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ARDUINO BASED ALCOHOL SENSE ENGINELOCK USING GPS & GSM

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Abstract - This project introduces an innovative approach to improving road safety by developing an Arduino-based alcohol detection and engine lock system, integrated with GPS and GSM technologies. The main goal is to prevent driving under the influence of alcohol by disabling the vehicle's engine upon alcoholdetection.

The system employs an MQ-3 alcohol sensor to measure the driver's breath alcohol content. When alcohol is detected, the Arduino microcontroller processes the data from the sensor and activates the engine lock mechanism, thus preventing the vehicle from starting. This functionality is enhanced with GPS technology to provide precise location tracking of the vehicle. In the event of alcohol detection, the system utilizes the GSM module to send alerts to pre-configured contacts, supplying real-time information about the driver's condition and the vehicle's location.

By incorporating GPS, the system ensures continuous location monitoring, adding an extra layer of security and enabling swift emergency response. The GSM module allows for immediate communication, dispatching SMS alerts to family members or authorities, thereby increasing the safety of both the driver and the public.

This comprehensive solution aims to reduce incidents of drunk driving by leveraging Arduino for sensor interfacing and control, and combining it with GPS and GSM technologies for real-time tracking and communication. The proposed system is cost-effective, easy to implement, and scalable, offering a practical tool for enhancing road safety and saving lives.

***Key Words*:** Arduino Alcohol sensor, Engine lock, MQ-3 sensor, GPS tracking, GSM module etc.

1. INTRODUCTION

Driving under the influence of alcohol is a leading cause of road accidents globally. Despite stringent laws and regulations, a considerable number of accidents still result from drunk driving. To combat this issue, an innovative alcohol detection and engine locking system has been developed.

This system is designed to measure the alcohol level in a driver's breath and prevent the vehicle from starting if the detected level exceeds a predetermined threshold. It can be installed in any vehicle, providing a cost-effective solution to decrease the incidence of accidents caused by drunk driving.

The objective of this project report is to provide a comprehensive overview of the alcohol detection and engine locking system, detailing its working principles, design, and implementation. Additionally, the report will discuss the system's advantages and its potential impact on road safety.

The alcohol detection and engine locking system aims to prevent drunk driving by using an alcohol detection device installed in the vehicle, ideally in a location close to the driver. When the driver enters the vehicle, they are required to blow into the alcohol detection device. The device then measures the alcohol level in the driver's breath.

If the measured alcohol level exceeds the set threshold, the system will prevent the engine from starting, thereby immobilizing the vehicle. The system also includes an alert mechanism that notifies the driver when their alcohol level is too high, enhancing its preventive capabilities.

This innovative system offers a practical and effective solution to enhance road safety by reducing the risk of accidents caused by drunk driving.

2. Literature Survey

1. Several studies have explored the development of alcohol detection and engine locking systems using the MQ3 sensor. For instance, K. R. Chaudhary et al. (2018) developed a system utilizing an MQ3 sensor paired with an Arduino microcontroller. Their system demonstrated high accuracy in detecting alcohol levels in the driver's breath and effectively prevented the vehicle from starting when the alcohol concentration exceeded the predetermined limit.

2. In another study, R. A. Fatima et al. (2019) implemented a similar system using an MQ3 sensor in conjunction with a Raspberry Pi microcontroller. This system not only detected breath alcohol levels but also sent notifications to the driver and law enforcement agencies when the alcohol concentration was above the permissible limit.

3. Moreover, M. M. Alam et al. (2020) designed an alcohol detection and engine locking system that incorporated an MQ3 sensor and a GSM module. Their system was capable of detecting alcohol levels in the

driver's breath and sending alerts to both the driver and the vehicle owner when the alcohol level was too high. Additionally, it had the capability to remotely lock the vehicle's engine.

4. The alcohol detection and engine locking system using Arduino technology is designed to detect the presence of alcohol in a vehicle and immobilize the engine to prevent driving. This system comprises an Arduino board, an alcohol sensor, and a relay. The Arduino board continuously monitors the output from the alcohol sensor and sends a signal to the relay to lock the engine if alcohol is detected.

5. The semiconductor alcohol sensor used in this system is highly sensitive and can detect alcohol concentrations as low as 0.05%. The relay, a standard automotive component, is activated by the Arduino's command based on the sensor's readings, resulting in the deactivation of the vehicle's DC motor.

3. System Architecture

System Architecture for Arduino-Based Alcohol Sense Engine Lock Using GPS & GSM

The system architecture for an Arduino-based alcohol sense engine lock using GPS and GSM can be divided into several key components:

1. Alcohol Detection Unit

MQ-3 Alcohol Sensor: The primary sensor used to detect alcohol concentration in the driver's breath. It outputs an analog signal proportional to the alcohol concentration.

Arduino Microcontroller: Processes the analog signal from the MQ-3 sensor, converts it to a digital value, and compares it with the preset threshold value.

2. Microcontroller Unit

Arduino Board: Acts as the central control unit, interfacing with all other components, processing inputs, and executing control commands.

3. Engine Lock Mechanism

Relay Module: Connected to the Arduino board and the vehicle's ignition system. It receives signals from the Arduino to either allow or prevent the engine from starting based on the alcohol concentration detected.

4. GPS Module

GPS Receiver (e.g., Neo-6M GPS Module): Provides real-time location data of the vehicle. The Arduino reads this data to track the vehicle's position continuously.

5. GSM Module

GSM Module (e.g., SIM900A): Facilitates communication by sending SMS alerts. When high alcohol levels are detected, the Arduino uses this module to send notifications to predefined contacts (e.g., family members, authorities).

6. Power Supply Unit

Battery/Power Supply: Supplies power to the Arduino board, sensors, GPS module, GSM module, and relay module. It ensures that the system operates reliably.

