

# Design and Development of a Novel Headgear for Rash Driving and Accident Prevention with Alert System

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## ABSTRACT

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Currently, accidents are a serious problem for everyone. Accidents are increasing day by day, so efforts are made to avoid them to minimize their penalty. We live in a world where the rules of the road have no importance for people and they are frequently violated. In addition, its human nature to oppose what is imposed on them. Thus, using a different point of view, we provide safety with comfortable and intelligent features using a smart helmet. The vehicle accidents are mostly caused by not wearing helmets or wearing improperly such as not putting on the buckle belt. Helmets save the riders life by reducing the shock of the crash from the accident. This paper presents a design of a test system that ensures the rider is to wear a helmet properly. We are going to use accelerometer sensor on the Smart Phone. After installing a program on a mobile phone, it will calculate acceleration based on sensor readings and compare them with typical unsafe driving patterns drawn from actual driving tests. The application allows the owner to track their vehicles. This application sends a notification to owner mobile regarding the vehicle rash driving if any. It also sends the location of the vehicle to the emergency contacts. It introduces an accident warning system that alerts the person driving the vehicle, in case of an accident from the vehicle. the system will send information to the registered mobile number. In addition to this, system doesn't allow the person to drive the vehicle without wearing helmet i.e., if a person is not wearing helmet then the rider will not be allowed to start the vehicle.

**Keywords :** Smart Helmet, Smart Phone, Rash Driving, Accelerometer.

## I. INTRODUCTION

Motorcycles and bikes are an integral part of personalized transportation in India, although

unfortunately this also includes innumerable accidents and later according to subsequent loss and lives. Every year about 300,000 teenagers go to the emergency department because of the bike and at

least 10000 teenagers have injuries that Requires a few days in hospital. Statistics say that the cause of death of motorcycles is 15% of all motor vehicle deaths in 2015 and more than twice as many than motorcyclists died in 1997. During 2015, close to 5 lakh road accidents took place in which 1.46 lakh people were killed and approximately 5 lakh people were injured. Among these statistics 1.44 lakh accidents belonged to the two-wheeler category in which thirty-six thousand people were killed in thirty-four thousand numbers of accidents.

The incidence of accident is increasing day by day in our India. There are various reasons for not having an accident, sufficient parity to drive, faulty two-wheel vehicle rash driving, driving drunk and so on, but the main reason is that the person should not be wearing a helmet. This can lead to brain damage or death due to brain damage, so it is important to wear a helmet while riding a bike. So, our project is that when a bike driver turns on the bike and he is not wearing a helmet, then the bike will not start Because as long as the driver does not have a helmet, the bike will not run Due to which any loss will not hurt us and we are safe the bike will start when a driver wears a helmet.

Rash driving is also considered to be a major one as rush driving causes millions of people to have trouble walking and driving on the roads. And rash driving also causes a very big accident and many people have died. That is why rash driving is also considered a crime. There is a rule in India that it is necessary to wear a helmet while riding a

bike. When a bike driver over speeds on a highway so with the help of the helmet sensor, one recognizes that the speed of the bike is increasing. And will automatically send SMS to their family and register mobile number that is overspeed, If a bike driver rides a bike in Tilting Motion, then the SMS will be sent to the RTO or their family members. There will

be no possibility of any accident if the bike driver gets an accident, then direct msg will be sent from the GSM module to their home as well as to the nearby hospital and the location of that bike rider from the GSM module. The system basically comprises a smart phone, Arduino, ultrasonic sensor and HC05 Bluetooth module. The system displays the time taken by the vehicle in crossing this distance from one pair to the other from which the speed of the vehicle can be estimated and also can be set as a reference value for further calculations. Arduino is the heart of the system, which control all the function of the circuit. It measures the speed and control the circuit through a

programming flashed inside system. Ultrasonic sensors are used to keep watching the speed of each vehicle crossing the sensors. So, the sense of moral responsibility towards society laid the foundation for our "Smart Helmet" project.

## II. LITREATURE SURVEY

In the literature, we found many smart helmet systems but with different approaches and proposed solutions.

