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ALCOHOL DETECTION USING SMART HELMET SYSTEM

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Abstract: Drink and drive detection is in interest since it has potential to save accidents whose main cause is over drinking of alcohol. Much research is currently being undertaken to develop detection technique of alcohol limit which cause unconsciousness and the human will not in able to work, walk and understand things properly. The research is primarily achieved by utilizing the significant of electronics and automobile parts, components and concept. A variety of devices exists including: different MQ series sensors, face expression reading devices etc. Among these, the MQ-3 Sensor has shown potential within the field of Electronics, which detect the concentration of alcohol in human beings. Aspects related to the long-term environmental impact of drink and drive detection technology are taken carefully and are considered carefully. This study is aimed to promoting the understanding and commercial investigation of the detection technique effect in the field of safety precautions.

This paper presents a device and system commonly known as alcohol sensor device which is used to detect the concentration of alcohol in human. This device detects the alcohol level concentration and if the alcohol concentration is above specific concentration level then the ignition system of automobile is stopped i.e. the automobile will not start.by the use of above device we can save the accidents which cause due to the drink and drive.

As we know drunk driving is a very dangerous behavior. People will become slow In reacting and can't control their actions. Drunk drivers are not able to deal with the emergency situations when they are driving. The investigation done by the World Health Organization in 2008 shows that about 50%-60% of traffic accidents are related to drunk driving. The drunk drving has been listed as the main for the fatal car accident.

Index Terms - **Alcohol Detector, Alcohol Sensor; LCD: MQ3**

I. INTRODUCTION

Drunk driving is a significant problem in modern society, causing countless injuries and fatalities every year. According to the National Highway Traffic Safety Administration (NHTSA), drunk driving accounted for 28% of all traffic fatalities in the United States in 2019. In response to this problem, many efforts have been made to develop innovative technologies that can help prevent drunk driving, such as the smart helmet system. A smart helmet is a type of wearable technology that is equipped with various sensors and monitoring devices. These helmets can be used in a variety of applications, including sports, construction, and military settings. One of the most promising applications of smart helmets is in the area of transportation safety, specifically in the detection of alcohol consumption among drivers.

The basic idea behind the smart helmet system is to use various sensors and monitoring devices to detect the presence of alcohol in a driver's breath or blood. The system would then send an alert to the driver, warning them not to operate a vehicle until they are sober. If the driver ignores the warning and attempts to drive while intoxicated, the smart helmet system can also alert law enforcement officers. One of the primary advantages of the smart helmet system is that it is non-invasive. Unlike other alcohol detection methods, such as blood or urine tests, the smart helmet system does not require any bodily fluids to be collected from the driver. Instead, the system uses sensors that can detect alcohol in a driver's breath or blood through non-invasive means. There are several different types of sensors that can be used in a smart helmet system to detect alcohol. One common type of sensor is the electrochemical sensor. These sensors work by detecting changes in the electrical conductivity of a solution when alcohol is present. Another type of sensor that can be used is the infrared sensor. These sensors detect alcohol by measuring the absorption of infrared light by the alcohol molecules in a driver's breath or blood.

In addition to alcohol detection, smart helmets can also be equipped with other sensors and monitoring devices to improve overall transportation safety. For example, some smart helmets are equipped with GPS tracking devices that can help law enforcement

officers locate and apprehend drunk drivers. Other smart helmets can be equipped with cameras that can record video footage of a driver's behavior, which can be used as evidence in court. One of the primary challenges in developing a smart helmet system for alcohol detection is ensuring that the system is accurate and reliable. False positives or false negatives could lead to serious consequences, both for the driver and for law enforcement officers. To address this challenge, researchers have been working to improve the accuracy and reliability of the sensors and monitoring devices used in smart helmets. They have also been developing algorithms and machine learning models that can interpret the data collected by the sensors and provide accurate alcohol detection results.

