



## Review Paper of Smart Helmet for Accident Detection Mechanism Using IoT

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### ABSTRACT

Riding a motorcycle is undoubtedly an exhilarating experience, but it also comes with its own set of risks. Even the most experienced riders are not immune to accidents, especially if they do not follow the necessary safety precautions or fail to obey traffic rules. Unfortunately, the consequences of a motorcycle accident can be severe and even fatal, making it crucial for riders to prioritize safety at all times. By wearing proper protective gear, maintaining their motorcycle, and being aware of their surroundings, riders can minimize the chances of accidents and enjoy the open road with confidence. A smart helmet is a type of wearable technology designed for motorcycle riders. It integrates sensors, cameras, and communication devices to increase road safety and provide a more secure riding experience. In the event of an accident, the helmet can detect the impact, alert emergency contacts, and call for assistance. Key features of a smart helmet may include real-time accident detection, GPS tracking, emergency contact alert, helmet-to-helmet communication, voice control, and camera for recording rides. The goal of a smart helmet is to provide riders with peace of mind and increased protection while on the road. Here we proposed a system that reduce the fatality of accidents and also prevent motorcycle accidents. Family members are informed about accidents and also accidents location. This Accidents detection mechanism has high accuracy and automatically record, detect, and report the accidents immediately.

**Keywords:** Smart Helmet, GPS, Sensor, Impact sensor, Alcohol sensor

### INTRODUCTION

In this paper, we have included some of the glimpses and overview of these system. We have also mentioned why we chose this problem, what motivated us and also what are our Objectives with expected outcomes of these system.

Bike riding is cheaper to run, flexible in traffic and easier to park. Yet statistics have shown that the growth of people commuting through their two wheelers have turned exponential. Riding a motorcycle can be an exhilarating and freeing experience, but it also requires a great deal of responsibility and caution. Unfortunately, not all riders take this responsibility seriously, and some choose to ignore safety regulations and put themselves and others at risk. As a result, motorcycle accidents can happen, and the consequences can be devastating, both for the riders and their loved ones. From minor scrapes and bruises to life-altering injuries or even fatalities, the risks of motorcycle riding are real and should never be taken lightly. Therefore, it is essential for all riders to prioritize safety and take every necessary precaution to prevent accidents and ensure a safe ride. Although there are laws related to safe operation of motorcycles most of the times the rules are not followed. The traffic police who are responsible for enforcing the laws on the riders find it very challenging due to rapid increase in the number of motorcycle riders and not having adequate manpower to monitor the situation.

According to data from the World Health Organization (WHO), wearing a helmet properly can significantly reduce the number of severe injuries and deaths in road accidents involving two-wheeled vehicles. Wearing a helmet correctly has been shown to reduce the risk of severe head injuries by 70% and the risk of death by 40%. This highlights the importance of wearing a helmet for two-wheeled vehicle riders, and the potential impact that proper helmet use can have on reducing the number of road accidents and fatalities [1]. In the current existing system, the rider who has met with an accident is not in a position to get the first aid treatment nor there is a procedure to determine in case the rider is drunken or not. The motivation behind this work is because of social responsibility. Almost 90% of the bike riders who lost their lives have not been wearing helmet according to a statistics by Online National Electronic Injury Surveillance System.

IoT comprises of smart machines and sensors interacting with other machines using an underlying network infrastructure. The IoT devices sense the data from the environment and send the data to each other or a central server. This leads to huge amount of data generated which can be further processed and analysed to generate useful conclusions. This gives the advantage of remote monitoring the environment and insights into real time data reported from the environment.

A smart helmet with accident detection is a type of wearable technology that integrates sensors, cameras, and communication devices to protect motorcycle riders. It can detect an accident, alert emergency contacts, and call for assistance. Other features may include GPS tracking, real-time

communication, and helmet communication to system. The goal of a smart helmet with accident detection is to increase road safety and provide a more secure riding experience.

The proposed system, a smart helmet with accident detection, aims to prevent motorcycle accidents and reduce the fatality of accidents. By integrating sensors, cameras, and communication devices, the smart helmet can detect an impact and trigger an emergency response, alerting emergency contacts and calling for assistance. By providing real-time accident detection, GPS tracking, and other safety features, the smart helmet aims to increase road safety and provide a more secure riding experience for motorcycle riders. The goal is to reduce the number of accidents and fatalities, providing riders with peace of mind and increased protection while on the road.

