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Smart Motorcycle Vest

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Abstract: *The Smart Motorcycle Vest is a pioneering safety gear that utilizes advanced technology to enhance rider protection and revolutionize motorcycle safety. This cutting-edge vest incorporates features such as high-visibility LED lights, intelligent collision detection, real-time haptic feedback, an integrated communication system, and active impact protection. By integrating these innovations, the vest aims to provide riders with unparalleled safety and a secure riding experience. This article explores the key advancements and benefits of the Smart Motorcycle Vest, highlighting its potential to transform the motorcycle industry and improve road safety for riders. Connectivity plays a crucial role in the smart vest's capabilities. Utilizing wireless communication, the vest establishes connections with other vehicles, infrastructure, and emergency services. This connectivity enables the exchange of vital information such as location, speed, and intentions, fostering improved situational awareness for both the rider and nearby vehicles. In the unfortunate event of an accident, the vest automatically initiates an emergency distress signal, transmitting precise location details to expedite rescue operations*

Keywords: Driver Safety, Sensor Technology, Wireless Connectivity, Location tracking and User interface.

I. INTRODUCTION

Motorcycle safety is a critical concern as riders face inherent risks and vulnerabilities on the road. To address this pressing issue, there is a growing interest in developing advanced safety solutions that can enhance rider protection and mitigate accidents. This introduction presents an original overview of the concept of a smart motorcycle vest, focusing on leveraging technology to revolutionize rider safety. The smart motorcycle vest is envisioned as a cutting-edge wearable device designed to integrate state-of-the-art technologies and provide real-time assistance to motorcyclists. By combining sensor technology, connectivity, and intelligent algorithms, this innovative vest aims to proactively identify risks and support riders in maintaining a safe riding experience. Central to the functionality of the smart motorcycle vest is its array of sensors strategically positioned to continuously monitor vital parameters. These sensors track key physiological indicators such as heart rate, respiration rate, and body temperature. By closely monitoring these metrics, the vest can detect any anomalies or deviations from the normal ranges. This capability enables the vest to alert the rider and nearby vehicles, providing timely warnings for potential health-related incidents or fatigue-induced accidents.
These sensors analyse the surrounding environment in real-time, scanning for nearby vehicles, objects, and potential hazards. By leveraging sophisticated algorithms, the vest can assess potential collision risks and promptly alert the rider through haptic feedback or audio signals. This proactive warning system empowers riders to respond quickly and effectively to impending dangers.
Connectivity is a crucial element of the smart motorcycle vest's functionality. Leveraging wireless communication capabilities, the vest establishes connections with other vehicles, infrastructure, and emergency services. This connectivity enables the exchange of vital information, including the rider's location, speed, and intentions, fostering enhanced situational awareness for both the rider and other road users. Furthermore, in the unfortunate event of an accident, the vest automatically triggers an emergency distress signal, providing precise location details to expedite rescue operations.
This research paper gives design and developmentof a smart motorcycle vest that leverages advanced technologies to enhance rider safety on the road. The specific features include:

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- **Integrating sensor technology:** Incorporate acomprehensive sensor suite to monitor vital parameters such as heart rate, respiration rate, and body temperature in real-time.
- **Early detection of health-related incidents:** Develop algorithms to analyze sensor data and detect anomalies or deviations from normal ranges, enabling timely alerts to the rider and nearby vehicles in the event of potential health-related incidents or fatigue-induced accidents.
- **Warning system:** Design a warning system that provides haptic feedback or audio signals to alert the rider ofimpending collisions.
- **Seamless connectivity:** Establish wireless communication capabilities to exchange information with other vehicles, infrastructure, and emergency services. Enable precise location tracking and facilitate quick response in the event of an accident.
- **User-friendly interface:** Develop an intuitive user interface, such as a wearable augmented reality (AR) device, to provide real-time information without distracting the rider. Integrate with the rider's smartphone for hands-free operation and seamless integration with navigation and communication applications.
- **Effectiveness and feasibility:** Conduct rigorous testing and evaluation of the smart motorcycle vest prototype to assess its effectiveness in enhancing rider safety. Evaluate its feasibility in terms of practicality, comfort, and compatibility with existing motorcycle gear.

