

Smart Safe Helmet for Bike Activation

B Sonia¹, B Divya², B Koteswara Rao³, Ch SaiKumar⁴, Ch Sangeetha⁵, B Mohan Naidu⁶

Department of Electrical and Electronics Engineering, Vignan's Institute of Information Technology(A),
Visakhapatnam, Andhra Pradesh, India.

E-mail: divyabandaru0808@gmail.com

ABSTRACT:

The development of a smart helmet to two-wheeler safety outlined, featuring wireless transmission between helmet and motorcycle. Helmet acts as a sender, housing advanced components such as the NodeMCU32 microcontroller and an ultrasonic sensor, establishing seamless wireless communication with a motorcycle. On a two-wheeler side, a NodeMCU8266 microcontroller serves as the receiver, integrated with a relay system in the bikes ignition mechanism, both operating via WI-FI. Crucially, the system incorporates a security protocol wherein the bikes ignition is contingent upon the presence of the transmitting helmet within range, deterring unauthorized usage and enhancing theft prevention. This innovative integration of wireless communication enhances two-wheeler safety, ensuring rider compliance with shield measures contributing to a safer driving exposure throughout.

KEYWORDS: Smart Helmet, Wireless communication:WI-FI integration, NodeMCU, Rider authentication.

I. INTRODUCTION:

Recently it is mandatory to wear helmets is introduced in Indian states there are multiple crashes between two wheelers in our country increases by 4444 every year. According to road safety ministry for every hour 53 accidents are occurring for every motor cycle rider it is essential to

put on protective headgear in accordance, with moreover riding a two-wheeler not wearing a helmet is an offense. Nether the motor vehicle act 1939 which stipulates that cyclists will be punished currently 4444 cyclists are easily evading the law [1] these are the three main themes that motivated the development of this project.

In recent years fusion of technologies with everyday objects has revolutionized protective measures across various domains including transportation motorcycling. While exhilarating poses inherent risks that necessitate innovative solutions to enhance driver safety addressing the need we present a groundbreaking project centred around the development of a smart helmet safety system. Integrating wireless communication between the helmet the motorcycle the project aims to leveraging advanced technologies, such as NodeMCU32 microcontroller ultrasonic sensor within the helmet establishing seamless connectivity with the two-wheeler concurrently motorcycle is equipped with a NodeMCU8266 and relay system operating via wi-fi to receive signals from the helmet notably the system. Incorporates a robust security protocol where the ignition of the motorcycle is contingent upon the presence of the transmitting helmet, within proximity thereby thwarting unauthorized usage and enhancing theft deterrence this introduction sets the stage for exploring the intricacies of our innovative smart

helmet safety system which promises to redefine motorcycle protective standards ensuring a safer and more secure riding experience for enthusiasts worldwide.

The smart safe helmet system described offers several advantages:

1. **Enhanced safety:** By integrating wireless transmission between the helmet and the two-wheeler system enhances driver protective factors such as real-time monitoring of helmet presence provide that riders adhere to safety protocols before starting the two-wheeler reducing risk of accidents.
2. **Convenience:** The wireless transmission system eliminates the need for physical connections between the helmet the two-wheeler enhancing convenience for driver this streamlined approach simplifies the driving acquaintance and reduces the hassle associated with traditional safety mechanisms.
3. **Integration of advanced technologies:**By leveraging components such as NodeMCU microcontrollers and ultrasonic sensors the project showcases the integration of advanced technologies into two-wheeler safety systems this technological sophistication not only improves protection but also demonstrates the potential for innovation in the automotive industry.
4. **Compliance:**Monitoring the system enables monitoring of rider compliance with protective measures such as put on a headgearprotection before operating the two-wheeler this feature encourages responsible riding behaviour.

5. **real-time transmissions:** Through wireless transmission system facilitates real-time transfer of data among the headgear protection and the two-wheeler this capability enables prompt responses to safety-critical events enhancing situational awareness for riders overall the smart helmet system offers a comprehensive approach to two-wheeler safety combining technological innovation along practical usefulness to create a protection and more secure riding environment.

