

# Smart Helmet system for Identification of Road Accident using Internet of Things

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## Abstract:

*This research paper proposes the day to day life road accidents are increasing most of them are caused due to negligence of not wearing the helmet, drunk and drive and over speeding which many leads to injured or death due to lack of medical treatments provided to the injured person at right time. This motivates us to think about making a system which ensures the safety of biker, by making it mandatory to wear the helmet by the rider to prevent head injuries that may lead to immediate death, prevent drink and drive scenario by testing the breath of the rider before the ride, prevent over speeding and rash riding by alerting the rider and also to provide proper medical attention, if met with an accident by notifying the concerned person with the location details.*

**Keywords:** *Helmet, Microcontroller, IoT, GPS, Sensors, Accelerometer, Accident detection*

## 1. Introduction

It is a well-known fact that young generation prefers bikes and motorcycle over four-wheeler. The riders avoid wearing helmet without any specific reason. Moreover, over speeding and drink and drive have become common issues. Due to the lack of experience or focus and violation of traffic rules, which leads to accidents? So, with the help of technology we made sure that traffic rules are followed, problems mentioned above are avoided and their effects are minimized [1]. The idea of developing this work comes from our social responsibility towards society. In many accidents that occur, there is a huge loss of life. Many people die on roads every year that occur due to bike accidents. There are various reasons for accidents such as not having adequate ability to drive, defective two wheelers, rash driving, drink and drive, etc. But the main reason was the absence of helmet on the person which leads to immediate death due to brain damage [2]. Therefore, it is important that there should be a facility to minimize the after effects of these accidents. However, the main goal of our work is to make it mandatory for the rider to wear a helmet during the ride, to prevent drink and drive scenario and over speeding or rash riding by motorcyclists and also provide proper medical attention when met with accident by alerting the concerned person which will provide solutions to other major issues for accidents.

### 1.1 Objectives

The main objective of this system is to design a helmet that provides safety to motorcyclist and to prevent drink and drive. It detects accident and alert the guardian about accident and prevents over speeding and to develop an android application to monitor motorcyclist and send alert SMS.

## 2. Proposed System

This paper describes the prototype of smart helmet using IOT [8], which ensures the safety and security of the bike rider. Here the system is responsible for the following functionalities. The system will not allow the rider to start the vehicle, if the rider is not wearing the helmet. It detects the consumption of alcohol, if the rider has consumed alcohol, the bike engine will not start. The system alerts the rider when the speed exceeds the limited value. The fingerprint authorization provides security and prevents vehicle theft [6]. When met with an accident it detects it and gives the notification to the registered contact with a location and picture information

### 3. System Implementation

This system consists of two modules that is user and admin module. User module consists of an android application where it used to send the notification to the guardians and nearby authorities. The admin module consists of two sections: a) Helmet section and b) Bike section

#### 3.1 Helmet Section

This section consists of push button, alcohol sensor, accelerometer, micro controller, RF transmitter.

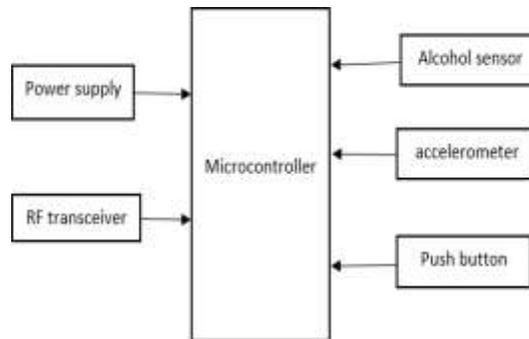


Figure.1. Helmet Section transmitter

#### 3.2 Alcohol sensor



Figure.2. Alcohol sensor (MQ-3)

It is a gas sensor which detects the presence of alcohol content gas concentration from 0.05 mg/L to 10 mg/L. it is an high sensitive to alcohol and a low cost semiconductor sensor which provides fast response and gives both digital and analog output.

#### 3.3 Accelerometer

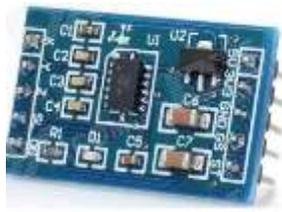


Figure.3. Accelerometer (MMA7361)

It is an integrated circuit which is used to measure the acceleration with respect to the object where this accelerometer is attached. Here we use this accelerometer for accident detection by placing it to helmet and can be detected by tilting of helmet with respect to ground.