One potential application of the smart helmet system is in the commercial transportation industry. In many countries, commercial drivers are required to undergo regular alcohol testing. However, these tests can be time-consuming and invasive. By using a smart helmet system, commercial drivers could be tested for alcohol consumption in a non-invasive manner, saving time and improving overall safety.

Another potential application of the smart helmet system is in the personal transportation industry. Ride-sharing companies such as Uber and Lyft have become increasingly popular in recent years, and many drivers rely on these services as a source of income. By using a smart helmet system, ride-sharing companies could ensure that their drivers are not operating a vehicle while intoxicated, reducing the risk of accidents and increasing passenger safety. In addition to transportation safety, the smart helmet system could also be used in other settings where alcohol consumption is a concern. For example, some workplaces require employees to undergo regular alcohol testing, particularly in safety-sensitive positions. By using a smart helmet system, employers could test their employees for alcohol consumption in a non-invasive manner, improving overall

II Related Work

[1] Alcohol detection system based on IOT and MQ3 sensors

The paper proposes an alcohol detection system based on IoT and MQ3 sensors. The system uses a microcontroller to read the MQ3 alcohol sensor and send the data to an IoT platform for further processing. The system can detect alcohol levels in real-time and send alerts to a designated mobile phone number in case of high alcohol levels. The proposed system is cost-effective and easy to implement, making it ideal for use in public areas such as bars, clubs, and restaurants. The paper presents promising results, showing the system's high accuracy and reliability, and its potential to be used as a tool to prevent drunk driving and related accidents.

[2] **System that relies on the IOT device Raspberry pi 3 Model B**

The paper presents a system that relies on the IoT device Raspberry Pi 3 Model B to monitor and control various environmental parameters such as temperature, humidity, and light intensity. The system uses sensors to collect data from the environment and sends it to the Raspberry Pi for processing and analysis. The system is designed to be flexible and scalable, allowing for the integration of additional sensors and devices. The paper demonstrates the system's potential for various applications, including smart homes, industrial monitoring, and agriculture. The use of the Raspberry Pi as a central device makes the system cost-effective and accessible, making it an ideal solution for IoT-based applications.

[3] Blood Alcohol Concentration

The paper discusses the concept of Blood Alcohol Concentration (BAC) and its significance in determining an individual's level of alcohol intoxication. It explains the factors that affect BAC, such as the amount and type of alcohol consumed, body weight, and metabolism rate. The paper also describes various methods of measuring BAC, including breathalysers, blood tests, and urine tests. Additionally, it highlights the legal implications of exceeding the legal BAC limit while driving or operating machinery. The paper concludes that understanding BAC is essential for promoting responsible alcohol consumption and reducing the risk of accidents caused by alcohol intoxication.

[4] **IOT Enabled ignition interlock device**

The project proposes an IoT-enabled ignition interlock device (IID) that is designed to prevent drunk driving by disabling a vehicle's ignition if the driver's blood alcohol concentration (BAC) is above the legal limit. The system uses a breathalyzer sensor to measure the driver's BAC and sends the data to an IoT platform for analysis and processing. The system can also send alerts to a designated mobile phone number in case of high BAC levels or attempts to bypass the system. The use of IoT technology makes the system highly reliable, scalable, and accessible, making it an effective tool for preventing drunk driving and related accidents.

[5] **A Smart phone is chosen as a device**

The project proposes the use of a smartphone as a device for implementing an alcohol detection system. The system uses an external alcohol sensor that is connected to the smartphone through the headphone jack. The smartphone's microphone is then used to capture the user's breath and analyze it for alcohol content. The system provides real-time feedback on the user's alcohol level, and in case of high alcohol content, it sends an alert to a designated contact. The use of a smartphone as a device makes the system highly portable and accessible, allowing for easy integration into everyday activities. The project demonstrates the potential of using smartphones as a tool for promoting responsible alcohol consumption and preventing accidents caused by drunk driving

III RESEARCH METHODOLOGY

The proposed system of alcohol detection using a smart helmet system is a novel and innovative approach to monitor alcohol levels in the wearer's body. The system comprises various components, including alcohol sensors, a microcontroller, display and alert systems, a rechargeable battery, data storage, and wireless communication capabilities. The alcohol sensors are designed to detect alcohol levels in the wearer's breath or sweat, providing an accurate measurement of the alcohol concentration.