S. Chandran et al. Developed a uniform system for detecting and reporting accidents [1]. The system under development holds much more features and improvements. M. Fogue et al. highlighted the use of V2V for vehicle assistance [2]. A lot of systems have already been developed for four wheelers to detect accidents but the field of twowheeler accident detection is still in its infancy. J. White et al. have developed a system to detect accidents with the help of smartphones [3]. This system uses the inbuilt accelerometers in smart phones to detect accidents and the inbuilt connectivity features of smartphones for accident notification. This system is not accurate and reliable as smartphones are susceptible and experience a lot of sudden acceleration changes

which can be triggered as false accidents. S. Hari Sankar et. al. identifies the main cause of fatalities due to accidents [4]. They have identified the critical golden hour and in this period dispatch ambulances to the accident spot. E. Nasr et. al. also has come up with a system which detects accidents and relays the accident location to the Public Safety Organization [5]. Amit Meena et. al. has also come up with a system to combat the increasing mortality rate of two-wheeler accidents in India [6]. The system however cannot plot accidents and thus identifying trends is not possible. Bruno Fernandes et. al. aim to detect accidents in four wheelers using a smartphone app [7]. The app interfaces the inbuilt sensors of the smartphone to detect any anomalies which may be an accident. Using a smartphone to detect accidents lowers the reliability as false positives might be triggered.

### III. SYSTEM ARCHITECTURE

The diagram of system architecture of the project is shown in the figure as follows :

#### A. Arduino

The arduino UNO is having 14 digital pins and provide digital output, there are other 6 analog pins that provide analog output along with 3 ground terminals, 2 power sources with 3.3 V and 5.0V respectively.



Figure 1. Arduino module

#### B. Bluetooth Module



Figure 2. HC05 Bluetooth module

The HC-05 module is easy to use Bluetooth serial port protocol module designed for transparent wireless serial connection set up. In the system, this Bluetooth module is intended for transparent wireless sequential joining arrangement.

#### C. Global System for Mobile communication (GSM)



Figure 3. GSM module

The above figure shows GSM/GPRS. GSM is the universal paradigm for mobile and telephones. It sends the location information fetch using GPS to one of the family member through SMS service.

### D. Global Positioning System (GPS)



Figure 4. GPS module

A satellite based navigation system is called is called as Global Positioning system (GPS). GPS is used to locate the positions on the earth. GPS is consist of satellites, receivers and control and monitor stations. The information is transmitted by satellite and received by GPS receivers for calculating user's accurate location.

### E. Ultrasonic Sensor



Figure 5. US sensors module

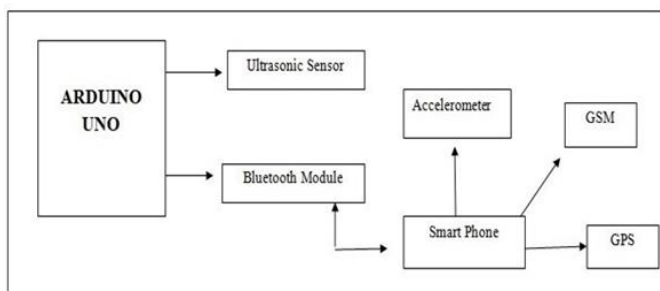


Figure 6. System architecture of the entire system

HC-SR04 ultrasonic sensors are using for accident detection. The ultrasonic sensors measure distance to the target after determining time within emission and reception. This is a satellite based navigation system which finds the location in terms of longitude and latitude. GPS system is never affected by the weather conditions or anything else. It provides service for complete period of time.

### F. Accelerometer



Figure 7. ADXL 335 module

We are using ADXL 335 triple axis accelerometer module which provides easy access to the X, Y and Z axis analog outputs from the accelerometer. It can sense forces up to 3g in all the three axis. We need to store the corresponding values when the helmet is normally worn. This is the calibration we require. The values are stored in ROM, and the difference of current readings and the stored readings are used to detect a possible accident.

## IV. PROCESS DESCRIPTION

The proposed system works very simple. Various bump sensors are placed in different places of helmet where it is more probable to hit and the same are connected to arduino. If the rider crashes and hit the ground the sensors sense the vibrations and give it to the arduino, then the controller send using GSM module that is interfaced to it. If the data goes minimum stress limit then GSM module sends alert message to family member at the

same time. If the rider will not wear helmet the ignition switch will not ON that's why it is compulsory to wear the helmet. When the rider will be drunk the ignition switch will be automatically locked and the location and the status of the rider will be notified to the saved family member's registered number. If the rider happens to accident, the family members will be notified via GSM and GPS module. The main utility of the smart helmet is fall detection. In case the rider falls bike it will be notified to the family. The project helps to reduce rash driving. If a person is driving rashly, the system will automatically sends the message to nearest RTO officials and the registered family member.