With these features, it contribute to the advancement of intelligent motorcycle safety systems and provide valuable insights for the development of future smart wearable solutions for motorcycle riders.

II. EXISTING SYSTEM

Fauziana Lamin, et.al. [1] concentered on industrial workers who commute using a motorcycle to and back from work in peninsular Malaysia. This study objective is to determine the frequency of reported construct among motorcyclists, especially on speeding and usage of PPE. A self-administered questionnaire, a Malaysian version of the Motorcycle Riding Behaviour Questionnaire (MRBQ) and socio-demographic details, was collected to measure the riding behaviour of the workers. However, this paper was focus only on speeding and safety equipment construct. The data was collected during a commuting accident intervention program conducted at the respective company.Saima Siddique Tashfia and et.al [2]authorized licensed use tomotorcycle industry which is booming economically in recent years. The number of fatal accidents and causalities are increasing day by day. Motorcycle driving, maintenance knowledge, and service level, etc. are below the standard, which leads to major fatal road accidents. This research work proposed such a system that monitors a motorcycle.Airbag system is first introduced by Dr. J. Krishna, et.al [3] in 4-wheeled vehicles, that gives information about the introduction of the airbag system can be used in the Riding Jackets (for bike riders). This shows the working,construction, installation and what will be problems can occur are discussed.A. Grassi, D. et.al [4] has introduced Powered Two-Wheelers (PTWs) circulating park constantly increased. This phenomenon was strictly linked to the user unremitting demand for mobility. Specifically, motorcycles, scooters and mopeds play a significant role in cities around the world, where traffic congestion and parking spaces represent a relevant daily problem. Siddique Tashfia et.al [5] motorcycle industry is booming economically in recent years. The number of fatal accidents and causalities are increasing day by day. Motorcycle driving, maintenance knowledge, and service level, etc. are below the standard, which leads to major fatal road accidents. This research work proposed such a system that monitors a motorcycle as well as its rider’s condition using IoT devices and an expert system to diagnose the vehicle for fault identification.

III. PROPOSED SYSTEM

The proposed smart motorcycle vest system aims to enhance rider safety and provide additional functionalities through integrated technologies. The system includes features such as accelerometer-based motion detection, LED indicators, button inputs, infrared sensor detection, a buzzer, light-dependent resistor (LDR) sensing, and GPS tracking.

The system is an IoT project implemented on an ESP32 board. It utilizes various sensors including an ADXL345 accelerometer, an infrared sensor, an LDR sensor, and a GPS module. The ESP32 connects to the Blynk IoT platform using Wi-Fi and communicates sensor data to the Blynk app. The accelerometer readings are used to detect left or right

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movement, controlling LEDs accordingly. The state of buttons, IR sensor, LDR sensor, and GPS data is monitored. The system sends this information to the Blynk app using virtualWrite () functions. Additionally, GPS data is parsed to extract latitude and longitude coordinates which are then converted to decimal format and transmitted to the Blynk app. The system includes error handling for cases when GPS signal is not detected. Overall, the system enables monitoring and control of various environmental parameters and movement detection through the Blynk app.The smart vest project is designed to improve safety for the user by providing real-time information on their location, movement, and surroundings, as well as alerting other road users to the user's actions and presence.

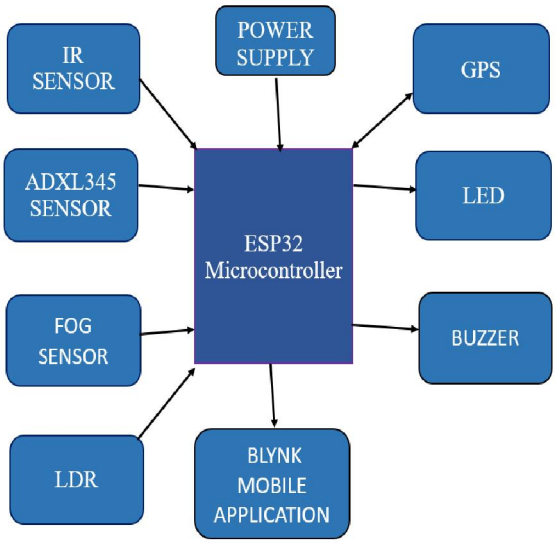

Fig.1: Block diagram of proposed system.

