IoT-Enabled Smart Helmet System for Enhanced Road Safety and Accident Prevention

Project Report

Submitted for the partial fulfillment of the degree of

Bachelor of Technology

In

Internet of Things (IOT)

Submitted By

Srishti Rai
(0901IO221069)

UNDER THE SUPERVISION AND GUIDANCE OF

Dr.Aftab Ahmed Ansari
Assistant Professor

Centre for Internet of Things

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
Deemed University
NAAC ACCREDITED WITH A++ GRADEA

Jul-Dec 2024

DECLARATION BY THE CANDIDATE

I hereby declare that the work entitled **"IoT-Enabled Smart Helmet System for Enhanced Road Safety and Accident Prevention"** is my work, conducted under the supervision of **Dr.Aftab Ahmed Ansari, Assistant Professor ,** during the session Jul-Dec 2024. The report submitted by me is a record of bonafide work carried out by me.

I further declare that the work reported in this report has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Srishti Rai

Srishti Rai
0901IO221069

B.Tech. V Sem

Date: 19th Nov,2024
Place: Gwalior

This is to certify that the above statement made by the candidates is correct to the best of my knowledge and belief.

Guided By:

Dr.Aftab Ahmed Ansari
Assistant Professor
Center for IOT
MITS, Gwalior

Departmental Project Coordinator

Dr.Nookala Venu
Assistant Professor
Centre for Internet of Things
MITS, Gwalior

Approved by HoD

19/11/2024

Dr. Praveen Bansal
Assistant Professor
Centre for Internet of Things
MITS, Gwalior

PLAGIARISM CHECK CERTIFICATE

This is to certify that I, a student of B.Tech. in **Internet of Things (IOT)** have checked my complete report entitled **"IoT-Enabled Smart Helmet System for Enhanced Road Safety and Accident Prevention"** for similarity/plagiarism using the "Turnitin" software available in the institute.

This is to certify that the similarity in my report is found to be 15% which is within the specified limit (20%).

The full plagiarism report along with the summary is enclosed.

Srishti Rai

Srishti Rai
0901IO221069
B.Tech. V Sem

Checked & Approved By:

Soumyajit Ghosh 9/11/24

Dr. Soumyajit Ghosh
Assistant Professor
Centre for Internet of Things
MITS, Gwalior

ABSTRACT

IoT-Enabled Smart Helmet System for Enhanced Road Safety and Accident Prevention

Motorcycles, while thrilling, pose significant safety risks. To address these concerns, we propose an innovative Arduino-powered smart helmet designed to enhance rider safety. This helmet integrates multiple safety features, including alcohol detection, anti-sleep detection, and enhanced visibility.

Alcohol Detection: The helmet incorporates an MQ3 alcohol sensor to prevent intoxicated riders from operating their motorcycles. If the sensor detects a blood alcohol content above a predetermined threshold, the helmet will activate a buzzer and LED lights, preventing the bike from starting.

Anti-Sleep Detection: To combat the dangers of drowsy riding, the helmet utilizes an IR sensor to monitor the rider's eye movements. If the sensor detects that the rider's eyes have been closed for more than five seconds, the helmet will trigger a loud alarm and activate flashing LED lights at the back of the helmet. This alerts other road users and may rouse the drowsy rider.

Enhanced Visibility: To improve nighttime visibility, the helmet is equipped with four bright LEDs at the back. These lights increase the rider's visibility to other road users, reducing the risk of accidents.

Data-Driven Safety: Numerous studies have shown that helmet usage significantly reduces the risk of severe injuries and fatalities in motorcycle accidents. By promoting the adoption of this smart helmet, we aim to encourage safer riding practices and potentially save lives.

This Arduino-powered smart helmet represents a significant step forward in motorcycle safety technology. By combining advanced sensors, real-time monitoring, and proactive alerts, this innovative device empowers riders to make informed decisions and stay safe on the road.

ACKNOWLEDGEMENT

The full semester Project has proved to be pivotal to my career. I am thankful to my institute, **Madhav Institute of Technology & Science** to allow me to continue my disciplinary/interdisciplinary Project as a curriculum requirement, under the provisions of the Flexible Curriculum Scheme approved by the Academic Council of the institute. I extend my gratitude to the Director of the institute, **Dr. R. K. Pandit** and Dean Academics, **Dr. Manjaree Pandit** for this.

I would sincerely like to thank my department, **Centre for Internet of Things,** for allowing me to explore this project. I humbly thank **Dr. Praveen Bansal,** Assistant Professor and Coordinator, Centre for Internet of Things, for his continued support during the course of this engagement, which eased the process and formalities involved. I am sincerely thankful to my faculty mentors. I am grateful to the guidance of **Dr.Aftab Ahmed Ansari,** Assistant Professor, and Centre for Internet of Things, for his continued support and guidance throughout the project.I am also very thankful to the faculty and staff of the department.

Srishti Rai
0901IO221069
B.Tech. V Sem
Centre for Internet of Things

CONTENT

Table of Contents

Declaration by the Candidate i

Plagiarism Check Certificate ii

Abstract iii

Acknowledgement iv

Content vi

Nomenclature vii

List of Figures viix

Chapter 1: Introduction 1

Chapter 2: Literature Survey 3

Chapter 3:Hardware Tools 4

Chapter 4:Methodology and Algorithm 7

Chapter 5:Modelling and Quick Design 9

Chapter 6:Results Analysis 10

Chapter 7:Conclusions and Future Scope 11

Turnitin Plagiarism Report 12

References 13

Annexures

Self-evaluation of Project 14

NOMENCLATURE

General Technology Terms:

- Microcontroller: A bitsy computer on a single chip, frequently used to control electronic bias.

