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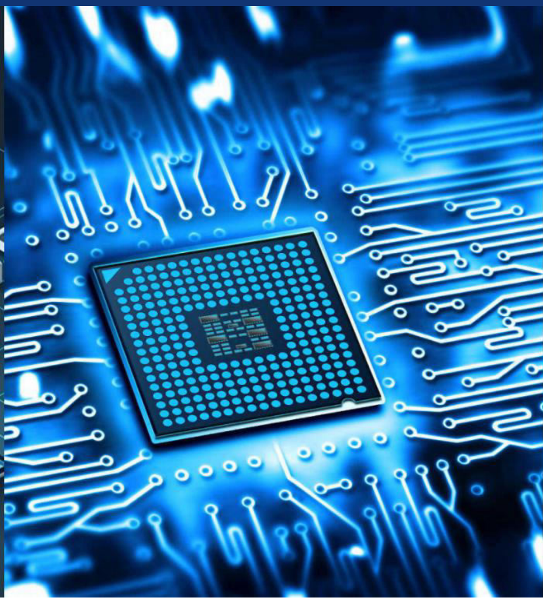


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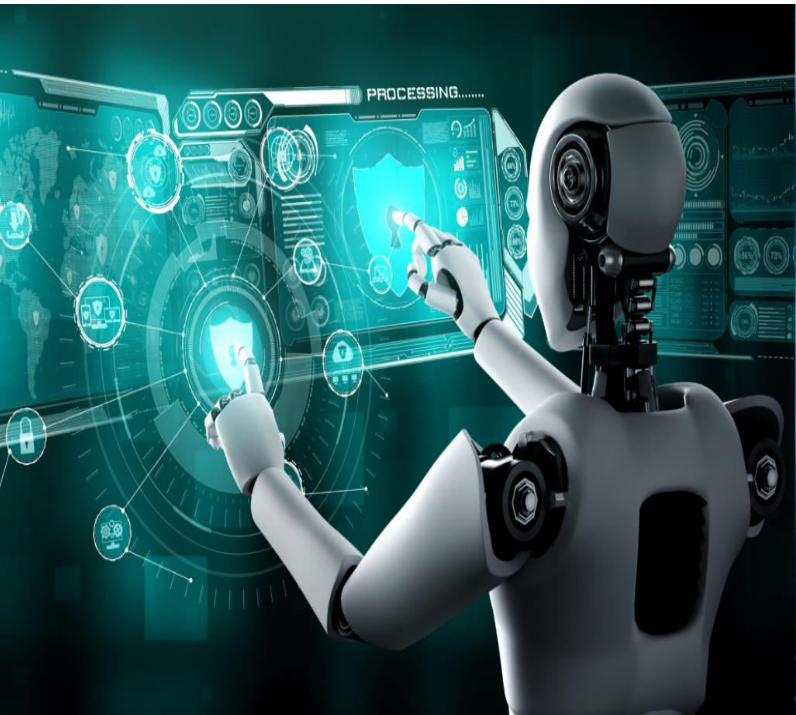