II. RELATED WORK:

Numerous study efforts the intent on reinforcetwo-wheeler safety along the assimilation of equipment particularly in the domain of smart safe helmet wireless transmission among the helmet the two-wheelerone notable study by“lee et al”2019.Explored the progress of a smart helmet prototype equipped with sensors detecting driver vital signs and environmental circumstances the system utilized Bluetooth equipment for wireless transmission with the two-wheeler. Enabling real-time observation of driver safety factors while similar in concept this study primarily focused on health monitoring aspects rather than rider authentication for ignition control.

In many state the mandate to wear helmets coupled with rising road accidents in India motivates the development of this system adhering the two wheeler vehicles act standards our project enforces protective headgear use and combats drunken driving a criminal offense utilizing force sensing equipment for helmet detection and MQ-3 alcohol sensors for breath analysis agitation starts when constrains are met sending alerts if the rider is intoxicated fall detection via accelerometers addresses

delayed medical aid post-accident aiming to mitigate fatalities with a focus on driver safety our smart safe helmet integrates various sensing equipment across two microcontroller-based units ensuring seamless communication via rf modules for enhanced protection on the road.^[1]

Smart safe helmet consisting MQ3 gas detecting equipment which identifies gases identifies alcohol provide more safety to two-wheeler by controlling ignition theintegration of rf module control ignition and communicate between helmet and bike.^[2]

Study enhances ride security with safe helmet integrating properties accident identification location detecting utilizes GPS modules for area detecting and GMS for messaging transforming helmet with a vital part of a smart bike,^[3]

The purpose of the studies is to expand a real-time self-sufficient helmet detection device the usage of the yolo deep gaining knowledge of technique to enhance bike safety non-compliant helmets pose a good-sized risk so automating detection can lessen reliance on guide enforcement yolo a sort of CNN offers green real-time item detection capabilities.^[4]

The smart helmet can be done using IOT (internet of thing) using Arduino this can one of the advanced equipment in technologies used now a days we can sense the accident detection alcohol levels.^[5]

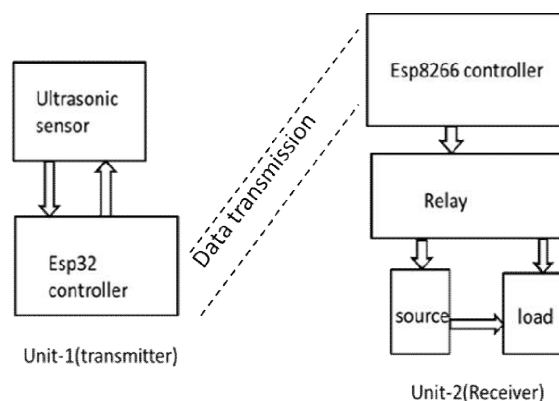
smart helmets integrate improved management for alcohol identification GPS tracking to improve rider protection for two-wheeler driver location driver accident zone.^[6]

The aim of this project is to develop an intelligent bicycle dashboard with a vision sensor that detects helmet use and prevents

fires without a helmet in terms of security it is equipped with an alcohol sensor and GPS as well as SMS notifications for authorities and family members as an additional feature it connects to a mobileapp via Bluetooth to save your vehicles battery.^[7]

III. PROPOSED WORK:

This paper delivers about two wheeler rider safety while driving based on the survey many accidentsoccurring due to rapid increase in two wheeler not following the rules and regulation to overcome this problem we came across with an idea of developing a smart safety helmet for two wheeler riders in this project we are having two units one is transmitting unit and receiving unit the transmitting consist of NodeMCU esp32 controller and ultrasonic sensor and receiving unit consist of NodeMCU esp8266 controller and relay these units communicate with each other through Wi-



Fi and transfer data.

METHODOLOGY:

- i. **Communication Protocol:** A Wi-Fi-based communication protocol will be established between the helmet and the motorcycle to

facilitate seamless data transmission.

