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Smart Helmet with Rear View and Accident Detection System for increased safety

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ABSTRACT: This project presents a smart helmet to show the rider his rear view using a raspberry pi camera. A speed limit indicator will help the rider stay within safe speed limits. Accident detection system is implemented by means of a heart rate sensor. In case of an accident an automated SMS will be sent to the relevant authorities using a GPS and GSM module. The heart rate sensor is also used to detect drowsiness and a vibrator alerts the rider to stay awake. A smart turn indicator warns the vehicles behind motorcycle of the rider's intention to turn. This proposed smart helmet aims to make motorcycle riding safer. Sensors, and cloud computing infrastructures are utilized for building the system. A smart helmet with a rear-view and accident detection system is an innovative and potentially life-saving technology designed to enhance the safety of motorcycle riders and cyclists. The accident detection system communicates the accelerometer values to the processor which continuously monitors for erratic variations. When an accident occurs, the related details are sent to the emergency contacts by utilizing a cloud based service. A system typically combines various sensors, cameras, and connectivity features to provide real-time information and alerts to the wearer. The vehicle location is obtained by making use of the global positioning system. The system promises a reliable and quick delivery of information relating to the accident in real time and up dated to cloud which are accessed by IOT. Thus, by making use of the ubiquitous connectivity which is a salient feature for the smart cities, a smart helmet for accident detection is built.

KEYWORDS: Raspberry pi, GPS, GSM, Drowsiness, Vibration Sensors.

I. INTRODUCTION

India has a huge number of road accidents every year. The accidents may be due to many reasons like driving rashly, exceeding the speed limit, etc. Some deaths are due to the ambulance not reaching the desired location on time. The use of the safety helmet is the single most critical factor in the prevention of reduction of head injury. The helmet along with safety should provide several advanced features to the user to increase rider's interest in wearing a helmet. Hence the motive of this project is to provide the idea about Smart Helmet which is safe and secure for the user and consists of certain smart features. Helmet Design is the smart helmet would have a design similar to a traditional helmet but with added technology components integrated into it. It should maintain the necessary safety standards to protect the head in case of an accident. Rear-View Camera, typically mounted at the back of the helmet, captures a live video feed of what's happening behind the rider. This feed is then displayed on a heads-up display (HUD) or a small screen inside the helmet's visor. The helmet is equipped with sensors that can detect sudden deceleration, impact, or any unusual movement patterns. If a significant impact or accident is detected, the system can trigger various actions, such as sending emergency alerts, recording the incident, and activating safety measures. The helmet connects to a smartphone or a dedicated app via Bluetooth or other wireless technologies. This connectivity allows for data transfer, including GPS location, speed, and accident notifications. GPS Tracking in the helmet's system tracks the rider's location in real-time, enabling features such as route planning, location sharing, and emergency services to quickly locate the rider in case of an accident. In the event of an accident or a sudden impact, the helmet can automatically send an alert to predefined contacts or emergency services, providing them with the rider's location and other critical information. A smart helmet would need a reliable battery system to power its various components. Charging can be done through a USB port or wireless charging. Smart helmets with rear-view and accident detection systems have the potential to

significantly improve road safety for motorcycle riders and cyclists by enhancing their awareness of their surroundings and providing timely assistance in case of emergencies. However, it's essential to ensure that such devices are designed, tested, and used responsibly to maximize their benefits while minimizing any potential distractions or risks.

The outcome and benefits of proposed Smart Helmet and Accident Detection System

Enhanced Rider Safety in primary objective of the smart helmet is to improve rider safety. By providing a clear rear-view camera feed on a heads-up display (HUD), it eliminates blind spots and enhances the rider's awareness of vehicles approaching from behind. This increased visibility can prevent accidents caused by sudden lane changes or merging into traffic. Accident Detection and Response: The accident detection system is a crucial feature. It can detect accidents, sudden impacts, or falls and trigger immediate responses such as sending alerts to emergency contacts or emergency services. Rapid response times can be crucial in reducing the severity of injuries and saving lives. The integration of voice command technology allows riders to control various functions without taking their hands off the handlebars or their eyes off the road. This reduces distractions and promotes safer riding.

