

Node MCU Based Alcohol Sensing Engine Lock Using GPS & GSM

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ABSTRACT:

Road accidents caused by drunk driving remain one of the major threats to road safety. To address this issue, this project proposes a Node-MCU-based alcohol sensing and engine locking system integrated with GPS and GSM modules. The system employs an alcohol sensor to detect the presence of alcohol in the driver's breath. If alcohol concentration exceeds a predefined threshold, the Node-MCU disables the vehicle's ignition system through a relay/engine lock mechanism. Simultaneously, the system activates an alert via a buzzer and displays the status on an LCD. In addition, the GPS module provides real-time location data, while the GSM module transmits an alert message containing the driver's location to registered contacts or authorities. The system also integrates auxiliary components such as a power supply, push buttons, and a servo motor for enhanced control. This smart embedded solution ensures driver safety, prevents drunk driving, and enables quick emergency response through GPS and GSM communication.

Keywords: Node MCU, Alcohol sensor, Vibration sensor, Accelerometer sensor, DC Battery (5V), Servo motor, LCD display, GSM module, GPS module, Buzzer

INTRODUCTION:

According to a study published by the World Health Organization in 2008, drunk driving is responsible for about 50-60% of traffic accidents. Despite the fact that drinking and driving is strictly forbidden, most people disobey the law and drive after drinking alcohol, resulting in road accidents. This is dangerous for pedestrians and small cars, but the lush manages to flee the accident area without being caught. The aim of this project is to establish a method of preventing car accidents using an alcohol detector in order to minimize traffic accidents caused by drunk driving. The alcohol sensor is integrated with the Node-MCU ESP32 board as micro-controller in this project. The MQ-3 alcohol gas sensor was used in this project to detect the presence of alcohol in human breath. As a prototype, an ignition device that produces spark plugs is designed to serve as the ignition starter for the vehicle's engine. The ignition system will be breath. The primary goal of this project is to detect drunk driving. The internet of things (IOT) was added since technology in the world continues to advance and succeed. As a result, the IOT is used in this project to make it simple for people to detect their location and receive messages through their smartphones. There are three main objectives which is to design and improve a project of an Intelligent Alcohol Detection System that has been done by people in order to measure the road incidence. Other than that, to implement IOT in this project to make it simple for people to detect, monitor and track their location. Lastly, to

develop software in order to measure blood alcohol content in the drunk driver's breaths whether the BAC levels cross the threshold. This project has been done by many people but the information about the drunk drivers is not enough to be identified. Therefore, in this case we redesigned and improved a project of an intelligent alcohol detection system using IOT in order to control, detect, monitor and track drunk driving as much as possible. Otherwise, in case the drunk drivers are not in possession of their phone, the liquid crystal display (LCD) display could be useful for them. So, by adding an LCD display in this project, it will show all the sensed values towards the drunk driver's breath.

LITERATURE SURVEY:

This study uses artificial intelligence to achieve non-contact detection of drunk state from facial images. The proposed system utilizes a two-stage deep neural network, where the first stage uses the simplified VGG to determine the age range of the subject and the second stage uses the simplified Dense-Net to identify the facial features of drunk driving for alcohol test identification. In this paper, we presented EILEEN, a novel multi-modal NLP framework designed to extract detailed alcohol consumption patterns from unstructured clinical notes. By fine-tuning multilingual language models, EILEEN is capable of accurately identifying clinically significant alcohol consumption patterns of patients from bilingual clinical notes. This unique feature enables EILEEN to be particularly practical for medical institutions in non-English-speaking countries or those lacking extensive medical text-processing resources. This study aims to develop a system that prevents drunk driving by developing an IoT based system that can sense alcohol intoxication levels in a driver's breath. This research presents the design and implementation of an integrated safety system for vehicles aimed at enhancing road safety, deterring impaired driving, mitigating rash driving behaviors, and preventing vehicle theft. This paper presents a design and implementation of an alcohol detection and engine locking system using an MQ3 sensor and Arduino Uno. This project has used sense the consumption through sensing the gaseous material in the breath of the drivers. WHO targets to reduce alcohol consumption to at least 10% in each country and reduce the number of deaths caused by traffic accidents by as much as 50%. The first is to eliminate interference in the WiFi signals caused by the motions of a moving vehicle. This problem was solved with a series of signal processing algorithms. The second is determining which specific features of alcohol's side effects best reflect driving under the influence of alcohol. We have addressed this challenge with a C-Attention network. The results of extensive experiments confirm that *DetectDUI* provides highly accurate drunk driving detection and BAC prediction. It shows that the sensor can detect vapor-phase alcohol in perspiration from 0.09 ppm (equivalent to 0.09 mg/dL sweat alcohol concentration at 25 °C under Henry's Law equilibrium) to over 500 ppm at one-minute time resolution. Additionally, a digital sensor was employed to monitor the temperature and humidity levels inside the sensing chamber. Two male human subjects were recruited to conduct studies with alcohol consumption using calibrated prototype TAC sensors to validate the performance. Our preliminary data demonstrated that, under well-controlled conditions, this sensor can acquire TAC curves at low doses (1–2 standard drinks). Moreover, TAC data for different doses can be easily distinguished. The system was designed as an arcade game, with prototypes and a walk-through study conducted in the design process. The developed interactive system was evaluated by the usability test with participants. The results show that virtual reality is a successful interactive method, and it brings an immersive and impressive experience of drunk driving to users. The system can be further improved according to the evaluation. The system consists of three modules: anti-collision, anti-drunk driving and anti-fatigue driving: STM32 is used as the core to expand outward. The