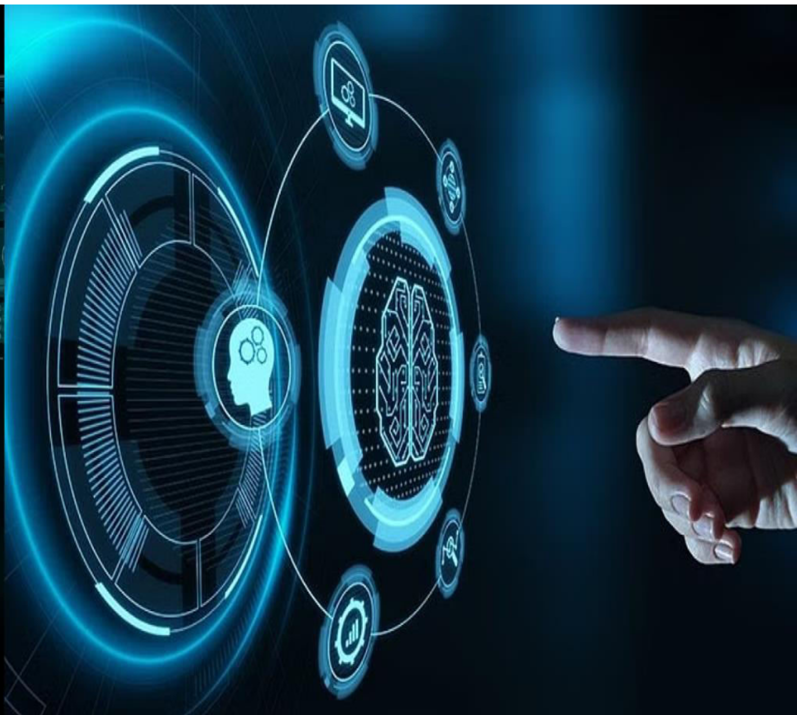

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Alcohol Sensing Alert with Engine Lock Feature

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ABSTRACT: Driving under the influence of alcohol is a significant cause of road accidents, leading to loss of life and property. This project presents an innovative system designed to mitigate such incidents by continuously monitoring the driver's breath for alcohol. The system employs an alcohol sensor strategically placed on the steering wheel or in proximity to the driver's breathing zone. If alcohol is detected in the driver's breath either during engine ignition or while driving, the system takes immediate action. At engine startup, if alcohol presence is detected, the system prevents the engine from starting. If the driver consumes alcohol while driving, the system detects it and halts the engine, allowing the vehicle to be safely steered to the roadside. The core components of this system include an AVR family microcontroller, an alcohol sensor, an LCD display, and a DC motor to simulate engine functionality. The alcohol sensor continuously relays breath data to the microcontroller, which processes the signals to take appropriate actions. Detected alcohol presence triggers a notification on the LCD and disables the motor to simulate engine locking. A push button is used to initiate engine startup. This project demonstrates a cost-effective and practical solution to reduce drink-and-drive incidents, thereby enhancing road safety.

KEYWORDS: Alcohol Detection System, Automotive Safety Technologies, Breath Alcohol Concentration, Drunk Driving Prevention, Engine Locking Mechanism, Real Time Monitoring, IoT based Vehicle Security, Anti Drunk Driving Solution

I. INTRODUCTION

The primary goal of this system is to prevent intoxicated individuals from operating vehicles, thereby reducing the likelihood of accidents. The system works by continuously monitoring the driver's breath for the presence of alcohol using an alcohol sensor. The sensor is strategically placed near the driver, such as on the steering wheel, to enable consistent breath detection. This project uses an AVR family microcontroller, an MQ-3 alcohol sensor, an LCD display for real-time notifications, and a DC motor to simulate engine functionality. A push button is employed to start the vehicle, making the prototype user-friendly. This system serves as a cost-effective and practical solution to minimize drink-and-drive incidents. By incorporating real-time alcohol detection and automatic engine locking, it enhances road safety and protects lives, aligning with the global mission to reduce road traffic accidents.

II. RELATED WORK

Over the years, there has been an evolution of various techniques of guiding visually impaired persons, thus, toward attaining their self-independent by freely moving around their environment without guidance from others; some of these are:

Breath Alcohol Detection Using a Metal Oxide Semiconductor Sensor (2010): Metal Oxide Semiconductor (MOS) sensors work by detecting the changes in resistance that occur when alcohol vapors come into contact with the semiconductor material. These sensors are used in portable breath alcohol testers due to their sensitivity to ethanol. The MOS sensor technology has been applied in breathalyzers for field use, providing a quick and effective means of alcohol detection by measuring the presence of alcohol in exhaled air.

