Smart Helmet Using Raspberry Pi 3B

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Abstract -According to World Health Organization survey nearly 1.3 million humans die every year throughout the globe due to road accidents and around 30-40 million people suffer non-fatalinjuries leading to disabilities of their body parts.
Many rules and regulations are implemented by the Govt. of India to prevent roadaccidents and proper implementation of rules. The main purpose of a helmet is for safety,which protects the rider's head from injuries during an accident. Deaths and injuries are causedbecause of speeding and not wearing helmets.Hence to improve rider safety we are implementing a helmet model which uses Voiceassistant and Raspberry Pi along with relay and other major sensors which in real time systemis related to the ignition system of the Motorcycle.
The main purpose is for safety, which is to protect the rider's head from the impactduring an accident. It protects the rider's head as the helmet provides ventilation system.
Speeding and not wearing a helmet are the main reasons of fatalities and injuries.

***Key Words*:**non-fatalinjuries, Motorcycle,Voiceassistant.

1.INTRODUCTION

In this era of increasing road accidents, a large number of people meet with accidents. Many lives could have been saved if the emergency service could get the crash information in time. As such, efficient automatic accident detection with an automatic notification to the emergency service with the accident location is a prime need to save the precious human life.

As a remedy for these problems, we are designing an intelligent system that ensures the safety of biker by making it necessary to wear helmet, as per government guidelines, prevents road accidents to a limit by detecting alcohol consumption and detect crash and can notify quickly the accident to a predefined number.

By using this proposed system, it sends an automatic alert message to the authorized person or ambulance in case of an accident or any emergency situations. The alert message body contains the place and time of the consequence to speed up the first aid service to the victim.

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2. Components

2.1 Raspberry Pi 3B+

Raspberry Pi 3 B+ has a quad core 64-bit processor and runs at 1.4GHz, it has a Bluetooth 4.2/BLE, along with 2.4GHz and 5GHz dual-band wireless LAN, a faster Ethernet, and separate PoE HAT. The Raspberry Pi 3 B+ has the same architecture as both the Raspberry Pi 3 B and the Raspberry Pi 2B but with additional features. The dual-band wireless LAN comes with modular compliance certification, allowing the board to be designed hence improving both cost and time to market.

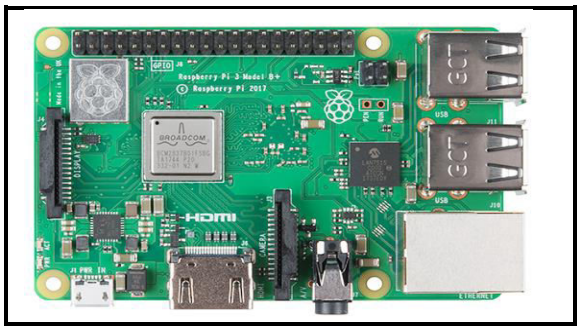

Fig. 2.1 - Raspberry Pi 3B +

2.2 Collision/Impact Sensor

There are many advancements that take place in the vibration monitoring and the analysing the equipment's, there can be various selection of the sensors are many different ways they can be mounted on a machine that remains in its critical factors in finding out the success rate of any of the monitoring system or program. The financial factor can be a made as a optional compromise on the inferior sensors which is not a beneficial investment because the bulk of information that is provided about a particular machine of its interest cannot necessarily be accurate or to be reliable.

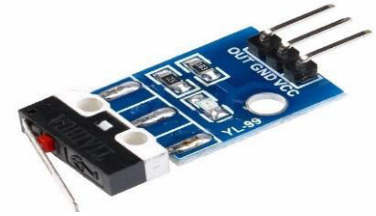

Fig. 2.2 - Collision/Impact Sensor

2.3 GPS Module

The GPS sensors are the devices with transmitters and receiver antennas that make use of the satellite-based navigation system with a huge network of different satellites in the earth's orbit. The main purpose of using the GPS Sensor in the smart helmet is to locate the area where the accident has taken place. The GPS sensor sends the longitude and latitude of the location and will be sent to the contacts of that person. This makes it easy to locate the particular and send necessary help. This GPS sensor is linked with the cloud-based computing system which can be only accessed by a security code algorithm in the emergency contacts that are listed will receive the date stored in the cloud.

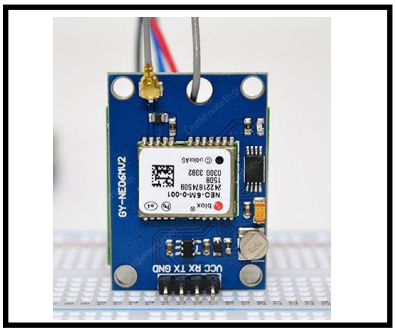

Fig. 2.3 – GPS Module

2.4 Breath Analyzer (MQ3)

An alcohol sensor is basically used to detect the attentiveness of the alcohol gas that is present in the air and an analog voltage is used to calculate and find the output reading. The alcohol sensor gets activated when is used at a temperature values ranging from -10 to 50 degrees with a minimum amount if power supply less than 150 Ma to 5V. The sensing range for the alcohol sensors is from 0.04 mg/L to 4mg/L, which is the most suitable for the breathalysers. The alcohol sensor that is MQ-3 that is used on most of the technical components is placed in a particular region where it can be interfaced with an external operating environment like Raspberry pi. This sensor is useful because it says that whether the person is sober or not. The amount of alcohol consumed is measured using the special unit called the BAC (Blood alcohol concentration). In the MQ-3 alcohol sensor the BAC is measured starting from the minimum range that is 0.03.