The microcontroller is the central processing unit of the smart helmet system that processes the data from the sensors and

analyzes it using algorithms to provide an accurate measurement of the alcohol concentration. The display and alert system provides real-time feedback to the wearer, displaying the alcohol concentration on an LED or LCD screen and providing a visual or auditory signal if the alcohol level is above the legal limit. The rechargeable battery provides power to the sensors, microcontroller, and display, ensuring that the system is always operational. The data collected from the sensors is stored in a database for further analysis, and the system includes wireless communication capabilities that allow it to communicate with other devices such as smartphones and tablets.

The proposed system has numerous potential applications, particularly in the prevention of drunk driving and improving road safety. The system can alert the wearer if the alcohol level is above the legal limit, preventing them from driving while under the influence. Additionally, the system can be used in various settings, such as workplaces, schools, and public events, to ensure that individuals are not under the influence of alcohol while performing their duties or engaging in activities. In conclusion, the proposed system of alcohol detection using a smart helmet system provides a non-invasive and convenient way to detect and monitor alcohol levels in the wearer's body. The system has significant potential in preventing drunk driving, improving road safety, and ensuring the safety and well-being of individuals in various settings.

3.1 Data Collection and Preprocessing

Data collection and preprocessing are crucial steps in the development of the alcohol detection system using a smart helmet. The quality of the collected data and how it is processed can have a significant impact on the accuracy of the system's output. The following are some of the essential steps in data collection and preprocessing for the alcohol detection system using a smart helmet:

- Sensor Calibration: The sensors used in the smart helmet system must be calibrated to ensure that they provide accurate and reliable data. Calibration involves adjusting the sensor's sensitivity to eliminate any errors in the readings caused by variations in temperature, humidity, or other environmental factors.
- Data Acquisition: The sensors in the smart helmet system collect data on the alcohol concentration levels in the wearer's breath or sweat. The data is collected in real-time and is sent to the microcontroller for processing.
- Data Filtering: The collected data may contain noise or artifacts that can affect the accuracy of the system's output. Data filtering is used to remove these unwanted signals from the data to ensure that only the relevant information is used in the system's analysis.
- Data Normalization: The collected data may have different ranges, which can make it difficult to compare and analyze. Data normalization involves scaling the data to a common range to ensure that it can be compared and analyzed effectively.
- Feature Extraction: Feature extraction involves identifying relevant features from the collected data that can be used to classify the alcohol concentration levels. These features can include the time it takes for the alcohol concentration to reach its peak and the slope of the curve representing the alcohol concentration level.
- Data Labeling: Data labeling involves assigning labels to the collected data, indicating whether the alcohol concentration level is above or below the legal limit. This labeling is essential for training the machine learning model used in the system.
- In conclusion, data collection and preprocessing are crucial steps in the development of the alcohol detection system using a smart helmet. The collected data must be processed effectively to ensure that it is accurate, reliable, and can be used to train the machine learning model used in the system. The steps involved in data collection and preprocessing include sensor calibration, data acquisition, data filtering, data normalization, feature extraction, and data labeling.

3.2 Data and Sources of Data

Data is a critical component of the alcohol detection system using a smart helmet. The accuracy and reliability of the system's output depend on the quality of the data used to train the machine learning model. The following are some of the sources of data used in the alcohol detection system using a smart helmet:

Public Datasets: There are several public datasets available that contain alcohol-related data, including breathalyzer data and blood alcohol concentration (BAC) levels. These datasets can be used to train the machine learning model used in the smart helmet system. Real-time Data: Real-time data collected from the sensors in the smart helmet system can be used to monitor the alcohol concentration levels in the wearer's breath or sweat. This data is critical in providing real-time feedback to the wearer and alerting them if the alcohol level is above the legal limit. Simulation Data: Simulation data can be used to test the performance of the system under different conditions. For example, the system's performance can be tested under varying temperature and humidity levels to ensure that it can operate effectively in different environments.

