Smart Helmet Using IOT

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Abstract:- As we all know that there is increase in accidents now a day and we can also notice that there are more accidents in two-wheeler vehicles than other. To avoid this issue our government is implementing many laws and regulation. With the help of smart helmet we can help the government and also avoid the accidents. The main objective of smart helmet is to detect and reporting accidents. There is much need to use the helmet while riding the vehicle because according to the survey 4 people die every second by the accident so to avoid this the use of helmet is needed. In this system when the accident occurs it is informed to authenticated person and also the detection of alcohol is done. The project aims to develop a smart helmet using Internet of Things (IoT) technology to enhance safety and monitoring capabilities for users. The smart helmet incorporates various sensors, such as accelerometers, gyroscopes, GPS modules, and environmental sensors, to collect real-time data on the wearer's physical parameters, location, and surrounding conditions. The collected data is then processed and analyzed to detect potential risks, such as accidents or hazardous situations, and trigger appropriate actions or alerts. The connectivity aspect of IoT enables communication with other devices and systems, allowing for features like location tracking, integration with smart city infrastructure, and remote monitoring and control. The project intends to improve safety, provide real-time feedback, and enhance the overall user experience in various applications, including industries, sports, and healthcare. The rate of death relative to the size of the world's population has remained constant, according to the world health organization (WHO). WHO targets to minimize the ratio of road death to the half by 2022. This paper discusses a way for accident detection and notification which can decrease this ratio. The paper reviews related work in different fields where smart helmets have been implemented, including industrial safety, sports, emergency services, navigation, and communication. Researchers have integrated IoT sensors into helmets to monitor parameters such as temperature, gas levels, and impact forces, enabling early detection of hazards and injury prevention. Additionally, smart helmets have been designed with GPS navigation, wireless communication, and video streaming capabilities to enhance situational awareness and communication among users.

Keywords:- Accidents, Smart Helmet, IOT, Laws and Regulation.

I. INTRODUCTION

In today's fast-paced world, safety and connectivity are paramount. The emergence of the Internet of Things (IoT) has revolutionized various industries, and one such innovation is the smart helmet. A smart helmet is a technologically advanced headgear designed to enhance safety, provide real-time data, and establish seamless connectivity in diverse environments. The integration of IoT technology into helmets has opened up a new realm of possibilities, transforming traditional head protection gear into intelligent devices. These helmets leverage a network of interconnected sensors, communication modules, and data processing capabilities to offer a range of features that prioritize user safety and convenience. With the ability to collect, analyze, and transmit data in real time, smart helmets have become an indispensable tool for numerous sectors, including industrial, sports, and emergency services. They enable users to access vital information, communicate wirelessly, and monitor their environment with ease. The purpose of this paper is to explore the multifaceted benefits of smart helmets empowered by IoT technology. We will delve into their key components, functionalities, and applications, highlighting how they are revolutionizing safety standards and ushering in a new era of connected headgear. By providing real-time monitoring of environmental conditions, such as temperature, humidity, and gas levels, smart helmets enhance workplace safety by alerting users to potential hazards. In sports and recreational activities, these helmets offer advanced tracking and performance analytics, enabling athletes to improve their skills and prevent injuries. Moreover, smart helmets equipped with built-in cameras and communication systems facilitate seamless collaboration among team members, especially in emergency response scenarios. The ability to stream live video feeds, receive instructions, and share critical data enhances situational awareness and decision-making capabilities. Throughout this paper, we will delve into the technical aspects of smart helmet development, discussing the integration of IoT technologies like sensors, GPS, Wi-Fi, and Bluetooth. Additionally, we will explore the challenges faced during implementation, such as power management, data security, and user interface design.
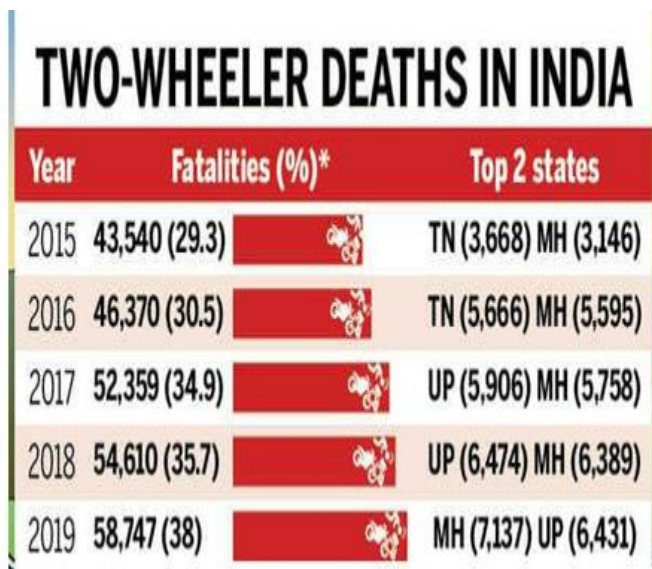
Fig 1 Two wheeler deaths in India

II. RELATED WORK

Industrial Safety: One of the primary areas where smart helmets have found extensive application is in industrial settings. Researchers have developed helmets embedded with IoT sensors to monitor parameters such as temperature, gas levels, and air quality. For instance, a study conducted by Li et al. [1] proposed a smart helmet system that incorporated gas sensors and wireless communication to detect and alert workers about hazardous gases in real time. This technology enhances safety by providing early warnings and enabling timely actions to mitigate risks.

