Smart Helmet for Safety and Accident Detection using IOT

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Abstract - *Road accidents are increasing in our country, most of them are caused due to negligence of not wearing the helmet, drink and drive and over speeding which many leads to death or severe injuries 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.*

Key Words: Accelerometer, Microcontroller, Alcohol detection, Accident detection, Notification.

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. 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. 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, 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 authorisation, provides security and prevents vehicle theft.

- When met with an accident it detects it and gives the notification to the registered contact with a location and picture information

3. SYSTEM DESIGN

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:

Helmet section
Bike section

3.1 Helmet Section:

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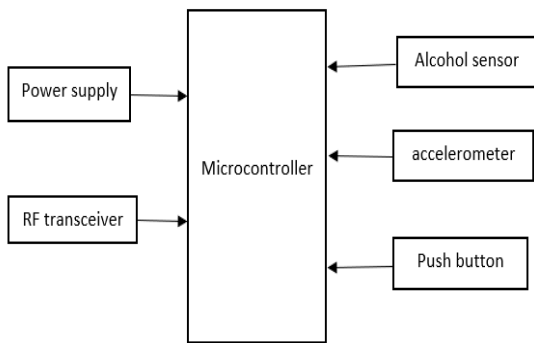

Fig 1 Helmet Section

3.1.1 Alcohol sensor:

Fig 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.
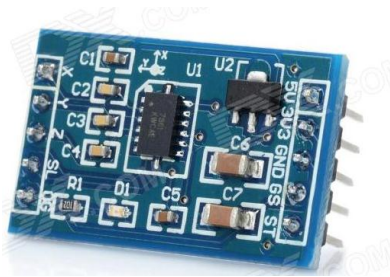
3.1.2 Accelerometer:

Fig 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.

3.2 Bike Section:

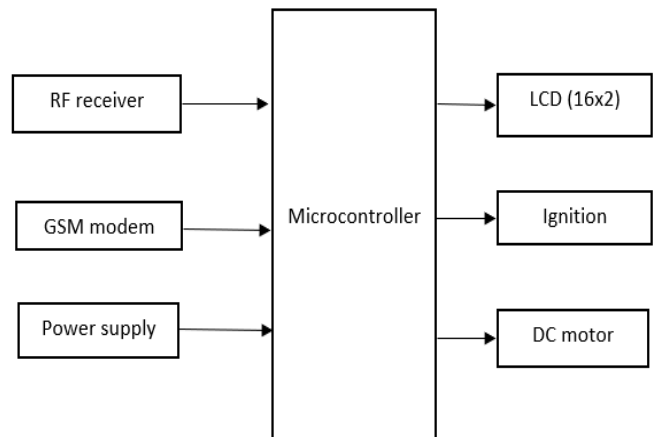This section consists of RF receiver, Microcontroller, GSM module, decoder.

Fig 4 Bike Section

3.2.1 GSM modem:

Fig 5 GSM modem (sim900)

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.

3.2.4 Microcontroller(P89V51RD2):

Fig 6. P89V51RD2 microcontroller

It is an 80C51 microcontrollers which consists of 64KB Flash a 1024 bytes RAM. It supports the 12 clock or 6 clock mode selection through software. The parallel programming and serial system programming are supported by flash program. It offers a program at high speed and also cost reduce programming.

4. IMPLEMENTATION

The implementation of this system provides a very cheap and effective accident detection. Notification is

provided using the android app which is controlled by an admin module.
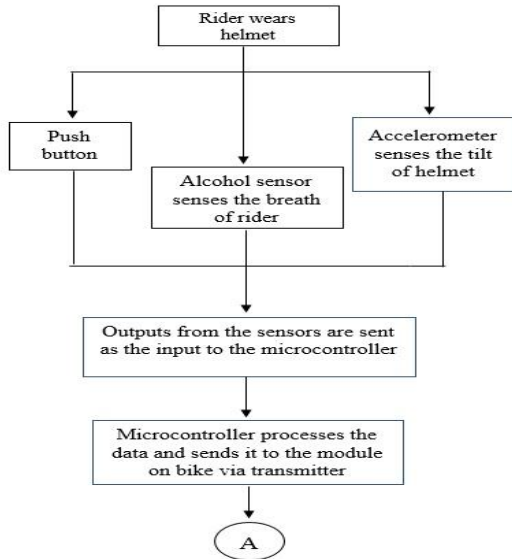
Helmet section:

Fig 7. Flow chart of helmet section

When the rider has worn the helmet, the push button is pressed. [2] 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.

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.
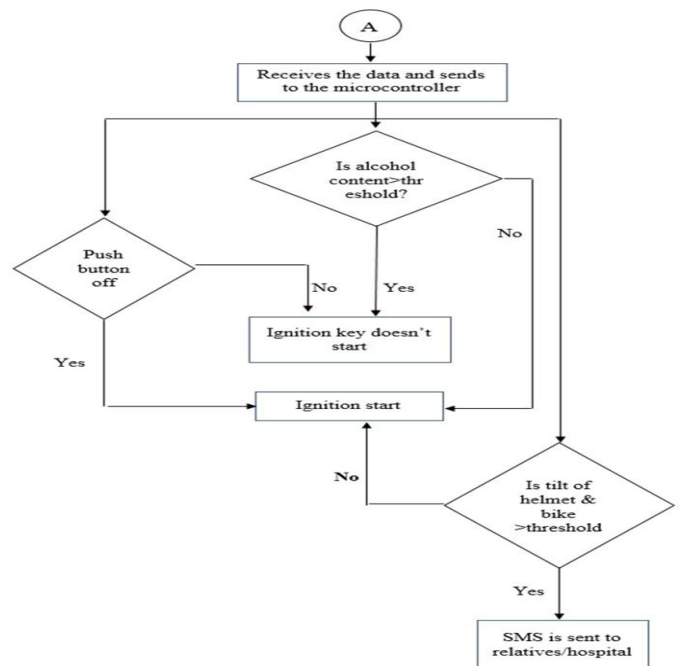

Fig 8. Flow chart of Bike section

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.

ACCI ASSISTO:

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.

Fig 9 IOT side application

Guardian side application:

In Guardian side application, here it receives the alert notification of accident information. So, the Guardian request 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.

Fig 9 Guardian side application

5. RESULT

The system makes sure that the rides ware 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 results show the system was able to detect the accident 275 times out of the 290 times in which 15 were false positives i.e. an accuracy of 94.82% was reached and sends the notification with the correct and current coordinates 96.72% (266/275) of the time. This accident detection result is based on the tilting of the helmet.

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.

6. CONCLUSIONS

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 authorisation 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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