

# A Comparative Study of Smart Helmets in IoT

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**Abstract—** Internet of Things (IoT) is a growing network of everyday objects from industrial to consumer goods that can share information and complete tasks without human intervention. This paper presents a comparative study of smart helmet which is capable of communicating. There exists number of reasons for a bike accident to happen. For each unique reason, solution can be plotted effectively. This paper highlights the technology based solution to some of the investigated reasons and workflow of the solution.

**Index Terms—** Arduino, GPS, GSM, Smart Helmet, Vibration Sensor

## I. INTRODUCTION

The Internet of Things (IoT), sometimes referred to as the Internet of Objects, will change everything—including ourselves<sup>[1]</sup>. Soon every device you own – and nearly every object you can imagine – will be connected to the Internet. Whether it's through your phone, wearable tech or everyday household objects, the Internet of Things (IoT) will connect us in ways we can't even imagine yet. IoT has its impact in every field of life which everyone experiences it in one or the other way. This paper illustrates how IoT can be made use of to transform an ordinary helmet to "Smart Helmet" which will enhance the safety of two wheeler riders. There is an alarming increase in the morbidity and mortality due to two wheeler road accidents. In India, it is estimated that one accident takes place every 2 minutes. The occupants and riders of two wheeler vehicles are among the majority to be affected in road accidents. Two wheeler catastrophes have also been shown to have maximum case fatality in accidents. The people involved in the accidents need to be taken care of and immediately taken to the

emergency room. But there is a lag in handling the aftermath of road accidents in the country. The nearby police station needs to be notified instantly about the accidents so that they can be taken to the hospitals immediately.<sup>[2]</sup>

## II. LITERATURE SURVEY

In<sup>[3]</sup>, the author focuses on reducing the rate of 2 wheeler accidents. The reasons for the accident considered in the paper are listed here-One among the main reason for bike crash is; the rider might have consumed alcohol. Author's of this paper brings out a solution to reduce the accident due to drunken drive with the help of MQ3 sensor. This system can be integrated with the ignition system of the bike thus allowing only sober citizens to drive the bike. MQ3 alcohol sensor is suitable for detecting alcohol concentration on the rider's breath. It is just like a common breathalyzer. It has a high sensitivity and fast response time. It can be placed just below the face shield. Other reasons include carelessness of the rider. Taking this reason into consideration, IR sensor is employed which is used as obstacle detectors. One IR sensor is used on bike module for safe zone detection. If any obstacle is detected, it gives signal to microcontroller and microcontroller take action and gives an alert to the rider.

In<sup>[4]</sup>, the paper focuses on road safety in a different perspective with additional feature. Baseline that the paper emphasis is that: most of the time rider hesitates to wear helmet which could result in fatal

accidents. Drunken driving and Drowsy driving are the major factors for such road accidents. Some statistics shows that 35% of the accidents are caused by two wheelers and in that 60% of the two wheeler accidents are caused due to lack of consciousness, drunken driving and not wearing helmet. The primary concern of all riders is safety. A new smart helmet with Brainwave technology is introduced to avoid these kinds of accident. This helmet warns the rider if he is having distracted state of mind or drunken and it also prevent accidents and makes the rider drive safely. The breath alcohol sensitizer in the smart helmet helps to identify BAC and prevents him/her from drunken driving and thus reduces accidents. The Smart MP3 player adjusts the volume of the music automatically while rider is listening to the music as a safety precaution. The rider can use GPS technology to locate himself/herself and can navigate to the destination. In case of accidents GSM/GPRS modem send a message to a person regarding rider's location. This smart helmet mainly concerned on safety and comfortableness of the rider.

In <sup>[5]</sup> the author's of the paper focuses on the fact that riders usually forget to wear the helmet before starting to commute. Problem solution framed is; one technology which can be used for this purpose is compulsion of wearing the helmet to the bikers as well as an automatic SMS alert in the accidental situation with exact location of the biker. The ignition system of bike would start only when relay is connected and it could be only possible when receiver circuit would get the signal from transmitter at the helmet.