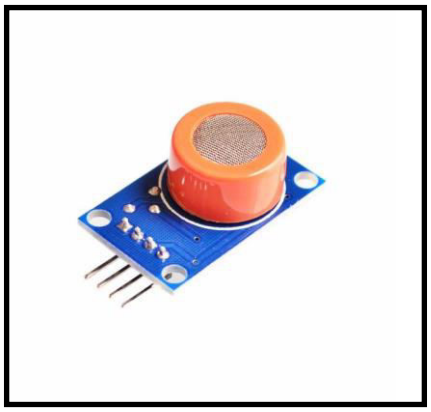

Fig. 2.5 – MQ-3 Alcohol Sensor

2.5 GSM Module

GSM is a mobile communication module, that stands for "Global system for mobile communication". GSM is a digital cellular technology that is used for transmitting voice and message signals operating at the frequency ranges 850 MHz, 900MHz, 1800MHz, 1900Mhz. Then main purpose of using the gsm sensor in the smart helmet is when a person meets with an accident due to which some amount of pressure is incident on the sensor to detect the pressure level. If it exceeds a particular pressure level, it is imitated to the cloud (GSM) to send the message for he contacts that are stored in the cloud. When an accident at any of the places, the information is gathered GPs & the GSM sensor from the cloud which is connected to the raspberry pi sensor which will function and send the messages to the ambulance, family, police, and the nearby hospitals in that particular area so that the person can get the required help as soon as possible. This entire data is made record of and is stored in the cloud and information is maintained. This stored data will be useful for the government to this stored data to investigate such particular areas that are prone to accidents and can declare them as accident prone areas.

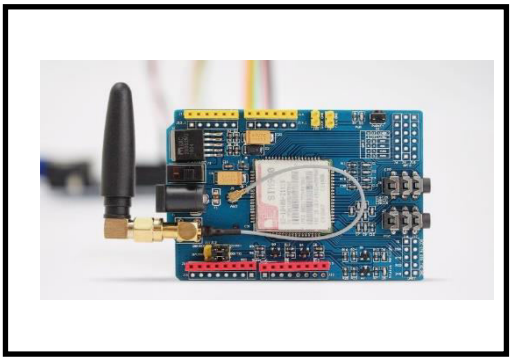

Fig. 2.5 - SIM900 GSM/GPRS

2.6 Actions on Google

Actions on Google is a development platform for the Google Assistant. It allows the third-party development of "actions"—applets for the Google Assistant that provide extended functionality. The actions platform supports "direct" actions, as well as "conversational" actions for more complex applications. More advanced developers are able to develop directly against the API, and a SDK for Node.js is also available.

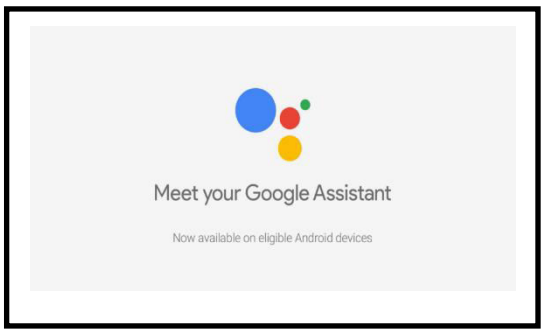

Fig. 2.6 – Google Assistant

3. Working

3.1.1 Proposed System

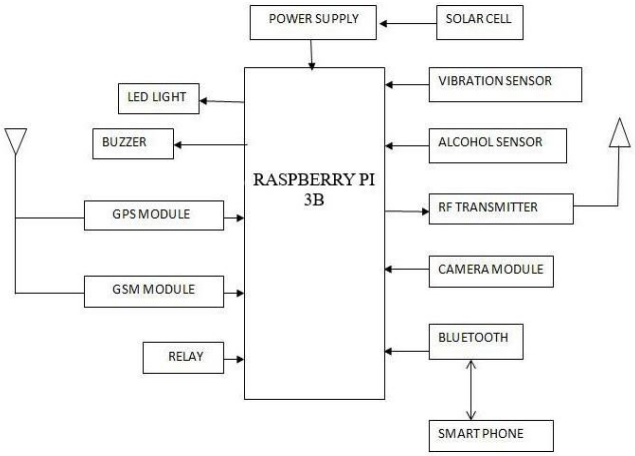

Fig. 3.1.1 Block Diagram

3.1.2 INTERFACING GOOGLE ASSISTANT

Interfacing Speaker and Mic:

```
pcm. ! default {
type asym
capture.pcm “mic”
playback.pcm  “speaker”
}
pcm.mic {
type plug
slave {
pcm “hw:<card number>,<device number>”
}
}
pcm.speaker {
type plug
slave {
pcm “hw:<card number>,<device number>”
}
}
```