Alcohol Detection Using Infrared Spectroscopy (2012): Infrared (IR) spectroscopy works by analyzing the absorption of specific wavelengths of infrared light, which is characteristic of different molecules. Alcohol molecules absorb infrared light at specific wavelengths, allowing for their detection in breath samples. This technology has been

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explored as a more precise method for alcohol detection, providing high accuracy. However, its application has generally been limited to more stationary setups, as the required equipment is often bulky and expensive.

Development of a Breathalyzer Based on Solid-State Gas Sensors" (2014): Solid-state sensors detect alcohol in breath by measuring changes in electrical resistance when alcohol interacts with a sensing material. These sensors are smaller, more cost-effective, and more durable than traditional gas sensors. They offer a portable and low-cost alternative to older breathalyzer technologies. Solid-state sensors have been integrated into various handheld devices for alcohol detection, enabling them to be widely used in personal androadside alcohol testing.

III. SYSTEM IMPLEMENTATION

A. Hardware Requirements:

ATmega 328 P Microcontroller–

The high performance Microchip 8-bit AVR RISC-based microcontroller unites 32KB ISP flash memory with read while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three adjustable timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire sequential interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes.

Fig1:ATmega Microcontroller

MQ3 Sensor–

The **MQ-3 sensor** is a popular gas sensor primarily used for detecting alcohol (ethanol) vapors in the air. It is part of a family of sensors designed for air quality monitoring and is widely used in applications such as breathalyzers and gas leakage detectors. The MQ-3 sensor is a widely used, cost-effective gas sensor primarily designed for detecting alcohol vapors. It operates on the principle of changing resistance in the presence of ethanol and is used in applications like breathalyzers and air quality monitoring.

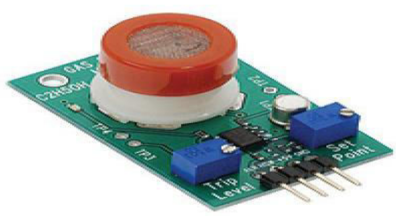

Fig2: Ultrasonic Sensor

Piezo Buzzer–

The piezo buzzer is an electronic device which generates sound through it. The buzzer is used as an indication to the user. It is used in the car reversing system and braking system as an indication. It is based on the principle of piezoelectricity discovered in 1880.

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Fig3: Buzzer

DC Motor–

There are two basic types of vibration motor. An eccentric rotating mass vibration motor (ERM) uses a small unbalanced mass on a DC motor, when it rotates it creates a force that translates to vibrations. A linear resonant actuator (LRA) contains a small internal mass attached to a spring, which creates a force when driven.

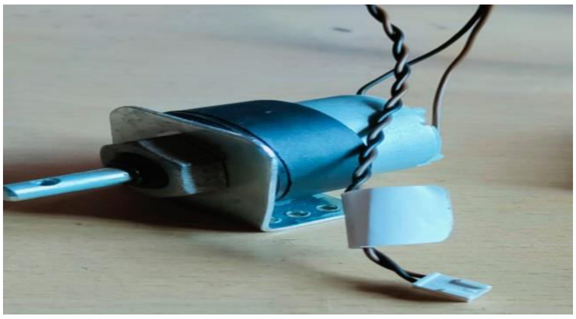

Fig4: DC Motor

Crystal Oscillator–

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency.

Fig5: Crystal Oscillator

B. Software Requirements:

The project requires an operating system compatible with Windows 7/8/9/10/11. The coding language utilized is Embedded C++, which is commonly used in embedded systems programming. The Integrated Development Environment (IDE) chosen for programming and development tasks is Arduino IDE, known for its user-friendly interface and compatibility with various microcontrollers. These software requirements are crucial for the successful implementation and functioning of the smart assistance system for visually impaired individuals.

