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INTEGRATED VEHICLE MONITORING AND CONTROL SYSTEM WITH REMOTE INTERACTION

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Abstract

This abstract presents two innovative vehicular safety solutions. Firstly, an anti-theft tracking system utilizing IoT technology is proposed, tending to the rising worry of vehicle theft by providing real-time tracking and monitoring capabilities. Upon vehicle theft, a GSM module sends GPS-determined area information to the owner's cell phone using an Android application, offering quick following and recuperation help. Furthermore, an alcohol detection system is presented to battle intoxicated driving, coordinating a liquor sensor with an Arduino board and LCD show. After recognizing alcohol in the driver's breath, the system automatically immobilizes the vehicle's engine, hence preventing accidents. The system's utilization of an MQ3 module ensures reliable alcohol identification with a responsiveness range suitable for different vehicle types, improving overall road safety.
Keywords – Vehicular Safety, Alcohol detection system, Road safety

INTRODUCTION

As the number of metropolitan vehicles develops quickly with the economy's advancement, individuals are getting more concerned about vehicle theft prevention, which creates broader market prospects for vehicle anti-theft.

Various vehicle anti-theft devices have been developed lately; notwithstanding, the outcome is yet frustrating since all kinds of devices have their disadvantages. Homegrown and abroad vehicles against theft items are innovatively characterized into three classes: mechanical lock devices, vehicle alert frameworks, and vehicle following/recuperation systems, mainly focusing on preventing cars from being broken in and driven away. The most utilized mechanical lock gadget is the directing wheel lock, which is moderately modest but badly arranged to utilize and might be effortlessly incapacitated by talented criminals. Vehicle alert gadgets are extremely well-known nowadays. However, insights show that 96% of the general population don't know when they hear a caution considering the constant false alerts which additionally upset the existence of occupants around. These alert frameworks don't cover huge regions; the region is simply less than 100m. When the vehicle is taken, the proprietor and the police can't follow its place. The ongoing situation shows that most car crashes are brought about by intoxicated driving.

The indivisible propensity for drinking liquor and afterward driving a vehicle is a serious offense according to regulation. The issue is likewise a serious general well-being concern and could turn into a main pressing issue before very long. The arrangement developed targets to lower the risk of driving and reduce the misfortune on the road in the coming days due to drunken drivers. The work done in this space utilizes various utilizations of electronic sensors and microcontrollers. This examination manages the improvement of a liquor sensor that actions change in liquor particles present in the air. This sort of identifier is known as a breath analyzer, as it is accustomed to finding the examination of the liquor content present in human relaxation. This item contains a finder, microcontroller, and other electronic parts that distinguish the presence of liquor in the environmental factors and quickly block the fuel and stop the motor. This movement is a course of action to guarantee travelers' well-being as it doesn't permit plastered drivers to keep their motors running.

LITERATURE SURVEY

The project has advanced a method that uses GPS and GSM to detect alcohol. This procedure is very costly, yet the costs can be sliced off to an incredible extent. In this project, an alarm is being utilized which is exceptionally affordable and can keep individuals in closeness vigilant. Wearing a brilliant head protector to forestall any disaster is proposed by essayists which has specific lacks [1]. First limitations on the utilization of caps to just 2-wheelers. Second, mega computers based on software are microcontrollers. framework in contrast with the practical alarms that are open-source equipment. [2] Worrying about the tanked driving the Venture recommends the framework to defeat the issue yet utilizing the mQ2 liquor sensor has come blazes. The MQ2 liquor sensor isn't valid and raises the opportunity for deception while we have utilized MQ3 which is exceptionally authentic. [3]. To adapt to cap carelessness and liquor location synchronously the essayist proposed a system, that makes extensive use of P89V57RD2, which makes it profoundly costly additionally this framework must be furnished with 2 wheelers Whereas Arduino Uno microcontroller is conservative also as it can be furnished with any class of vehicle making it more bona fide and successful.