In <sup>[6]</sup> a survey on detection of alcohol using a smart helmet system is presented. It checks whether the user is wearing the helmet and has non- alcoholic breath while driving the vehicle. The system is divided into two halves: A transmitter section and a receiver section. There is a switch placed on the

helmet, which powers the helmet and the pressure sensors placed to ensure the proper wearing of helmet on the head. An alcohol sensor MQ3 is placed near to the mouth of the driver in the helmet to detect the presence of alcohol. The vehicular engine should not be started, if any of the two conditions is violated. Microcontroller Unit (MCU) controls the function of relay and thus the ignition, it control the engine through a relay and a relay interfacing circuit.

In <sup>[7]</sup>, after we surveyed the paper, it was very obvious that the baseline of the problem being discussed was the same. The author's idea was to pre-check the rider for alcohol consumption and also to insist the rider to put on the helmet. The bike would not be started if these pre-conditions fail. Also one step ahead, the author plots an idea for post-accident scenario. If a person is met with an accident, with the help of GPS and GSM module, an alert message along with the location information will be sent to the family members as well as to the emergency services.

In <sup>[8]</sup>, working of smart helmet is very simple, vibration sensors are placed in different places of helmet where the probability of hitting is more which are connected to microcontroller board. So when the rider crashes and the helmet hit the ground, these sensors sense and give to the microcontroller board, then controller extract GPS data using the GPS module that is *interfaced to it. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or family members. It is very similar to what is discussed in <sup>[9]</sup>.*

### III. COMPARATIVE STUDY

Paper Ref No.	Advantages	Disadvantages
3	Severity due to accident is mainly when a person is drunken driving and another one is when a helmet is ignored. This paper deals with both the condition through which the rate of accident can be minimized.	<ol style="list-style-type: none"> <li>1. False alarm rate can be high in this proposal. There are possibilities where the conditions can be faked.</li> <li>2. The greatest drawback of the PIR sensor is that it will detect anything that is moving - air, shadows, grass, etc - and has a temperature differing from ambient. Many schemes have been tried to minimize this problem, but in harsh outdoor settings, some "faking" is unavoidable.</li> </ol>
4	The most common reason for accident is carelessness of the rider or distractions from the surrounding environment. This may be because of various reasons like rider listening to music	<ol style="list-style-type: none"> <li>1. Expensive</li> <li>2. Complexity in designing the product with the help of brainwave technology is high.</li> <li>3. Everyone's brainwave signal is bit different from others even when they think about the same thing.<sup>[11]</sup></li> </ol>
		while riding etc. This paper presents a solution through Brainwave technology .
		5,8 It covers all the features that were discussed in former papers.
		6 It checks for alcohol consumption and also checks whether the rider is wearing a helmet.
		7 Post-accident scenario is taken care. Also pre-conditions like alcohol consumption and
		1. Receiver and transmitters are used. Type of communication between them may be wireless or be wired. 2. If wireless mode of communication is used, the coverage area is limited. However the cost would be high to implement wired communication. 3. Also false alarm rate is high.
		1. Post accident scenario is not considered at all. 2. Reasons for the accident may not necessarily be due to consumption of alcohol. 3. Even carelessness of the co-travelling rider may be the reason for this calamity.
		1. The location information is sent in the form of latitude and longitude. It is always not necessary that the person who receives the message be owning a smart phone or be at the situation where he can

	wearing of helmet is checked. The location information will be sent to the ambulance as well as to the family members.	patiently look for the address.
10	Mobile App is prepared especially for this project which avoids the additional use of GSM and GPS module. Hardware requirement are minimized.	<ol style="list-style-type: none"> <li>1. This workflow fails if the person does not own a smart phone.</li> <li>2. Also during a crash there are possibilities for the phone to get damaged.</li> </ol>

**Table 1: Comparative Study**

#### IV. CONCLUSION

Various dimensions of smart helmet are discussed briefly in this paper. Smartness of the helmet depends on both, aftermath scenario of an accident and also on the safety of the rider. Out of all the discussed papers, the cost efficient one was with the mobile App as it is less hardware dependent. However, this proposal does have some disadvantage as mentioned above. The rest of the papers are all similar with same features which might bring a sure change when designed.

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