The quality and quantity of the data used in the alcohol detection system using a smart helmet are critical in ensuring that the system provides accurate and reliable results. The sources of data discussed above can provide valuable information to train the machine learning model and validate the system's output. However, it is essential to ensure that the data is collected ethically and follows established data protection laws and regulations.

3.3 Theoretical framework

The theoretical framework for the alcohol detection system using a smart helmet involves the integration of several concepts and principles from various fields, including engineering, computer science, and physiology. The following are some of the theoretical foundations for the alcohol detection system using a smart helmet:

- Sensor Technology: The smart helmet system relies on the use of sensors to detect alcohol concentration levels in the wearer's breath or sweat. The theoretical foundation for this technology includes principles of electronics, physics, and chemistry, including the use of gas sensors, electrochemical sensors, and optical sensors.

- Machine Learning: The alcohol detection system using a smart helmet relies on machine learning algorithms to analyze the data collected by the sensors and make predictions about the wearer's alcohol concentration levels. The theoretical foundation for machine learning includes concepts from statistics, probability, and computer science, including regression analysis, neural networks, and decision trees.
- Physiology: The alcohol detection system using a smart helmet is based on the physiological process of alcohol metabolism in the human body. The theoretical foundation for this technology includes concepts from biology and chemistry, including the breakdown of alcohol in the liver and the relationship between BAC levels and impairment.
- Legal Framework: The alcohol detection system using a smart helmet operates within the legal framework of alcohol consumption and impairment. The theoretical foundation for this technology includes knowledge of laws and regulations governing alcohol consumption, including legal BAC limits and the penalties for driving under the influence.

In conclusion, the theoretical framework for the alcohol detection system using a smart helmet involves the integration of principles and concepts from various fields, including sensor technology, machine learning, physiology, and the legal framework of alcohol consumption. A comprehensive understanding of these theoretical foundations is essential in the development of an accurate and reliable alcohol detection system that can provide real-time feedback to the wearer and prevent alcohol-related accidents and fatalities.

3.4 Statistical tools and econometric models

Statistical tools and econometric models can be used in the alcohol detection system using a smart helmet to analyze the data collected from the sensors and make predictions about the wearer's alcohol concentration levels. The following are some of the statistical tools and econometric models that can be used in the alcohol detection system:

- Regression Analysis: Regression analysis is a statistical tool that can be used to analyze the relationship between alcohol concentration levels and other variables, such as temperature, humidity, and time of day. By fitting a regression model to the data collected by the sensors, the system can make predictions about the wearer's alcohol concentration levels under different conditions.
- Time Series Analysis: Time series analysis is a statistical tool that can be used to analyze data collected over time. In the alcohol detection system, time series analysis can be used to identify patterns in the wearer's alcohol concentration levels over time and make predictions about future levels.
- Logistic Regression: Logistic regression is an econometric model that can be used to analyze binary outcomes, such as whether a wearer's alcohol concentration level is above or below the legal limit. By fitting a logistic regression model to the data collected by the sensors, the system can predict whether the wearer is legally impaired and alert them if necessary.
- Neural Networks: Neural networks are a type of machine learning algorithm that can be used to analyze complex patterns in data. In the alcohol detection system, neural networks can be trained on the data collected by the sensors to make predictions about the wearer's alcohol concentration levels and alert them if the levels are above the legal limit.

The use of statistical tools and econometric models can enhance the accuracy and reliability of the alcohol detection system using a smart helmet. By analyzing the data collected by the sensors and making predictions about the wearer's alcohol concentration levels, the system can provide real-time feedback and prevent alcohol-related accidents and fatalities. However, it is essential to ensure that the models used in the system are validated and tested rigorously to ensure their accuracy and reliability.