The integration of technology into vehicles for security and well-being purposes has acquired huge consideration lately. [4] One basic region is the advancement of frameworks that can distinguish and forestall vehicle robbery and guarantee the well-being of drivers and travelers. Furthermore, with the rising worries over plastered driving, there is a developing interest in alcohol recognition systems incorporated into vehicles [5]. This writing study expects to investigate existing exploration and innovations connected with vehicle burglary counteraction and liquor location frameworks, giving experiences and headings to a task considering these ideas.

[6] The various approaches and technologies utilized in the creation of alcohol detection and vehicle theft prevention systems are highlighted in the literature review. [7] While huge headway has been made, there are still difficulties to beat regarding reconciliation, protection, and certifiable adequacy. Future exploration ought to zero in on addressing these difficulties to foster more vigorous and dependable frameworks for improving vehicle security and well-being.

1. PROPOSED SYSTEM

The proposed system watches out for a comprehensive response for recognizing alcohol impedance and hindering vehicle burglary, accordingly overhauling road prosperity, and shielding vehicle owner's assets. Its blend of state-of-the-art advancements and keen computations ensures action while offering straightforward connection points and movable features. The system is perfectly organized with the vehicle's control structures, allowing it to connect with the engine turnover and other central parts. This joining ensures a short response to perceived alcohol levels or robbery attempts.

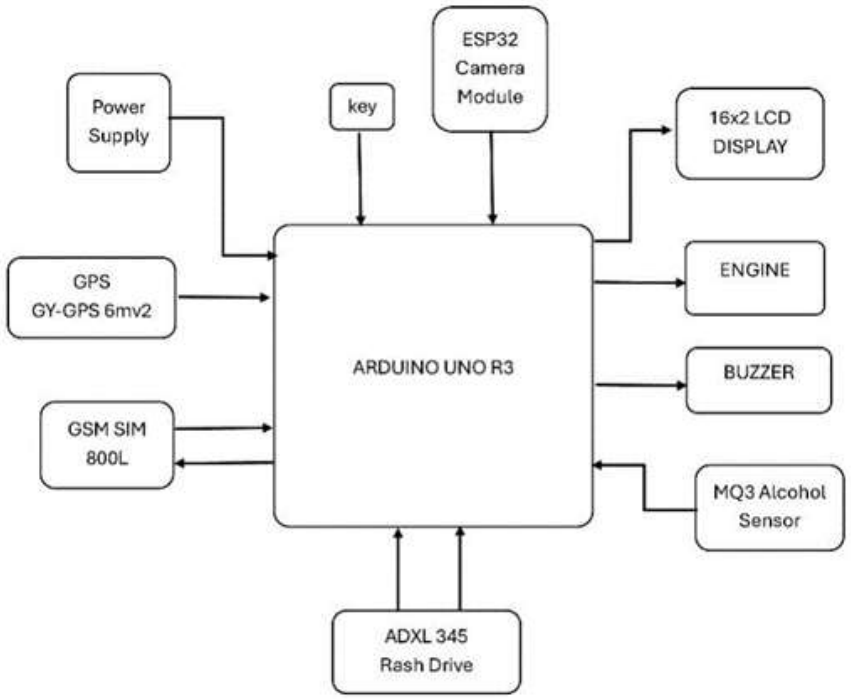

Fig 1: Overall system structure diagram

This is expected with the MQ3 alcohol sensor which is managed by an Arduino Uno. The MQ3 sensor is used to estimate the liquor level of a driver [1]. The power supply is given to Arduino Uno and the 5V supply is given to the MQ3 sensor from Arduino. The sensor MQ3 will pass the data of liquor focus to the Arduino Uno. In Alcohol detection system detects the substance of alcohol in the breath and subsequently, it endeavors to cinch down on alcoholics. This system utilizes Arduino, LCD, MQ-3gas sensor, GPS module, and GSM module. The alcohol content directly correlates with the sensor's output. consumed. They have utilized an old plan which isn't valuable and builds the general expense of the framework which makes it costly and to some degree exorbitant to specific fragments thus, its application extension is restricted. Subsequently, our system is more financially savvy and can be handily managed

