

<https://ijgst.com.2023.v12.i2.pp90-93>

Connected Smart Helmet for Continuous Monitoring, Avoidance, and Reporting of Collisions

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Abstract

In this essay, we've examined the many strategies that have previously been employed to develop a smart helmet. The study aids in our understanding of the many technologies available and how to best utilise the capabilities of the helmet. Our goal is to create a smart helmet with an android application built in. The primary goal of this smart helmet is to assure the driver's safety by detecting speed differences and notifying the driver, seeing accidents, and reporting them as soon as possible. The smart helmet employs pressure sensors, speed sensors, front and rear-view cameras, Wi-Fi, Bluetooth, and other technologies to collect information on the vehicle's speed, the accident's location and severity, as well as photographs.

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 factors 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.1. 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.

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, Vasudha 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

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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. Serenity 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 Afia Mohd Rails, Nina Korine 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.

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 incise of any accident. The app also keeps reminding the user to wear a helmet and keep the WI-FI/net on during the ride

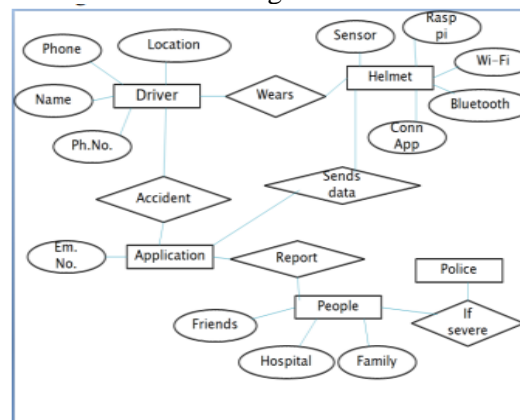


Fig.2. ER Diagram

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.

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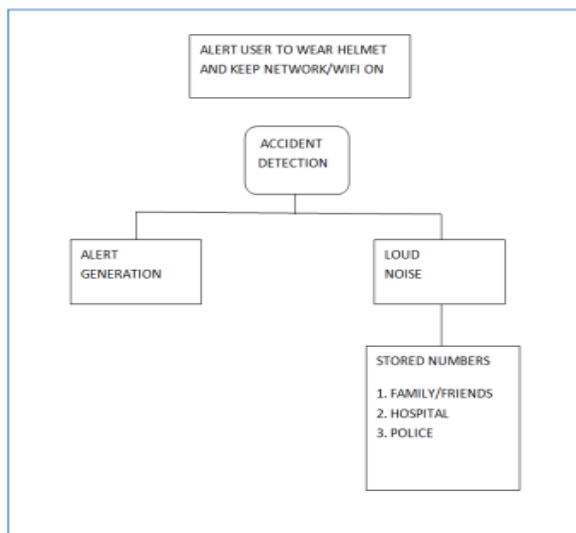


Fig.3.Mechanism of Android Application

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 highspeed 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

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.

CONCLUSION

In this work, a smart helmet is presented that focuses on real-time accident prevention, detection, and reporting. The Helmet also eliminates a number of drawbacks that the previous approaches had. The suggested remedy makes sure that the user is reminded to wear a helmet, that the user is informed and aware of the roads and the speed limit, and that the accident is reported as soon as possible. The sound produced by the smartphone will nevertheless assist in grabbing the attention of those in the immediate area in the event that the reporting of the accident is unsuccessful due to network issues. In this approach, our technology guarantees the user's total safety in

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every situation and has an extremely low failure rate.

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