7. User Interface

LCD Display: Optional component to display real-time status messages, alcohol concentration levels, and system alerts.

Buzzer: Optional component to provide audible alerts when high alcohol levels are detected.

Working Principle

1. Initialization: Upon powering up, the Arduino initializes all the connected modules (MQ-3 sensor, GPS module, GSM module, and relay module).

2. Alcohol Detection:

The driver breathes into the MQ-3 sensor.

The sensor detects the alcohol concentration and sendsan analog signal to the Arduino.

The Arduino converts this analog signal into a digital value and compares it with the predefined threshold.

3. Engine Lock Control:

If the alcohol concentration exceeds the threshold, the Arduino triggers the relay module to cut off the engine ignition circuit, preventing the vehicle from starting.

If the alcohol concentration is below the threshold, the relay module allows the engine to start normally.

4. Location Tracking:

The GPS module continuously sends location data to the Arduino.

The Arduino can use this data to track the vehicle's position and store or send it as needed.

5. Communication:

When high alcohol levels are detected, the Arduino uses the GSM module to send SMS alerts to predefined contacts, including the vehicle's location data from the GPS module.

6. User Notifications:

The system can use an LCD display to show real-time information about the alcohol level and system status.

A buzzer can provide audible alerts to notify the driver of high alcohol levels.

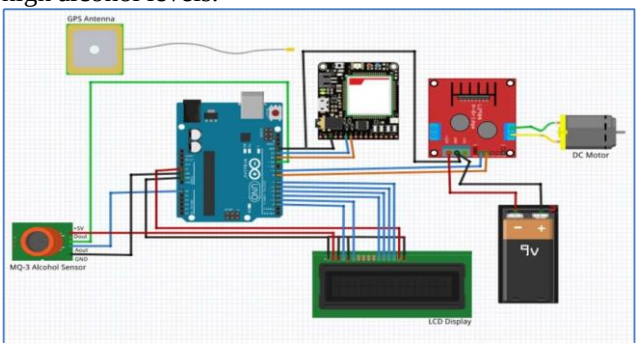

Fig. Circuit Diagram

4. Software & Hardware Requirement

1. Arduino Uno:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller, developed by

Arduino.cc. It features a range of digital and analog input/output (I/O) pins that can be connected to various expansion boards (shields) and other circuits. Specifically, the board includes 14 digital I/O pins (six of which can provide PWM output) and 6 analog I/O pins. Programmable using the Arduino IDE (Integrated Development Environment) via a type B USB cable, the Arduino Uno can be powered either through the USB connection or an external 9-volt battery, with an acceptable voltage range of 7 to 20 volts. Similar to the Arduino Nano and Leonardo, the Arduino Uno's hardware reference design is released under a Creative Commons Attribution Share-Alike 2.5 license, and the layout and production files for certain versions are available on the Arduino website.

2. GSM Module:

The GSM/GPRS module facilitates communication between a computer and a GSM-GPRS system. GSM, which stands for Global System for Mobile communication, is a widely adopted architecture for mobile communication across many countries. It provides the infrastructure for cellular networks and enables voice and data transmission for mobile devices.

3. GPS Module:

The Global Positioning System (GPS) is a vital technology used across industries, including transportation, logistics, and outdoor sports. The GPS module, an electronic device, communicates with GPS satellites to provide accurate geographical location data, enabling applications such as vehicle tracking, route optimization, and outdoor navigation.

4. MQ3 Sensor:

The Global Positioning System (GPS) has revolutionized various industries, including transportation, logistics, and outdoor sports. At the core of GPS technology is the GPS module, an electronic device that communicates with GPS satellites to deliver accurate geographical location data. This article aims to provide insights into GPS modules, their.

Operating within a network of orbiting satellites, GPS modules receive and process precise microwave signals to determine location coordinates. They play a crucial role in vehicle tracking, route optimization, outdoor navigation, and other location-based services across different sectors.

5. RGB LED:

A light-emitting diode (LED) is a semiconductor device that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.

6. Speaker/Sound:

A loudspeaker (commonly referred to as a speaker or speaker driver) is an electroacoustic transducer that is a device that converts an electrical audio signal into a corresponding sound. A speaker system, also often simply referred to as a "speaker" or "loudspeaker", comprises one or more such speaker drivers, an enclosure, and electrical connections possibly including a crossover network.

Software

The software components of the AI-based voice assistance system using ChatGPT and ESP32 boards are critical for enabling seamless interaction between the hardware peripherals and the AI models. These components encompass firmware development for the ESP32 boards, code implementation for interfacing with cloud-based APIs, and algorithms for voice and text processing. Below are the key software components involved

1. Arduino IDE:

The Arduino IDE is an open-source software application used to write and upload code to Arduino boards. It is compatible with various operating systems, including Windows, Mac OS X, and Linux. The IDE supports programming languages C and C++. The term IDE stands for Integrated Development Environment.

Arduino IDE Setup:

The IDE environment is mainly distributed intothree sections

1. Menu Bar
2. Text Editor
3. Output Pane

Conclusion

In a foregoing time, a person had control over their own information—personal documents of banking or business transactions existed on a sheet of paper that the person possessed in their file cabinets. The scribbles and intimate handwritten notations in one's diary would be safely tucked away under their pillow or buried in their nightstand. But with changing times a lot of our information is already on the web via all the social networking sites. With devices penetrating our lives, it is within our rights to stop more of our information going out there. In this study, we have seen that there is substantial unawareness about privacy settings about

their smart home IPAs. We also see that the participants are willing to alter their behavior upon being made aware. This work is the stepping stone towards coming up with design solutions that can go a long way in protecting private information.

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