- Sensor :A device that detects and responds to physical stimulants, similar as light, temperature, or stir.

- LED(Light- Emitting Diode) :A semiconductor light source that emits light when current overflows through it.

- Arduino: A popular open- source electronics platform used for erecting a wide range of systems, from simple circuits to complex robots.

Safety-Affiliated Terms

- Accident Detection :The process of relating and responding to implicit accidents or dangerous situations.

- Doziness Discovery :A technology that monitors a person's geste to identify signs of fatigue or somnolence.

- Enhanced Visibility: perfecting the visibility of a vehicle or person to others, frequently through the use of lights or reflective accoutrements .

LIST OF FIGURES

- Figure 1: Illustration of a Two-Wheeler Accident Scenario Demonstrating the High-Risk Factors for Riders
- Figure 2: Trends in Road Accidents, Fatalities, and Injuries in India (2018-2022) [2]
- Figure 3: MQ-3 Sensor
- Figure 4: IR Sensor
- Figure 5: Buzzer
- Figure 6: Node MCU
- Figure 7: Jumper Wire
- Figure 8: Design Process
- Figure 9: Prototype Design

CHAPTER 1: INTRODUCTION

Road safety is a major worldwide concern that becomes a focus of public health and policy discussions in nations with high accident and fatality rates. According to the International Road Federation's World Road Statistics 2022, India regrettably leads the world in traffic fatalities. This concerning stance highlights the pressing need for creative safety measures, especially for two-wheeler riders, who are among the most at-risk road users. This concerning stance highlights the pressing need for creative safety measures, especially for two-wheeler riders, who are among the most at-risk road users [1]. A concerning trend can be seen in the 2022 data from the Ministry of Road Transport and Highways' Annual Report on Road Accidents in India (Figure 2): despite brief declines in accidents in 2020 as a result of lockdowns brought on by the pandemic, traffic incidents have increased once more, with 4,61,312 recorded accidents in 2022 alone, resulting in 1,68,491 fatalities and 4,43,366 injuries [2]. These figures highlight the urgent and continuous need for solutions that take into account the various risk factors connected to traffic accidents.

Impaired driving, whether from the use of psychoactive substances or alcohol, is one of the main causes of traffic accidents. Even low blood alcohol concentration (BAC) levels can dramatically increase crash risk; drivers with BACs of 0.04 g/dl or higher have a much higher chance of a serious incident. The hazards that riders face on a daily basis are starkly illustrated in Figure 1, which depicts a typical two-wheeler accident scenario. These risks are frequently exacerbated by things like impaired vision, delayed reaction times, or loss of control brought on by drugs or alcohol. These pictures effectively convey the seriousness of the situation and provide strong support for specific safety precautions. Notably, two-wheeler riders are particularly vulnerable to the combined risks of fatigue, poor vision, and drunk driving, necessitating customized solutions to increase their road safety.

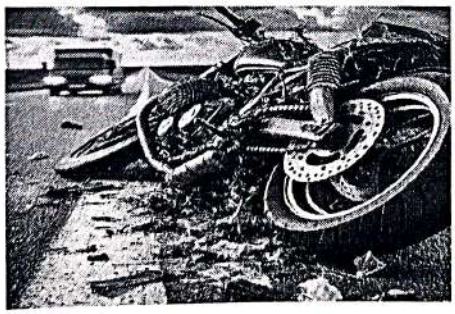

Fig.1 Illustration of a Two-Wheeler Accident Scenario Demonstrating the High-Risk Factors for Riders

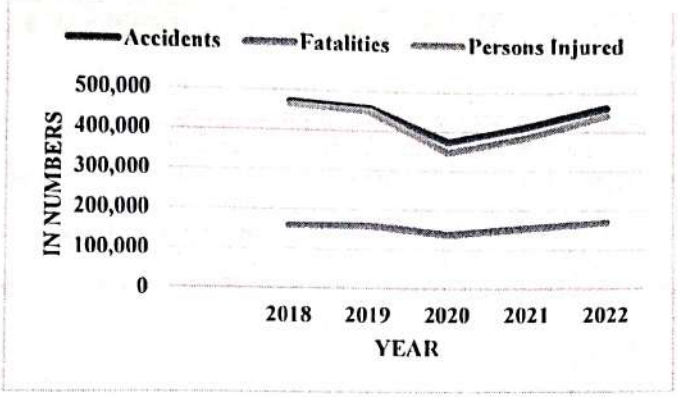

Fig.2 Trends in Road Accidents, Fatalities, and Injuries in India (2018–2022) [2]

This paper presents an innovative approach to these complex risks: an Internet of Things (IoT)-enabled smart helmet that can identify and stop two-wheeler riders from getting into accidents. This IoT-enabled smart helmet, in contrast to conventional helmets, incorporates a number of safety features to address major risk factors that frequently result in mishaps and fatalities. The smart helmet's main features include an alcohol detection sensor (MQ3) that tracks the rider's breath to stop drunk drivers from starting their cars, thereby directly preventing drunk driving. The common but often ignored problem of drowsy driving, which is a leading cause of traffic accidents, is combated by an anti-sleep infrared sensor. The system will sound an alarm and flash LEDs on the back of the helmet to warn other drivers if the rider's eyes are closed for more than five seconds. For long-distance or nighttime riders who might be more prone to fatigue, this feature is especially important.

