

Smartphone Integrated Smart Helmet for Real-time Detection, Prevention and Reporting of Accidents.

Sarasija Arvind Parakkal
sarasijaparakkal@gmail.com

Priyanka Vikram Avhad
ppriyankaavhad724@gmail.com

Vishakha Dhole
vishakha_dhole@outlook.com

Yash Raikar
yashraikar97@gmail.com

Prof B.B. Gite
bbgite.sae@sinhgad.edu

Sinhgad Academy of Engineering, Kondhwa (Bk.), Pune

Abstract

In this paper we have analyzed the various approaches that have been used in the past to create a smart helmet. The research helps us to realize the various technologies that can be used and how the helmet functions can be optimized for better results. Our intention is to develop a Smart helmet that is integrated with an android application. The main objective of this smart helmet is to ensure the safety of the driver by sensing the variations in speed and alerting the driver, detecting the accident and reporting them within the minimum time. The smart helmet uses pressure sensors, speed sensors, front and rear view cameras, Wi-Fi, Bluetooth, etc. to gather data on speed of the vehicle, location, force of the accident, images of the location and other such information that can be used to prevent or detect an accident.

Keywords—Smart Helmet, Bluetooth, WI-FI, Sensors, Android application, Google Maps.

I. INTRODUCTION

According to Global Status Report on Road Safety 2018 given by World Health Organization (WHO) [1], the number of deaths on the world's roads remains unacceptably high, with an estimated 1.35 million people dying each year due to road accidents. Out of these accidents more than half of all road traffic deaths are among vulnerable road users: pedestrians, cyclists and motorcyclists. Pedestrians and cyclists represent 26% of all deaths, while those using motorized two wheelers and three wheelers comprise another 28%. Also head injuries are the leading cause of death and major trauma for two- and three-wheeled motor vehicle users. Correct helmet use can lead to a 42% reduction in the risk of fatal injuries and a 69% reduction in the risk of head injuries. Hence, the use of a helmet is one of the most important factor in reducing the number of accidents. A total of 49 countries representing 2.7 billion people currently have laws on motorcycle helmet use that align with best practice.

These days, wearing a helmet is compulsory across most of the states even in India. Most of the times the reason for the

death is also because of the delay in the arrival of ambulance, absence of pupil at the site of accident to report the accident, etc. Thus, a lot of people die due to lack of treatment at the right time even after wearing helmets.



Fig.3.Helmet Safety Awareness

These problems can be solved by developing a Smart helmet. The Smart helmet proposed in this paper is integrated with an android application that can be used in the reporting of accidents. Additionally the helmet consists of pressure sensors that are used to determine the impact of the accident and uses cameras for recording the journey as well as to give a 360 degree view to the driver. When an accident occurs, the sensors present in the helmet transfer the sensor data through a raspberry pi to the application which further sends an alert message to the nearby hospitals as well as the close members whose numbers have been saved in the application. The helmet is also capable of generating light and sound to alert the nearby pupil of the accident.

II. RELATED WORK

The internet of things (IOT) is one of the fastest growing technology. As per the reports, four accidents occur every hour in India. To prevent the accidents, *Divyasudha N, Rajkumar E.R*, proposed that if the rider or user is wearing the helmet then and then only the bike will start and the user can ride otherwise the user will not be able to ride the bike. Also the user will not be able to use the bike if he/she has consumed alcohol. The alert of accident will be sent to the nearby hospitals and relatives as well and the location of accident can be traced through the GPS/WIFI and the data will be saved on the server.

Sreenithy Chandran, Sneha Chandrasekar, Edna Elizabeth N proposed the detection and notification of the accidents using the combined framework of Cloud Computing and Ubiquitous Sensing. It provides the support for- i. Reading data streams, ii. Transparent and Scalable processing of data and, iii. When events of interest are detected, the predetermined set of actions has to be triggered by utilizing the various algorithms of Cloud Computing.

