International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 10 | October - 2023 SJIF Rating: 8.176 ISSN: 2582-3930

Smart Helmet Using Artificial Intelligence and IOT

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Abstract:

This paper introduces a novel approach to SMART HELMET with the help of ARTIFICIAL INTELLIGENCE.
India has witnessed 43.9% accidents in 2019. Additional 12% spike in 2021. Bike accidents are a major problem in India. In 2021, there were 1,58,954 road accidents involving two-wheelers, resulting in 69,240 deaths. This means nearly 44% of all road deaths in India were caused due to two-wheelers in India. Many two-wheeler riders in India do not receive proper training on how to ride safely. This can lead to accidents caused by inexperienced riders. So we have come up with an idea of building a smart helmet assisted by Artificial Intelligence which will help the inexperienced and also the experienced drivers to get proper judgement while driving two-wheelers.

I. Introduction

The development of smart helmets has been one of the most significant advancements in recent times. Integrating artificial intelligence with the helmet offers a promising pathway towards enhancing the safety of two-wheeler drivers.

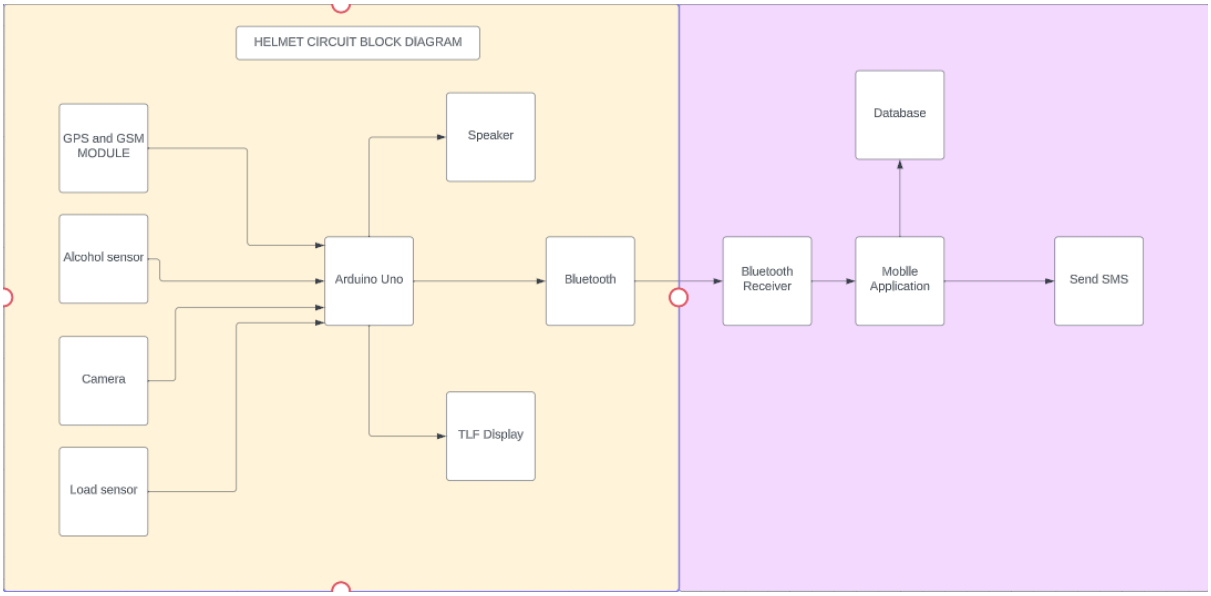
Project Scope:

Project overview:

The project involves the development of a smart helmet leveraging artificial intelligence (AI) technologies to enhance safety, functionality, and user experience for motorcyclists and other potential users.

Project objectives:

- Design a smart helmet integrated with AI capabilities.
- Improve rider safety through real-time road detection and collision avoidance.
- Enhance rider convenience with AI-driven features such as voice and visual navigation, and alerts.
- Establish compatibility with various bike models.



II. Related Work

Skully Fenix AR:

Skully's Fenix AR is an existing smart helmet that incorporates AI features such as a heads-up display (HUD), navigation, and voice control. It offers riders turn-by-turn navigation, rearview camera, and Bluetooth connectivity to smartphones.

CrossHelmet X1:

The CrossHelmet X1 is a smart motorcycle helmet that features a wide-angle rearview camera, sound control, and smartphone integration. While it doesn't utilize advanced AI algorithms for hazard detection, it demonstrates some smart features.

Senzar Asset Helmet:

Senzar's Asset Helmet integrates AI for crash detection and emergency notifications. It includes an SOS feature that can alert emergency services in the event of an accident.

III. Proposed Work

Advanced Hazard Detection:

The proposed smart helmet will use camera to detect and analyse road hazards, including obstacles, potholes, and other vehicles. It will provide real-time warnings and potentially even autonomous hazard avoidance assistance.

Energy-Efficient AI:

The system will prioritize energy efficiency to extend the helmet's battery life.

Continuous Learning and Updates:

The helmet's AI system will support over-the-air updates, enabling continuous improvement, bug fixes, and the addition of new features.

The proposed system represents an advanced smart helmet that leverages cutting-edge artificial intelligence technologies to significantly enhance rider safety, convenience, and overall riding experience compared to existing system

IV. Methodology

Introduction:

The development of smart helmet has been one of the most significant advancements in recent times. Integrating artificial intelligence with the helmet offers a promising pathway towards enhancing the safety of two-wheeler drivers.