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## PROBLEM REPRESENTATION

A smart helmet with accident detection typically uses a combination of sensors to detect an accident, including:

- Accelerometers: measure the force of impact and the speed of the motorcycle
- Gyroscopes: detect changes in orientation and movements
- Barometers: measure changes in atmospheric pressure
- GPS: track the location of the motorcycle and rider

The data from these sensors is processed using algorithms to determine if an accident has occurred and how severe it is. If an accident is detected, the helmet can trigger an emergency response, such as sending a message to designated emergency contacts or calling for help. The specific detection method may vary between different models of smart helmets.

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## LITERATURE SURVEY

Sandhya.A.Kulkarni [1] proposed Smart Helmet based on IoT is a safety application designed to protect bike riders from road accidents. It is equipped with various sensors, such as an alcohol sensor, ultrasonic sensor, and accelerometer, as well as a microcontroller, power supply, GSM, GPS, Zigbee, buzzer, DC motor, and LCD. The system is capable of detecting alcohol consumption by the rider, identifying potholes and humps on the road, and notifying family members in case of accidents. It uses GSM technology to send notifications and reports to registered phone numbers, providing location information through GPS. The system is also equipped with a torch to provide lighting when necessary. The Smart Helmet is designed using various components, including a microcontroller, alcohol sensor, ultrasonic sensor, GSM, accelerometer, GPS, Zigbee, DC motor, and power supply. These components work together to provide reliable and efficient safety features for bike riders.

Mohamed A. Torad [2] proposed system discusses the development of a smart helmet that utilizes hardware and software components to detect accidents and track the location of the helmet wearer. The hardware component includes a piezoelectric sensor that detects changes in temperature, acceleration, pressure, force, or strain, while the software component includes an Android mobile application connected to the helmet via Firebase Realtime Database. The proposed system aims to increase the safety of two-wheeler riders against road accidents by minimizing head injuries, which may lead to brain haemorrhage. The paper discusses related works in this field and highlights the main features of the proposed smart helmet.

Mohammad Ehsanul Alim [3] Proposed system describes a project aimed at building a cost-effective system to prevent people under the influence of alcohol from riding motorcycles. The project makes use of various sensors and microcontrollers, including an MQ-3 sensor for alcohol detection, a vibration sensor for detecting accidents, and a sharp IR sensor for detecting if the rider is wearing a helmet. The project also includes an RF module for transmitting data between the helmet and bike units, a GPS module for locating accidents, and an OLED display for showing outputs. The passage emphasizes the importance of helmets in preventing accidents and reducing fatalities, and notes that more than half of all traffic deaths involve pedestrians, motorcyclists, and cyclists. The passage also briefly mentions the Internet of Things (IoT), which is the network of connected devices that can communicate with each other to exchange data and perform tasks.

Guntupalli Sireesha [4] system comprises an alcohol sensor, switch, accelerometer, microcontroller, and RF transmitter. The alcohol sensor detects the presence of ethanol in the air, indicating whether the rider has consumed alcohol. The switch detects whether the rider is wearing a helmet or not, and the accelerometer measures the rider's head inclination and position of the helmet to calculate the likelihood of accidents. The RF transmitter transmits data from the helmet to the bike section. If the rider has consumed alcohol, the ignition key is automatically turned off by the relay. If an accident occurs, the GPS tracker sends the location data to a registered contact via the GSM modem.

Md. Atiqur Rahman [5] proposed system's helmet sensors are processed using an Arduino microcontroller, and a mobile application is used to communicate with a central monitoring system. The monitoring system can track the accident history of each user, send accident locations to the nearest hospital and police station, and help prevent future accidents. The smart helmet offers a promising solution to reduce the number of deaths and injuries caused by motorcycle accidents.

Rajkumar E.R [6] his paper proposes a smart helmet system that can prevent accidents and identify accidents if they occur. The system uses a range of sensors including IR, gas, and load sensors to prevent accidents, and a 3-axis accelerometer to detect accidents. The smart helmet is connected to a mobile application and a central monitoring system which allows the authorities to monitor every user's accident history. In case of an accident, an alert message

is sent to the nearest hospital and police center providing details such as the location and time of the accident. The proposed system also includes features such as a helmet detection system that prevents the rider from starting the bike without wearing the helmet and an alcohol detection system that prevents the rider from starting the bike if they have consumed alcohol. The system comprises a microcontroller, position sensor, alcohol sensor, piezoelectric sensor, RF transmitter, IOT modem, GPS receiver, power supply, and solar panel. This smart helmet system has the potential to greatly reduce the number of accidents and fatalities on the roads.

