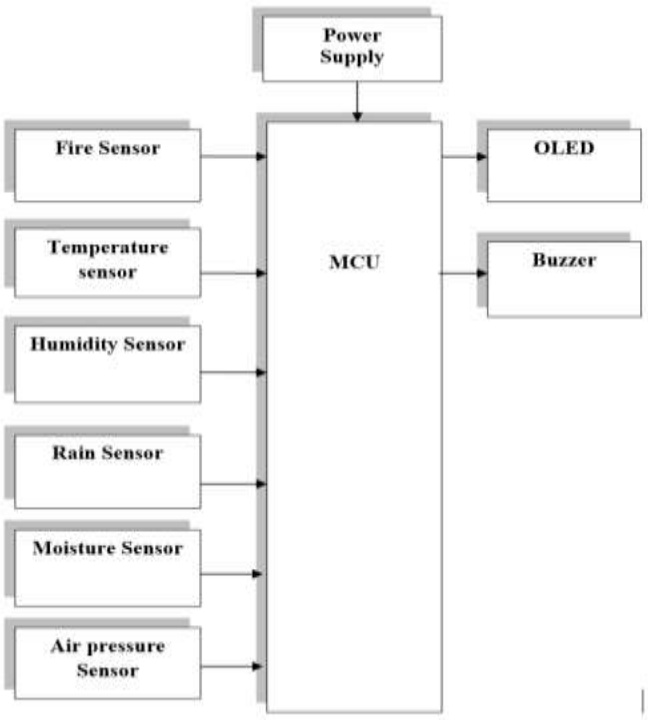
III. EXISTING SYSTEM

The existing system for alcohol sensing and engine locking typically uses standalone breathalyzers or alcohol detection devices connected to a vehicle's ignition system. These devices detect alcohol levels in a driver's breath and prevent the engine from starting if alcohol is detected. However, these systems may not integrate well with other technologies like GPS or GSM for remote monitoring and communication.

IV. PROPOSED SYSTEM

The proposed system combines alcohol sensing with engine locking technology, where a breathalyzer is integrated with the vehicle's engine control system. Additionally, the system uses GPS and GSM technology to communicate real-time data. If alcohol is detected, the engine is locked, and the system sends an alert via SMS or a mobile app to a designated person, while also tracking the vehicle's location using GPS. This enhances both safety and monitoring, providing a comprehensive solution.

V. METHODOLOGY

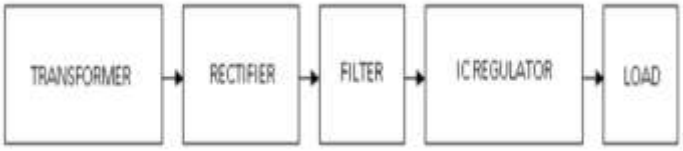


VI. HARDWARE DETAILS

POWER SUPPLY

The power supply section is the section which provide +5V for the components to work. IC LM7805 is used for providing a constant power of +5V.

The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.



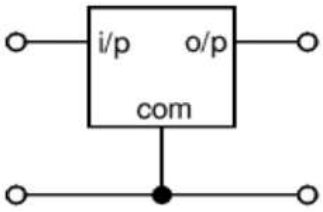
Transformer

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC.

Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in India) to a safer low voltage.

Voltage Regulators

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts totens of watts.



MICROCONTROLLER

The Raspberry Pi Pico is a compact and affordable microcontroller board powered by the RP2040 chip with a dual-core Arm Cortex-M0+ processor running up to 133 MHz. It includes 264KB SRAM, 2MB flash memory, and 26 GPIO pins with support for UART, SPI, I2C, and PWM. The board features USB 1.1, drag-and-drop programming, and operates within a wide voltage and temperature range. It also includes 8 PIO state machines for custom hardware functions and an onboard temperature sensor. The Pico supports low-power modes and provides efficient performance for embedded applications.

OLED (Organic Light Emitting Diodes)

OLED (Organic Light Emitting Diode) displays use organic thin films that emit light when powered, eliminating the need for a backlight and making them thinner and more energy-efficient than LCDs. They offer superior image quality with better contrast, brightness, color range, and faster refresh rates. OLEDs are also more durable, flexible, and suitable for future technologies like foldable and transparent displays.

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SENSOR:

Alcohol sensors detect alcohol vapors quickly and accurately, providing stable, long-lasting performance for breathalyzers. Accelerometers measure acceleration forces, both static and dynamic. Modern MEMS accelerometers are small, efficient devices replacing larger, bulkier types.

GLOBAL POSITIONING SYSTEM:

The Global Positioning System (GPS) is a satellite-based navigation system that provides precise location and time information anywhere on Earth using signals from 24–32 satellites. It consists of three segments: the space segment (satellites orbiting Earth), the control segment (monitoring and correcting stations), and the user segment (GPS receivers). GPS receivers use signals from at least four satellites to calculate accurate 3D positions. This system is widely used for navigation, mapping, and determining distances.

RELAY:

A relay is an electromechanical switch that uses a low-power signal to control high-power circuits by moving contacts via an electromagnet. A DC motor converts direct current electrical energy into mechanical energy, commonly used for controlled continuous motion in various applications.

GLOBAL SYSTEM FOR MOBILE:

GSM modems use SIM cards to enable wireless data and SMS communication via mobile networks. The GSM network has three parts: Switching System (call control), Base Station System (radio communication), and Operation Support System (network management). It is organized into cells and location areas to provide seamless coverage**.**

BUZZER:

A buzzer is an electronic signaling device that produces a buzzing or beeping sound, commonly used in appliances and game shows. Modern buzzers often use piezoelectric sounders for high-pitched tones and can lock out others when activated.

VI. SOFTWARE DETAILS

The Arduino Integrated Development Environment (IDE) is a software platform used to write, compile, and upload programs called sketches (with a .ino extension) to Arduino boards. It features a text editor, toolbar, message area, and console, along with menus like File, Edit, Sketch, Tools, and Help for managing code, libraries, and board settings. The IDE supports functions such as verifying and uploading code, opening the serial monitor for communication with the board, formatting code, managing libraries, selecting the correct board and port, and customizing preferences, making it a complete tool for Arduino-based development.

VII. CONCLUSION

An effective solution is provided to develop the intelligent system for vehicles which will sense the various levels of alcohol present in the breath of the driver and would respond accordingly. The system adopted different principles as explained in this paper, by using hardware platform who's Core is Atmega8, Alcohol sensor mq3, GPS & GSM module. The communication with preregistered phone numbers in this designed system is done via GSM, GPS and control of various parameters. The whole control system has the benefit of small volume and high reliability. Future scope of this system is to decrease accident numbers and providing useful details about the accidental vehicle, thereby reducing the rate of accidents taking place due to drunken driving. This system brings modernization to the existing technology in the vehicles and also maintains and improves the safety features, hence proving to be an effective development in the automobile industry.

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