International Journal of Advance and Innovative Research
Volume 12, Issue 2 (XXI): April - June 2025
ISSN 2394 - 7780

SMART HELMET WITH ACCIDENT DETECTION AND PREVENTION TECHNIQUE

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ABSTRACT
With an increase in road accidents involving motorcycle drivers, increasing rider safety through technology has become an important area of research. This paper presents an advanced version of the smart helmet system that integrates the IOT technique with the abilities of alcohol and accident detection, adding the real -time camera sensor for video monitoring. The proposed system consists of four major components: a helmet circuit, mobile application, vehicle circuit and camera module. The helmet includes alcohol detection (through MQ3 sensor), accident detection, GPS-based location tracking, and now, a camera sensor to monitor the real-time monitoring of the rider's environment. The camera captures video data, which is transmitted to the cloud and can be accessed through the mobile app in case of emergency situations or events. This visual data, with GPS coordinates, provides detailed information to emergency respondents. The system prevents the vehicle from starting if alcohol is detected and sends an alert in case of accidents. The inclusion of a camera sensor not only increases the prevention of accidents, but also helps in post-incident analysis, which makes it an important addition to smart helmet technology.

Keywords: *IoT, Smart Helmet, Camera Sensor, GPS, Alcohol Detection, Accident Detection, Real-Time Monitoring.*

I. INTRODUCTION
Road accidents, especially two-wheelers, have become a significant global concern, causing injuries and ambitions at a dangerous rate. According to recent data, two-wheelers account for a significant stake of accidents related to traffic, often due to lack of security measures and inability to provide timely emergency assistance. In response, governments have implemented various laws and rules, aims to reduce the number of accidents and ensure road safety. However, these measures are not fully effective in addressing the main issues related to rider safety, especially for motorcycle drivers. For example, integration of advanced technology, such as the Internet of Things (IOT), in individual protective equipment, provides a promising approach to reduce these risks. This paper presents a enlarged smart helmet system designed to improve the safety of motorcycle drivers by taking advantage of IOT technology. The system includes several major components, including alcohol detection, accident detection, GPS-based location tracking and a real-time camera sensor to monitor the rider environment. The helmet is equipped with an MQ3 alcohol sensor, which monitors the rider's breath to detect the presence of alcohol.

If the liquor is found beyond the predetermined range, the system prevents the ignition of the vehicle, ensuring that impaired riders are unable to operate the motorcycle. Additionally, the system features an accelerometer-based accident-based accidental mechanism that identifies conflict or sudden effects. In the event of an accident, the system sends an alert to emergency contacts along the GPS location of the rider, which enables a rapid response. This system includes one of the major innovations in the camera sensor, which provides the real -time video reaction of the rider's environment. This feature not only increases the prevention of accident by capturing live footage, but also helps in post -accident analysis, providing valuable insight into the causes of accidents. The helmet is associated with a mobile application, which receives data from the helmet's sensor and provides control of specific functions to the user, such as disabling ignition from a distance or looking for real -time video footage. The proposed smart helmet system rider represents an important step in increasing security, including several techniques to provide a comprehensive safety solution. By integrating IOT capabilities, real -time monitoring and automated response mechanisms, the purpose of this system is to reduce the risk of accidents and improve emergency response time, eventually saving life

II. LITERATURE REVIEW
[1]. A thorough technique that measures the amount of alcohol in a rider's breath using gas, vibration, and infrared sensors was created by Jesudoos A et al. The amount of alcohol consumed is calculated using this information. Using Micro-Electro-Mechanical Systems (MEMS), the vehicle's control system is operated. A load checker tracks the weight of the vehicle, while a vibration sensor detects collisions. Every sensor has a PIC microcontroller linked to it. The gas sensor shows an alert on an LED display if alcohol is detected. When an accident occurs, the vibration sensor uses GPS to send information to emergency personnel.

ISSN 2394 - 7780

[2]. A helmet with a vibration sensor is part of a safety system that was proposed by M. Kabilan et al. A notification is transmitted to emergency responders via GPS if the vibration frequency surpasses a predetermined threshold. This system has the potential to save lives and is intended to enhance accident detection.

[3] A system that integrates a helmet with a motorcycle was created by Kimaya Bholaram Mhatre al. Infrared sensors, a vibration sensor, a GSM module, a GPS module, a MQS alcohol sensor, and an intercom system are all part of this configuration. In the event that the rider's alcohol content exceeds a specific threshold, the motorcycle will not start. A registered phone number is notified in the event of an accident if the vibration sensor detects a substantial impact. This technology is affordable and improves motorcycle riders' safety.