The helmet's GPS tracking system provides real-time location data. This can be beneficial in several ways, including the Riders can plan routes and receive turn-by-turn directions through the helmet's HUD, reducing the chances of getting lost. Riders can share their location with friends or family for added safety during long rides. In case of an accident, emergency services can quickly locate the rider's exact position using GPS coordinates. Increased Emergency Response Efficiency is the ability of the helmet to automatically send accident alerts, including the rider's location and condition, to emergency services can significantly reduce response times.

Promotion of Responsible Riding their actions and behaviors are being monitored can encourage riders to adopt safer and more responsible riding habits, ultimately reducing the risk of accidents. Compliance with Safety Standards: Smart helmets are designed to meet safety standards and regulations, ensuring that they provide the necessary protection in case of an accident, in addition to their technological features. Smart helmets with rear view and accident detection systems, the overall safety of roads can improve. Reduced accidents involving motorcycles and bicycles can lead to fewer injuries and fatalities for all road users.

II. PROPOSED SYSTEM

In our project ,A pi camera on the rear side of the helmet is installed to fetch the view behind riders back, the same will be displayed on led display. Then the Gyroscope Sensor used to find out any accident occurred on vehicle then GPS will also generate location report for an emergency system under which various emergency services and rider's family is informed about the accident. Mainly our project we used heart rate sensor. The heart rate sensor is also used to detect drowsiness and heart beat of rider.in case of accident detect drowsiness then the vibrator motor give vibrate alert to rider wake.The Smart Helmet with Rear View and Accident Detection System offers a comprehensive set of features and benefits aimed at enhancing rider safety, improving emergency response times, and contributing to overall road safety. By addressing common safety challenges faced by motorcycle riders and cyclists, this technology has the potential to save lives and reduce the severity of injuries on our roads. This feature can be especially critical in remote areas or when the rider is unable to call for help. Data Logging for Accident Investigation the helmet's ability to record incidents and accidents can provide valuable data for accident investigations. This can help in determining the causes of accidents and improving road safety measures.