## V. WORKING

### A. HelmetDetection

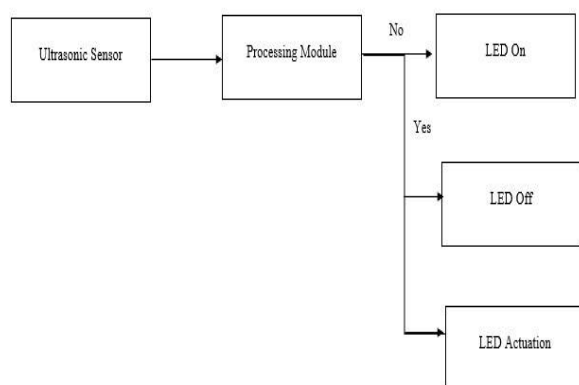


Figure 8. Workflow diagram of Helmet Detection Module

Ultrasonic Sensor has 2 openings on its front: Trigger and echo. Trigger opening transmits ultrasonic waves and echo receives them.

- If the wave is returned after getting reflected by any object i.e., head of helmet back to the echo,
- then it is considered that the person is wearing helmet and thus LED is off.

- If the wave from trigger is not getting reflected by the head of helmet and the having passing completely through it, then we can say that person is not wearing helmet and thus LED is on (to tell us the feedback that person is not wearing helmet).

### B. Location Tracking

#### B. Location Tracking

After the detection of helmet, the Bluetooth module sends signal to receiver (android) which enables GPS and GSM. The app sends a message to the pre-defined number along with the location of the vehicle.

### C. Accident Detection

We will detect the crash or accident by using the accelerometer. If there is any sudden change in accelerometer readings system will beep continuously and will wait for 20 seconds. If the driver pushes the button on the helmet to tell its a false case no SMS will be sent. If its a real accident the GPS location will be retrieved. The information and location will be sent to emergency contacts stored in EEPROM using GSM module.

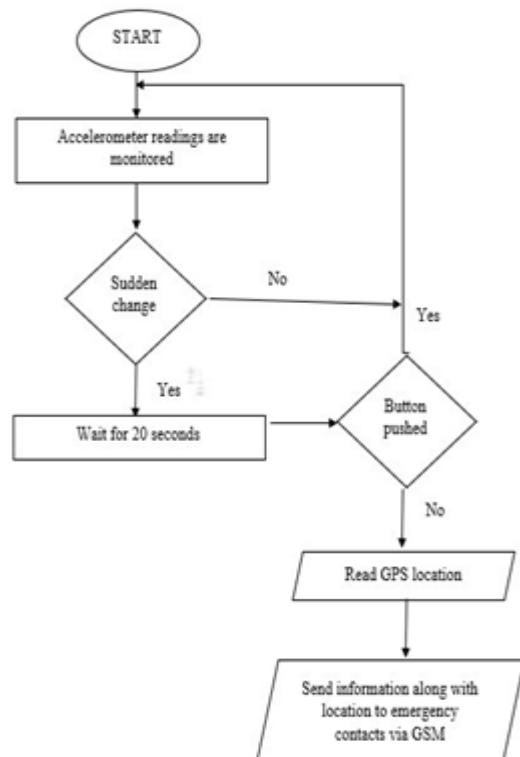


Figure 9. Workflow diagram of Accident Module



### D. Overspeeding Detection

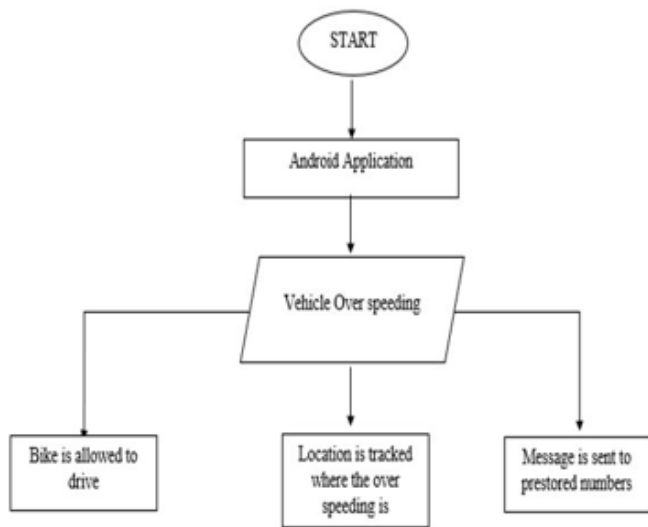


Figure 10. Workflow diagram of Over speeding Detection Module

### VI. RESULT

We implemented different types of sensors here to detect the vehicle crash, location of vehicle, GSM Module to convey the SMS. So that in this concept project we can track live location of driver with the help of GPS module deployed in the helmet. With this integrated system of driver safety gear could save lives of someone.



Figure 11. Snapshot of received SMS

The software application provides the location of the vehicle and speed of the vehicle is also detected. The application shows the bike status i.e., ON/OFF status. Software application involves the android programming which shows the threshold value of speed. If the value of speed goes above

threshold and then the SMS will send to the numbers given in the text box of application.



Figure 12. Implementation of android app representing latitude, longitude and speed

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