- ii. **Security Implementation:** A security mechanism will be implemented to ensure that the motorcycle's ignition remains inactive unless the transmitting helmet is detected within range.
- iii. **Testing and Evaluation:** The functionality and effectiveness of the smart helmet system will be tested under various conditions, including range, signal strength, and environmental factors, to assess its reliability and performance in enhancing motorcycle safety.

wearing helmet distance is within the range if it is in given range then the relay switches from normally open to normally closed then the motor of the two-wheeler get activated else motor gets deactivated.

a) **system functions:**
the required hardware components for this project are:

1. Node MCU(ESP32)
2. Node MCU(ESP8266)
3. Ultrasonic sensor
4. 5v relay
5. Dc motor
6. Smart phone
7. 12v Dc supply
8. Connecting wires

i. **NodeMCU(ESP8266)Specifications:**

1. **Microcontroller:** ESP8266 operating at 2.4GHz.
2. **Voltage:** It operates at voltage of 3.3V.
3. **Memory:** 4 MB of Flash memory and 64 KB of RAM.
4. **I/O Pins:** It has 1 Analog pin and 17 GPIO/PWM pins.
5. **Speed:** It operates with the clock frequency of 80MHz.

Figure 1: Block diagram of Safe helmet for bike activation

The transmitting unit and receiving both interconnects through the Wi-Fi via NodeMCUesp32 at transmitter side and esp8266 at receiver side once both the NodeMCUs are activated esp32 take inputs from ultrasonic sensor which works based on ultrasonic waves reflection between object and calculate the distance between the objects after the data collected by esp32 is transferred to the receiving unit esp8266then esp8266 check the person

6. **Wi-Fi:** Speed of wi-fi in ESP8266 is 2Mbps

ii. **Node MCU(ESP32) Specification:**

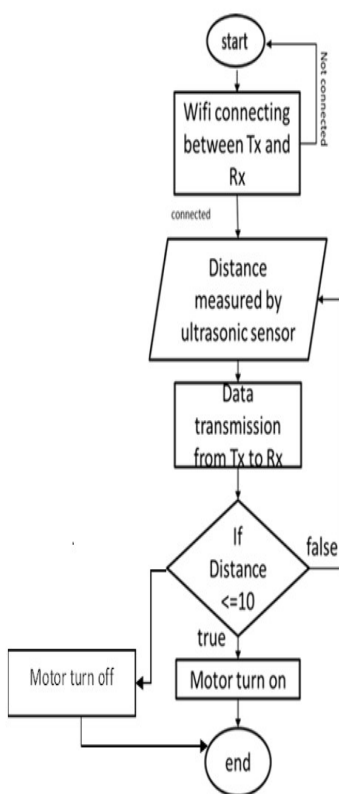
1. **Microcontroller:** ESP32 operating at 2.4GHz.
2. **Voltage:** It operates at voltage of 3.3V.
3. **Memory:** 4 MB of Flash memory, 520 KB of SRAM and 448 KB ROM.
4. **I/O Pins:** It has 1 Analog pin and 36 GPIO/PWM pins.
5. **Speed:** It operates with the clock frequency of 160MHz to 240 MHz.
6. **Wi-Fi:** Speed of wi-fi in ESP32 is 2Mbps

iii. **Ultrasonic Sensor:**

1. **Supply voltage:** 5V DC
2. **Supply current:** 15mA
3. **Modulation frequency:** 40Hz
4. **Output:** 0–5V, with higher output when an obstacle is detected in range
5. **Rangingdistance:** 2cm–400cm
6. **Measuring angle:** 15°
7. **Triggerinputpulse width:** 10uS

- iv. **Relay module Specifications:**
 1. **Supply voltage:** 3.75V to 6V
 2. **Quiescent current:** 2mA
 3. **Current when the relay is active:** ~70mA
 4. **Relay maximum contact voltage:** 250VAC or 30VDC
 5. **Relay maximum current:** 10A
- v. **Dc Motor:**
 1. **Type:** Standard 130 Dc motor
 2. **Operating voltage:** 4.5V to 9V
 3. **Current at No load:**70mA
 4. **Loaded Current:**250m

IV. FLOW CHART:



V. RESULTS AND DISCUSSION

The primary goal of this smart safe helmet for two wheeler is to the use of Wi-Fi connection enables seamless transmission of data from the helmet to the bike letting for real-time transmission of data and commands this ensures instantaneous response minimizing any potential delay in the activation or deactivation of the bikes ignition system moreover the reliability robustness of the wireless transmission link have been validated through rigorous testing ensuring consistent performance under various environmental conditions .