Mohd Khairul Afiq Mohd Rasli, Nina Korlina Madzhi, Juliana Johari, proposed that the belt should be buckled compulsorily at the time of the bike ride for better safety. They also proposed another method for safety of rider that, if bike exceeds speed above 100 km/h then the flash light will flash and a sound will be generated for alerting the driver of the speed limit. The Peripheral Interface Controller(PIC) 16F84a, Force Sensing Resistance(FSR) and the Speed Sensor(BLDC Fan) are used as sensor to operate this project.

III. PROPOSED METHODOLOGY AND DESIGN

The Smart Helmet proposed in this paper makes use of a smart phone for location tracing, as almost all the smart phones today have inbuilt features such as WI-FI, GPS tracker, Bluetooth, etc. The Helmet will consist of pressure sensors which will detect the variation in pressure when an accident occurs. The sensor data will be transferred to the android application with the help of Bluetooth through raspberry pi. Based on the amount of pressure the application predicts if an accident has taken place. This application then sends an alert message/emergency call to the nearby hospitals along with the location of the accident

and an image of the surroundings taken captured from the front and rear view cameras on the helmet. Additionally the application also generates a loud noise through the smart phone to alert the nearby pupil about the accident. The user can also add additional numbers of friends and family to the application to ensure that they are also alerted incase of any accident. The app also keeps reminding the user to wear a helmet and keep the WI-FI/net on during the ride.

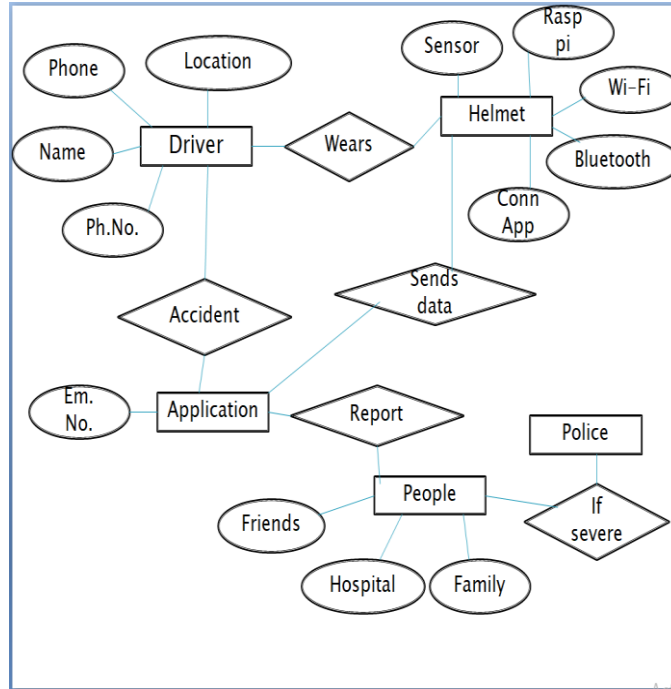


Fig.2. ER Diagram

The helmet also uses speed sensors to detect the variation in the speed of the vehicle and alerts the driver to slowdown if the limit is exceeded in any case. The helmet will also have small a Bluetooth speaker attached on the inner side of it. This speaker will be connected to the Google maps application that can be useful in getting the directions. The Google maps application also provides the user with the information on the state of traffic such as heavy traffic, moderate traffic, etc. In this way, the driver will be well aware of the roads and their traffic conditions. This also reduces the risk of an accident considerably as the driver will be constantly aware of the road and traffic conditions. On the other hand, the helmet will also be capable of providing the driver with a 360 degree view of the road using a rear view camera.