As shown in the Fig.1, the hardware components capture data, such as left and right turn signals, braking signals, object detection signals, and fog detection signals. The microcontroller processes this data and executes the appropriate software logic to control the hardware components. The GPS module also captures location data, which can be used for location tracking and other purposes.

- **ESP32:** This is the main microcontroller that will control all the components in the smart vest. It will receive input from various sensors, process the data, and output commands to control the LEDs, buzzer, and other components.
- **ADXL345:** This is a 3-axis accelerometer that will be used to detect left and right turns. When the accelerometer detects a turn, it will trigger the corresponding LED to turn on.
- Brake button and lights: This is a button that the user can press to indicate that they are braking. When the button is pressed, the corresponding LED will turn on to indicate that the user is slowing down.
- **IR sensor:** This is an infrared sensor that will be used to detect obstacles in front of the user. When an object is detected, it will trigger the buzzer to alert the user of the obstacle.
- **Fog sensor:** This is a circuit made up of an LDR and LED that will be used to detect fog. When the LDR detects a decrease in light due to fog, it will trigger the LED to turn on to increase visibility.
- **GPS:** This is a GPS module that will be used to get the location coordinates of the user. The GPS module will communicate with the ESP32 via serial communication.
- **COMMUNICATION:** The ESP32 microcontroller can communicate with other devices, such as smartphones, using Bluetooth or other wireless protocols, to provide real-time updates on the user's location and other relevant information.
- **POWER SUPPLY:** The smart vest can be powered by a rechargeable battery, which can be charged using a USB cable or other charging mechanism. The power consumption of the various hardware components should be considered when selecting the battery capacity.

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IV. RESULT

The designed system of smart motorcycle vest for the drivers of two wheelers is shown in the Fig.2. Here,the design of motorcycle/ bicycle vest utilizes special features like GPS Module and LED. The different signs are shown using the LEDs by turning ON them for various situations. Some of the different situations are turning left, turning right, going straight, applying break and others.

Light vests provide a bright, consistent light that is visible from a distance, making it much easier for people to see and be seen.Light indicators, also called signaling lights, are signaling devices whose function is to indicate, by means of a light source, the operating or fault status of a specific application in which they are installed.

This west contains the LED strip which is shown in the Fig.3, so the LED will glow according to the motorcycle or cycle rider's direction as the raider turns left then the light glows in the direction of the left side arrow. Then the raider wishes to turn right so the light will show the indication of the right side and glows as shown in the Fig.3. And also which indicates the forward and stop of the raiders.

Fig.2:Light Vest indicating different signals for different situations

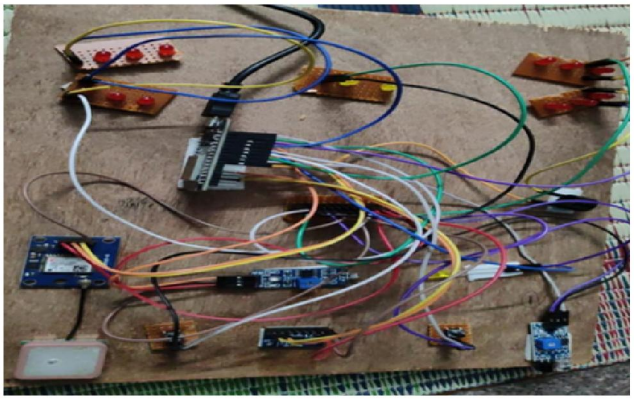

Fig.3: Smart Vest Prototype

The wire connections of different components are also shown in the Fig.3. This has to be made as PCB and inserted in the vest, which the driver can easily wear it. The vest and the components weight are managed in such a way that the vest is not too heavy to wear and simultaneously the vest is comfortable to wear for all age group.

V. CONCLUSION

The smart motorcycle vest represents a promising solution to enhance rider safety by leveraging technological advancements. Through continuous monitoring of vital signs, collision detection, seamless communication, and user-friendly interfaces, this innovative vest aims to significantly reduce motorcycle accidents and protect riders on the road. The subsequent sections of this document will delve into the specific features, design considerations, and potential benefits of the smart motorcycle vest, paving the way for further research and development in the field of intelligent motorcycle safety systems.

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