Motorcycle safety technology has advanced significantly with the introduction of the IoT-powered helmet, which provides riders with an intelligent and proactive safety solution. In addition to offering complete protection, the helmet promotes safer riding practices by integrating several safety features into one unit. This study examines how each feature lowers the risk of accidents, showing how the helmet can significantly improve two-wheeler riders' road safety. The suggested remedy provides a model that could be used globally to protect motorcycle riders and is in line with international road safety initiatives that aim to lower traffic-related fatalities and injuries.

CHAPTER 2: LITERATURE SURVEY

Numerous smart helmet designs have been proposed to address safety concerns across various industries. Behr et al. [3] designed a helmet system for the mining sector that uses an accelerometer to detect high-impact events using the Head Injury Criterion, an IR sensor to detect helmet removal, and electrochemical sensors to monitor dangerous gases like CO, SO_2, and NO_2. In a similar vein, Elizabeth et al. [4] developed a smart helmet for motorcycle riders that can identify collisions and send prompt post-accident alerts to emergency contacts via an automated call system if the rider is not responding.

A helmet system with an accelerometer to detect accidents, an ALCHO-LOCK to prevent drunk driving, and a piezoelectric buzzer for overspeed detection was proposed by Vashisth et al. [5]. Additionally, the system has a fog sensor to enhance visibility and toll payments that are automatically deducted from a virtual wallet. In order to notify contacts in the event of an accident, Selvathi et al. [6] developed a helmet that detects whether the wearer is wearing a helmet and whether they have consumed alcohol before permitting engine ignition. In addition to ensuring helmet compliance prior to engine start, Archana D. et al. [7] developed a helmet that employs ultrasonic sensors to identify oncoming cars and vibrates the handlebars to alert the rider.

In order to increase the accuracy of accident detection over time, Tapadar et al.[8]proposed a methodology that makes use of accelerometer and pressure sensors. Data is then transmitted to a cloud-based support vector machine (SVM). By adding sensors to detect CO and methane and wirelessly sending data to the control room, Additionally, Vashisth et al. [9] added GSM alerts for speeding and an ALCHO-LOCK mechanism. Nataraja N. et al. presented a helmet with an accident-detection system that stops a bike from starting if it is not worn. Sarika K. et al. [10] created a helmet with an automated wiper to remove moisture and improve visibility in rainy conditions. Divyasudha N. et al. [11] demonstrated helmets for accident detection and miner safety, while Venkateswara Rao et al. [12] introduced IoT-based helmets with GPS tracking, Bluetooth, and mandatory helmet-wear to start the vehicle, improving response and compliance. Lakshmi et al. [13]designed a control system that prevents ignition without a helmet aiming to reduce road fatalities through automated safety measures.

CHAPTER 3: HARDWARE TOOLS

1. MQ-3 Sensor: A gas sensor called the MQ-3 is made to identify whether alcohol is present in the air. It is frequently utilized in systems that require alcohol detection, such as breathalysers. A tin dioxide (SnO2) layer that is sensitive to alcohol particles is used in the sensor to measure changes in resistance. A detectable current flow results from the sensor's resistance decreasing in the presence of alcohol. Both analog and digital outputs are available from the MQ-3; the analog output shows different alcohol content levels. This sensor checks for alcohol in the rider's breath in an Internet of Things-based accident detection helmet to make sure they are sober.

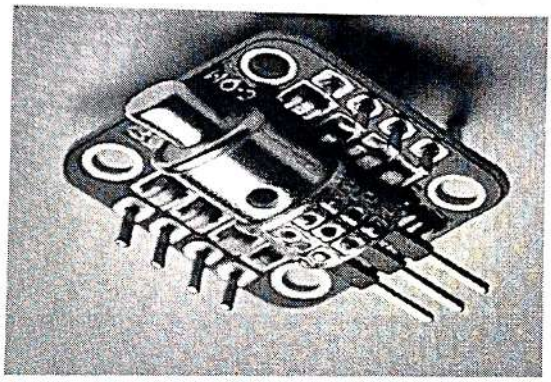

Fig.3 MQ-3 Sensor

2. IR Sensor: An IR sensor is an essential part of many automation and safety systems since it uses infrared light to identify objects, distance, or obstructions. Infrared light is emitted by an IR LED, and the reflected light from an object is collected by a photodiode. The intensity of the reflected infrared light rises with proximity to the item, causing the sensor to produce a signal. When it comes to helmets, the infrared sensor can be utilized to determine whether the rider is wearing them correctly. In order to ensure that safety procedures are followed, the system will prevent the motorcycle from starting if the helmet is not detected on the rider's head.