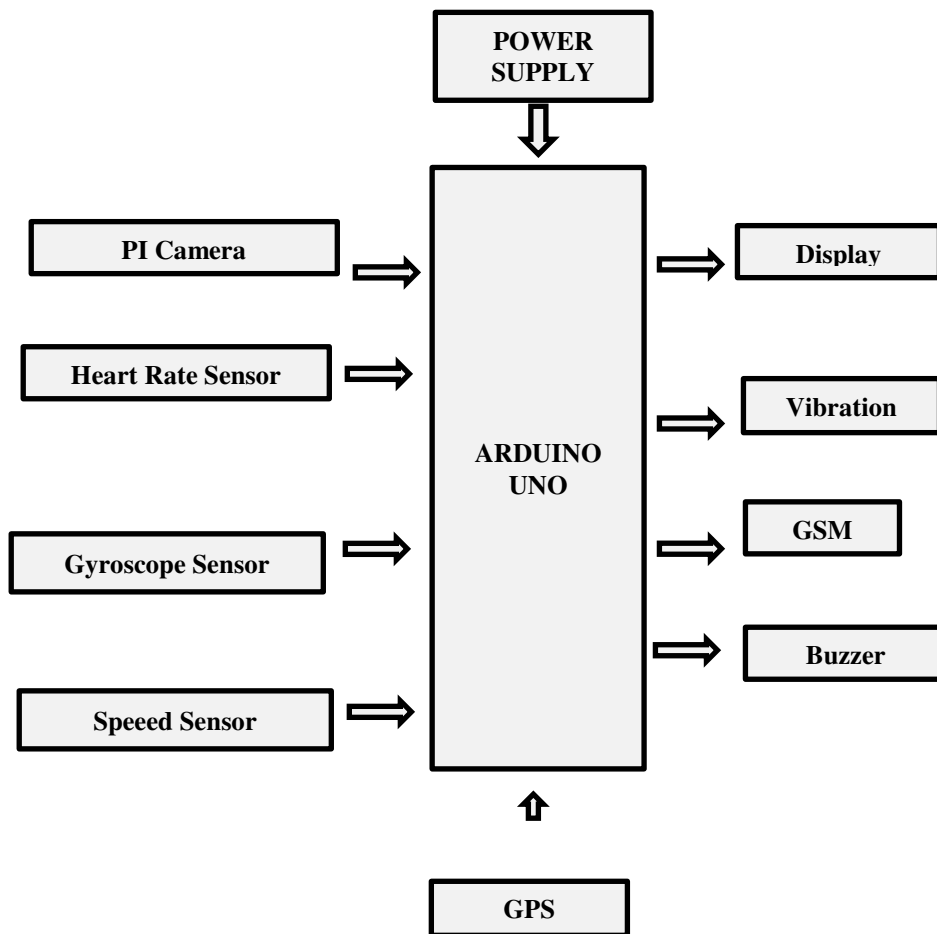


Fig. 1 Architecture of proposed system

Advantages:

- Speed limit indicator is very useful
- In case of accident sensor detect drowsiness and a vibrator alerts the rider to stay awake

III. WORKING FLOW

They received heavy current bill than what they usually receive every month , it is may be because of many reasons such as usage of more electricity due to work from home culture, more people present in home back from hostels, other country etc, Also if the usage exceeds 200 units there will be an extra charge and there is no alert system to intimate in traditional energy meters and also the wastage of current by some busy individuals by not switching off the lights and fans when not in use due to their busy schedules and work.

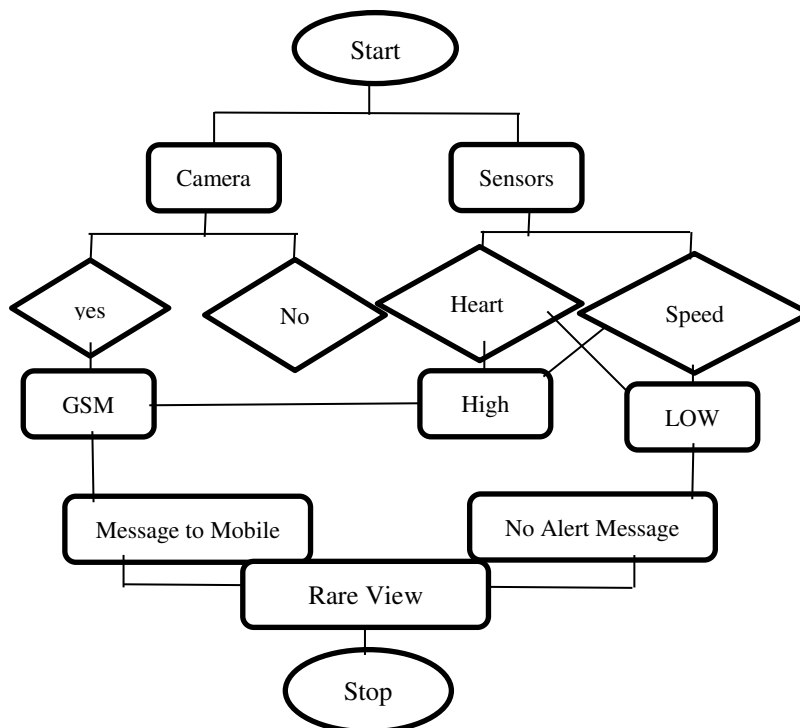


Fig. 2 Architecture of Workflow Chart

IV. COMPONENTS DISCRPTION

Raspberry Pi Controller:

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. The Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. We want to see the Raspberry Pi being used by kids all over the world to learn to program and understand how computers work.