HC-SR04 ultrasonic range finder is used to detect the distance from the front obstacle. The side-heated semiconductor alcohol gas sensor MQ-3 is used to detect the alcohol concentration in the air. Collect and process the facial information with the Raspberry Pi, and issue a prompt when the driving time reaches the upper limit for continuous driving. As a result, this system achieves the three major functions: anti-collision, anti-drunk driving and anti-fatigue driving.

METHODS

The Alcohol detection & engine locking system using Node-MCU is used to reduce the road accidents occurred due to the drunk & driving. In our project MQ3 Sensor senses the alcohol levels and sends to the Node-MCU board continuously. when the driver drunks above the threshold level then the information to the engine Buzzer sound. Person live The location alcohol sense sends the Node-MCU then be locked with the drunken will sends to the particular person who have the Our exp mobile application Using GPS and GSM module.

A. Sensor Selection and Deployment

The system uses a range of sensors to assess important variables. A MQ3 alcohol sensor can detect alcohol concentrations ranging from 25 ppm to 500 ppm. A vibration sensor with low-frequency mechanical faults (10-1000 Hz,mm/s) like imbalance and high-frequency bearing issues (500Hz-16kHz,g) checks vibration levels. The accelerometer sensor range is the maximum typically expressed in +/-g(e.g., +/-2g, +/-16g, +/-250g). These sensors are placed all over the project to monitor and sense.

B. Data Acquisition and Processing

An Arduino or Pic micro-controller is connected to each sensor, and it continuously collects data from each sensor node. Once this data has been accepted, the micro-controller compares the measurements to preset threshold values for each parameter in addition to search for issues.

C. Local Monitoring and Display

The real-time display of the collected and processed data on an LCD screen allows warehouse workers to rapidly monitor conditions. If any parameter passes safe limits, the system takes automatic action to prevent spoiling, such as activating ventilation or sounding alarms.

D. Control and Decision-Making

Ideal storage conditions are automatically maintained by the system. By reacting immediately to threshold breaches, the control approach ensures grain preservation without depend on external communication networks.

PROPOSED WORK

Here's a proposed system overview for a Node MCU-based Alcohol Sensing Engine Block System using GPS and GSM. This type of system is generally designed for smart vehicle safety, ensuring that a driver is sober before the engine starts and also alerting authorities or owners in case of alcohol detection. Node MCU is a micro-controller board that uses the ESP8266 chip, which is a Wi-Fi enabled system on a chip(SOC) and it controls the entire kit. The MQ3 alcohol sensor works on a semiconductor principle using a tin dioxide (SnO₂) sensing element, which has low conductivity in clean air. When alcohol vapors are present, they react with the (SnO₂), causing its conductivity to increase. which the sensor translates into a varying output voltage that can be read by a micro-controller. By adding extra two sensors those are vibration sensor and accelerometer sensor to prevent accident and death. A servo motor works on a closed-loop feedback system. When alcohol sensor sense the presence of alcohol automatically the servo

motor seized. LCD display is used to monitor real-time conditions. GSM module is used to send SMS to registered mobile number when alcohol detect as well as occur accident. GPS module is used to locate vehicles when accident occurs. A buzzer creates sound by converting electrical signals into sound waves through mechanical vibration, achieved either piezo-electrically or electromagnetically.

ADVANTAGES:

Reduces drunk driving accidents.

Sends real-time alerts.

Low-cost and efficient safety solution.

