

## A Review on Smart Helmet for Accident Detection using IOT

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### Abstract

As we know that accidents are increasing day by day, we can also notice that many laws and regulations are posed by government in order to avoid this accidents. Accidents can be defined as the unplanned event or the mistake that may occur resulting in injury and sometimes it also leads to death. The accidents in case of two wheelers are more compared to other vehicles. This may be avoided by wearing helmets and riding vehicles without consuming alcohol. This survey is on smart helmet for accident avoidance and also examining various related techniques. This research also helps us to understand IOT technology which is being emerged now a days. From the literature survey we find that the method proposed using microcontroller RF transmitter and other sensors is cost effective but we find the system proposed using Raspberry pi module, Pi camera, Pressure Sensor, GPS system which uses image processing algorithms is most efficient since the image processing is included so that we can easily detect the use of helmet from the rider. Smart helmet system helps to provide safety and security to the two wheeler riders.

**Keywords:** Accidents, smart helmet, IOT, Laws and Regulation.

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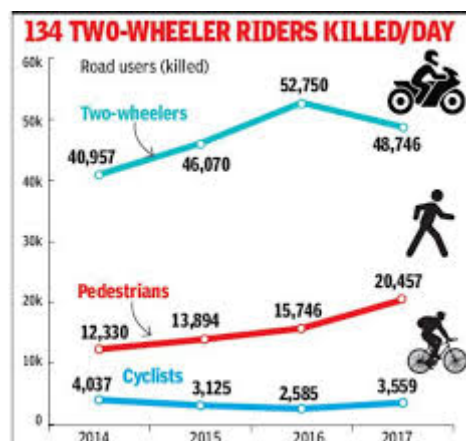
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### 1. Introduction

Internet of things are currently being used in many fields such as wearable's, home automations, smart appliances, smart agriculture etc where there is a mutual communication between devices and people over a network. The work of the IOT devices is to sense the data and send the data to server by this huge amount of data can be generated. By the generated data we can draw the conclusion by processing and analysing the data obtained. This gives the advantage in real time data reporting from environment. Now a days motorbike accidents are increasing day by day and we can notice numerous loss in lives. We can avoid this by using smart helmet. From the survey we can know that in India 4 people die every hour because they do not wear helmet. In 2017, more than 48,746 two wheeler user died in road accidents, Incidental 78.3% of them did not wear a helmet. To go

through or to solve this, there are two important conditions that should be checked before the bike starts by the smart helmet. First most condition is that we should check whether the rider is using the helmet and not just keeping it. Second to check whether the user has consumed alcoholic substance or not by his breath, this can be verified by using sensors. Third if a person meets with an accident, the sensor check the condition of person and bike and send information of location to nearby hospital. If the person has no major injurious then the button is pressed which is present in the bike this indicate that the person condition is good.

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**Figure 1.** Representation of rate of accidents in two wheeler

The figure 1 gives the picture of rate of accident in two wheelers. The comparison is done between two wheelers, pedestrians, cyclists and the rate of accident is more as represented in graph.

## 2. Literature survey

In this survey we are discussing various smart helmets with various approaches and methodologies.

Jesudoos A et.al[1] 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. The bar control of the vehicle is handled by MEMS. 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. If an accident occurs the vibration sensor, sense the accident and send information through GPS to the hospital. If there is any rash driving is done by the rider the MEME sensor detect the amount of the person from his bank account. To check whether the rider is wearing the helmet or not IR sensor is used. In this system exactness and accuracy are high and ambulance is booked automatically based on ten location.

K.M. Mehata et.al[2] proposed a techniques which provide safety to the workers or to identify any fall of the workers in working area. The proposed system has two components. One is the wearable device built using sensors and electronic elements. Another component is the cell phone. The communication between the two components is provided by GSM module. These devices also monitor the health and safety of the worker is continuously. This system ensures good fall detection and alert the register person to give medical attention.

Divyasudha N et.al[3] proposed a system consists of micro controller, position sensor, Alcohol sensor, piezoelectric sensor, RF Transmitter, IOT Modem, GPS

receiver, Power supply & Solar panel to avoid the accidents and check the alcohol consumption. In this system two condition is checked that is whether the rider is wearing the helmet or not and to check whether he had consumed alcohol or not if this is not followed by the rider the bike will not start and it is indicated by beep sound. If any accident Occur it is informed to predefined number and police station using IOT modem. This system is cost efficient compare to other kind of helmets.

Manish Uniyalet.al[4] proposed a system with two units that is helmet unit and two wheeler unit. RF receiver of the matching frequency gives the helmet position data to the two wheeler section. The microcontroller placed on the TW section will have information of the helmet position which is continuously checked. There are various other sensors such as accelerometer (tilt angle measurement), Hall-effect sensor (speed measurement), GPS module (location pointer) placed on the TW vehicle. The sensors collect the data and send the data to the microcontroller then if there is a internet connection then it is sent to the server. The speed of the vehicle can be accessed by the people at any instant by this method. In this system people can access the speed of the vehicle. Parents can see that is their child have worn helmet or not.

