Enhancing Motorcycle Safety with Smart Helmet Technology

TEAM MEMBERS:

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PROJECT OVERVIEW

Key Features:

Alcohol Detection: Utilize an alcohol sensor to detect intoxication levels in the rider's breath. Prevent bike ignition if alcohol is detected.
Helmet Detection: Implement an IR sensor to verify helmet usage before allowing the bike to start.
Distance Monitoring: Incorporate an ultrasonic sensor to warn riders of unsafe distances from the front vehicle, reducing collision risks.
Accident Detection: Integrate an accelerometer to detect sudden impacts or falls, triggering emergency procedures.
Emergency Communication: Utilize GPS and GSM modules to send SMS alerts with the rider's location to predefined contacts during emergencies.
Video Recording: Include a camera module to record ride footage for analysis or evidence in case of accidents or violations.
Display and Audio Alerts: Provide real-time information and warnings to the rider via an LCD display, alarm, speaker, and mic.

Raspberry Pi Control: Employ Raspberry Pi to manage sensor data, system operations, and communication.

NEED ANALYSIS

01 - ALCOHOL RELATED INCIDENTS

Drunk driving is a leading cause of motorcycle accidents, resulting in severe injuries and fatalities. A smart helmet equipped with an alcohol sensor can prevent such accidents

02 - HELMET COMPLIANCE

By incorporating an IR sensor, the smart helmet ensures that riders can’t start bikes without helmet promoting safety and reducing likelihood of head accidents

03 - COLLISION PREVENTION

An ultrasonic sensor integrated into the smart helmet can alert riders when they are too close to the front vehicle, enabling them to adjust their speed and maintain a safe distance

04 - EMERGENCY COMMUNICATION

In the unfortunate event of an accident, by incorporating GPS and GSM modules, the smart helmet can automatically send SMS alerts to emergency contacts

05 - EVIDENCE COLLECTION

Video footage of rides can help identify cause of accidents, hold accountable parties responsible and inform policy decisions for road safety

LITERATURE SURVEY

Shravya K., Mandapati Y., Keerthi D., Harika K., and Senapati R.
Smart helmet for safe driving

Budhathoki S., Nyaupane S., Chai S., Nath S.
Design of Smart Helmet using Microcontroller

Sireesha G., Jahnavi K., Anusha N., Baburay A.
Smart Helmet using IoT

Sekar S., Jaivenkatesh L., Kumar S., Kumar D., Jeevanantham N.
IoT BASED SMART HELMET

Deekshitha K J, Pushpalatha S
IMPLEMENTATION OF SMART HELMET

Balgude P., Bhoite R., Baral S., Borate4 S.
Smart Helmet using IoT

NOVELTY

The proposed smart helmet system for enhancing motorcycle safety brings several novel aspects that differentiate it from existing solutions and approaches:

Integrated Safety Features: Our smart helmet has various features like alcohol detection, helmet compliance verification, distance. monitoring, accident detection and emergency communication capabilities

Real-time Preventive Measures: By inhibiting bike ignition in the presence of alcohol or without a helmet, the system actively prevents potential accidents before they occur.

Smart Communication and Data Collection: The utilization of GPS, GSM, and camera modules facilitates valuable insights into accident causes, contributing to ongoing safety improvements

User-friendly Interface and Integration: Our project emphasizes a user-friendly interface for riders helping easily access vital information without distraction improving situational awareness

Scalability and Future Enhancements(Optional): The project's design allows for scalability and future enhancements, such as smartphone integration and cloud connectivity

PROBLEM STATEMENT

The project aims to develop a smart helmet system for motorcycle riders, integrating various sensors and modules to enhance safety and convenience. Key objectives include detecting alcohol consumption, ensuring helmet usage, monitoring distances from the front vehicle, detecting accidents, and providing emergency communication capabilities..

OBJECTIVES

Design and Develop Smart Helmet Prototype

Implement Sensor Integration and Control System

Enhance Safety and Preventive Measures

Enable Emergency Communication and Data Collection

Validate System Performance and User Feedback

ASSUMPTIONS

Sensor Accuracy: The assumption that the sensors used in the smart helmet, such as alcohol sensors, IR sensors, ultrasonic sensors, and accelerometers, provide accurate and reliable data.

User Cooperation: Assuming that users will cooperate with the system by wearing the smart helmet properly and following safety guidelines.

Communication Infrastructure: Assuming the availability and reliability of communication infrastructure (e.g., cellular network coverage) for sending SMS alerts during emergencies.

Legal Compliance: Assuming that the smart helmet system complies with relevant legal and regulatory requirements for road safety devices and data privacy.

Maintenance and Support: Assuming that there will be adequate resources and procedures in place for maintaining and supporting the smart helmet system after deployment.

CONSTRAINTS

Cost: Budget constraints may limit the selection of sensors, communication modules, and other components, impacting the overall functionality and performance of the smart helmet system.

Size and Weight: The size and weight limitations of the helmet may constrain the integration of multiple sensors, modules, and components, affecting the design and usability of the system.

Power Consumption: The power constraints of the system, especially considering it's a wearable device, may limit the choice of components and functionalities to ensure reasonable battery life.

Processing Power: Constraints on the processing power and memory capacity of the Raspberry Pi or microcontroller used in the system may influence the complexity of algorithms and real-time processing capabilities.

Regulatory Compliance: Compliance with safety standards, data protection regulations, and other legal requirements may impose constraints on the design, features, and deployment of the smart helmet system.

Testing and Validation: Time and resource constraints for thorough testing, validation, and certification of the system's safety features, communication protocols, and user interface may limit the project scope.