[4] Sayan Tapadar developed a prototype that uses a number of sensors and an Internet of Things (IoT) module to track alcohol intake and evaluate accident conditions. The system predicts if sensor signals point to an accident using real-time simulations and a Support Vector Machine. High detection accuracy and dependability are shown by the results.

[5]. Sayan Tapadar and coworkers (2018): To enhance rider safety, the authors of the study unveiled a smart helmet with Bluetooth. If alcohol is found in the rider's breath, the helmet's built-in alcohol detecting mechanism stops the motorcycle from starting. It also has a crash detection system that, when a collision is detected, instantly notifies emergency contacts.

[6] Syed Umair Ahmed and Riaz Uddin (2020) developed an Internet of Things (IoT) smart helmet that has multiple sensors to identify mishaps. In order to provide timely medical aid, the system notifies pre-designated emergency contacts in real-time when it detects an accident, including the incident's location.

[7] Shouvik Chakraborty and Sachidananda Sen stated how the study and creation of active safety systems in contemporary cars is a result of the growing incidence of vehicle accidents. Several sensors are installed for this purpose in order to measure the acceleration, wheel velocities, and vehicle yaw. However, a few crucial metrics, such as frictional forces and slip angle, are expensive and difficult to measure with sensors. For the design of active safety systems, the estimation of the friction coefficient and frictional forces has been crucial since the data is needed to create an effective control system. Furthermore, because the system is highly nonlinear, using a linearized estimating technique could result in significant approximation errors.

[8]. This study presents Shereen Ismail's improved electronic safety system design for elder drivers and teenagers, along with simulation results, by Hussain A. Attia1. Due to the physiological traits that underlie several driving errors, they require monitoring in order to prevent recurrence. Two more parameters are taken into account by the safety system provided in this study compared to the original design: the number of driving errors and the length of faults. The total number of driving faults that were recorded (lower or higher than the low or high front distance limitations, respectively) will be taken into account based on these two factors. If this figure is higher than a predetermined error limit, a suitable response will be considered a safety reaction.

II. METHODOLOGY

A. System Architecture:

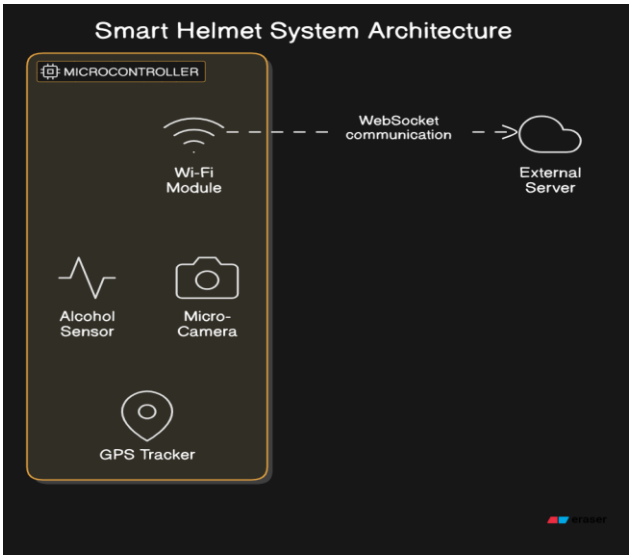

Fig no: 1

ISSN 2394 - 7780

a. ESP8266: ESP8266 is a versatile Wi-Fi module that is commonly used in Internet of Things (IOT) projects. It has 128 KB RAM and 4 MB flash memory, which provides adequate storage for data and programming. In particular, ESP8266 supports a deep sleep mode, which increases energy efficiency. Its built-in Wi-Fi capabilities and high processing power make it an excellent choice for a wide range of IOT applications.

Fig no. 2

b. GPS module: GPS module, especially NEO -6M model, is an engineer to give highly accurate status data. It is equipped with a UART TTL connector and has a strong active GPS antenna measuring 25 x 25 mm, which appoints advanced technology for optimal performance. To facilitate sharp acquisition of GPS lock, the module contains an underlying battery. This update GPS module is compatible with Arduino Pilot Mega V2 platform, providing accurate status information that significantly enhances the performance of Arduino pilot and other multi control systems.

Fig no. 3

c. MQ3 Sensor: The MQ3 gas sensor is designed to be resistant to gasoline, vapor disturbances and smoke, exclusively demonstrating high sensitivity to alcohol. It produces an analog resistance output that varies according to the concentration of alcohol present in the environment. As the concentration of alcohol gas increases, the conductivity of the sensor increases accordingly. The internal resistance of the sensor changes depending on the detection of alcohol for accurate measurement of alcohol.