Jesudoos A [7] authors have proposed a mechanism, where sensors such as IR sensor, vibration sensor and gas sensor, mems are used. The gas sensor is used to detect the amount of liquor he had consumed by checking the breath of a person wearing the helmet. MEMS control the bar control of the vehicle. Accident is detected by vibration sensor. Load of the vehicle is recognized by load checker. The Sensors are interfaced with the PIC microcontroller. The gas sensor will detect if a user consumed alcohol and display on the LED display. When accident occurs the vibration sensor, detect the accident and send data through GPS to the hospital. If there is any rash driving is done by the rider the MEME sensor detects the amount of the person from his bank account. IR sensor is used to check whether the rider is wearing the helmet or not. In this system precision is high and automatically based on locations ambulance is booked.

Shoeb Ahmed Shabbeer [8] The authors propose a novel method to detect and report accidents using a smart helmet equipped with a microcontroller, accelerometer, GSM module, and GPS module. The system utilizes cloud infrastructure to send notifications and reports to the appropriate authorities and emergency contacts in the event of an accident. The system's performance was evaluated, and the results showed that it achieved a high detection rate of 94.82% and a high accuracy rate of 96.72% in sending correct coordinates. This method has the potential to improve response times and increase the chances of saving lives in the event of an accident, making it a promising solution for improving road safety.

Sreenithy Chandran [9] The paper proposes the development of a smart helmet called Konnect, which is designed to detect and notify emergency contacts in the event of an accident. The helmet uses a network of sensors, a Wi-Fi-enabled processor, and cloud computing infrastructure to achieve its purpose. A 3-axis accelerometer is used to continuously monitor the head orientation of the driver and the helmet's position, and hence calculate the possibility of an accident. When the threshold limit is exceeded, a text message containing the location of the driver is automatically sent to the emergency contacts. The paper outlines the challenges associated with automatic detection and notification of accidents.

## COMPARISON:

In this section we briefly discuss existing literature review on smart helmet and also discuss various methods applied along with the limitations and accuracy.

Reference Name	Methodology	Observation
Sandhya.A.Kulkarni [1]	The smart helmet model consists of following components- micro controller, IR sensor, ultrasonic sensor, alcohol sensor, accelerometer, power supply, GSM, GPS, zigbee, buzzer, DC motor, LCD power supply.	It cost effective approach which can be employed for safety of the bike riders. Smart helmet uses minimal hardware and software resources which are easy to install and use.
Mohamed A. Torad [2]	The smart helmet system uses a piezoelectric sensor and an Arduino microcontroller to detect accidents and track the user's location. An Android app with GPS and real-time database integration is used to save user data and notify emergency contacts in case of an accident.	This proposed system costs around \$50, which is more expensive than its competitors. Additionally, the temperature sensor is not necessary for bike riders while riding, and due to size limitations, mounting the Arduino microcontroller on the helmet becomes challenging.
Mohammad Ehsanul Alim [3]	System uses Sharp Infrared Proximity IR and MQ-3 gas sensors to detect the motorcyclist's head and alcohol availability.	Due to high cost implementing these sensors on helmet is not affordable
Guntupalli Sireesha [4]	The proposed bike system ensures safety by allowing the engine to start only if the rider wears a helmet and is not under the influence of alcohol. In case of an accident, the system detects the tilt of the helmet and sends a notification with the location to a registered contact via GSM	By utilizing the tilt sensor in the helmet, the system can detect accidents and also determine if the rider is under the influence of alcohol. If the rider is over the limit, the system will prevent the bike from starting. The system operates based on the rider's actions.

Md. Atiqur Rahman [5]	The system divides into three parts helmet circuit, automobile circuit, and mobile application.	Microcontroller used in this system is costlier and bigger in size than our proposed system. Accident detection sensor is not reliable.
Rajkumar E.R [6]	The proposed system controls the bike engine. If the rider is wearing a helmet and the alcohol is not detected then the engine starts. GPS receiver fetches the current location. sensor detects the crash, Alert message will be sent.	This system incorporate ignition part of bike, which requires the use of additional components. The proposed helmet not accommodate all the needed facilities in a compact manner.
Jesudoss A [7]	This paper propose, when accident happens with rider, the sensor detects the condition of the bike and informs about the accident.	Pic microcontroller is used as main controller of the system. The length of the program will be big in this microcontroller.
Shoeb Ahmed Shabbeer [8]	Accident detection is facilitated with the help of MPU6050 which is a 6-axis accelerometer and gyroscope which detects the acceleration which is very costly to implement.	Due to high cost implementing these sensors on helmet is not affordable
Sreenithy Chandran [9]	This mechanism promises a dependable and rapid delivery of data relating to the accident quickly and is appropriately named Konnect.	The objective of the smart helmet is to facilitate a mechanism for detecting and notifying accidents.

## PROPOSED SYSTEM

The objective of this system to avoid motorbike accidents and also reduce the severity of accidents. Family members are informed about accidents and also accidents location This smart helmet has increased accuracy and automatically record, detect, also report the accidents immediately. Using this system motorbike riders would get habit of always wearing helmet. This accident detection mechanism would make assure a bike journey safer and more protected.