PROJECT REQUIREMENTS

Smart Helmet Prototype : Smart helmet system integrating various sensors (alcohol sensor, IR sensor,Ultrasonic sensor, Accelerometer), GPS,GSM, camera module, LCD, speaker, microphone and Raspberry Pi micro controller

Safety Features Implementation: Implemented algorithms for alcohol detection, Integrated IR sensor for helmet control, Ultrasonic sensors for distance monitoring

Emergency Communication System: Enabled GPS and GSM modules for automatic SMS alerts to predefined emergency contacts

Data Collection and Analysis: Camera module for recording ride footage, mechanisms for post incident analysis and evidence collection

User Interface: User friendly interface on an LCD display

Documentation and Reports: Presentation materials for project outcomes.

PROJECT OUTCOMES

Smart Helmet Prototype: A fully functional prototype of the smart helmet system integrating various sensors

Safety Features Implementation: Incorporated ultrasonic sensors for distance monitoring and collision prevention alert

Emergency Communication System: Developed protocols for data transmission and handling of emergency communication procedures

Data Collection and Analysis: Developed mechanisms for post-incident analysis, evidence collection, and improving safety based on recorded data insights

User Interface and Feedback Mechanism: Incorporated feedback mechanisms to gather user input and improve system usability and effectiveness

PROJECT EXECUTION PLAN

Design and Develop Smart Helmet Prototype: Conduct a thorough review of existing smart helmet technologies, sensor modules, l safety standards.

Design the physical structure of the smart helmet prototype to accommodate necessary sensors, communication modules, and lcontrol components..

- **Implement Sensor Integration and Control System:** Interface and integrate sensors (alcohol, IR, ultrasonic, accelerometer) with the Raspberry Pi microcontroller board.
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Enhance Safety and Preventive Measures:

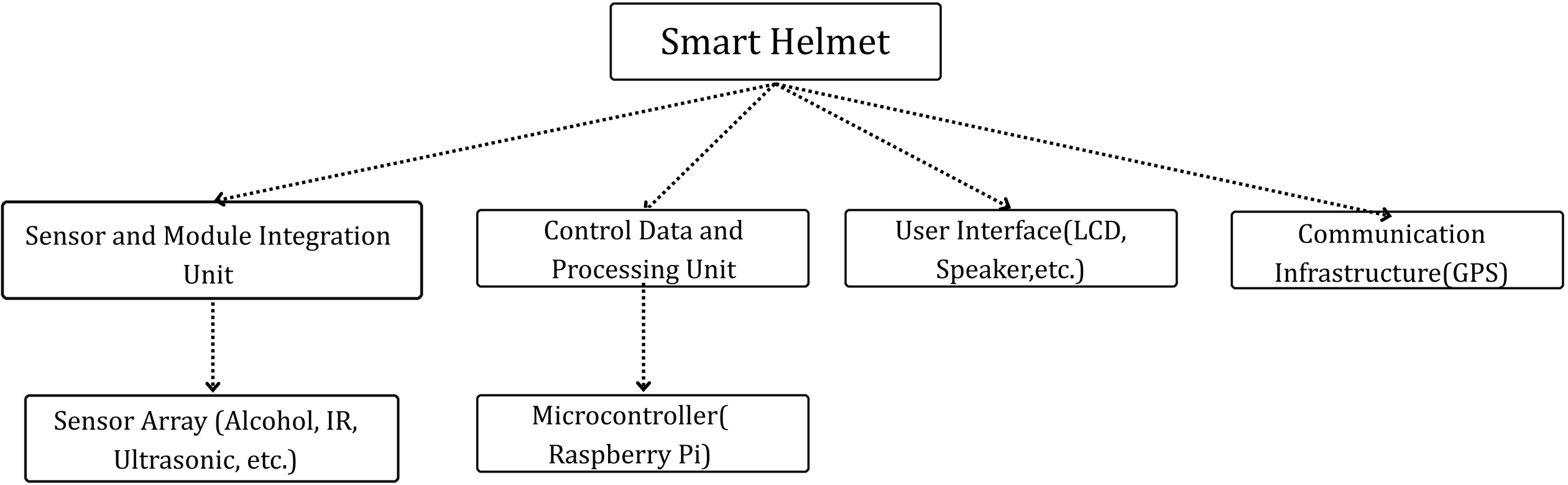
Implement algorithms to detect alcohol levels in the rider's breath using the alcohol sensor and disable bike ignition if oxication is detected.

Develop logic to verify helmet usage through the IR sensor before allowing the bike to start, and provide audio and visual rnings if the helmet is not detected.

Integrate ultrasonic sensors to monitor distances from the front vehicle and trigger warnings/alerts if unsafe distances are ected, encouraging safe riding practices.

- **Enable Emergency Communication and Data Collection:**

Integrate GPS and GSM modules to enable automatic SMS alerts with the rider's location to predefined emergency contacts in case of accidents or emergencies.


Smart Helmet
Sensor and Module Integration Unit
Control Data and Processing Unit
User Interface(LCD, Speaker,etc.)
Communication Infrastructure(GPS)
Sensor Array (Alcohol, IR, Ultrasonic, etc.)
Microcontroller(Raspberry Pi)

WORK PLAN

Sr. No.	Activities	February	March	April	May	June	July	August	September	October	November	December
1	Identification,Formulation and Planning of project											
2	Study of documents and research papers											
3	Creating documentation and approval											
4	Design phase											
5	Component Selection and Procurement											
6	Software Devlopment											
7	Performing Modifications											
8	Prototype Development											
9	Testing of helmet											
10	Final Submission											

ROLES

Hardware Integration and Functional Testing : Amanpreet Singh
Sensor Configuration, Calibration and Testing: Siddhant Jain
Wireless calibration and configuration : Samarth Thakur
Documentation and data analyst : Saksham Mutneja
Project Management: Shivam Gupta

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THANK YOU