Fig no. 4

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d. CAM Sensor: CAM sensor often incorporates advanced features such as autofocus, image stabilization and enhanced low-light performance, which requires them to capture high quality images under various circumstances. The development of CAM sensors continues to develop, with the ongoing improvement in technology, better image quality, rapid processing speed and versatility in applications have increased.

Fig no. 5

e. Battery power supply: The effectiveness capacity of the battery power supply (measured in ampere-hour, AH), is affected by factors such as voltage and discharge rates. Battery technology continues to increase advance energy efficiency, lose weight and increase the longevity of the battery.

III. EXISTING SYSTEM

Currently, motorcycle helmets mainly serve as a protective gear to reduce head injuries during accidents, but they provide any additional facility to help the riders or protects against basic physical safety Improve, not existing systems and technologies are limited in helmets:

- **Standard Helmet Design:** Traditional helmets provide basic impact protection, but there is a decrease in contingency security facilities such as casual identity or real -time monitoring.
- **Alcohol detection:** Riders are responsible for ensuring that they are not impaired, but if a rider is under the influence of alcohol, there is no technique to monitor or alert.
- **Limited emergency response:** In an accident, emergency response often delays a significant delay in emergency response due to the inability of rider in time.
- **No integration with mobile technology:** traditional helmets do not integrate with mobile devices or applications, which provide real -time safety data or alert for emergency contacts.

IV. PROPOSED SYSTEM

The proposed system addresses these shortcomings by integrating advanced IoT technologies into helmets. Smart helmets provide many features that increase rider safety, provide real-time data, and facilitate rapid emergency reactions. Using cutting-edge IoT technology, the suggested system overcomes the drawbacks of conventional helmets to improve rider safety, deliver real-time data, and speed up emergency responses. The Smart Helmet's numerous safety features, which include automated alarms and ongoing monitoring, guarantee rider protection.

Major components of the proposed system include:

a) **Impact detection and emergency alert system:** Smart helmets integrate an ADX335 effect sensor for detecting accidents and conflicts. On detection, the helmet sends an immediate alert to emergency contacts or services, including the GPS location of the rider. It enables rapid emergency response and can help save lives.

b) **Alcohol detection system:** An MQ3 alcohol sensor is included in the helmet for monitoring the rider's breath for alcohol content. If the rider is impaired, the helmet sends an alert to the rider's connected mobile app, warning them not to ride. This feature discourages impaired riding and increases road safety.

c) **GPS tracking and real-time location monitoring:** Helmets include a GPS module to track the real-time location of the rider. In the case of an accident, emergency responders can quickly detect the rider, reduce the response time and improve the results.

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d) **Camera for Evidence Collection:** A camera records a rider's journey, which captures video footage of the surroundings and reflects accidental events. This footage can be used as evidence in legal and insurance processes, the accuracy of claims and investigations can be improved.

e) **Mobile App Integration:** Smart helmet connects to a mobile app that receives real-time alerts, including accident information and alcohol detection. The app allows users to track the location of the rider and configure emergency contacts, which makes the system user-friendly and comprehensive.

IoT-based sensors, communication modules, and real-time monitoring technologies are all integrated into the suggested smart helmet system to improve rider safety. The system architecture, which includes both software and hardware components, guarantees accurate emergency response, alcohol monitoring, and accident detection.

