BIKER'S SAFETY JACKET

R Manju Bhargavi [1] | G.Sagarika [2] | S Rakshitha Reddy [3] | G.Bhavya [4]

1 Associate Professor, EEE department, Bhoj Reddy Engineering College for Women,Hyderabad, Telangana, India.

**2, 3&4 Undergraduate Students, Bhoj Reddy Engineering College for Women,Hyderabad, Telangana, India.*

ABSTRACT: A large number of individuals lost their lives on road each year. According to the records of the road accidents maintained by the Indian Government, every day hundreds of people killed in India. So, the paper deals with a safety jacket designed for bikers, integrating LED indicators and vibrators for enhanced awareness of surrounding vehicles and tracking system. This paper integrates two high-visibility LEDs into the biking jacket to improve the rider's visibility, particularly during low-light conditions. These LEDs are strategically positioned to signal braking and turning intentions, thereby alerting rider and reducing the risk of collisions. Additionally, the jacket is equipped with two vibrators placed. These vibrators are linked to a relay system that detects vehicles approaching the rider's blind spots. In the unfortunate event of an accident, the system automatically triggers a buzzer and an SMS alert to be sent to pre-configured emergency contacts, providing them with the rider's location by using GPS tracking which is a satellite-based navigation system used to receive the accident location through wifi and alerting them to the potential accident. This prompt notification ensures that help can be dispatched quickly, potentially saving lives.

INTRODUCTION

Motorcyclists are among the most vulnerable road users, facing significant risks due to factors such as limited visibility, unawareness of surrounding vehicles, and delayed emergency response in the event of an accident. These challenges contribute to a high number of motorcycle-related accidents, often resulting in severe injuries or fatalities. While traditional protective gear, such as helmets and armored clothing, provides essential physical protection, it does not adequately address the critical issues of rider visibility and situational awareness.

To mitigate these risks, the Biker's Safety Jacket has been developed as an innovative solution designed to enhance motorcycle safety. This jacket integrates multiple advanced technologies to improve rider protection on the road. It features high-visibility LEDs strategically positioned to make the rider more noticeable, particularly in low-light conditions or adverse weather. These LEDs help signal braking and turning intentions, allowing surrounding drivers to better anticipate the rider's actions and reducing the likelihood of collisions.

In addition to enhancing visibility, the jacket incorporates vibrators and a buzzer that activate when nearby vehicles are detected. This system provides real-time alerts to the rider, increasing awareness of their surroundings and addressing common blind spot concerns. Furthermore, in the unfortunate event of an accident, the jacket's GPS tracking system automatically sends the rider's location to pre-configured emergency contacts via Wi-Fi technology, ensuring prompt.

By combining these innovative features, the Biker's Safety Jacket represents a significant advancement in

motorcycle safety. It actively works to prevent accidents while also ensuring quick emergency response, ultimately aiming to save lives and improve the overall safety of motorcycle riders on the road.

LITERATURE REVIEW

The "Smart Wearable Safety Jacket" by Swati A. Sakhare,Anurag A.Kale,Deva G.More , Prajwal A.Kumkar, Jay M.Mirase and Udaykumar S.Sahu(IJARSCT Volume 3,Issue 5): This paper discusses the primary need for creating smart, Internet of Things-enabled clothing and illustrates the potential long-term effects of smart clothing on business models. The basic types and components of smart IoT wearables and clothes are described, their key needs are examined, and some of the most current smart clothing applications are evaluated. Additionally, a worldwide

Io architecture is offered. This paper examines the history and current state of smart clothing in order to offer recommendations for the designers of a network that will connect clothing to other IoT devices in the future: Smart Clothing on the Internet.

“Electronics Women Safety Jacket" by K. A. Patil , Vaibhavi Deshinge,Sakshee Jagtap,Rutuja Keripalea and Shreya Wani. (IJSREM,Volume 07, Issue 12): This research introduces a safety jacket aimed primarily at women, incorporating features for personal security. The jacket includes a panic button to alert authorities and a GPS tracker to provide location information during emergencies, addressing the specific safety needs of female riders and enhancing their sense of security while traveling.

"Wearable Safety Device for Two Wheeler Riders" by Md Firuz Mia, Md Asim Akram, Md Shehab Akter Redoy and Md Aqib Rahman(IJRAR, Volume 11, issue 02): The paper aims to focus on designing and developing a rider's safety jacket that is beneficial for motorcycle riders, horse riders, and individuals who operate in high-rise structures. These devices work on the same principles as vehicle-mounted airbags, which inflate automatically to reduce injuries in the event of an accident. Every second, people die in accidents involving two-and four-wheelers and building sites, including painters, electricians, and masons. The newly designed life-saving jacket is linked to the pressure cylinder via the MPU sensor. Whenever a crash occur the MPU sensor activates, pressurized air inflates the jacket, creating a cushion between the human body and the crashing structure. This absorbs the most impact and minimizes injury

BLOCK DIAGRAM

The block diagram for Biker's Safety Jacket system is shown in the Figure 2.1.