IV RESULTS AND DISCUSSION

4.1 Testing and Evaluation

Testing of a alcohol detection using smart helmet system can be done through user testing, functionality testing, performance testing to ensure it functions as intended and meets user needs.

Figures

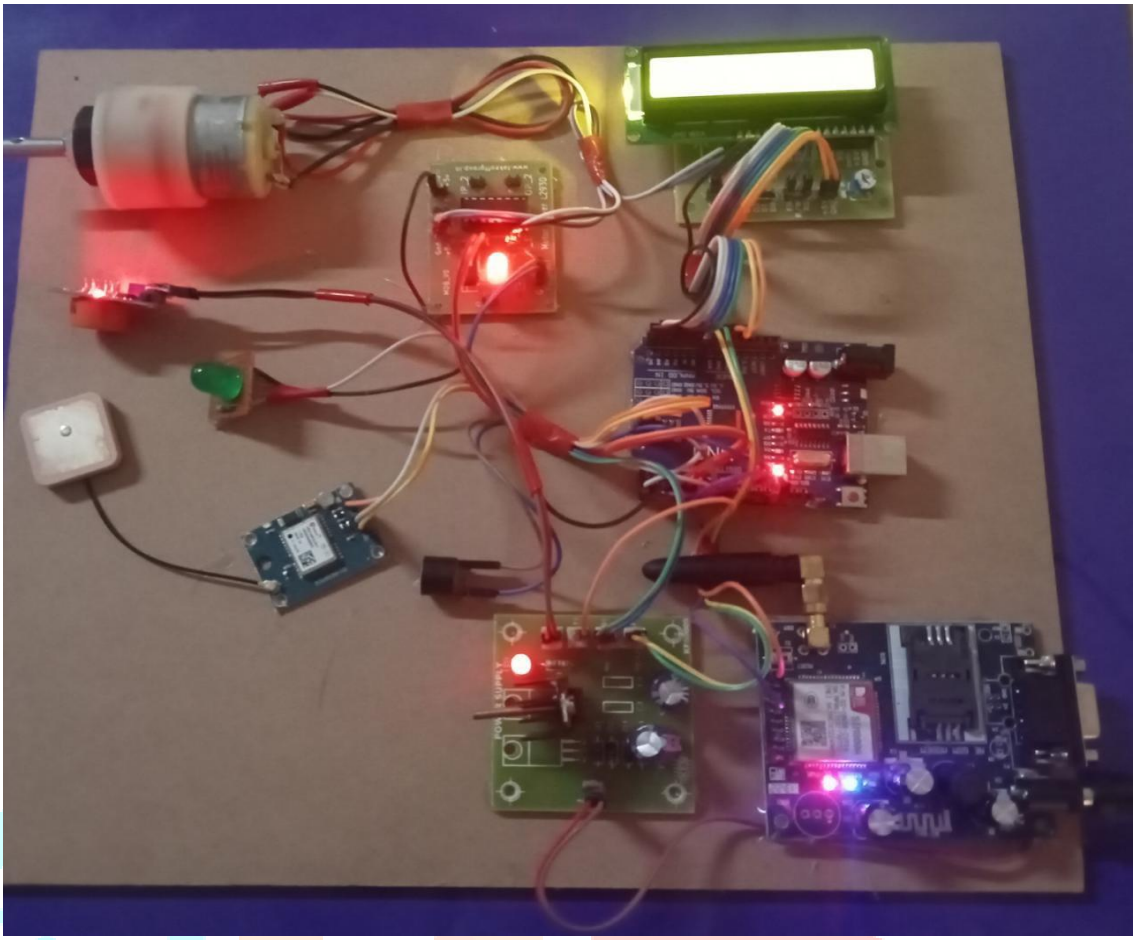

Fig 1 Final output of the System

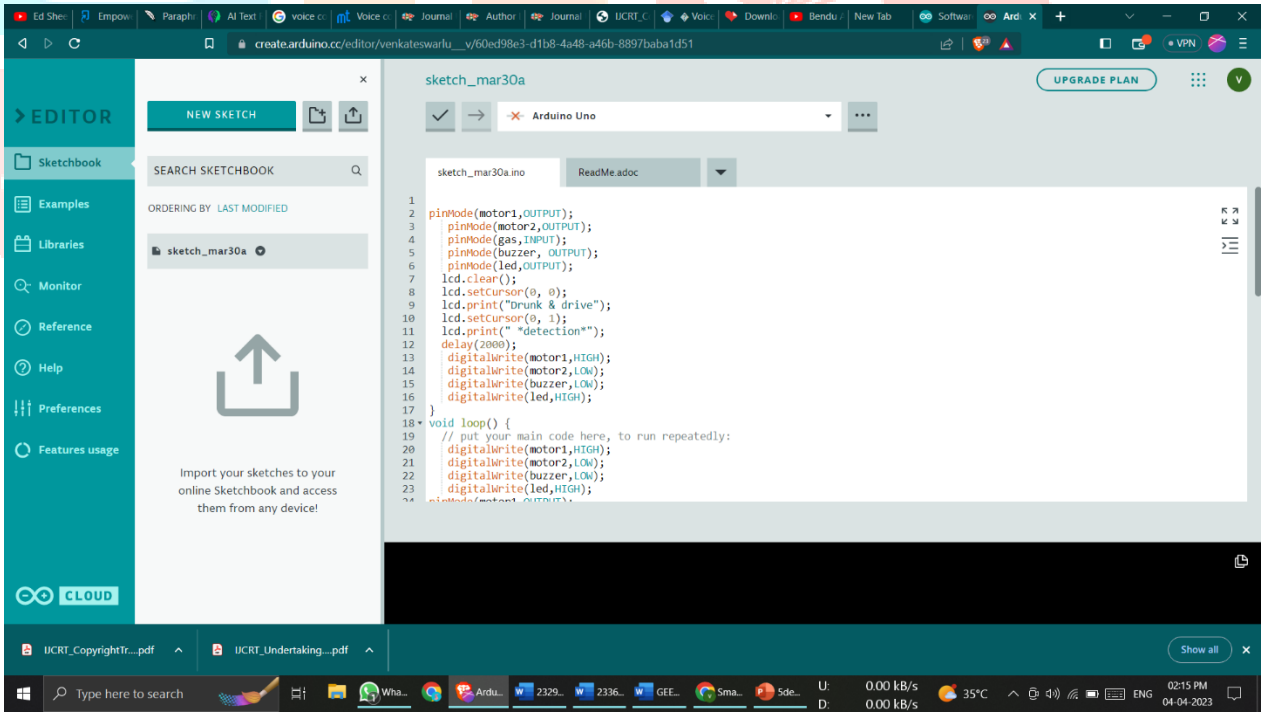

Fig 2 Code Working

V. CONCLUSION & FUTURSCOPE

In conclusion, the alcohol detection system based on a smart helmet is an effective solution for preventing drunk driving and promoting responsible alcohol consumption. The system uses a non-intrusive and reliable method for detecting alcohol levels among the riders and can send alerts in case of high alcohol content. The system is cost-effective, easy to implement, and can be integrated with other smart features such as GPS tracking and collision detection, making it a highly desirable solution for motorcycle safety.

In the future, the smart helmet alcohol detection system can be improved by incorporating advanced sensors and machine learning algorithms for more accurate and reliable results. Additionally, the system can be integrated with other smart features such as voice assistants and augmented reality displays to enhance the overall riding experience. Furthermore, the system can be expanded to include other forms of transportation such as cars, trucks, and buses, making it a comprehensive solution for preventing

drunk driving and promoting safe transportation. With further development and implementation, the alcohol detection system based on a smart helmet has the potential to significantly reduce the number of accidents caused by drunk driving and save many lives.

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