ShoebAhmed Shabbeer et.al [5] proposed the smart helmet method which detect and report the accidents. In this method they use microcontroller interfaced with accelerometer and GSM module. The notification and report of the accident is provided using cloud infrastructures. In this method if the level of the acceleration exceeds than the threshold or if any accident occurs the information is sent to the emergency authority server which then sends the message to the assigned emergency contact through GPS module. The result of this system was able to identify accidents is of 94.82% and sends the correct coordinates 96.72% of time.

P.Rojaet.al[6] has proposed a system consisting a 6 units as follow, that is remover sensor, IR sensor, Air quality sensor, Arduinouno microcontroller, GPRS, GSM. This helmet provides the alert about the harmful gases in the mining areas to the workers and also proved information to the server if helmet is removed. Here this data transmission is done using IOT technology .

C.J Bheret.al[7] has proposed a system of smart mining helmet that detects three types of hazards that is harmful gases, remove of helmet and if any collision. Here they uses many sensors such as IR sensors, gas sensors, accelerometer.

SreenithyChandran et.al [8] has proposed a system of smart helmet named konekt. Here they use integrated network of sensors, WiFi enabled processors, cloudcomputing infrastructures to detect and prevent the accidents. This system also provide the information to the provided contact by text message if the speed is increased than the threshold level.

Mohammed Khaja Areebuddin Aatifet.al[9] proposed a technique consisting of arduinouno, Bluetooth module, push button and 9V battery. Here the smart helmet integrated with Bluetooth is connected to the cell phones and push button is used if any emergency occur.

Archana.Det.al[10] proposed a system to reduce accidents, here the system consist of a sensor which sense the human

touch when he plug in the bike key. After he wear the helmet the sensor automatically lock the helmet and he can only remove is when bike is stopped.

Ahyoung Lee et.al [11] proposed a system based on three sensors: acceleration sensor, ultrasonic sensor, and carbon monoxide sensor, and also based on an Arduino MCU (Micro Controller Unit) with a Bluetooth module to provide safety to the workers.

Agung Rahmat Budiman et.al [12] proposed a system of smart helmet which is integrated with several functionalities. Warning notification is given if a rider is not wearing helmet and if he come with unsafe conditions and if helmet is not correctly locked so that to provide safety to the rider. In this system warning to the rider is generated in the form of notification to notify him in the unsafe condition. In the functionality test it is 100% success rate in 4 smart helmet features and 98.3% success rate in the communication test between the 2 modules.

Sayan Tapadaret.al[13] also proposed a prototype which detects the rate of alcohol consumed by the rider and detecting the accidents using IOT module and sensors. Here they are trying to use Support Vector Machines to predict if the values of the sensors correspond to an accident or not, by training the device using real-time simulation. This system gives satisfactory results. The accuracy and precision is also high.

Prashant Ahujaet.al[14] proposed smart helmet system using GSM and GPRS module. As we all know that the arrival of ambulance to the location may be late this prototype helps to inform the concerned person first about the accident and he may take the steps. In this system we can notice the feature such as high accuracy, cost efficient and giving information about the accident within minute.

Mingi Jeong et.al[15] proposed a system consisting sensors such as thermal camera, visible light camera, drone camera, oxygen remaining sensor, inertia sensor, smartwatch, HMD and command center system to avoid the accidents. This framework allows IOT services to be easily integrated and efficiently managed and able to notify the information in real time.

S.R.Kurkuteet.al[16] proposed a system consisting Raspberry pi module, Pi camera, pressured sensor, inbuilt wifi and GPS system. Image processing algorithms are used to capture the face of the biker. It can be applied in real time and it is cost efficient and effective and also used in any type of vehical.

Kabilan M et.al[17] proposed a system using vibration sensors. When the rider wear the helmet consisting of the vibrator sensor with a frequency if the frequency crosses the threshold then the message is sent to the emergency responses using GPS module. This system helps to detect and report the accident and can save the life. Dr. D

Vivekananda Reddy et.al [18] proposed a system consisting of two sections ie helmet section and bike section. In the helmet section there is a alcohol gas sensor to check if a person is drunk and it also contain IR sensor, Alcohol sensor, LCD display to display the information. In Bike section there is a vibration sensor which sense the accident and sends the information using GSM network and GPS module.

Kimaya Bholaram Mhatareet.al[19] proposed a system which consists of helmet module and bike module. It consists of IR sensors, MQS alcohol sensor, vibration sensor, GSM module, GPS module, Arduino, Intercom system. The workflow of the system is as follow, when the bike starts if the rider has consumed the alcohol and if it is greater than the threshold then the bike don't start else the bike will start and if the vibration sensor limit is greater than the threshold message is sent to the registered number about the accident. This system is cost effective and provide better security to the biker.

