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A Review on Smart Helmet for Enhance Safety

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Abstract: Smart helmet technology integrates advanced sensors, communication systems, and real-time processing capabilities to enhance safety for motorcyclists. This innovative system is designed to detect accidents and provide immediate emergency response. Equipped with sensors such as accelerometer, gyroscopes, and GPS modules, the helmet continuously monitors motion, impact, and location. In the event of an accident, the system automatically identifies the severity of the impact and triggers alerts. A real-time notification, including the rider's location, is sent to emergency services or per-defined contacts through wireless communication. Additionally, the smart helmet may feature add-on like voice-assisted navigation, alcohol detection sensors, and real-time traffic alerts to further enhance safety. By leveraging IoT and AI technologies, smart helmets aim to reduce response time during emergencies, potentially saving lives and minimizing injury severity. This paper discusses the design, implementation, and societal impact of smart helmet technology, emphasizing its role in revolutionizing road safety.

Keywords: ESP32, GPS Tracker, GSM Module, Sensors, Power supply.

I. INTRODUCTION

Every year, a great deal of traffic accidents occur in India. Numerous factors, including driving while intoxicated, acting rashly, going over the speed limit, etc., can cause accidents. It is not always the case that the injured party caused the accident. It could be the fault of a rider in another vehicle. However, both riders will ultimately be impacted. The riders might perish if emergency medical assistance and first aid are not provided in a timely manner. When the ambulance does not arrive at the intended location in time, some deaths occur. A system that can guarantee that the rider receives the necessary attention quickly is proposed in the event of an accident in order to save time and notify the relevant party. Two-wheeler are more common in India than four-wheeler due to their affordability and ease of use. The rider's head is usually the site of major injuries in many accidents. The rider's life can be saved in large part by wearing a helmet. In order to promote helmet wear and prevent injuries, a design that synchronizes the bike's module with the helmet's module is suggested. The bike will not start if the rider starts it without wearing the helmet. To start the bike, the rider needs to wear the helmet. The module in the bike synchronizes with the module on the helmet when the rider wears one. The Smart Helmet integrates sensors such as accelerometer, gyroscopes, and GPS modules to detect accidents and immediately send alerts to emergency services or predefined contacts. It also incorporates features like, ensuring that riders are in a safe condition to operate the vehicle. The system enhances the effectiveness of post-accident response by providing real-time location information, which is critical for reducing response time during emergencies. This project focuses on designing an innovative solution that not only ensures rider compliance with safety regulations but also acts as a life-saving device critical situations. The smart helmet promises to be a step toward smarter, safer road travel, blending technology with safety for the betterment of society

A. Problem Statement

Road accidents involving two-wheeler motorcycles are a major cause of injury and death worldwide. Despite the various safety measures taken, the number of accidents continues to rise. One of the main reasons for this is the delay in receiving medical attention due to the inability to detect accidents immediately. There is a need for a system that can quickly detect accidents involving two-wheeler motorcycles and notify emergency services to reduce the response time and improve the chances of survival for the riders. A potential solution to this problem is a smart helmet-based accident detection and notification system that can automatically detect accidents and alert emergency services.

B. Objective

- 1) Design and develop a smart helmet to detect accidents.
- 2) Improve road safety for motorcycle and bicycle riders.
- 3) Provide real-time feedback to riders for safe riding habits.
- 4) Reduce accidents, injuries, and fatalities.

- 5) Provide peace of mind for riders and their loved ones.
- 6) Enhance emergency response time and accuracy.
- 7) Promote safe and responsible riding practices.

II. LITERATURE REVIEW

Author Name	Published year	Tittle	Relevance to current study
Shrutika S. Ghosalkar, & S. L. Nalbalwar, &n.S.Jadhav	May 2012	Smart Helmet: For Driver Safety	These accidents happens due to many reasons like high speed of the bike, drunk and drive cases and last because of not wearing helmets during driving.The solution to these problems is smart helmet. The main objective of this work is to develop smart helmet to provide safety of these people
Margie Peden, Richard Scurfield,David Sleet, Dinesh Mohan	October 2017	World report on road traffic injury prevention	It sees this as recognition of the major efforts made by the French population as a whole, which mobilized to reduce the death and destruction it faces on the roads
Keesari Shravya , Yamini Mandapati , Donuru Keerthi	November 2018	Smart helmet for safe driving	A smart helmet is a type of protective headgear used by the rider which makes bike driving safer than before. The main purpose of this helmet is to provide safety for the rider.
K Eshwar, Karthik M, K Ravivarma, K Venugopal	May 2015	Development of Smart Helmet Using Iot Technology for Safety and Accident Detection	Today a number of countries have made it mandatory to wear helmet while riding. In this project we describe a helmet which is made smart using latest IOT technologies.

III. METHODOLOGY

A. Literature Review Methodology

- Conduct a comprehensive review of existing literature on smart helmets, accident detection, and safety protocols.
- Identify key features, functionalities, and benefits of smart helmets.

B. System Design

- Design the overall system architecture, including hardware and software components
- Identify sensors, micro controllers, and communication protocols.

C. Prototype Development

- Integrate sensors, microcontrollers, and communication protocols.
- Develop a user-friendly interface for riders.
- Test and refine the prototype.

D. Data Acquisition and Processing

- Collect data from sensors and other sources. Develop algorithms for data processing and analysis.
- Implement machine learning techniques for accident detection.

E. Testing and Validation

- Validate the accuracy of accident detection algorithms.
- Test the reliability and robustness of the system.