Arduino UNO R3

Arduino can be utilized to foster independent intelligent articles or can be associated with programming on your PC (e.g. Flash, Processing, MaxMSP). The open-source IDE can be downloaded for nothing (presently for Macintosh operating system X, Windows, and Linux).
The Arduino Uno R3 is usually utilized for prototyping projects, establishing intuitive articles or conditions, and learning because of its convenience and enormous local area support. It tends to be modified utilizing the Arduino Incorporated Advancement Climate (IDE), which improves on the most common way of composing and transferring code to the board. Moreover, it upholds many libraries and safeguards, making it profoundly flexible for different applications.

Fig 2: Arduino Uno R3

Power Supply

A power supply is a gadget that changes one voltage completely to one more helpful voltage.
while delivering power. Power supplies are planned from the result back to the info.

GPS GY-GPS 6mv2

The GY-GPS 6MV2 is a GPS (Worldwide Situating Framework) module and is utilized for route. The module essentially looks at its location on the earth and gives yield information which is the longitude and latitude of its position. It is from a group of independent GPS receivers including the high-performance U-blox 6 positioning engines.

Fig 3: GPS GY-GPS 6mv2

GSM SIM 800L

SIM 800L CHIP is a complete Quad-band GSM/GPRS arrangement in an SMT type, which can be implanted in client applications. These modules are sub-frameworks of the Web of Everything equipment. SIM800L upholds Quad-band 850/900/1800/1900MHz, it can communicate Voice, SMS, and information data with low power utilization.

Fig 4: GSM SIM 800L

ADXL 345

The ADXL345 is a complete 3-axis acceleration measurement system with a selectable measurement range of ±2 g, ±4 g, ±8 g, or ±16 g. It estimates both unique speed increases. coming about because of movement or shock and static speed increases, for example, gravity, which permits the gadget to be utilized as a slant sensor. The ADXL335 is a small, thin, power-complete 3-axis accel-ergometer with signal-conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g.

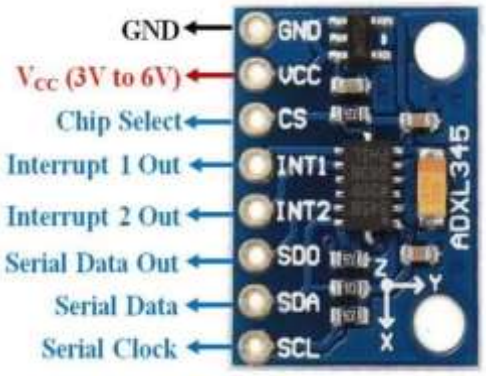

Fig 5: ADXL 345

16X2 LCD Display

The LCD shows real-time status updates about different vehicle parameters such as engine temperature, fuel level, battery voltage, tire pressure, etc. This allows the operator to monitor the condition of the vehicle at a glance.

As the vehicle is equipped with GPS navigation, the LCD can display maps, directions, and routing information to assist the operator in navigating to their destination.

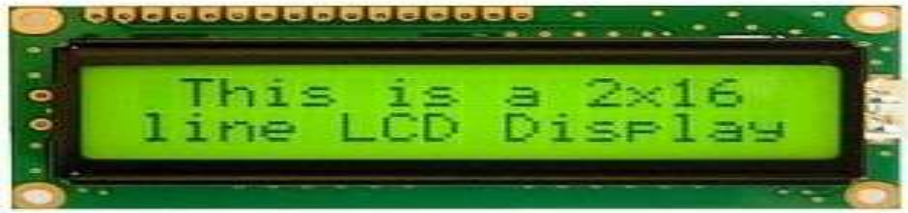

Fig 6: 16X2 LCD Display

MQ3 Alcohol Sensor

Fig 7:MQ3 Alcohol Sensor

MQ3 Alcohol Gas Sensor dentifies the convergences of liquor gas in the air and results in its perusing as a simple voltage. The sensor can gauge groupings of 0.04 mg/L to 4mg/L. The focus detecting range is reasonable for breathalyzers. This module is made utilizing Alcohol Gas Sensor MQ3. It is a low-cost semiconductor sensor that can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L.

The sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air. The MQ3 alcohol sensor operates at 5V DC and consumes around 800mW. It can detect alcohol concentrations ranging from 25 to 500 parts per million (ppm).

It is sorted out in such a design to give high affectability to alcohol and low affectability to Benzene. It has a prompt drive circuit to give an energetic response, quality, and longer lifetime It has a reasonable point of interaction type. On the sensor, port pins 1, 2, 3, and 4 watch out for the yield, GND, and VCC on their own.

1.1. Camera Module

Fig8: ESP32 Camera Module

The camera module is a product used to take photos and videos from mobile devices, such as smartphones, automobiles, and smart home appliances. In all areas, an elevated degree of innovation is required that requires high goals, scaling down, thinning, low power, and high firmness. A contingent access module (CAM) is an electronic gadget, as a rule consolidating an opening for a savvy card, which prepares an incorporated computerized television or set-top box with the fitting equipment office to see restrictive access content that has been encoded utilizing a contingent access framework. Camera Reduced Module (CCM) is a significant electronic gadget for picture catching. To put it plainly, a device changes the optical sign of an article into a computerized signal that can be perused and put away. It is fundamentally made from

a focal point, picture sensor, VCM engine/base, IR channel, circuit board, and different parts.

ENGINE

An engine is a machine that converts energy from a fuel to some mechanical energy creating motion in the process. Engines - such as the ones used to run vehicles - can run on a variety of different fuels, most notably gasoline and diesel in the case of cars. The Engine is a mechanism which is designed to convert one form of energy into another form of Energy to operate the vehicle (give thrust).

Engines are majorly classified into Two types; they are

- INTERNAL COMBUSTION
- ENGINE & EXTERNAL COMBUSTION ENGINE

3.10 ALARAM

Fig9: Buzzer

An alarm clock or alarm is a clock that is designed to alert an individual or group of people at specified time. The primary function of these clocks is to awaken people from their night's sleep or short naps; they can sometimes be used for other reminders as well. Most alarm clocks make sounds; some make light or vibration. Some have sensors to identify when a person is in a light stage of sleep, to avoid waking someone who is deeply asleep, which causes tiredness, even if the person has had adequate sleep. To turn off the sound or light, a button or handle on the clock is pressed; most clocks automatically turn off the alarm if left unattended long enough.

Software Implementation of the project

4.1 Arduino IDE

Arduino projects are managed centrally using the free and open-source Arduino IDE software. It offers an intuitive environment in which you may create sketches, or code, and upload them to your Arduino board.

Compose the Code: With the integrated code editor in the IDE, you can create sketches in the more straightforward C/C++ language. You are helped by features like code completion and syntax highlighting.

Compilation: The IDE compiles your code after it has been written. This converts your machine code, which can be understood by the Arduino board's microcontroller, into human-readable code.

Upload to Board: The compiled code is sent to the memory of your Arduino board using the upload function. Now that the code has been uploaded, the board may control any attached electronics by carrying out the commands in your sketch.

Benefits of Arduino IDE:

Suitable for Novices: Because of its user-friendly design, the UI is ideal for individuals who are new to coding. Work on your work offline, even while you're not connected to the internet.

Broad Board Compatibility: Works with a large variety of Arduino and related boards.

Active Community: You can get helpful information and solutions to your queries in an encouraging online community.