Figure 2:The Transmission unit

figure 2 describe a unit consisting interval scaling piece that is ultrasonic it calculates within a person’s neck and the helmet and sends the input to the Esp32.Esp32 sends data to the receiving unit.

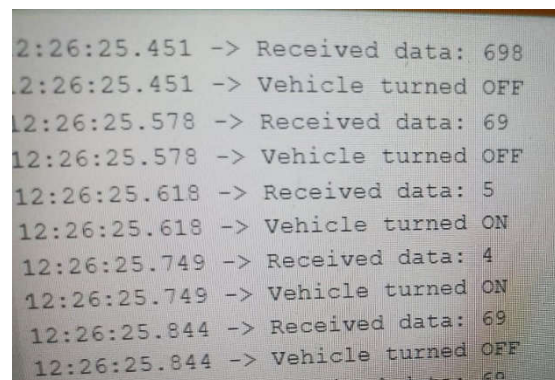


Figure 3:The transmission of data in Arduino

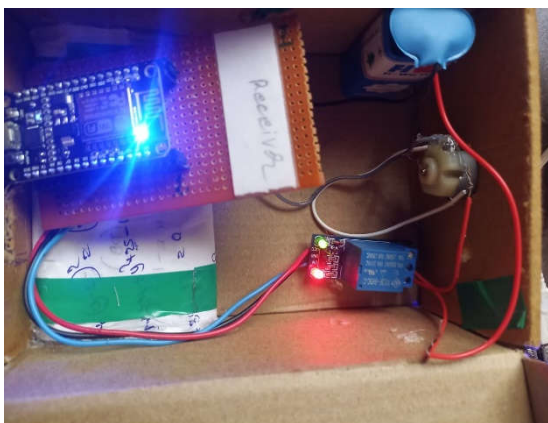


Figure 4: The receiver unit when condition is true and relay on

From figure 3 and figure 4 when the data transferred between Esp32 Esp8266 it checks condition if it is in given range turn on the relay and two-wheeler get on.

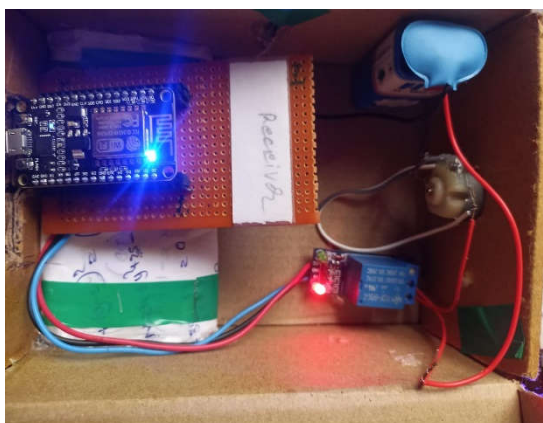


Figure 5: the receiver unit when condition fails and relay off

From figure 3 and figure 5 when the data transferred between esp32 esp8266 it checks condition if it is not in given range the relay get turn off and two-wheeler get stopped.

VI. CONCLUSION:

The integration of wireless data transmission between the smart safe helmet and two wheeler represents a significant advancement in rider safety by employing NodeMCU modules and

ultrasonic sensors the helmet effectively communicates with the two wheeler enabling necessary safety estimate the requirement for transmitting safe head Gare to be worn at the beginning of motorcycle starts serves as a proactive safety measure preventing unauthorized or unsafe operation of the two wheeler overall the smart safe helmet system enhances driver protection by advance responsible compliant actions thereby decreasing the possibility of accident injuries. Helmet and two wheeler represents a significant advancement in rider safety by employing NodeMCU modules and ultrasonic sensors the helmet effectively communicates with the two wheeler enabling necessary safety estimate the requirement for transmitting safe head Gare to be worn at the beginning of motorcycle starts serves as a proactive safety measure preventing unauthorized or unsafe operation of the two wheeler overall the smart safe helmet system enhances driver protection by advance responsible compliant actions thereby decreasing the possibility of accident injuries.

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