#### 3.4 Bike Section

This section consists of RF receiver, Microcontroller, GSM module, decoder

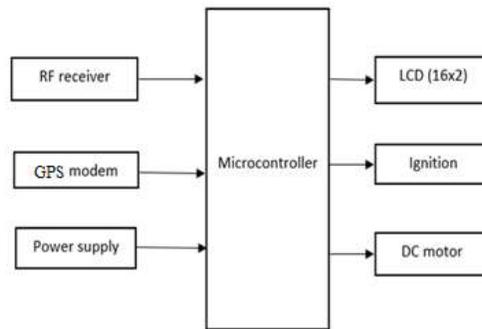


Figure.5. Bike Receiver section

### 3.5 GSM modem



Figure.5. GSM modem

It consists of an sim card port where the sim has to be inserted and can be operated using a mobile operator where to communicate through mobile network. It is used by internet connectivity to send and receive the messages.

### 3.6 Microcontroller (ARM7)



Figure.6. ARM7 Processor

Embedded system and SOC (system on chip) designers choose particular microprocessor cores, libraries, and different tools to develop microprocessor based applications. An ARM processor is one of the best alternatives obtainable for embedded system designers.

The full form of an ARM is an advanced reduced instruction set computer (RISC) machine, and it is a 32-bit processor architecture expanded by ARM holdings. The applications of an ARM processor include several microcontrollers as well as processors. The architecture of an ARM processor was licensed by many corporations for designing ARM processor-based SoC products and CPUs. This allows the corporations to manufacture their products using ARM architecture. Likewise, all main semiconductor companies will make ARM-based SOCs such as Samsung, Atmel, TI etc

### 3.6 Design Flow chart Helmet Section

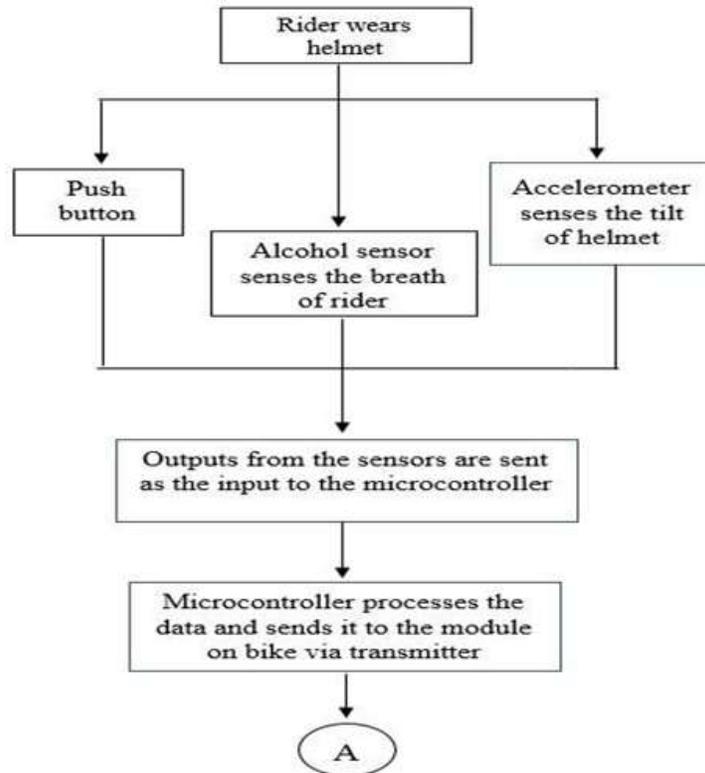


Figure.7. Flow chart of helmet section

When the rider has worn the helmet, the push button is pressed [4]. Alcohol sensor measures the presence of alcohol in rider's breath. Accelerometer measures tilting of the helmet. The output of these components will act as input for microcontroller which is on the helmet. The microcontroller processes the data and sends it to the bike section using RF transmitter.

### 3.7 Bike Section

RF receiver receives the data and the data is transmitted to the microcontroller. Microcontroller makes the decision according to the output of the helmet section.