A smart helmet for accident detection is a type of wearable technology that is designed to protect motorcycle riders in the event of an accident. It integrates sensors, cameras, and communication devices to detect an impact, alert emergency contacts, and call for assistance. The goal of a smart helmet with accident detection is to increase road safety and provide a more secure riding experience.

Introducing the innovative smart helmet, a revolutionary system that combines hardware and software sections to ensure user safety while driving. Equipped with advanced technology, this helmet is designed to detect accidents and track the user's location in real-time. The smart helmet incorporates an impact sensor that detects changes in the helmet's angle of position along the X, Y, and Z axes.

This data is then processed by the NodeMCU Microcontroller, which is responsible for analysing and transmitting the data to the mobile application. The mobile application acts as a central hub for both hardware and software sections, providing real-time data on the user's location and helmet data. The application is connected to the helmet through Blynk IoT technology, which enables the Microcontroller to store user data and facilitates various functions to ensure maximum safety.

With the smart helmet, users can enjoy a safer driving experience and greater peace of mind knowing that they are protected by advanced technology. Whether on a leisurely ride or a busy commute, the smart helmet is an essential tool for any responsible rider.

The working of system is illustrated on this diagram step by step it is being described below:

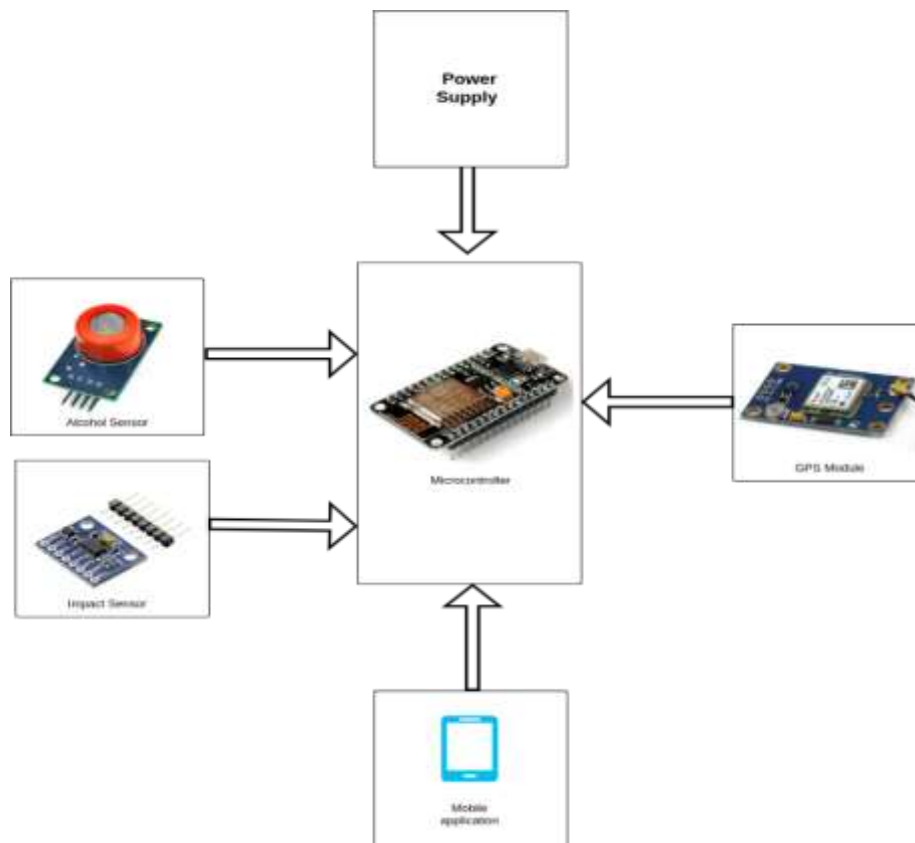


Fig- Architecture diagram of proposed system

## DISCUSSION WITH OPEN ISSUES

In this paper, study of smart helmet with accident detection mechanism. Mostly traditional helmet not suitable for human protection standard. A smart helmet for accident detection is a type of wearable technology that is designed to protect motorcycle riders in the event of an accident. It integrates sensors, cameras, and communication devices to detect an impact, alert emergency contacts, and call for assistance. The goal of a smart helmet with accident detection is to increase road safety and provide a more secure riding experience. Some of the key features of a smart helmet for accident detection may include:

- Real-time accident detection and notification
- GPS tracking
- Emergency contact alert
- Alcohol detection alert

These features work together to provide riders with a safer and more connected riding experience, giving them peace of mind and increased protection in the event of an accident.

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