

Smart Helmet For Making Motorcycle Ride Safer

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Abstract - Motorcycle safety is a critical concern, and the smart helmet project aims to address this by integrating advanced sensor technology and wireless communication systems. This smart helmet can prevent the motorcycle from starting if the rider isn't wearing the helmet or if the rider is intoxicated, ensuring safer riding practices. Additionally, the helmet is equipped with accident detection capabilities, sending real-time location alerts to designated contacts via SMS using GPS and GSM technology. The system consists of two modules: one embedded in the helmet and the other on the motorcycle. These modules communicate wirelessly using RF signals, managed by an Arduino microcontroller. The helmet module includes an alcohol sensor, IR sensor, and accelerometer, while the bike module contains the RF receiver, GPS, GSM, and a relay to control the engine. This innovative smart helmet system enhances rider safety by promoting responsible behaviour and providing immediate assistance in case of an accident, making motorcycle riding significantly safer.

Key Words: Smart Helmet, Motorcycle Safety, Sensor Technology, Wireless Communication, Accident Detection.

1.INTRODUCTION

Motorcycle riding can be dangerous, and safety is a big concern for riders. The smart helmet is a new and innovative solution designed to make riding safer. By using advanced sensors and wireless communication, this helmet can do a lot more than just protect your head. It can stop the motorcycle from starting if you're not wearing the helmet or if you've had too much to drink. This helps ensure that only safe and responsible riders are on the road.

The smart helmet also has features to detect accidents. If you crash, it can automatically send a message with your location to family members or emergency services, helping them reach you quickly. This is made possible through GPS and GSM technology.

Our project includes two main parts: a module in the helmet and a module on the bike. These parts talk to each other wirelessly using RF signals and are controlled by an Arduino microcontroller. The helmet module has sensors to detect alcohol, check if the helmet is worn, and measure sudden impacts. The bike module has a receiver for the RF signals, a GPS for location, a GSM for sending messages, and a relay to control the engine.

This smart helmet system is designed to make motorcycle riding much safer. By encouraging responsible behavior and providing quick help in case of an accident, it offers peace of mind to riders and their loved ones.

2. LITERATURE REVIEW

Jennifer William, Kaustubh Padwal, Nexon Samuel, Akshay Bawkar, and Smita Rukhande [1] proposed a smart helmet system aimed at ensuring rider safety by enforcing helmet usage and checking for alcohol consumption before starting the bike. If either safety rule is violated, the system prevents the bike from starting. Additionally, in the event of an accident, the system automatically sends an SMS with the rider's location to the police station, facilitating prompt medical attention for the victims.

Manjesh N, Prof. Sudarshan Raj [2] provided insights into a similar system where the helmet detects wearing status and alcohol levels, alerting family members via SMS in case of an accident. They utilized GSM technology for transmitting accident information through SMS, employing a GSM module equipped with a SIM card slot for communication.

Manjesh N, Prof. Sudarshan Raju C H [3] explained the operation of a smart helmet equipped with vibration sensors strategically placed within the helmet to detect crashes. Upon impact detection, the sensors relay the information to a microcontroller board, which then extracts GPS data using an interfaced GPS module. If the stress exceeds a predefined threshold, the GSM module automatically sends a distress message to an ambulance or family members.

Mr. K. Nishanth Rao, Mr. S. V. S. Prasad, G. Veerababu, D. Akash, P. Udaychowdary, R. Naga Venkataramana [4] introduced a system focused on locating vehicle accidents by embedding a system within the vehicle. Their approach utilizes a basic microcontroller, AT89S52, for cost-effectiveness while aiming to enhance vehicle security.

Yash Pandav, Darshan Siroya, Keyur Gajera, Shweta Gaur [5] discussed a helmet system that prevents bike ignition if the rider isn't wearing the helmet or if alcohol consumption exceeds a set threshold. Their system prioritizes preventing head injuries and accidents by ensuring safe riding practices.

K. Rambabu, B. Premalatha, and C. Veeranjanyulu [6] implemented wireless communication between the helmet, bike, and traffic signals. They employed ZigBee and RF protocols with an Arm-7 Microcontroller for communication, aiming to

enhance rider safety through effective communication between the various components.