There are two conditions to start bike ignition:

- Push button should be pressed when a rider wears the helmet.
- Rider should not be alcoholic.

When the output of the helmet section matches these two conditions, then the bike ignition will start.

If the rider exceeds the threshold speed, then the rider will get the alert message to slow down the speed.

When an accelerometer measures the tilting of helmet with respect to ground as zero, it means that an accident has occurred. [3] Immediately accident notification will be sends to the registered contact number using GSM through "ACCIASSISTO" Application.

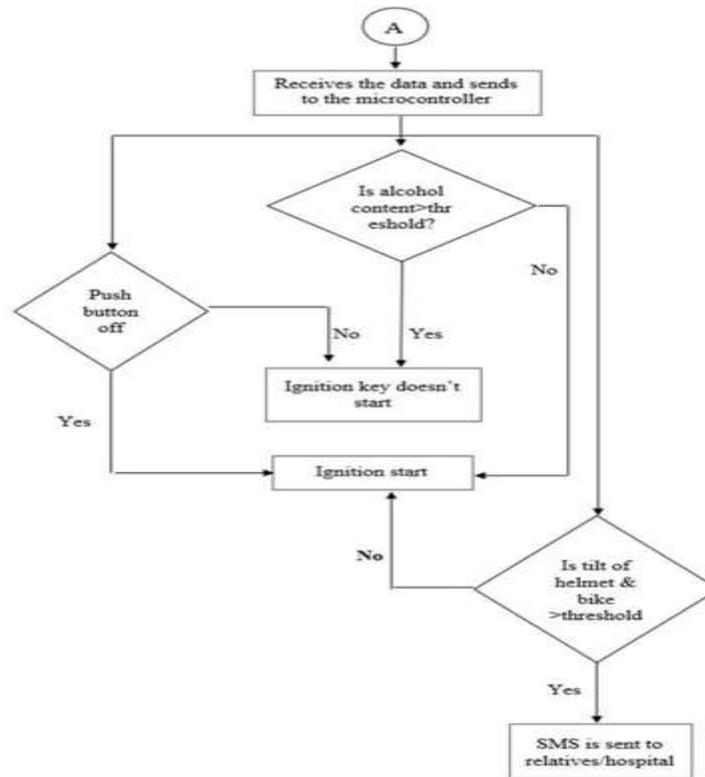


Figure.8. Flow chart of Bike section

The registered person will get the notification then he can request for the location and picture for more clarification.

Then they can provide the immediate medical requirement and they can also inform about the incident to the police station. If the accident is minor then the rider can abort the accident notification to the registered number.

#### 4. Results

The system makes sure that the riders wear the helmet before the ride. The push button installed at the top of the helmet will provide signal to the microcontroller that the helmet is worn by the rider, if the signal from the push button is not received by the bike section the ignition of engine of the bike will not turn on. If the rider removes the helmet during the ride ignition of the bike will turn off.

The alcohol sensor detects for the presence of alcohol in the breath of the rider, if the alcohol content is detected the bike ignition will not turn on. The results show that the system detected the presence of alcohol in the breath of the rider 225 times out of 250 times.

The implementation of this system provides very cheap and effective accident detection. Notification is provided using the android app which is controlled by an admin module.



Figure.9. IOT side application

In Guardian side application, here it receives the alert notification of accident information. So, the Guardian requests the location area and image of accident occurs. By entering the user number who had met with an accident. So that guardian receives the accident information and location area of accident occurs.



Figure.10. Guardian side application

It is an android application used to send the notification to guardians or nearby authorities. It consists of two side application one is guardian side application and the other is IOT side application where the person met with an accident.

**IOT side application:**

It is a user side application, here we have registered some emergent contact number.so that, it sends the alert notification to the registered contact number about the information of accident occurs and location area of the accident.

### **Conclusion**

The system designed provides safety and reduces the after effects of the accident, notifying about the accident will provide timely care and treatments to the victim reducing the severe impacts on the person. The fingerprint authorization prevents vehicle theft and provides security. The alcohol detection will prevent drink and drive scenario and the effects of drink and driving to public and the rider himself. Android application built for the system will ensure the smooth functioning of the system. Speed monitoring of the vehicle will prevent over speeding rash riding and violation of traffic rules.

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