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The implementation process involves several steps:

a) Hardware Selection and Integration: For the alcohol detection system with engine lock, use a compact MQ-3 alcohol sensor integrated with an Arduino or ESP32 microcontroller. Control the engine lock with a servo motor or solenoid, using a relay for current management. Ensure the system is lightweight, power-efficient, and housed in a durable, waterproof enclosure for protection and user comfort.
b) Software Development: Develop firmware for sensor data management and communication. Implement algorithms for alcohol detection.
c) User Testing and Feedback: Conduct usability testing with alcohol drunk drivers to assess functionality and accessibility. Gather feedback to refine hardware and software components.
d) Documentation and Deployment: Document system architecture, hardware setup, software implementation, and user interface. Prepare user manuals and instructional materials for effective device operation. Deploy the alcohol detection system to vehicles and provide training and support.
e) Monitoring and Maintenance: Establish monitoring mechanisms for device performance and connectivity.

- Provide ongoing maintenance, updates, and technical support. Continuously optimize the system based on feedback and evolving needs.

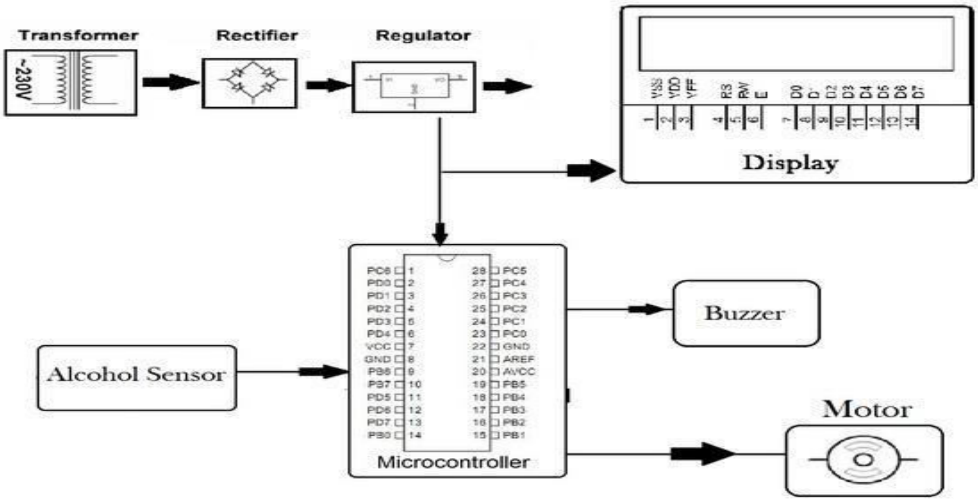

Fig6: Block Diagram

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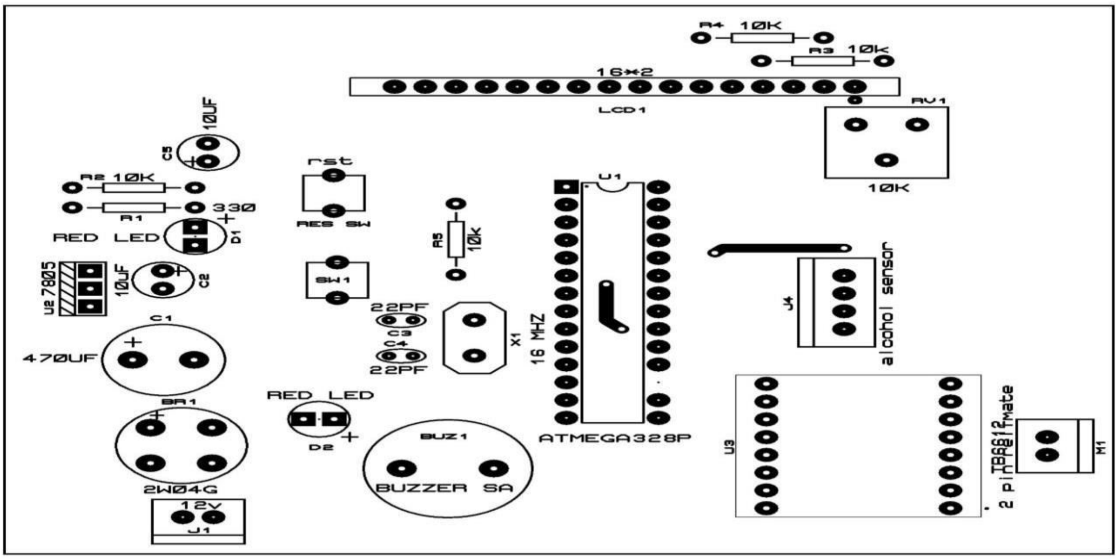