Definition:

A smart helmet is a technologically advanced headgear designed to provide a range of features beyond the traditional functions of protection and comfort. These helmets often incorporate various electronic components, sensors, and communication technologies to enhance safety, connectivity, and user experience.

Camera:

This helmet consists of two camera which are removable and are attached at the front and back of the vehicle.

Mini Display:

The helmet is equipped with a high tech display which responds to the threats detected by the sensors and displays specific warnings.

There is a mini map feature on the display which is integrated with maps once connected to your mobile.

SOS:

The helmet has an emergency S.O.S. service which sends an alert to registered emergency contacts in case of an emergency situation.
Many think "SOS" stands for "save our souls" or "save our ship," but it actually doesn't stand for anything.

SOS is a Morse Code distress signal. Morse Code is a system that uses dots, dashes and spaces to communicate letters and numbers.

Artificial Intelligence:

The helmet is equipped with a high-tech display, integrated with artificial intelligence which responds to the threats detected by the sensors and displays specific warnings.

There is a mini map feature on the display which is integrated with maps once connected to your mobile.

MQ-3 Gas Sensor:

The MQ-3 module is a commonly employed electrochemical gas sensor designed for alcohol detection. It utilizes Tin Dioxide (SnO2) as its sensing material, which exhibits lower conductivity compared to clean air. When exposed to higher concentrations of alcohol, the sensor's conductivity increases, resulting in a reduction in its internal resistance. This variation in resistance between two points is used to detect the presence of alcohol in the breath of a rider.

Database:

The mobile application facilitates the storage of a vast amount of user data within the database. When a motorcycle rider registers on the mobile application, all their information is systematically recorded in the database. This data can serve dual purposes: it can be leveraged for monetization and can be conveniently categorized based on the operator's preferences, all in real-time and from a remote location.

In the unfortunate event of an accident, the system automatically transmits both the accident location and the pertinent details of the motorcycle rider to the nearest hospital and the designated emergency contact numbers. Additionally, the operator has the capability to organize and classify all accident-related data, including time and location details.

The database also stores additional rider information, such as data related to instances of overspeeding and overloading. This comprehensive data repository allows law enforcement authorities to monitor individual users or groups of users, contributing significantly to ensuring safer traffic conditions for both law enforcement and riders alike.

Load Sensor:

Strain-gauge type load sensors are a commonly employed technology for measuring loads. These sensors rely on strain gauges, which serve as transducers, converting applied force into an electrical signal. When force is exerted on a strain gauge, it generates a voltage difference. This voltage difference can be either positive or negative, depending on whether the strain gauge is compressed or stretched. To achieve this flexibility, strain gauges are designed to change shape when subjected to these forces. Stretching a strain

gauge makes it longer and thinner, leading to an increase in its internal resistance, whereas compressing it makes it shorter and thicker, resulting in a decrease in its internal resistance. This alteration in internal resistance translates into a measurable voltage difference.

In this paper, an S-type load cell is employed to detect overload conditions. For safe driving, there is a predefined threshold load value. If the sensor detects any load exceeding this threshold, the rider is unable to start the motorcycle. The established threshold load value is approximately 180 kg, equivalent to the weight of two adult individuals. The S-type load cell is strategically positioned within the motorcycle's spring system to accurately measure and respond to load variations.

V. Modules

Camera Module:

- The first important module is Camera module.
- This module plays an important role in detection.
- This module is used to capture real time data and process the data for detection.
- It is able to detect road and helps in avoiding obstacles

Bluetooth Module:

- The second important module is Bluetooth module.
- This module plays an important role in updating the helmet.
- This module is used to connect the helmet with the mobile and used when there is any update.
- Machine learning algorithm is updated to helmet by Bluetooth module.

Software Module:

- The third and most important module is Software module.
- This module plays an important role in updating the helmet.
- This module is used to update the helmet .
- First the software is updated then using Bluetooth module
- Machine learning algorithm is first updated in the software.
- It also includes SOS service that they are mentioned as the feature of the smart helmet.

VI. Algorithm

The Smart subsystems automatically detect whether you're wearing the helmet and will only activate functionalities on proper wear.

Get proper navigation by two-wheeler specific voice navigation carried to you directly, all within your helmet by connecting with your mobile and maps. This is to ensure the ride with proper navigation. In addition to it in the left corner display there is arrow navigation with distance.

There is an alert system that is used to detect vehicles from all the four sides of the helmet.

This alert system works based on the speed of another vehicle. If the vehicle is approaching you faster, then there is an alert given to you indicating the type of vehicle and its approaching direction.

There is an accident detection technology. This accident detection technology lets your helmet detect any accidents or impacts you may have, and immediately after 1 minute, it shares the location and time of the incident to your emergency contacts, nearby ambulance and police station. If you are fine, you can turn off the alert.

This S.O.S service works when your phone is connected. The data is transferred from the helmet to the user's mobile through a Software made for this smart helmet. Then using the GPS of the mobile to send the alert. Using the GPS system it checks for the nearby hospital, Police and ambulance.

VII. Conclusion

The project aims to design, prototype, and manufacture a smart helmet for motorcycle riders that enhances safety and connectivity. The smart helmet will feature integrated sensors for real-time accident detection and prevention, information display, and Bluetooth connectivity for seamless communication with smartphones and other devices. This project outcome will contribute to improving rider safety and convenience in the motorcycle industry

VII. References

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