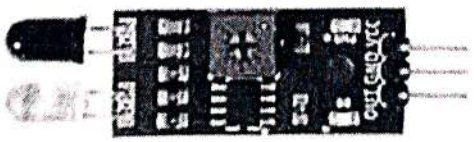

Fig.4 IR Sensor

3. Buzzer: A buzzer is a basic electronic device that emits a sound when electricity passes through it. IoT systems use it to send out warnings or alerts, as when anomalous situations are found. If the rider exhibits symptoms of fatigue, alcohol consumption, or improper helmet wear, the buzzer on an accident detection helmet may sound. This auditory alarm is an essential safety element to avoid accidents because it provides the rider or anyone nearby with an instant warning.

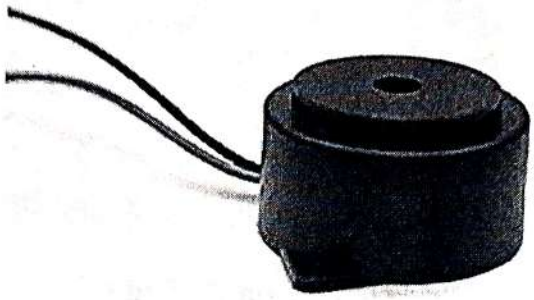

Fig.5 Buzzer

4. Node MCU: A low-cost, open-source IoT development board with integrated Wi-Fi, NodeMCU is based on the ESP8266 microprocessor. In IoT-based systems, it acts as the hub, gathering sensor data and sending it to other devices or cloud services. The NodeMCU in an IoT helmet receives input from parts such as the anti-sleep modules, IR sensor, and MQ-3 sensor. After processing the data, it transmits it via Wi-Fi to cloud platforms, mobile apps, or other systems for additional action, such notifying emergency contacts in the event of an accident.

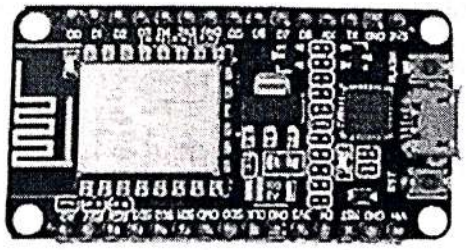

Fig.6 Node MCU

5. Jumper Wires: Jumper wires are straightforward electrical cables with connector pins on both ends that are used to connect parts of a microcontroller or a breadboard temporarily. Depending on the needs of the connection, they can be classified as male-to-male, female-to-

female, or male-to-female. The sensors (such as the MQ-3 or IR sensor) in an IoT helmet are connected to the NodeMCU via jumper wires, which facilitates seamless data transfer between the parts.

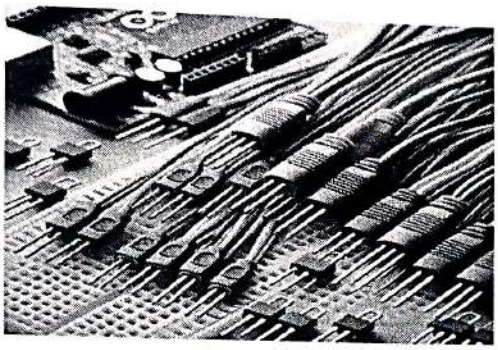

Fig 7: Jumper Wire

CHAPTER 4: METHODOLOGY AND ALGORITHM

METHODOLOGY

The multipurpose Arduino-powered accident detection helmet combines a number of hardware and software elements to improve motorcycle safety. An Arduino microcontroller, an alcohol sensor (MQ3), an infrared sensor, a relay module, a buzzer, LEDs, and a battery are among the essential hardware parts. The system's brain, the Arduino microcontroller, regulates all of its operations. While the IR sensor tracks eye movement to identify indications of tiredness, the alcohol sensor picks up alcohol vapors in the rider's breath. The motorcycle's ignition system is managed by the relay module, which stops it from starting if the rider is intoxicated. To alert the rider to possible dangers, the buzzer and LEDs give visual and auditory cues, respectively.

The Arduino processes sensor data to make decisions and activate responses. The alcohol detection algorithm prevents engine ignition if the alcohol level exceeds a threshold, the relay is activated to prevent engine ignition. The anti-sleep algorithm monitors the IR sensor data to identify periods of prolonged eye closure.[4]

ALGORITHM

Step 1: Component Initialization

This stage involves setting up the Arduino's digital and analog pins to interface with the LEDs, relay, buzzer, IR sensor, and alcohol sensor. Each pin is designated to either give output signals to control devices such as the relay and LEDs or accept input from the sensors.

Step 2: Setting Up a Baseline for Alcohol Sensors

To guarantee precise detection, a baseline reading is obtained from the alcohol sensor. The system will initiate safety measures, such stopping the engine from starting, if a threshold value is exceeded.

Step 3: Anti-Sleep Detection Configuration

The time length specifies how long the rider must keep their eyes closed in order for the anti-sleep detection to work. This aids the system in determining whether the rider is falling asleep.

Step 4: Main Loop Alcohol Level Monitoring

The alcohol sensor readings are continuously monitored in the main loop. In order to ensure that the rider cannot operate a motorbike while intoxicated, the relay module is triggered if the alcohol level over the predetermined threshold.

Step 5: Using an IR sensor to detect drowsiness

The rider's eyes are tracked by the infrared sensor. The buzzer alerts the rider if the eyelids stay closed for longer than the predetermined amount of time, reducing the likelihood of fatigue related accidents.

Step 6: Managing LED Indicators in the Back

The rider's visibility to other drivers, particularly at night, is enhanced by the continual toggling of the back LEDs to produce a blinking pattern.