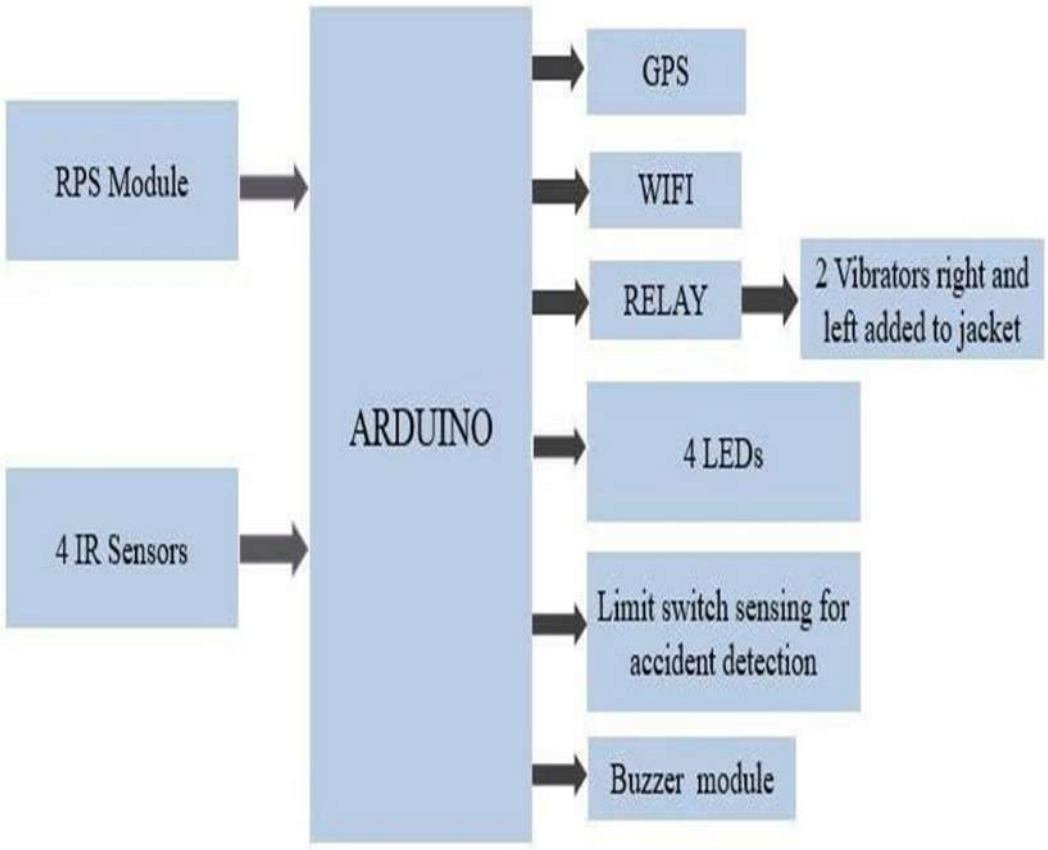

Fig. 2.1 Block diagram of Biker's Safety Jacket

The biker's safety jacket functions as an intelligent alert system to enhance rider awareness and safety on the road. As the rider moves, infrared (IR) sensors continuously monitor the surroundings for any nearby vehicles, particularly from the sides. When a vehicle gets too close, the sensors send signals to the jacket's central controller (an Arduino). The controller processes this input and responds by activating vibrators on the corresponding side of the jacket, alerting the rider through physical feedback. Simultaneously, LED lights and a buzzer provide additional visual and auditory signals to warn both the rider and those around them.

The jacket also includes accident detection via a limit switch, which senses impacts or sudden changes, potentially indicating a crash. When this happens, the jacket not only activates the buzzer but also sends the rider's GPS location to an emergency contact using a built-in Wi-Fi and GPS module. This way, assistance can be quickly dispatched if needed. In essence, the jacket functions as a multi-sensory alert system that helps riders stay aware of nearby vehicles and ensures they can quickly get help in case of an accident

HARDWARE MODULE

A 12V DC battery powers the Biker's Safety Jacket system, regulated to 5V for the Arduino Nano. The primary components include IR sensors, LEDs, vibrators, a buzzer, a GPS module, and a Wi-Fi module, all operating with the regulated 5V supply.

On startup, the GPS module activates, acquiring the rider's location, and the Wi-Fi module connects the system to a network for communication. The IR sensors detect vehicles passing by, sending signals to the Arduino Nano. When a vehicle is detected, the system activates the LEDs, vibrators, and buzzer. The LEDs enhance visibility, while the vibrators and buzzer provide tactile and auditory alerts to the rider.