Prof. Chitte P.P, Mr. Salunke Akshay S, Mr. Thorat Aniruddha N, Mr. Bhosale Nilesh T [7] proposed a system to mitigate accident effects and prevent bike theft. Their approach utilized Arduino Lilypad and RF module for wireless communication, deeming wireless connection superior to a wired link for its convenience and flexibility.

Anjali Baburaj, Thasni V.T, Reshma N.S, Yadhu Krishnan P, Deepak K.N [8] developed a smart helmet integrating multiple sensors for enhanced rider security. Their system utilized various microcontrollers like ZIGBEE, Arduino, and PIC along with technologies like GSM and GPS, providing comprehensive protection for riders.

Kshirsagar Rajat, Fakir Swaleha, Thombre Shubham, Prof. Apte S.K [9] introduced a smart helmet system capable of detecting helmet wearing status and alcohol levels beyond permissible limits. Their system aimed to reduce road accidents by promptly notifying family members and nearby police stations of the victim's location in case of an accident.

Anshu Singh Gautam, Gulshan Kumar Dubey, Mayank Mishra, Mohita Prabhat [10] utilized an MQ6 alcohol sensor for breath analysis in their smart helmet system. Their system ensured proper helmet placement and managed all system functions and sensor data through a Microcontroller Unit (MCU).

3. HARDWARE AND SOFTWARE USED

Hardware :

- Arduino Uno
- Helmet
- ADXL 335 Accelerometer
- Alcohol Sensor
- IR Sensor
- GPS
- GSM
- RF Transmitter
- RF Receiver
- 5V DC Relay
- 5V DC Battery
- 300 RPM motor with Gear box
- Charging Module
- Switch
- Connecting Wires

Software :

- Arduino IDE

4. METHODOLOGY

4.1 Working :

The Smart Helmet is designed to be a reliable guardian for motorcycle riders, offering a layer of protection and safety on the road. It functions through two main components: the Helmet Module and the Bike Module. Think of the Helmet

Module as a smart brain tucked inside the helmet, while the Bike Module acts as its counterpart attached to the motorcycle.

Inside the Helmet Module, there are various sensors that continuously monitor the rider and the environment. These sensors include ones that can detect alcohol levels, ensure proper helmet usage, and even sense sudden impacts, such as those from accidents. They work like small detectives, constantly checking for any signs of danger.

When any concerning activity is detected, such as the rider being intoxicated or a collision occurring, the Helmet Module sends a signal wirelessly to the Bike Module. This communication is swift and efficient, allowing for immediate action to be taken. For example, if the rider has had too much to drink, the Bike Module can prevent the motorcycle from starting, ensuring that the rider doesn't hit the road while impaired.

Additionally, in the event of an accident, the Helmet Module can quickly alert emergency services or designated contacts with the rider's location using GPS and GSM technology. This ensures that help is on the way as soon as possible, potentially saving lives in critical situations.

The seamless wireless communication between the Helmet Module and the Bike Module ensures that they can work together effectively, even while the motorcycle is in motion. This real-time interaction adds an extra layer of safety, providing riders with peace of mind knowing that they have a reliable safety net watching over them as they navigate the roads. Overall, the Smart Helmet is a powerful tool for promoting safer motorcycle riding and preventing accidents on the road.

