IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 6, March 2026
Impact Factor: 8.2

Smart Helmet for Riders

Shendkar Mayuri Santosh[1], Rathod Nandini Prakash[2], Miss Harshali Patil[3]
Department of Computer Technology[1-3]
Bharati Vidyapeeth Institute of Technology, Navi Mumbai, Maharashtra, India

Abstract: *Road accidents are one of the leading causes of death and serious injuries worldwide, especially among two-wheeler riders. According to recent studies, a large number of fatalities occur due to the non-usage of helmets, drunk driving, and delayed emergency response after accidents. These issues highlight the need for an intelligent safety system that can prevent accidents and provide immediate assistance when required.*

The Smart Helmet for Riders is an advanced safety solution based on Internet of Things (IoT) technology. The system integrates multiple sensors such as helmet detection sensors, alcohol sensors, and impact detection sensors to ensure rider safety. It also incorporates GPS and GSM modules for real-time location tracking and emergency communication.

The system ensures that the bike starts only when the rider is wearing the helmet and is not under the influence of alcohol. In case of an accident, the helmet automatically detects the impact and sends an emergency alert message along with the rider's location to predefined contacts.

The implementation of this system demonstrates improved safety, accident prevention, and faster emergency response. The Smart Helmet is a reliable and efficient solution for enhancing road safety and reducing fatalities.

Keywords: Smart Helmet, IoT, Road Safety, Alcohol Detection, Accident Detection, GPS, GSM

I. INTRODUCTION

With the rapid increase in population and vehicles, road accidents have become a major global concern. Two-wheeler riders are more vulnerable compared to other vehicle users due to lack of physical protection. Many accidents occur due to negligence such as not wearing helmets, overspeeding, and driving under the influence of alcohol.

Helmets are proven to reduce the risk of head injuries significantly, yet many riders ignore this safety measure. Additionally, delayed medical assistance after accidents often leads to loss of life. Therefore, there is a need for a smart system that not only enforces helmet usage but also ensures immediate help during emergencies.

The Smart Helmet for Riders is designed to address these challenges. It uses modern technologies like IoT, embedded systems, and wireless communication to create a safety ecosystem. The system verifies helmet usage, detects alcohol consumption, and monitors accidents in real time.

This project aims to improve rider safety by integrating preventive and responsive features into a single system. It ensures compliance with safety rules and provides quick emergency response, thereby reducing the severity of accidents and saving lives.

II. METHODOLOGY

The proposed system follows a structured methodology involving hardware components, sensors, and communication modules.

A. System Architecture

The system is divided into two main units:

Helmet Unit – Contains sensors and transmitter

Bike Unit – Contains receiver and control system

Both units communicate wirelessly using RF or Bluetooth technology.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 6, March 2026 Impact Factor: 8.2

B. Helmet Detection Mechanism

A pressure or IR sensor is installed inside the helmet to detect whether the rider is wearing it.

Working:

If the helmet is worn → Sensor sends signal

If not worn → No signal

Result:

Bike ignition is allowed only when helmet is worn

Prevents careless riding

C. Alcohol Detection System

An MQ-3 alcohol sensor is used to detect alcohol levels in the rider's breath.

Working:

Sensor detects alcohol concentration

Compares it with a predefined threshold

Result:

If alcohol level is safe → Bike starts

If alcohol level is high → Ignition is blocked

This feature helps prevent drunk driving, which is a major cause of accidents.

D. Accident Detection System

An accelerometer or vibration sensor is used to detect sudden impacts.

Working:

Monitors sudden movements or shocks

Detects abnormal conditions like fall or collision

Result:

If impact exceeds threshold → Accident detected

Emergency system is triggered automatically

E. Emergency Alert System

The system uses GPS and GSM modules for communication.

GPS Module:

Tracks real-time location of the rider

GSM Module:

Sends SMS alert to emergency contacts

Alert Message Includes:

Rider's location

Emergency notification

This ensures quick medical assistance after an accident.

F. Communication System

Wireless communication is established between helmet and bike using RF or Bluetooth.

Functions:

Transmits sensor data

Controls bike ignition

Ensures system synchronization

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 6, March 2026 Impact Factor: 8.2

G. System Workflow

Rider wears helmet
Helmet sensor verifies usage
Alcohol sensor checks breath
If safe → Bike starts
System continuously monitors movement
If accident occurs → Alert is sent

III. MODELING AND ANALYSIS

The Smart Helmet system follows an embedded system architecture combined with IoT communication.

System Components:

Microcontroller (Arduino/NodeMCU)
Sensors (Alcohol, Accelerometer, IR)
Communication modules (RF/Bluetooth)
GPS and GSM modules
Logical Model:
Helmet Status (H):
H = 1 → Helmet worn
H = 0 → Helmet not worn
Alcohol Status (A):
A = 0 → Safe
A = 1 → Unsafe

Ignition Condition:

Ignition = H AND (NOT A)

Accident Detection Model:

If Impact Force > Threshold → Accident = TRUE

System Analysis:

Ensures safety before riding
Reduces human negligence
Provides automatic emergency response
Improves survival rate after accidents

IV. RESULTS AND DISCUSSION

The Smart Helmet system was tested under various conditions to evaluate its performance.

Test Cases:

Helmet not worn → Bike did not start
Alcohol detected → Ignition blocked
Accident simulated → Alert sent successfully

Observations:

- Helmet detection was highly accurate
- Alcohol sensor effectively prevented unsafe riding
- Accident detection responded quickly
- GPS provided accurate location

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 6, March 2026
Impact Factor: 8.2

- GSM sent alerts within seconds

Advantages:

- Prevents accidents
- Encourages safety habits
- Provides real-time monitoring
- Saves lives through quick response

Limitations:

- Sensor calibration required
- Depends on network availability for GSM
- Cost may be higher for mass implementation

V. CONCLUSION

The Smart Helmet for Riders is an innovative solution that enhances road safety using modern technologies. It ensures that riders follow safety rules and provides immediate assistance in case of accidents.

By integrating helmet detection, alcohol sensing, accident detection, and emergency communication, the system offers a complete safety solution. It reduces accidents caused by negligence and improves response time during emergencies.

The system has great potential for real-world implementation and can significantly reduce road fatalities.

FUTURE SCOPE

Mobile app integration
AI-based accident prediction
Cloud data storage
Voice assistance system
Integration with smart traffic systems

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to our project guide and faculty members for their continuous support and guidance. We also thank our institution for providing the necessary resources to complete this project successfully.

REFERENCES

[1] World Health Organization – Road Safety Reports
[2] IoT-based Smart Helmet Research Papers
[3] Embedded Systems and Sensor Technology Books
[4] GSM & GPS Module Documentation
[5] Arduino Project Development Guides