In the event of an accident, a limit switch acts as an accident sensor, sending a signal to the Arduino Nano. This activates the buzzer and sends an emergency alert with the GPS location to a pre-configured contact via the Wi-Fi module. The combined functionality of the LEDs, vibrators, and buzzer ensures heightened awareness and quick response to potentially dangerous situations.

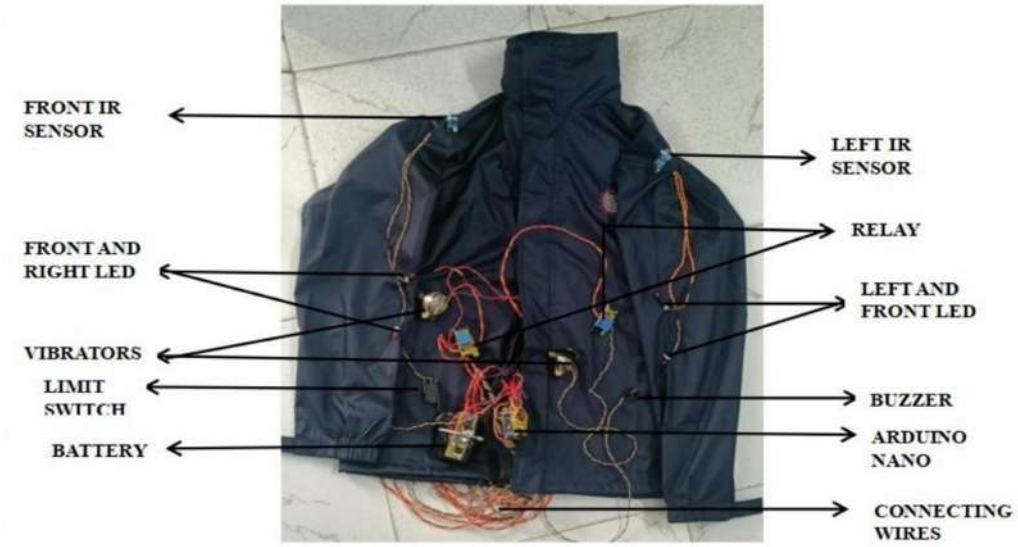

Figure. 3.1 Bikers Safety Jacket (front view)

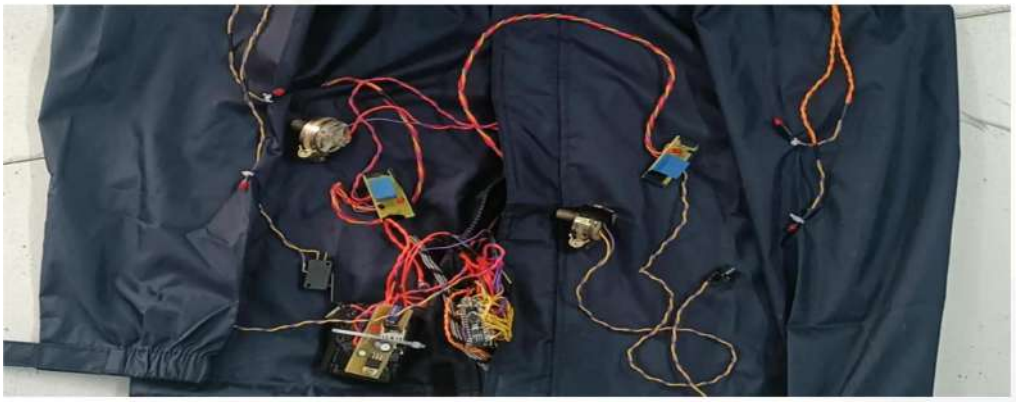

Fig.3.2 Near view of Bikers Safety Jacket

Fig.3.3 Bikers Safety Jacket (back view)

Testing and Results

Case i: Back side object detection

The system detects an object through the back IR sensor(upto 2 inches), which activates the buzzer to alert the user, while the left, front, and right IR sensors remain inactive. All LEDs stay off, and no message with the user's location is sent. This indicates that the system recognizes a nearby object, but since the situation is not critical, emergency protocols such as sending a location message are not triggered.

Case ii: Left side object detection

The left IR sensor detects an object (upto 2inches), leading to the activation of the back LED and the buzzer to notify the user of a nearby object on the left side. The back, front, and right IR sensors remain inactive. No message is sent through GPS and Wi-Fi, as this detection event does not meet the criteria for an emergency. This case highlights the system's capability to provide warnings without escalating to critical alerts unless necessary.

Case iii: Front side object detection

The front IR sensor detects an object (upto 2 inches), causing the buzzer to activate,while all LEDs remain off. Although the object is detected, no message is sent to a concerned person, as this scenario does not involve an accident or emergency. This case reinforces the system's function to alert the user without triggering emergency actions when there is no immediate threat.