Fig7: Circuit Layout

IV.RESULTS

The alcohol sensing alert with system lock feature successfully integrates alcohol detection with vehicle security. When the alcohol sensor detects a certain threshold of alcohol in the driver's breath, it triggers the alert system and activates the engine lock mechanism. The system ensures that the vehicle cannot start if the alcohol concentration is above the safe limit, enhancing road safety. The integration of a buzzer or visual indicator alerts the driver, while a servo motor or solenoid locks the ignition system, effectively preventing operation under unsafe conditions. This system provides an additional layer of security, reducing the risk of accidents caused by impaired driving.

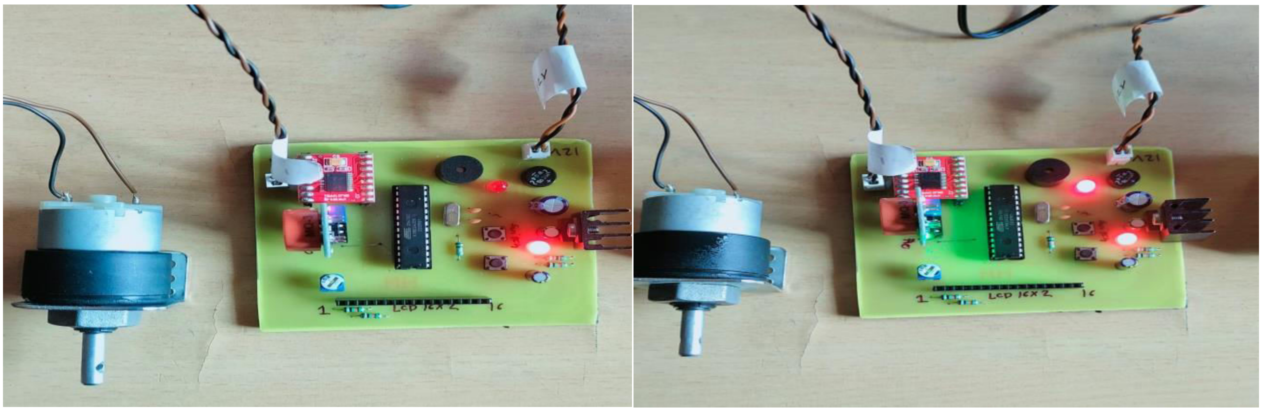

Fig8&9: Working of Glove

A key part of this evaluation is the classification report. Classification report is performance measure which handles metrics like precision, recall, F1-score, and accuracy. Precision tells us how often the signatures identified as genuine are actually authentic. Recall, on the other hand, measures how well the model catches all the genuine signatures. The F1-score balances these two metrics, making it especially handy when dealing with imbalanced datasets. Accuracy, as the name suggests, gives a straightforward percentage of how often the model gets things right overall.

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V. CONCLUSION AND FUTURE WORK

The alcohol sensing alert with engine locking feature provides a simple and effective solution to enhance road safety by preventing impaired driving. The system detects alcohol concentration in the driver's breath and, if it exceeds a safe threshold, triggers an alert and locks the engine to prevent the vehicle from starting. It is cost-efficient, portable, and easy to use. Future work could focus on improving sensor accuracy, miniaturizing the design, and adding advanced feedback options like mobile notifications. Additionally, optimizing battery life and incorporating wireless communication features for remote monitoring could further enhance the system's functionality and user experience.

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