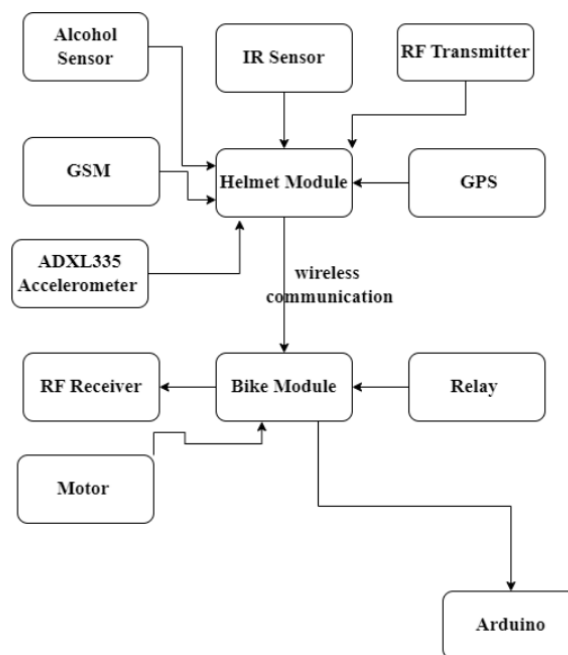


Fig.4.1.1 Block Diagram of Smart Helmet

4.2 Flowchart

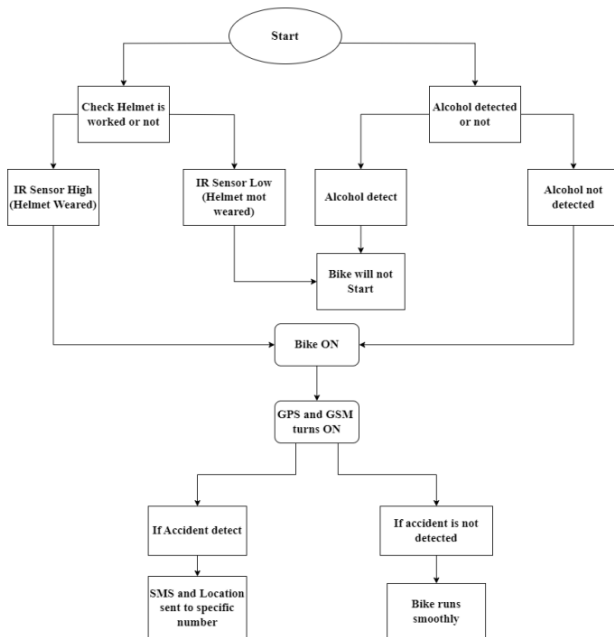


Fig.4.2.2 Flowchart of Smart Helmet

This flowchart outlines the operation of a smart helmet system, detailing the sequence of steps followed from the moment the rider wears the helmet to the end of the ride. Here's an explanation of each step:

- **Check if helmet is worn:** The system checks if the helmet sensor, likely a switch or sensor pad, is triggered, indicating that the helmet is worn. If the sensor is triggered, indicating that the rider is wearing the helmet, the system proceeds to the next step. If not, it displays a message prompting the rider to wear the helmet.
- **Check for alcohol intoxication:** The system checks if the alcohol sensor detects any alcohol intoxication. If the sensor is triggered, indicating the presence of alcohol, the system displays a message advising the rider not to ride due to intoxication. If the sensor is not triggered, indicating no alcohol presence, the system proceeds to the next step.
- **Initialize GPS and GSM:** The system activates the GPS (Global Positioning System) and GSM (Global System for Mobile Communications) modules. These modules are used for obtaining the current location coordinates of the rider and for sending SMS alerts in case of emergencies.
- **Monitor for accidents:** The system continuously monitors accelerometer readings to detect any significant impacts, which may indicate an accident. If a significant impact is detected, the system activates the GPS to obtain the current location coordinates. It then sends an SMS alert with the location to predefined contacts, informing them of the potential accident and prompting emergency response.

- **Send start/stop signal to bike:** The system checks if the rider initiates a command to start or stop the vehicle. If such a command is detected, the system sends an RF (Radio Frequency) signal to the bike module to either start or stop the vehicle remotely.
- **End of ride:** The system checks if the helmet is removed, indicating the end of the ride. If the helmet is removed, the system deactivates the GPS and GSM modules. If the helmet is not removed, indicating that the ride is ongoing, the system continues monitoring for further events.

This flowchart illustrates the logical sequence of operations within the smart helmet system, outlining the steps taken to ensure rider safety and facilitate communication in case of emergencies or accidents.