Case iv: Right side object detection

The right IR sensor detects an object(upto 2 inches), activating the back LED and the buzzer while the other IR sensors stay off. Despite the system's detection of an object on the right side and the user being alerted through the buzzer and LED, no location message is sent via GPS and Wi-Fi, as the scenario does not indicate a significant danger.

Case v: Accident Alert

In this case, the system detects an accident through the limit switch and sends the GPS coordinates to the concerned person using the Serial Wi-Fi Terminal app.The app connects to the system via Wi-Fi, allowing real-time location tracking. The buzzer is also activated, while all IR sensors and vibrators remain off to signal the emergency.

CONCLUSION

The Biker's Safety Jacket is designed to enhance rider safety by integrating essential components such as IR sensors, LEDs, vibrators, a buzzer, and GPS technology. The IR sensors detect nearby vehicles and trigger the LEDs, vibrators, and buzzer to alert the rider of potential hazards. This system provides both tactile and visual alerts, increasing rider awareness and reducing the likelihood of collisions.

In the event of an accident, the jacket features a limit switch that acts as an accident sensor, automatically sending the rider's location via GPS through a Wi-Fi module to pre-configured contacts. This quick notification ensures help can be dispatched promptly.The use of Arduino Nano for controlling the jacket's functions makes it an affordable and efficient safety tool for bikers. Overall, the Biker's Safety Jacket addresses the growing need for enhanced road safety, offering riders a reliable and effective solution to prevent accidents and ensure timely assistance in emergencies.

Integrating features of all the hardware components that are used have been developed in it. The presence of every module has been reasoned out and placed carefully, and thus contributing to the best working of the units. Secondly, these are using highly advanced Arduino with the help of growing technology; these papers are successfully being implemented. Thus these papers are successfully designed and tested.

FUTURE SCOPE

The future scope for the Biker's Safety Jacket focuses on the integration of IoT technology to enhance rider safety through real-time vehicle detection and monitoring. In this upgraded design, ultrasonic sensors will replace the existing infrared (IR) sensors for detecting nearby vehicles. Ultrasonic sensors offer improved accuracy in measuring distances, allowing the jacket to provide timely alerts to the rider about approaching vehicles, thereby reducing the risk of accidents.

In addition to vehicle detection, the jacket could incorporate features for remote monitoring, enabling fleet managers or guardians to track the rider's safety and location via mobile applications. This feature adds an extra layer of security, as the well-being of the rider can be monitored in real time.

Furthermore, incorporating predictive analytics can enhance safety by analyzing rider behavior and road conditions. By leveraging data from the ultrasonic sensors, the system can offer early warnings and insights to prevent accidents. These enhancements will transform the Biker's Safety Jacket into a comprehensive and

proactive safety tool.

ACKNOWLEDGMENT

The authors are thankful to the officials of Department of Electrical and Electronics Engineering, Bhoj Reddy Engineering College for Women, Hyderabad, India, for providing facilities required to carry out this work.

REFERENCE

[1] "Smart Wearable Safety Jacket" by Swati A.Sakhare,Anurag A.Kale,Deva G.More,Prajwal A.Kumkar,Jay M.Mirase,Udaykumar S.Sahu, Volume 3,Issue 5 ,April 2023.

[2] "Electronics Women Safety Jacket" by Mr. K. A. Patil, Vaibhavi Deshinge, Sakshee Jagtap, Rutuja Keripale, Shreya Wani, Volume 07, Issue 12, December 2023.

[3] "Wearable Safety Device for Two Wheeler Riders " by Firuz Mia, Asim Akram,Aqib Rahman , Shehab Akter Redoy,Mahbub Alam ,Volume 11, Issue 2, June 2024.

[4] H. R. P. K. S. P.-S. . M. Jutila, "Implementation of a Wearable Sensor Vest for the Safety and Well-being of Children," in The 2nd International Workshop on Body Area Sensor Networks, Finland , 2014.

[5] S. L. M. Y. B. Huang, "CycleSafe: A Technology-Assisted Safety Jacket to Prevent Traffic Accidents," Carnegie Mellon University, pp. 1-11, 2019.

[6] S. K. S. A. D. T. Banerjee, "Smart Motorcycle Vest Using Arduino and Vibration Sensing Module,"epartment of Computer Science and Engineering Institute of Engineering and Management Kolkata,India, pp. 1079-1085, 2018.

[7] "Wearable Sensors and Sensor Systems" by Emiliano Sardini and Mauro Serpelloni, Springer, 2016.

[8] T. G. A. Alocious, "Embedded System Controlled Smart Bike," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 4, no. 1,
pp. 165-171, 2015.

[9] "Sensors and Actuators: Engineering System Instrumentation" by David G. Alciatore and Michael B. Histand ,Wiley,2018 (2nd edition).