Sports and Fitness: Smart helmets have also made significant strides in the sports and fitness domain. These helmets are equipped with various sensors, including accelerometers and gyroscopes, to track the movement and performance of athletes. Researchers like Le Breton et al. [2] have developed smart helmets that monitor impact forces during contact sports, providing valuable data for injury prevention and athlete performance analysis. Such advancements aid in identifying potential head injuries and improving training techniques.

Emergency Services: Smart helmets have proven to be invaluable tools for emergency responders. Researchers have explored the integration of IoT capabilities, such as live video streaming and biometric sensors, to enhance communication and situational awareness during critical situations. For instance, a study by Martín et al. [3] presented a smart helmet system for firefighters, incorporating thermal imaging cameras and biometric sensors to monitor vital signs and provide real-time data to incident commanders. These advancements enable faster response times, better coordination, and improved safety for emergency personnel.

Navigation and Communication: Another important aspect of smart helmets is their ability to provide navigation assistance and seamless communication. Several researchers have focused on integrating GPS and wireless communication technologies into helmets to enable location tracking and voice communication. For example, a study by Singh et al. [4] proposed a smart helmet system for motorcyclists, incorporating GPS navigation, collision detection, and hands-free communication features. These innovations enhance user convenience, promote safer travel, and facilitate effective communication between riders.

III. LITERATURE SURVEY

➢ [1] This project highlights a smart helmet which was designed to help workers to get rid of hazardous events in industries. The design and implementation of a system which can provide security for construction Site and miner workers and take the appropriate action are required. It consists of three sensor, like buzzer,ESP8266 wife module, panic button for any emergency situation on Arduino Uno, those sensors are temperature sensor, gas sensor, and light dependant register.

➢ [2] This paper introduces a new model for tracking and accident detection system connected with Arduino mobile application through HC-05 module to evade interrupt to biker. This model may equip with accelerometer, Alcohol sensor and camera but more GPIO are needed to fullfill the new amendments, in other words another microcontroller with more GPIO and maintain the helmet size to fix the component into the helmet. All these amendments can integrate into IoT helmet application, to accommodate with different environments e.g., industrial, mining, hiking and riding.

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➢ [4] This smart safety helmet enables users to control the bike unit easily, it reduces the nuisance caused by a drunken driver. Also, it adds on to the preventing of any unwanted accidents that happen due to alcohol consumption or due to the negligence of helmet by the rider. It acts as a safety measure to the rider; it significantly reduces the accident possibilities. The user has to wear a helmet to ride the vehicle, and hence, traffic rules will follow with this. This system is under pocket control, i.e., The two-wheeled vehicle having safety and, in the budget, also. This easy and efficient functioning system provides better safety and security to the riders.

➢ [5] This paper has an effective solution to many problems using smart helmet. Wearing the helmet and giving necessary authentication are required Conditions for the bike to start, reducing the possibilities of

accidents.If an accident is occurred then the notification is sent to the sin people and then they can provide the hospitality by tracking the accident happened location using IOT,our engine cut off feature reduces the chances of fatalities significantly. The smart helmet acts as a virtual policeman keeping the drivers in check and making roads safer.

➤ [6] Mohd Khairul Amri Kamarudin has established, "Smart Helmet with Sensors for Accident Prevention. This paper provides an intelligent system for two wheeler accident prevention and detection for human life safety. The prevention part involves, Smart Helmet, which automatically checks whether the person is wearing the helmet and has nonalcoholic breath while driving.

➤ [7] D Kumar, S Gupta, S.Kumar, s.Srivastava "Accident detection and reporting system using GPS and GSM module", It aims at finding the occurrence of any accident and reporting the location of the accident to the previously coded numbers so that immediate help can be provided by ambulance or the relative concerned.. Jennifer William, Kaustubh Padwal, Nexon Samuel, Akshay Bawkar Smita Rukhande, "Intelligent Helmet", The intelligent helmet band is an idea which makes motor cycle driving safer than before. This is implemented using GSM and GPS technology. Limit switch is placed in the helmet which will detect whether the rider has worn the helmet or not. If not the bike will not start.

➤ [8] Sudarsan K and Kumaraguru Diderot P , "Helmet for Road Hazard Warning with Wireless Bike Authentication and Traffic Adaptive Mp3 Playback". Helmet for road hazard warning is designed with wireless bike authentication and traffic adaptive mp3 playback. The main aim of this project is to encourage people to wear helmet and prevent road accidents, which is achieved. Thus road accidents can be prevented to some extent and safety of bike riders is ensured

IV. OBJECTIVES

➤ Identify Trends: One objective is to analyze and understand the trends in two-wheeler road accident rates over a specific time period. This helps in identifying patterns, whether accident rates are increasing, decreasing, or remaining stable, and provides insights into the effectiveness of road safety measures and interventions.