V. FLOWCHART

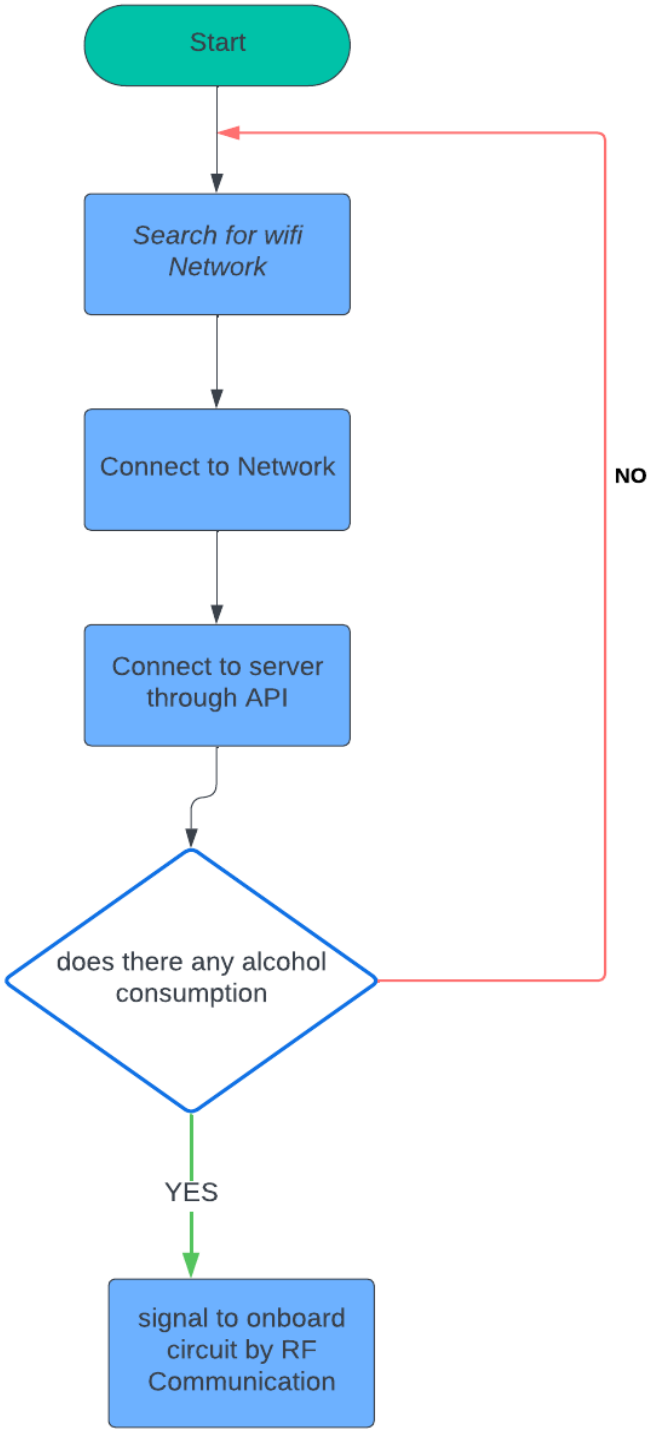

Fig no. 6

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VI. ADVANTAGES

The proposed IoT-integrated smart helmet offers multiple advantages in rider safety, accident prevention, and emergency response. Below are the key benefits:

1. **Enhanced Accident Detection & Faster Emergency Response:** ADX335 impact sensor detects accidents and collisions immediately. Automatic alert is sent to emergency contacts and services with the rider's GPS location. Reduces response time, increasing survival chances after a crash.
2. **Alcohol Detection & Prevention of Drunk Driving**: MQ3 alcohol sensor detects alcohol levels in the rider's breath. Alerts the rider and emergency contacts through a mobile app notification. Can be integrated with bike ignition control to prevent drunk riding.
3. **Real-Time GPS Tracking & Location Monitoring:** GPS module provides live tracking of the rider's location. In case of an accident, emergency responders can quickly locate the rider. Family members can monitor the rider's journey via the mobile app.
4. **Proactive Safety Instead of Just Protection:** Unlike traditional helmets, which only provide physical protection, this smart helmet offers preventive measures. Stops drunk driving, enables fast accident response, and tracks the rider's location. Reduces motorcycle accident rates and fatalities.
5. **Improved Insurance & Legal Benefits**: Video recording and GPS data logs serve as legal proof in case of accidents. Helps in faster insurance processing by providing accident evidence. Reduces false claims, benefiting both riders and insurance companies.

CONCLUSION

The development of a smart helmet equipped with an accident detection mechanism represents a significant progress in increasing motorcycle security. By integrating various techniques such as sensors to detect liquor levels, vibrations and GPS capabilities, the purpose of this innovative helmet is to provide real -time monitoring and rapid emergency response. The ability to detect accidents and alert emergency services not only enhances the possibility of timely assistance, but also has the ability to save life. Additionally, the characteristics that prevent operation under the influence of alcohol promote the behavior of further riding. Since the demand for safety solutions in the rising motorcycle market is increasing, smart helmet stands out as a promising tool for reducing accidents and improving overall rider safety. Constant research and development in this field will be necessary to refine these techniques, increase their credibility and ensure that they meet users' developed needs. Finally, smart helmets can play an important role in promoting a safe riding environment for all motorcycle drivers. By integrating mobile applications and IOT connectivity, this system allows for comfortable real -time monitoring, alert and user-friendly interaction, making it a practical and efficient solution for modern motorcycle drivers. Smart helmet is not just a protective tool, but a life -relationship that enhances road safety, reduces accidental confusion, and encourages responsible riding behavior. Future promotion may include fatigue detection, speed monitoring and AI-based future analysis to further improve rider safety. With continuous growth and comprehensive adoption, this smart helmet system has the ability to revolutionize motorcycle safety standers.

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