Step 7: Last-Minute Safety and Monitoring Procedures

The technology continues to track tiredness and alcohol consumption during operation. It ensures the rider's safety at all times by triggering alerts and blocking engine activation if any risky conditions are identified.

CHAPTER 5: MODELLING AND QUICK DESIGN

The modelling phase for the Arduino-powered accident detection helmet involved designing a system that integrates multiple sensors and components to function seamlessly. This included:

Component Selection and System Architecture:

- Alcohol Sensor (MQ-3): Detects alcohol concentration to determine if the rider is intoxicated.
- IR Sensor: Monitors eye closure for anti-sleep detection.
- Relay Module: Controls the ignition system to block the vehicle from starting when necessary.
- Buzzer: Alerts the rider during drowsiness events.
- LEDs: Enhance night visibility through a blinking pattern.

Design Process:

System Diagram: To illustrate how the Arduino board and peripherals interact, a conceptual block diagram was created which is shown in Figure.8. This stage made sure that communication protocols and pin assignments were clear.

Logical Flow: A flowchart was used to represent the system and show important processes such continuous monitoring, alcohol threshold detection, and sensor startup. All safety precautions were guaranteed to operate independently and in unison thanks to this flow.

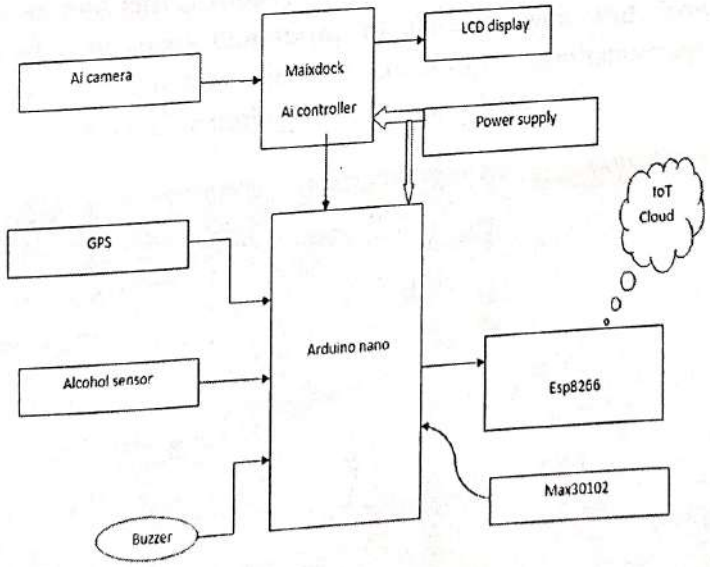

Fig.8 Design Process

CHAPTER 6: RESULTS ANALYSIS

System Initialization and Setup:
The Arduino successfully set up and initialized the sensors and parts (LEDs, relay, buzzer, alcohol sensor, and infrared sensor) without any problems. All devices responded successfully at starting, and the pins were able to interact effectively.

Alcohol Detection Accuracy:
The technology was able to precisely detect different alcohol levels after calibrating the alcohol sensor using baseline values. The relay appropriately prevented the engine from starting when the threshold was surpassed. Real-time safety enforcement was ensured by the relay's rapid reaction time between detection and activation.

Anti-Sleep Functionality:
Eye movements were successfully tracked by the infrared sensor. The buzzer sounded an alert if the eyes were closed for more time than was allowed. There were very few detection and reaction delays, and this feature operated consistently.

LED Visibility Performance:
The rear LEDs created a consistent blinking pattern to enhance visibility at night. This feature operated seamlessly, without interfering with other functions.

Continuous Monitoring and Integration:
The system maintained continuous monitoring of alcohol levels and drowsiness without crashes or malfunctions. It handled multiple conditions simultaneously (e.g., alcohol detection and LED toggling), demonstrating stability and robustness.

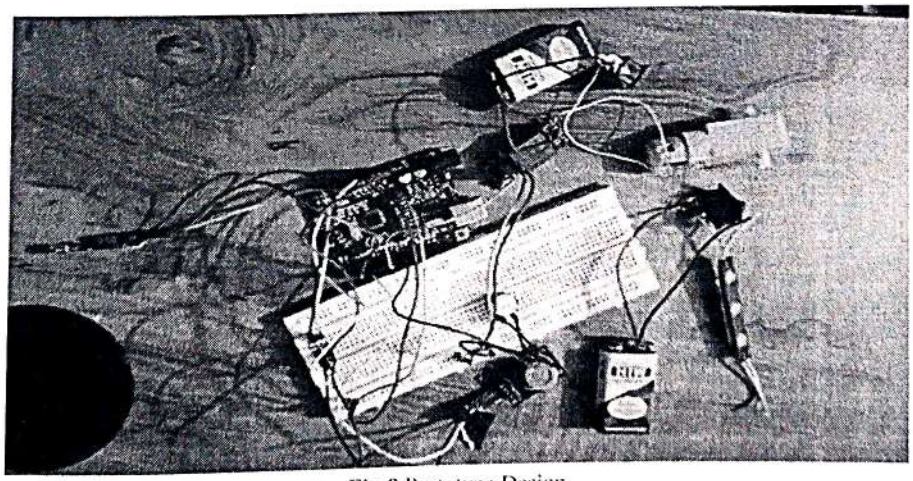

Fig-9 Prototype Design

CHAPTER 7: CONCLUSION AND FUTURE SCOPE

Alcohol detection, anti-sleep alert, and improved visibility are just a few of the safety features that the Arduino-powered accident detection helmet skilfully combines to mitigate the main risks of motorcycle riding. By precisely identifying intoxication and preventing engine start, tracking rider weariness with prompt alarms, and enhancing night vision with blinking LEDs, the system proved to be dependable during prototype.