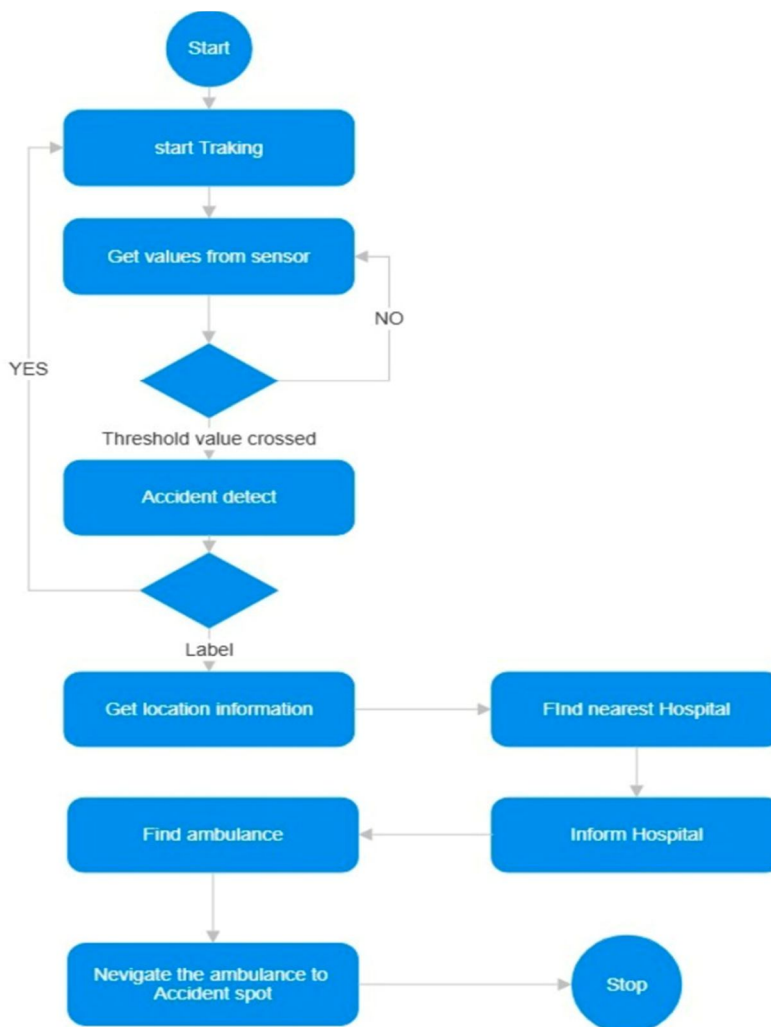
F. Performance Evaluation

- Assess the accuracy, reliability, and robustness of the system.
- Identify areas for improvement and optimization.

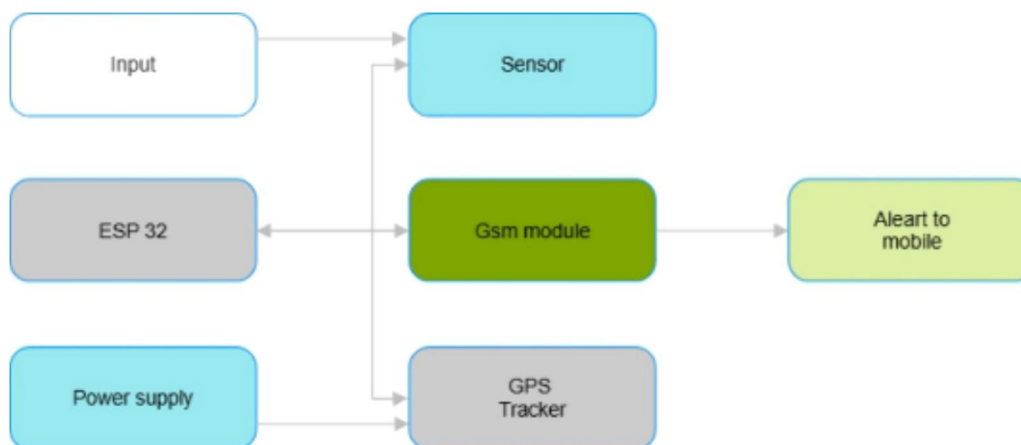
G. Deployment and Maintenance

- Establish a process for bug reporting and issue resolution.
- Develop a plan for future enhancements and feature additions. Establish a process for user feedback and support.

IV. FLOW CHART



V. BLOCK DIAGRAM



- 1) *Initialization:* The ESP32 micro controller is powered on, and the system initializes.
- 2) *Sensor Data Collection:* The accelerometer and gyroscope sensors collect data on the helmet's movement, acceleration, and orientation.
- 3) *Data Processing:* The ESP32 processes the sensor data to detect unusual patterns or thresholds that may indicate an accident.
- 4) *Accident Detection:* If an accident is detected, the ESP32 triggers an alert.
- 5) *GPS Location:* The GPS module provides the helmet's location, which is included in the alert message.
- 6) *Alert Transmission:* The ESP32 sends an alert message to the user's mobile phone via SMS using the GSM module.
- 7) *Ambulance Alert:* If the accident is severe, the smart helmet can automatically call emergency services, such as an ambulance, using the GSM module.

VI. CONCLUSION

The Smart Helmet project is a pioneering initiative that leverages cutting-edge technology to enhance road safety and provide critical emergency response. By integrating sensors, GPS, and GSM modules, the smart helmet can detect accidents, send alerts to emergency services, and provide real-time feedback to riders. This project has the potential to revolutionize road safety, reduce accidents, and save lives. With its innovative design and life-saving features, the Smart Helmet project is an exemplary model of how technology can be harnessed to create a safer and more connected world. The annual death toll from automobile accidents is estimated to be around 1.3 million. As a result of injuries incurred in traffic accidents, individuals, their families, and entire countries incur enormous financial damages. Automobile accidents cost most countries about 3% of their GDP every year.

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