➤ Assess Risk Factors: Another objective is to identify the contributing factors and risk elements associated with two-wheeler accidents. This includes analyzing variables such as road conditions, weather conditions, rider behavior, vehicle characteristics, and traffic patterns. By identifying these factors, strategies can be developed to mitigate risks and improve road safety.

➤ Evaluate Interventions: Many studies aim to evaluate the effectiveness of various interventions and policies implemented to reduce two-wheeler road accidents. This

could include analyzing the impact of helmet laws, traffic regulations, infrastructure improvements, rider training programs, and public awareness campaigns. Evaluating the outcomes of these interventions helps in determining their efficacy and making informed decisions about future road safety initiatives.

➤ Comparative Analysis: Comparing two-wheeler accident rates across different regions, countries, or demographic groups is another objective. This allows for benchmarking and identifying areas that require more attention or interventions. It helps in understanding variations in accident rates based on geographical, cultural, or socio-economic factors, leading to targeted interventions for specific contexts.

➤ Inform Policy and Decision-Making: The ultimate objective is to provide evidence-based insights that can guide policymakers, transportation authorities, and other stakeholders in formulating and implementing effective road safety policies and measures. The data and analysis can support the development of strategies to reduce two-wheeler accidents, enhance infrastructure, improve rider education, and prioritize resource allocation.

➤ Conduct Testing and Validation: Perform rigorous testing and validation processes to evaluate the functionality, reliability, and accuracy of the smart helmet system. Test the performance of sensors, connectivity, data transmission, and the effectiveness of safety features to ensure their proper operation.

V. APPLICATIONS OF SMART HELMET

➤ [1] Navigation and Communication: Smart helmets integrated with GPS and communication technologies assist users in navigation and communication while on the move. Motorcyclists, cyclists, and scooter riders can access GPS directions, receive alerts, and make hands-free calls without taking their eyes off the road. This improves safety and convenience, particularly in unfamiliar or congested areas.

➤ [2] Construction and Mining: Smart helmets are beneficial in construction and mining industries where workers are exposed to hazardous environments. These helmets can incorporate sensors to detect factors like proximity to heavy machinery, levels of harmful gases, and ambient temperature. By providing real-time alerts and data, they contribute to worker safety and enable proactive measures to prevent accidents.

➤ [3] Motorcycle Safety: Smart helmets designed specifically for motorcyclists offer advanced safety features. They can include features like collision detection systems, blind-spot monitoring, and helmet-to-helmet communication. These functionalities enhance rider safety, improve visibility, and facilitate communication among riders.

➤ [4] Health Monitoring: Smart helmets equipped with biometric sensors can monitor the vital signs of the wearer, such as heart rate, oxygen levels, and body temperature. This data can be transmitted to healthcare professionals or integrated with health monitoring

systems, allowing for early detection of health issues and timely interventions.

VI. CONCLUSION

In conclusion, smart helmets using IoT technology represent a significant advancement in headgear, offering a multitude of benefits across different industries and domains. These helmets leverage IoT sensors, connectivity, and data processing capabilities to enhance safety, improve performance, and establish seamless communication. Through real-time data monitoring, smart helmets contribute to early detection and prevention of potential hazards, promoting a safer environment for workers in industries such as construction and mining. In sports and fitness, these helmets enable athletes and coaches to track performance metrics, prevent injuries, and optimize training strategies. For emergency services personnel, smart helmets provide invaluable tools for situational awareness, communication, and monitoring vital signs. They enhance collaboration and coordination during critical situations, ultimately improving response times and safety outcomes. Smart helmets also find applications in navigation and communication, assisting users in receiving directions, alerts, and hands-free communication while on the move. This promotes safer travel and improves convenience, particularly for motorcyclists, cyclists, and scooter riders. Moreover, the integration of IoT technology enables smart helmets to collect biometric data, contributing to health monitoring and early detection of health issues. This data can be transmitted to healthcare professionals or integrated with health monitoring systems, enhancing overall well-being. While smart helmets offer numerous benefits, challenges such as power management, data security, and user interface design need to be addressed to maximize their potential. Further research and development efforts are necessary to overcome these challenges and continuously enhance the functionality and user experience of smart helmets. The connectivity aspect of IoT enables smart helmets to communicate with other devices, systems, or centralized platforms. This connectivity facilitates real-time data transmission, remote monitoring, and control. It enables functionalities such as location tracking, integration with smart city infrastructure, and communication with emergency services or designated contacts. However, the implementation of smart helmets also poses challenges and considerations. Factors such as user comfort, battery life, data security, and privacy need to be carefully addressed during the design and development process. Additionally, collaboration among various stakeholders, including helmet manufacturers, IoT solution providers, and regulatory bodies, is essential to ensure standardized practices, interoperability, and adherence to safety standards.

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