This research provides a workable way to lower the number of accidents brought on by drunk driving and sleepiness, two major causes of traffic fatalities, particularly in places like India. Future improvements are also possible because to the modular design, including adding GPS modules for accident alerts or using more energy-efficient parts to optimize power usage. Even though the prototype produced encouraging results, issues like power management and the alcohol sensor's sensitivity to environmental changes require more work. This technology has the potential to significantly improve motorcycle safety with further development and field testing, giving riders a complete safety tool that encourages cautious driving and lowers the likelihood of accidents.

REFERENCES

[1] "Data – World Road Statistics." Accessed: Nov. 04, 2024. [Online]. Available: https://worldroadstatistics.org/data/

[2] "Press Release: Press Information Bureau." Accessed: Nov. 04, 2024. [Online]. Available: https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1973295

[3] C. J. Behr, A. Kumar, and G. P. Hancke, "A smart helmet for air quality and hazardous event detection for the mining industry," *Proceedings of the IEEE International Conference on Industrial Technology*, vol. 2016-May, pp. 2026–2031, May 2016, doi: 10.1109/ICIT.2016.7475079.

[4] S. Chandran, S. Chandrasekar, and N. E. Elizabeth, "Konnect: An Internet of Things(IoT) based smart helmet for accident detection and notification," *2016 IEEE Annual India Conference, INDICON 2016*, Jan. 2017, doi: 10.1109/INDICON.2016.7839052.

[5] R. Vashisth, S. Gupta, A. Jain, S. Gupta, Sahil, and P. Rana, "Implementation and analysis of smart helmet," *4th IEEE International Conference on Signal Processing, Computing and Control, ISPCC 2017*, vol. 2017-January, pp. 111–117, Sep. 2017, doi: 10.1109/ISPCC.2017.8269660.

[6] D. Selvathi, P. Pavithra, and T. Preethi, "Intelligent transportation system for accident prevention and detection," *Proceedings of the 2017 International Conference on Intelligent Computing and Control Systems, ICICCS 2017*, vol. 2018-January, pp. 442–446, Jul. 2017, doi: 10.1109/ICCONS.2017.8250761.

[7] D. Archana, G. Boomija, J. Manisha, and V. K. G. Kalaiselvi, "Mission on! Innovations in bike systems to provide a safe ride based on IOT," *Proceedings of the 2017 2nd International Conference on Computing and Communications Technologies, ICCCT 2017*, pp. 314–317, Jul. 2017, doi: 10.1109/ICCCT2.2017.7972296.

[8] S. Tapadar, S. Ray, H. N. Saha, A. K. Saha, and R. Karlose, "Accident and alcohol detection in bluetooth enabled smart helmets for motorbikes," *2018 IEEE 8th Annual Computing and Communication Workshop and Conference, CCWC 2018*, vol. 2018-January, pp. 584–590, Feb. 2018, doi: 10.1109/CCWC.2018.8301639.

[9] R. Vashisth, S. Gupta, A. Jain, S. Gupta, Sahil, and P. Rana, "Implementation and analysis of smart helmet," *2017 4th International Conference on Signal Processing, Computing and Control (ISPCC)*, vol. 2017-January, pp. 111–117, Sep. 2017, doi: 10.1109/ISPCC.2017.8269660.

[10] S. Gupta, K. Sharma, N. Salvekar, and A. Gajra, "Implementation of Alcohol and Collision Sensors in a Smart Helmet," *2019 International Conference on Nascent Technologies in Engineering, ICNTE 2019 - Proceedings*, Jan. 2019, doi: 10.1109/ICNTE44896.2019.8945979.

[11] N. Divyasudha, P. Arulmozhivarman, and E. R. Rajkumar, "Analysis of Smart helmets and Designing an IoT based smart helmet: A cost effective solution for Riders," *Proceedings of 1st International Conference on Innovations in Information and Communication Technology, ICIICT 2019*, Apr. 2019, doi: 10.1109/ICIICT1.2019.8741415.

[12] C. Venkateswara Rao, S. Chegondi, K. Myla, S. Murala, S. S. Myla, and D. R. Kalava, "IoT Based Smart Helmet for Bike Rider Safety," *7th International Conference on Electronics, Communication and Aerospace Technology, ICECA 2023 - Proceedings*, pp. 1445–1448, 2023, doi: 10.1109/ICECA58529.2023.10394802.

[13] A. Bhagya Lakshmi, C. Ragunath, R. Yeswanth, and M. Rajkumar, "Smart Helmet for Riders to Avoid Accidents Using IoT," *2024 2nd International Conference on Computer, Communication and Control, IC4 2024*, 2024, doi: 10.1109/IC457434.2024.10486574.