Fig. 3 Raspberry pi

GSM Module:

GSM module is employed to send a message (SMS) to the registered user phone. When there is a detection of gas leakage by the gas sensor, microcontroller will send a signal to GSM module, during which one among the work is to deliver the text SMS. In the GSM module it will use SIM memory to save the data of the owner and the distributor or to whoever the messages got to be forwarded. It requires very less memory to send and receive messages and functions on simple 12 Volt supply.

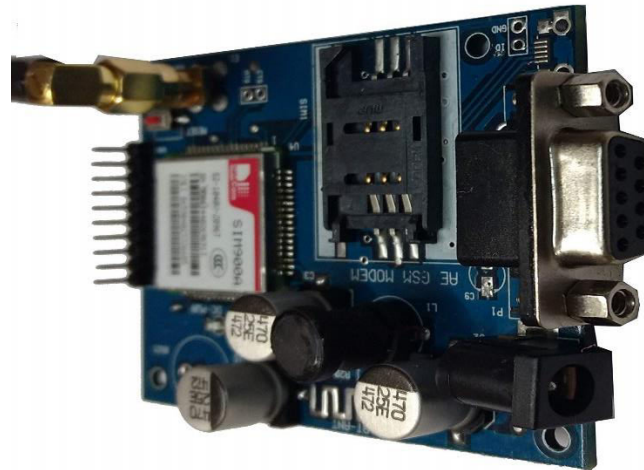


Fig. 4 GSM Module

Buzzer

A **buzzer** is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application.

Power Supply

Power supply is termed as a device which is useful to supply the electric power to the required devices through it to the electrical load. The main function of the power supply is to change the electric current and then power the load. A power supply is a component that supplies power to at least one electric load. Typically, it converts one type of electrical power to another, but it may also convert a different form of energy – such as solar, mechanical, or chemical - into electrical energy. A power supply provides components with electric power. The term usually pertains to devices integrated within the component being powered. For example, computer power supplies convert AC current to DC current and are generally located at the rear of the computer case, along with at least one fan. A power supply is also known as a power supply unit, power brick or power adapter.

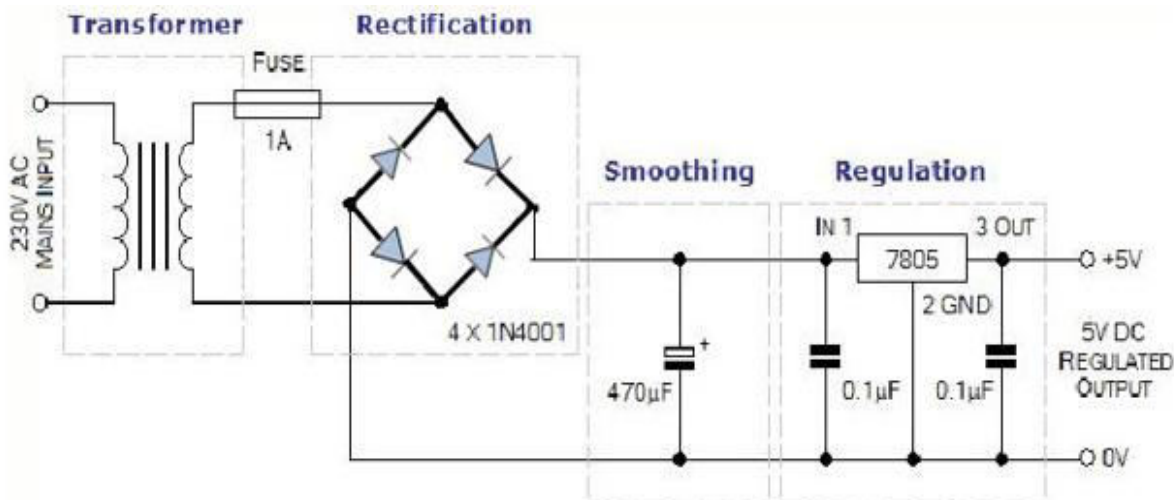


Fig. 5 Power Supply

GPS:

We can add a GPS module in IOT patient monitoring using Arduino. This GPS module will find out the position or the location of the patient using the longitude and latitude received. Then it will send this location to the cloud that is the IOT using the Wi-Fi module. Then USER can find out the position of the patient in case they have to take some preventive action.