3.1.3 Interfacing between a Raspberry Pi3 and GSM/GPRS module

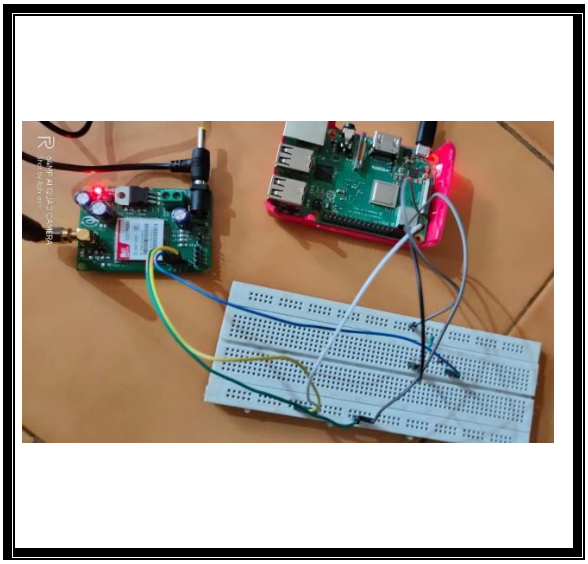

Fig. 3.1.3 Raspberry Pi3 and GSM/GPRS module Interface

3.1.3.1 Working

- Power on the raspberry pi module with Raspbian OS installed on it. Connect the hat module to the raspberry pi through USB as shown in the first figure.
- Insert a sim card to the HAT module to perform GSM operations.
- After connecting the USB, the pwr led will be in an on state.
- Press the PWRKEY for 3 seconds and remove it. The STA LED (status) will also be in a on state.
- The NET led will blink in a continuous manner and the after obtaining the range for sim card, the blinking rate will be reduced.

3. Result

3.1 Google Assistant Interface

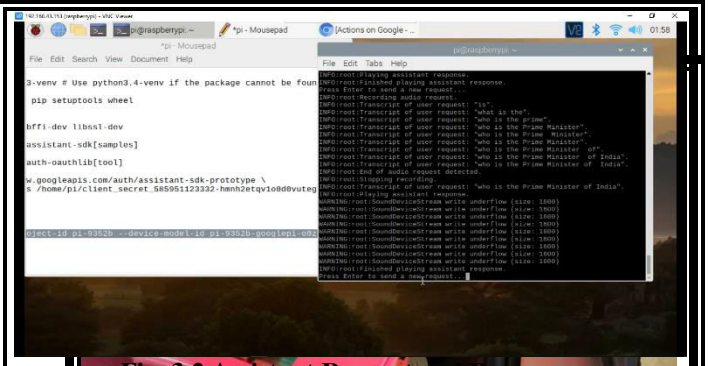

Fig. 3.2 Assistant Request and Response

Fig. 3.1 Assistant Setup

4. CONCLUSIONS

4.1 Introduction

This chapter primarily focuses on the conclusion and the recommendations related to this particular project. The suggestions that are provided here will basically involve an improvement on the existing project.

4.2 Summary of research

The smart helmet project was mainly developed to make such a useful device that can do multiple things which are interlinked with one another, and most importantly for the safety of the person who wears it.Varioustypes**of methods had been used in the** research and the development to implement a good plan from the various other investigators who were also building the smart helmet. The top-notch design and basically the circuit that is used is such that all the data that is stored in the cloud can be fetched at a single stretch without any delay in the information. The useful sensors that are embedded with the circuit which include two navigating sensors that is the GSM and the GPS play a very important role in this project. Sending of the valuable information in the form of SMS as well as sending the co-ordinates of the incident must have taken place become the two main highlights of the project. The raspberry pi that is linked to the cloud for storing the data and the basic sensors like the alcohol, speed sensor, pressure sensor and the relay act as the basic building blocks of the smart helmet. The extra guidance is provided by the "Google Assistant" that is programmed in such a way that it acts as a guiding system for the person riding his bike. The pressure sensors and the relay that are used in this project can avoid rash driving and over speeding of the vehicle. The power backup that is provided in this the mini solar panel that will be placed on the helmet in such a way that the battery power supply gets charged with the other added power supply to this entire circuit which makes it as a long-term useful tool.

4.3 Achievement of research objective

The objective of this Smart Helmet is to maintain the safety of the rider and prevent rash driving and driving after the rider is sober. This smart helmet acts as secure medium for the rider that can guide him with the help of google assistant for the destination he needs to reach, picking calls while riding can also be programmed by the google assistant.

4.4 Suggestion for future work

The Smart Helmet project can be implemented in future with some extra features. There are some for the improvement and future development of the project. We can adding calling via the internet in the future, also we can various different models of this smart helmet based on the requirements of the rider. We can further increase the range of the GPS and GSM frequencies based on the range that will be set in the near future. Further more if we can add the upgraded version of all the sensors for the better reception of all the devices with the main operator raspberry pi.

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