PAPER NAME
Srishti Rai.pdf

AUTHOR
S G

WORD COUNT
4164 Words

CHARACTER COUNT
24969 Characters

PAGE COUNT
22 Pages

FILE SIZE
2.0MB

SUBMISSION DATE
Nov 18, 2024 7:55 PM GMT+5:30

REPORT DATE
Nov 18, 2024 7:56 PM GMT+5:30

15% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

- 9% Internet database
- 1% Publications database
- Crossref database
- Crossref Posted Content database
- 13% Submitted Works database

Excluded from Similarity Report

- Bibliographic material
- Small Matches (Less then 10 words)

19/11/2024 SS 19/11/24

15% Overall Similarity

Top sources found in the following databases:

- 9% Internet database
- Crossref database
- 13% Submitted Works database
- 1% Publications database
- Crossref Posted Content database

TOP SOURCES

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	mitsgwalior on 2024-11-16 Submitted works	6%
2	mitsgwalior on 2024-05-27 Submitted works	3%
3	web.mitsgwalior.in Internet	2%
4	ijraset.com Internet	<1%
5	construction.jisc.ac.uk Internet	<1%
6	University of Central Lancashire on 2024-04-15 Submitted works	<1%
7	indianexpress.com Internet	<1%
8	Liberty University on 2024-06-09 Submitted works	<1%

19/4/2024

9	Mahagave Somnath, D Dhanalakshmi, Vuppulapu Sai Sripath, Shanmu... Crossref	<1%
10	Somaiya Vidyavihar on 2023-05-06 Submitted works	<1%
11	Sotiris Athanaselis, Artemis Dona, Stavroula Papadodima, Giannis Pap... Crossref	<1%
12	dynlab.mpe.nus.edu.sg Internet	<1%
13	ijircce.com Internet	<1%
14	ijisae.org Internet	<1%
15	kscst.iisc.ernet.in Internet	<1%

19/11/2024

29/11/24

ANNEXURE

SELF-EVALUATION OF THE PROJECT

Month	Start date – End date (DD/MM/YY) - (DD/MM/YY)	Progress of Project
Month- 1	05/08/24 - 31/08/24	Topic Selection and Project planning
Month- 2	01/09/24 - 30/09/24	Hardware selection and Prototype Development
Month- 3	01/10/24 - 31/10/24	Data Analysis and Results
Month- 4	01/11/24 - 18/11/24	Documentation of the Project

19/11/2024

Dr.Aftab Ahmed Ansari
Assistant Professor
Center for IOT
MITS, Gwalior

PAPER NAME
Srishti Rai.pdf

AUTHOR
S G

WORD COUNT
4164 Words

CHARACTER COUNT
24969 Characters

PAGE COUNT
22 Pages

FILE SIZE
2.0MB

SUBMISSION DATE
Nov 18, 2024 7:55 PM GMT+5:30

REPORT DATE
Nov 18, 2024 7:56 PM GMT+5:30

15% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

- 9% Internet database
- 1% Publications database
- Crossref database
- Crossref Posted Content database
- 13% Submitted Works database

Excluded from Similarity Report

- Bibliographic material
- Small Matches (Less then 10 words)

IoT-Enabled Smart Helmet System for Enhanced Road Safety and Accident Prevention

Project Report

Submitted for the partial fulfillment of the degree of

Bachelor of Technology

In

Internet of Things (IOT)

Submitted By

Srishti Rai
(0901IO221069)

UNDER THE SUPERVISION AND GUIDANCE OF

Dr.Aftab Ahmed Ansari
Assistant Professor

Centre for Internet of Things

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
Deemed University
NAAC ACCREDITED WITH A++ GRADEA

Jul-Dec 2024

DECLARATION BY THE CANDIDATE

I hereby declare that the work entitled "**IoT-Enabled Smart Helmet System for Enhanced Road Safety and Accident Prevention**" is my work, conducted under the supervision of **Dr.Aftab Ahmed Ansari, Assistant Professor ,** during the session Jul-Dec 2024. The report submitted by me is a record of bonafide work carried out by me.

I further declare that the work reported in this report has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Srishti Rai
0901IO221069
B.Tech. V Sem

Date: 19th Nov,2024
Place: Gwalior

This is to certify that the above statement made by the candidates is correct to the best of my knowledge and belief.

Guided By:

_____

Dr.Aftab Ahmed Ansari
Assistant Professor
Center for IOT
MITS, Gwalior

Departmental Project Coordinator

_____

Dr. Dhananjay Bisen
Assistant Professor
Centre for Internet of Things
MITS, Gwalior

Approved by HoD

_____

Dr. Praveen Bansal
Assistant Professor
Centre for Internet of Things
MITS, Gwalior

PLAGIARISM CHECK CERTIFICATE

This is to certify that I, a student of B.Tech. in **Internet of Things (IOT)** have checked my complete report entitled "**IoT-Enabled Smart Helmet System for Enhanced Road Safety and Accident Prevention**" for similarity/plagiarism using the "Turnitin" software available in the institute.

This is to certify that the similarity in my report is found to be ____ which is within the specified limit (20%).

The full plagiarism report along with the summary is enclosed.

Srishti Rai
0901IO221069
B.Tech. V Sem

Checked & Approved By:

Dr. Gaurav Khare
Assistant Professor
Centre for Internet of Things
MITS, Gwalior

ABSTRACT

IoT-Enabled Smart Helmet System for Enhanced Road Safety and Accident Prevention

Motorcycles, while thrilling, pose significant safety risks. To address these concerns, we propose an innovative Arduino-powered smart helmet designed to enhance rider safety. This helmet integrates multiple safety features, including alcohol detection, anti-sleep detection, and enhanced visibility.