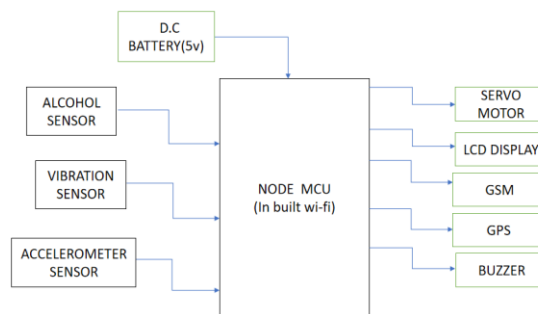


Fig. 1. Work Flow of the proposed system

System requirements

Hardware specifications

- *Node MCU*
- *Alcohol sensor*
- *Vibration sensor*
- *Accelerometer sensor*
- *DC Battery (5V)*
- *Servo motor*
- *LCD display*
- *GSM module*
- *GPS module -*
- *Buzzer*

Software Elements

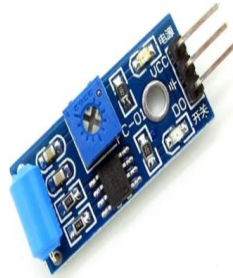
- *Arduino IDE*
- *Embedded C*

NODE-MCU



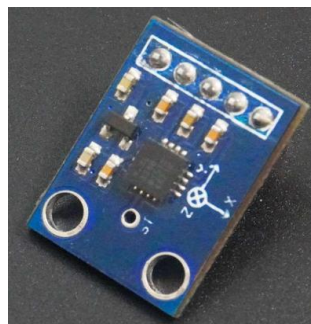
NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SOC from Reprive Systems, and hardware which is based on the ESP-12 module.

VIBRATION SENSOR



Vibration sensors are transducers that detect mechanical vibrations and convert them into measurable electrical signals. They are primarily used to quantify three fundamental physical quantities associated with vibration. The term vibration detectors typically refers to devices designed to identify the presence of vibration and often trigger alarms or signals when a certain threshold is exceeded. Unlike vibration sensors, which focus on precisely measuring the characteristics of vibration (like amplitude, frequency, and waveform), detectors' primary function is to sense a state change – from no vibration to vibration, or from normal vibration to excessive vibration.

ACCELEROMETER SENSOR



An accelerometer is a device that measures acceleration forces, such as gravity and motion, by converting them into electrical signals. These devices are used in various technologies, including smartphones for orientation detection and vehicles for stability control. Their ability to detect and measure changes in speed, direction, and tilt makes them essential in numerous applications. In this article, we will learn about the accelerometer, its working principle, types and applications.

DC BATTERY (5V)



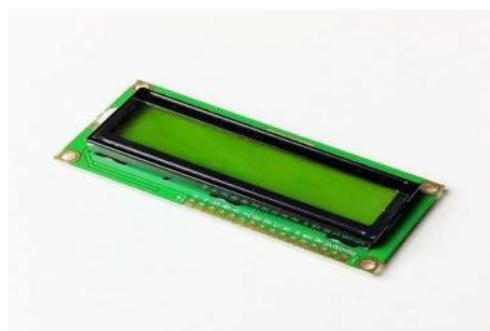
A 5V battery generates electricity through an internal chemical reaction. Take lithium-ion batteries, for example: lithium ions move between the positive and negative electrodes through an electrolyte, creating a flow of electric current. To deliver a steady 5V output, many 5V batteries come with a built-in voltage regulator (like a boost or buck converter). For instance, a common 18650 lithium-ion battery has a nominal voltage of 3.7V, so a boost circuit steps it up to 5V. On the flip side, some higher-voltage batteries need a buck converter to lower the voltage to a stable 5V. This regulation ensures your device gets consistent power, no matter the battery's charge level.

SERVO MOTOR



A servomechanism (servo) can refer to quite a few different machines that have been around longer than most may realize. Essentially, a servo is any motor-driven system with a feedback element built in. Servos are found everywhere from heavy machinery, to power steering in vehicles, to robotics and a wide variety of electronics.

LCD DISPLAY



Materials that combine the properties of crystals and liquids are used to create liquid crystal displays, or LCDs. Instead, the molecules are packed together in an ordered crystal form at their melting point temperature, which is almost as cellular as they are in a liquid. One of the two glass panels in the LCD display is liquid crystal sand. Transparent electrodes covering the inner surface of the glass plates create the patterns, symbols, or characters that will be shown. In order to give the liquid crystal inter molecular interactions a positive orientation perspective, polymer layers are deposited between the electrodes and the liquid crystal. Two glass panels have one polarizer adhered to their exteriors. Mild rays traveling through a certain perspective are deflected by these polarizers.