### 3. 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.

Table 1. Provides the comparison of the survey on Smart helmet using IOT.

Authors	Methodology	Limitations	Accuracy
Jesudoss A et.al[1]	Uses Sensors that are interfaced with PIC through the wires. Sensors such as gas sensor, load sensor, vibration sensor, IR sensor and mems sensors are used.	Exactness and accuracy is high.	90%
K.M.Mehata et.al [2]	This method consists of 2 modules Such as health monitoring and safety monitoring of workers. It uses heart beat sensors, temperature sensors, tri-axis accelerometer.	Ensure good fallen detection of the workers in working place.	67%

DivyasudhaN et.al[3]	The system consists of micro controller, position sensor, alcohol sensor, piezoelectric sensor, RF transmitter, IOT modem, GPS receiver, power supply and solar panel.	Cost effective.	85%
Manish Uniyal et.al[4]	There are 2 units namely helmet unit and two wheeler section which Uses helmet sensor switch, microcontroller unit, RF encoder, RF transmitter, accelerometer module, GPS module, speed sensor.	Tilt angle of the vehicle is also detected using accelerometer module. This helps us to know whether the has fallen or not.	92%
Shoeb Ahmed et.al[5]	Microcontroller interfaced with accelerometer and GSM module.The notification and report of the accident is provided using cloud infrastructures	System canfunction as remote immobilizer in case if vehicle is stolen.	94.82%
P.Roja et.al[6]	It consists of data processing unit(arduinouno),air quality sensors, infrared sensor, GSM modem, alerting unit, liquid crystal display to detect the danger in mining area.	The helmet should be properly weared. It works with proper power supply.	88%
C. J. Behr et.al[7]	Composed of Air Quality Sensor, Helmet Removal Sensor, Collision Sensor, Wireless Transmission, Data Processing Unit, Alerting Unit to detect hazards in industries.	Distance of workers want to be limited from interface.	90%
Sreenithy Chandran et.al[8]	Sensors, Wi-Fi enabled processor, and cloud computing infrastructures are utilised for building the system.	Depends on the response of authorized person	82%
Archana.D et.al[10]	Uses ultrasonic sensors, arduinouno , microcontroller, DC motor,LED	Proper power supply should be provided.	78%
MingiJeong et.al[15]	The smart helmet system consists of Bio & Framework Subsystem(BFS), Multimedia Processing Subsystem (MPS), and Communication Subsystem (CPS).	Power must be on.	81%
AgungRahmatBudiman et.al [12]	Consists of bike module, helmet module, external module.	No alcohol detection	78%
SayanTapadar et.al[13]	Consists of several sensors with accelerometer connected to cell phones with API's.	There may be wrong detection some times	83%

PrashantAhuja et.al [14]	Consists of IR sensor, vibration sensor, tilt sensor, NC sensor, microcontroller interface, GSM, GPRS connected to mobile.	The tilt sensor may fail to detect.	79%
S.R Kurkute et.al[16]	Consists of Raspberry pi module, Pi camera, Pressure Sensor,GPS system and uses image processing algorithms.	-	98%
Kabilan M et.al[17]	Consists of vibration sensor, GSM module, GPS module.	Network issues	86%
Dr. D. Vivekananda Reddy[18]	Consists of Helmet section and bike section consisting of sensors.	Power supply is important.	76%
KimayaBholaramMhatre[19]	Consists of Helmet module and Bike module which consists of IR sensor, MQS alcohol sensor,vibration sensor, GSM module,GPS module,Arduino,Intercom.	Need of 3.3V voltage supply for RF module.	81%

From the comparison and survey we can come across the methodology limitations and accuracy. Here we find the method proposed using microcontroller RF transmitter and other sensors is cost effective but we find the system proposed using Raspberry pi module, Pi camera, Pressure Sensor, GPS system and uses image processing algorithms is most efficient as the image processing is included so that we can easily detect the use of helmet from the rider.

#### 4. Applications of Smart Helmet

1. We can use smart helmets in real life it acts as real time application.
2. The Smart helmets can be used as the key as without the helmet we cannot start the vehicle.
3. Smart helmets can be used to warn triple riding, alcohol consumption, using mobile phone and also rash riding.
4. We can also use smart helmet in mining areas and also in construction area to provide safety to the workers.

#### 5. Conclusion

The survey demonstrates Smart helmet for accident avoidance. The helmet should be designed in order to reduce number of accidents in two wheelers this can be done by designing the device using IOT technology. Some sensor like IR sensor, alcohol sensor, GPS modules etc can be used to design a cost effective and user friendly smart helmet. The result should be accurate and should be useful to the government and society. This smart helmet can also be changed to seat belt system in case of four wheelers and can be implemented in future.

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