5. RESULT & DISCUSSION

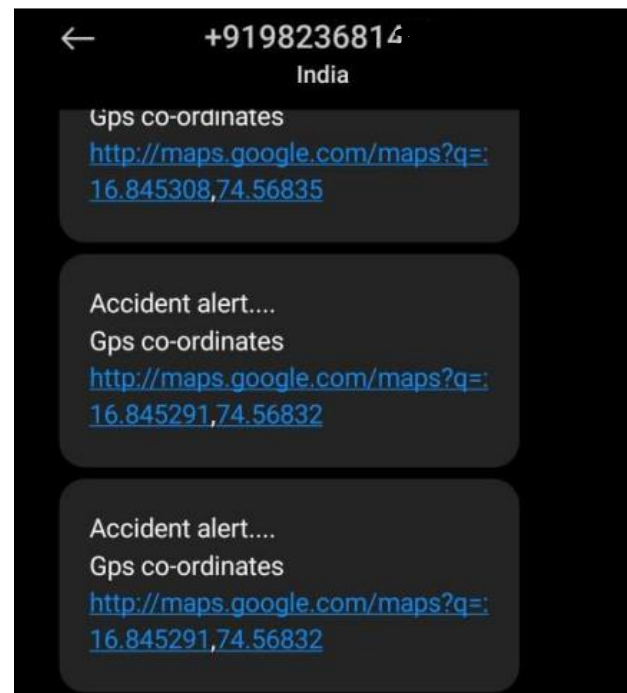


Fig.5.1 Result of Smart Helmet

The project successfully implemented a smart helmet system, integrating advanced sensor technology and wireless communication. Key functionalities, including alcohol detection, accident detection, and GPS-based location alerts, were effectively realized.

The system demonstrated reliable sensor performance, robust wireless connectivity, and prompt emergency response capabilities. Overall, the project validated the efficacy of the smart helmet concept in enhancing motorcycle safety, offering riders enhanced protection and facilitating rapid emergency assistance.

6. ADVANTAGES AND APPLICATIONS

6.1 Advantages

The smart helmet offers several advantages that contribute to enhanced safety and convenience for motorcycle riders:

- Sensors like accelerometers in the smart helmet quickly spot accidents, helping emergency services arrive faster to reduce injuries.
- Integrated alcohol sensors prevent drunk riding, making roads safer by avoiding impaired judgment accidents.
- Using GPS, the smart helmet tracks rider location in real-time, ensuring accurate help arrives swiftly in emergencies.
- With GSM/GPRS, the helmet sends SMS alerts to contacts during accidents, ensuring help reaches even remote areas promptly.
- By detecting alcohol and sending alerts, the smart helmet encourages safer riding habits among users.
- The smart helmet revolutionizes motorcycle safety with advanced features, ensuring riders' protection and peace of mind.

6.2 Applications

- Accident Response: Automatically detects collisions and sends emergency alerts with GPS location to emergency services and designated contacts.
- Drunk Driving Prevention: Prevents the motorcycle from starting if alcohol is detected, reducing the risk of accidents due to impaired riding.
- Real-time Location Tracking: Provides real-time tracking of the rider's location, aiding in quick response during emergencies.
- Emergency Communication: Sends SMS alerts in case of accidents or emergencies, ensuring timely assistance even in remote areas.

7. CONCLUSION & FUTURE SCOPE

7.1 Conclusion :

In conclusion, the smart helmet is a major advancement in motorcycle safety, providing riders with enhanced protection and a better riding experience. It integrates advanced sensors and wireless communication to address key safety concerns like accident detection, alcohol monitoring, and GPS tracking.

The helmet can quickly detect collisions, allowing for prompt emergency response. It also prevents riding under the influence by using alcohol sensors. With GPS tracking, riders' locations are constantly monitored, enabling timely help in emergencies. The helmet can send SMS alerts to contacts, offering crucial support during critical moments.

Overall, the smart helmet promotes responsible riding and reduces accidents. Its customizable design ensures it stays up-

to-date with safety standards and technological advancements, making it a valuable tool for enhancing motorcycle safety.

7.2 Future Scope :

The Future Scope of Smart Helmet are given below:

- Integration of additional sensors for expanded safety features, including biometric sensors and environmental sensors.
- Incorporation of artificial intelligence (AI) algorithms for real-time analysis of sensor data and predictive safety insights.
- Adoption of augmented reality (AR) displays for overlaying relevant information onto the rider's field of view.
- Implementation of biometric authentication systems and health monitoring capabilities for rider security and well-being.
- Utilization of smart connectivity and Internet of Things (IoT) integration for seamless interaction with connected devices and cloud services

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