GSM MODULE



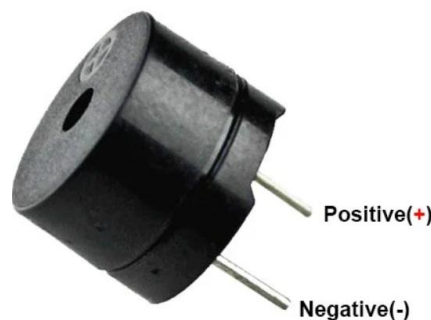
GSM or Global System for Mobile Communications is the most popular wireless cellular communication technique, used for public communication. The GSM standard was developed for setting protocols for second generation (2G) digital cellular networks. It initially started as a circuit switching network, but later packet switching was implemented after integration General Packet Radio Service (GPRS) technology as well. The widely-used GSM frequency bands are 900 MHz and 1800 MHz. In the Europe and Asia, the GSM operates in 900 to 1800 MHz frequency range, whereas in United States and other American countries, it operates in the 850 to 1900 MHz frequency range. It uses the digital air interface wherein the analog signals are converted to digital signals before transmission. The transmission speed is 270 Kbps.

GPS MODULE



A GPS (Global Positioning System) module is an electronic device that receives signals from GPS satellites and calculates its location on Earth. It provides latitude, longitude, and sometimes altitude coordinates that pinpoint the module's precise position. GPS modules are used in a wide variety of applications such as navigation, tracking, mapping, surveying, and timekeeping.

BUZZER



An audio signaling device like a beeper or buzzer symbol may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage, then produce sound and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren. The sound pressure level is a crucial parameter for the signal device. Piezo element material of metal plate can be brass, nickel alloy, or stainless steel. Metal plate can cause different piezoelectric effect.

LANGUAGE OF PROGRAMMING: EMBEDDED C

An extension of the C programming language, embedded C is used to program micro-controllers. Features that set the Embedded C language apart from conventional C programming include accessing address spaces, fixed-point arithmetic operations, and I/O Hardware Addressing. One programming language used in the creation of embedded systems is called Embedded C. Specialized systems created to carry out extremely particular tasks or functions are known as embedded systems. An embedded system is made up of both hardware and software, with the software—often referred to as firmware—being integrated into the hardware of the system. Numerous microprocessors and micro-controllers can be programmed using embedded C. Compared to high-level languages like assembly programming language, embedded C uses fewer resources to run. There are a few more data types and keywords in embedded C. Special function registers in memory are addressed by a few special data types in Embedded C, such as bits and sfr. Working with hardware, such as sensors and input-output devices, is made possible by embedded C. The embedded C program can be compiled using a variety of embedded C compilers, including Keil Compiler, SPJ Compiler, Embedded GNU C Compiler, and others. Small-scale, medium-scale, and sophisticated embedded systems are the different categories of embedded systems. Embedded C is used to program the gadgets we use on a daily basis, such as air conditioners, printers, and cell phones.

ARDUINO'S PROGRAMMING CONCEPT

Compared to conventional desktop computers, Arduino provides a more direct interface with the physical world and is a platform for building physical computing devices. Built around a micro controller, this easy-to-use single-board system comes with an integrated software development environment. Arduino makes it possible to create interactive objects that can react to inputs from switches or sensors and control a variety of physical outputs, including lights and motors. Arduino projects can work alone or in conjunction with computer software. The boards can be bought pre-assembled or assembled by hand, and the open-source design is freely downloadable. Drawing inspiration from the Processing Multimedia Framework, the Arduino programming language is an implementation of Wiring, a similar physical computing platform.

CONCLUSION:

In conclusion, an alcohol detection with engine locking system using GPS and GSM module is a highly effective and affordable solution for preventing drunk driving and improving road safety. By accurately detecting the presence of alcohol in a driver's breath and locking the engine and intimate through SMS if necessary, the system helps reduce the risk of accidents caused by impaired driving. The GPS module also provides real-time location tracking, allowing vehicle owners and fleet managers to monitor the location and route of vehicles in real-time, which helps improve fleet management and ensure that

vehicles are being used in accordance with company policies. Additionally, the system can be easily installed in most vehicles and has a wide range of applications in different sectors companies

RESULTS

The system successfully detected alcohol levels and controlled the vehicle ignition accordingly. When alcohol was below the threshold, the vehicle operated normally; when exceeded, the engine was immediately locked. The buzzer and LCD provided clear alerts to the user. The GPS module accurately provided location data, and the GSM module reliably sent alert messages with location details to registered contacts. All components worked together efficiently with quick response time. Overall, the system proved to be reliable and effective in preventing drunk driving and enabling real-time tracking and emergency alerts.

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