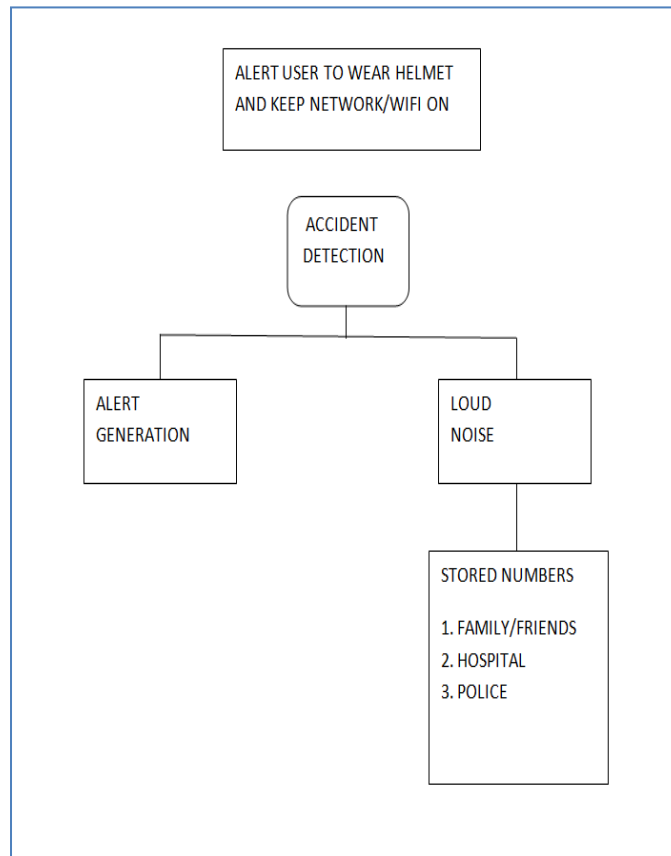


Fig.3.Mechanism of Android Application

IV. SOFTWARE AND HARDWARE REQUIREMENTS

- 1) Raspberry Pi-The Raspberry Pi is a small, affordable, and amazingly capable, credit card size multi-use computer. It is designed and manufactured by the Raspberry Pi Foundation, a non-profit organization dedicated to making computers and programming instruction accessible to the widest number of people.
- 2) Bluetooth-Bluetooth technology is a short-range wireless communications technology used for exchanging data between fixed and mobile devices over short distances using short-wavelength UHF radio waves. It uses low-energy radio waves to send wireless data between Bluetooth-enabled devices. It is similar to Wi-Fi in that it operates over radio waves.
- 3) Wi-Fi- Wi-Fi is a wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections. It is based on the IEEE 802.11 family of standards, which are commonly used for local area networking of devices and Internet access.
- 4) Pressure Sensors-A force sensor or pressure sensor is a force sensing resistor whose resistance changes when a force, pressure or mechanical stress is applied. Force sensors are basically devices used to convert an applied force to a quantity that can be measured.

V. LIMITATIONS OF EXISTING SYSTEM

In the past, many different attempts have been made to develop a Smart helmet. Although these attempts were successful, they also have certain limitations which make them less feasible for real time. In Smart Helmet with Sensors for Accident Prevention by Mohd Khairul Afiq Mohd Rasli, Nina Korlina Madzhi, Juliana Johari, they proposed that, the engine of the bike will start if and only if the user has buckled up the helmet safety belt properly. This is a drawback as the bike won't start without the helmet even if someone wants to go for a short ride where a helmet may not be required. For instance the person will need to carry the helmet even for a simple thing like changing the parking location of the bike. On the other hand, there may be cases where the helmet buckle is broken or the helmet may be damaged. Therefore keeping the bike dependent on a single helmet is not really feasible.

Also most of the methods used previously mainly focus on detecting and reporting the accidents while nothing has been done to prevent the accidents.

In our paper, we have also focused on preventing the accident by alerting the user when he exceeds a particular speed while keeping him updated about the traffic conditions of the road. This helps in keeping the driver aware constantly about his speed as well as the roads which reduces the chances of an accident greatly.

VI. CONCLUSION

The Smart Helmet proposed in this paper, focuses on preventing, detecting and reporting of accidents in real-time. The Helmet also overcomes several disadvantages that were posed by the existing methods. The proposed solution ensures that the user is reminded to wear a helmet; the user is updated and aware about the roads and speed limit and also ensures that the accident is reported within the minimum time. In case the reporting of accident is not successful due to network problems, the sound generated by the smart phone will still help in drawing the attention of the surrounding people. In this way our solution ensures complete safety of the user in all circumstances and has very few chances of failure.

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