Fig. 6 GPS

Heart Rate Sensor:

Pulse Sensor is a low cost, very small size a plug-and-play heart rate sensor for Arduino and Arduino compatible boards. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart-rate data into their projects. Pulse Sensor Amped adds amplification and noise cancellation circuitry to the hardware. It's noticeably faster and easier to get reliable pulse readings. Pulse Sensor works with either a 3V or 5V Arduino. A Color-Coded Cable, with a standard male header connectors. Plug it straight into an Arduino or a Breadboard. No soldering is required. An Ear Clip, perfectly sized to the sensor. It can be hot-glued or epoxied to the back of the sensor to get reading from an ear lobe.



Fig. 7 Heart Rate Sensor

Hardware Requirements:

- Raspberry pi
- GPS
- GSM
- Display
- Vibrator
- Buzzer
- Pi Camera
- Heart rate sensor
- Gyroscope Sensor
- speed Sensor
- Power supply

Software Requirements:

- Raspbian OS
- Python

RASPBIAN OS

There are tons of operating systems for the Raspberry Pi. While many Pi compatible OSES are Linux distributions (distros), Android, Chrome OS, and non-Linux images are available for the RasPi as well. Despite the plethora of operating system choices, the Raspberry Foundation's own Raspberry Pi OS remains a top choice as one of the best Raspberry Pi distros available. However, since its inception, the operating system formerly known as Raspbian has evolved greatly. Learn all about Raspberry Pi OS, from what it is, its history, and why you should use it! Raspberry Pi OS is a free, open-source Debian Linux-based operating system engineered for use on Pi boards. Additionally, several ARM-based single-board computers also run Raspberry Pi OS. The first version, then known as Raspbian, debuted in 2013, and from 2015 onwards the Raspberry Pi Foundation offered it as an officially-sanctioned Pi distro. Developers Peter Green and Mike Thompson are responsible for creating Raspbian, initially an independent endeavor.

V. METHODOLOGY

Developing a Smart Helmet with Rear View and Accident Detection System involves a systematic methodology to ensure the successful design, implementation, and testing of the technology. Below is a high-level methodology for Conceptualization

- a. Problem Definition: Clearly define the problem you aim to solve - enhancing the safety of motorcycle riders and cyclists through real-time awareness and accident detection.
- b. Market Research: Investigate existing technologies, competitors, and user needs to identify gaps and opportunities for innovation.

User Requirements: Collect input from potential users (motorcycle riders and cyclists) to understand their needs, preferences, and expectations for the smart helmet.

Technical Requirements: Determine the technical specifications, such as the type of sensors, cameras, connectivity, and

power sources required.

System Design:

- a. Helmet Design: Develop or modify the helmet design to incorporate the necessary technology components while ensuring safety and comfort.
- b. Component Selection: Choose appropriate sensors, cameras, processors, and connectivity modules based on the technical requirements.
- c. Software Architecture: Define the software architecture, including the operating system, algorithms for accident detection, and user interface design.

User Interface Development:

Create an intuitive and user-friendly interface within the helmet's visor or heads-up display to display the rear-view camera feed and other relevant information. This methodology outlines the key steps involved in developing a Smart Helmet with Rear View and Accident Detection System. It's crucial to involve experts in various domains, including hardware design, software development, and user experience, to ensure the helmet's effectiveness and safety. Additionally, considering legal and regulatory requirements is essential to bring the product to market successfully.

VI. CONCLUSION

Road accidents are increasing day by day because the riders are not using the helmet. In today's world, huge numbers of people are dying on road accidents. By using smart helmet, the accidents can be detected. The system also helps in preventing the fatal accidents caused by over speeding by cautioning the main rider by a buzzer alert system. In case of the smart helmet tampered or lost, a provision of an alternate method to start and use the bike is provided for a limited period of time till the user purchases a new smart helmet.

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