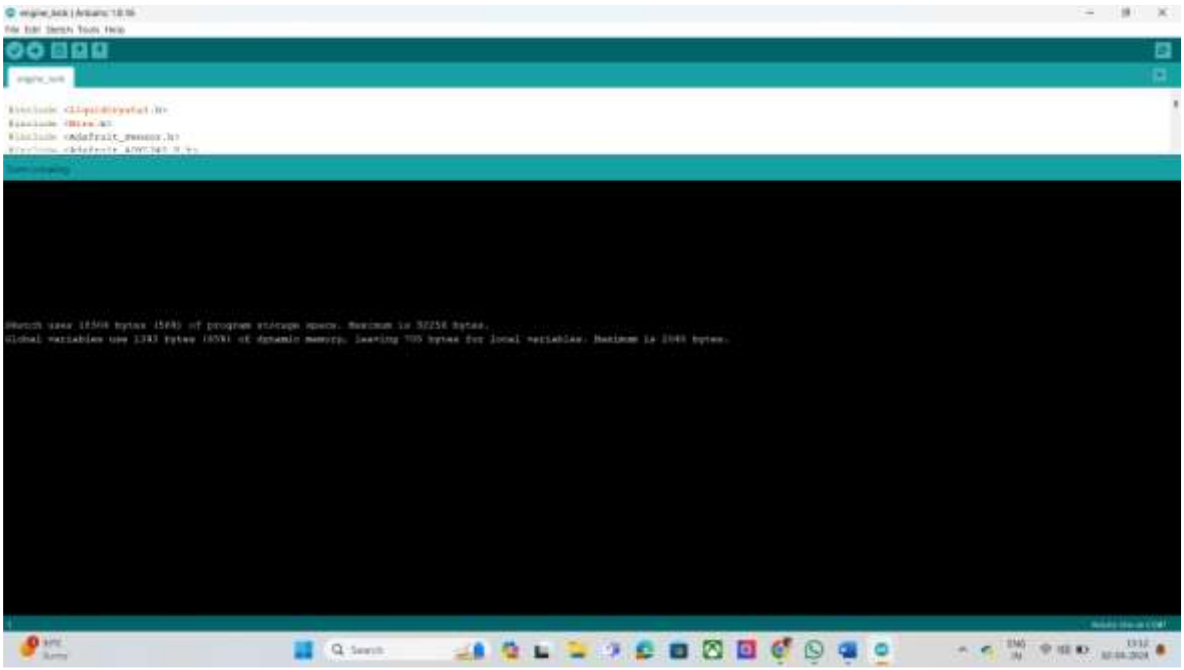

Fig 12 : Done Compiling and Uploading code to Arduino Board

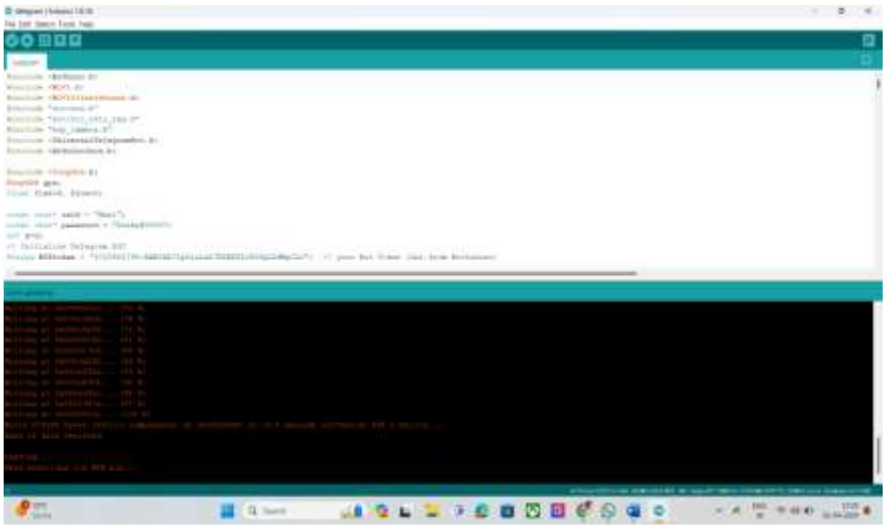

Fig 13 : Done Compiling and Uploading code to ESP32 CAM Board

5.WORKING

Arduino Part

- **Initialization**
- Libraries such as Liquid Crystal, Wire, Adafruit ADXL345, Software Serial, and Tiny GPS are included.
- Pins for components like LCD, motor, buzzer, sensors, and serial communication are set up.
- **Setup:**
- Serial communication is initialized for both hardware and software serial ports.
- Pins and components are initialized.
- A welcome message is displayed on the LCD.
- The system waits for specific conditions (button press and GPS signal) to start the vehicle.
- Upon starting, it sends an SMS and a serial message with the vehicle's location.
- **Loop:**
- Continuously reads data from the GPS module to update latitude and longitude.
- Checks for incoming commands via software serial communication.
- Controls the motor based on received commands ('$' for locking and '%' for unlocking).
- Monitors accelerometer data for accidents or abnormal vehicle movement.
- Sends SMS alerts and serial messages in case of an accident or detection of alcohol consumption by the driver.
- **5.2 ESP32-CAM Part**
- **Initialization:**
- Sets up libraries and pins for controlling the ESP32-CAM module and interacting with the Telegram Bot API.
- **Setup:**
- Serial communication is initialized for debugging.
- Pins for LED flash, button, and door lock are configured.
- The camera module is initialized.
- Connection to the specified Wi-Fi network is established.

Loop:

- Reads incoming serial data from the Arduino to receive commands.
- Handles various commands received via the Telegram Bot API, such as taking a photo, toggling the flash LED, locking/unlocking the door, and sending notifications.
- Periodically checks for new messages from the Telegram Bot API and processes them accordingly.
- Sends photos to specified Telegram chat ID upon request or based on certain conditions.

In summary, the project integrates hardware components, software functionalities, and network communication to provide comprehensive vehicle monitoring, control, and remote interaction capabilities, with the Arduino managing vehicle functions and the ESP32-CAM handling photo capture and Telegram Bot API interactions.

6.EXPECTED RESULTS

6.1Obtained Results

Fig 14: Sensors and ESP32 CAM interfaced with the Arduino

Fig 15: Displayed values on LCD

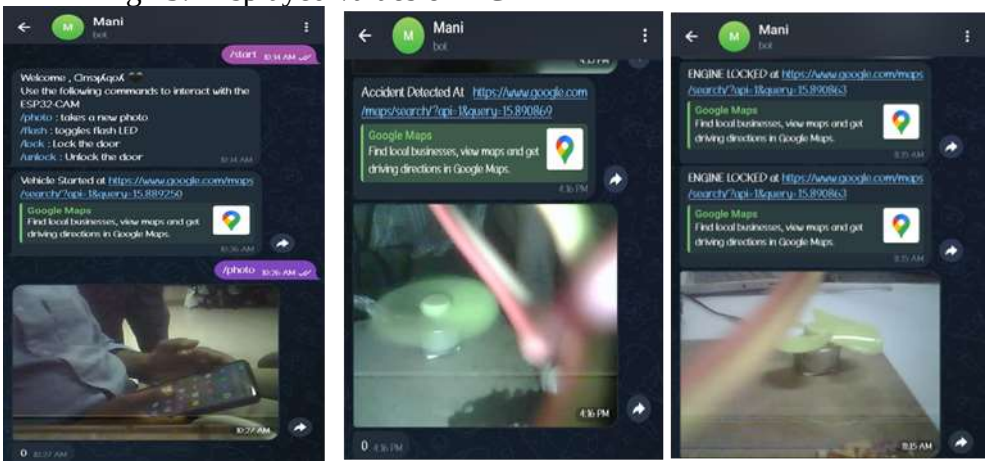

Fig 16 Messages in the telegram bot

7.CONCLUSION

In conclusion, the implementation of this system has the potential to significantly reduce the risks associated with impaired driving and unauthorized vehicle access. By preventing the engine from starting if the driver is under the influence of alcohol or if a theft attempt is detected, the system acts as a proactive deterrent and safeguard for both drivers and vehicle owners.

Furthermore, the user-friendly interfaces, customizable settings, and real-time alerts enhance the system's usability and effectiveness. It empowers vehicle owners with greater control over their vehicles' security while providing peace of mind knowing that their assets are protected.

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