Alcohol Detection: The helmet incorporates an MQ3 alcohol sensor to prevent intoxicated riders from operating their motorcycles. If the sensor detects a blood alcohol content above a predetermined threshold, the helmet will activate a buzzer and LED lights, preventing the bike from starting.

Anti-Sleep Detection: To combat the dangers of drowsy riding, the helmet utilizes an IR sensor to monitor the rider's eye movements. If the sensor detects that the rider's eyes have been closed for more than five seconds, the helmet will trigger a loud alarm and activate flashing LED lights at the back of the helmet. This alerts other road users and may rouse the drowsy rider.

Enhanced Visibility: To improve nighttime visibility, the helmet is equipped with four bright LEDs at the back. These lights increase the rider's visibility to other road users, reducing the risk of accidents.

Data-Driven Safety: Numerous studies have shown that helmet usage significantly reduces the risk of severe injuries and fatalities in motorcycle accidents. By promoting the adoption of this smart helmet, we aim to encourage safer riding practices and potentially save lives.

This Arduino-powered smart helmet represents a significant step forward in motorcycle safety technology. By combining advanced sensors, real-time monitoring, and proactive alerts, this innovative device empowers riders to make informed decisions and stay safe on the road.

ACKNOWLEDGEMENT

The full semester Project has proved to be pivotal to my career. I am thankful to my institute, **Madhav Institute of Technology & Science** to allow me to continue my disciplinary/interdisciplinary Project as a curriculum requirement, under the provisions of the Flexible Curriculum Scheme approved by the Academic Council of the institute. I extend my gratitude to the Director of the institute, **Dr. R. K. Pandit** and Dean Academics, **Dr. Manjaree Pandit** for this.

I would sincerely like to thank my department, **Centre for Internet of Things,** for allowing me to explore this project. I humbly thank **Dr. Praveen Bansal**, Assistant Professor and Coordinator, Centre for Internet of Things, for his continued support during the course of this engagement, which eased the process and formalities involved. I am sincerely thankful to my faculty mentors. I am grateful to the guidance of **Dr.Aftab Ahmed Ansari**, Assistant Professor, and Centre for Internet of Things, for his continued support and guidance throughout the project.I am also very thankful to the faculty and staff of the department.

Srishti Rai
0901IO221069
B.Tech. V Sem
Centre for Internet of Things

CONTENT

Table of Contents

Declaration by the Candidate i

Plagiarism Check Certificate ii

Abstract iii

Acknowledgement iv

Content vi

Nomenclature vii

List of Figures viix

Chapter 1: Introduction 1

Chapter 2: Literature Survey 3

Chapter 3:Hardware Tools 4

Chapter 4:Methodology and Algorithm 7

Chapter 5:Modelling and Quick Design 9

Chapter 6:Results Analysis 10

Chapter 7:Conclusions and Future Scope 11

References 12

Annexures

Self-evaluation of Project 14

NOMENCLATURE

General Technology Terms:

- Microcontroller: A bitsy computer on a single chip, frequently used to control electronic bias.

- Sensor :A device that detects and responds to physical stimulants, similar as light, temperature, or stir.

- LED(Light- Emitting Diode) :A semiconductor light source that emits light when current overflows through it.

- Arduino: A popular open- source electronics platform used for erecting a wide range of systems, from simple circuits to complex robots.

Safety-Affiliated Terms

- Accident Detection :The process of relating and responding to implicit accidents or dangerous situations.

- Doziness Discovery :A technology that monitors a person's geste to identify signs of fatigue or somnolence.

- Enhanced Visibility: perfecting the visibility of a vehicle or person to others, frequently through the use of lights or reflective accoutrements .

LIST OF FIGURES

- Figure 1: Illustration of a Two-Wheeler Accident Scenario Demonstrating the High-Risk Factors for Riders
- Figure 2: Trends in Road Accidents, Fatalities, and Injuries in India (2018-2022) [2]
- Figure 3: MQ-3 Sensor
- Figure 4: IR Sensor
- Figure 5: Buzzer
- Figure 6: Node MCU
- Figure 7: Jumper Wire
- Figure 8: Design Process
- Figure 9: Prototype Design

CHAPTER 1: INTRODUCTION

Road safety is a major worldwide concern that becomes a focus of public health and policy discussions in nations with high accident and fatality rates. According to the International Road Federation's World Road Statistics 2022, India regrettably leads the world in traffic fatalities. This concerning stance highlights the pressing need for creative safety measures, especially for two-wheeler riders, who are among the most at-risk road users. This concerning stance highlights the pressing need for creative safety measures, especially for two-wheeler riders, who are among the most at-risk road users [1]. A concerning trend can be seen in the 2022 data from the Ministry of Road Transport and Highways' Annual Report on Road Accidents in India (Figure 2): despite brief declines in accidents in 2020 as a result of lockdowns brought on by the pandemic, traffic incidents have increased once more, with 4,61,312 recorded accidents in 2022 alone, resulting in 1,68,491 fatalities and 4,43,366 injuries [2]. These figures highlight the urgent and continuous need for solutions that take into account the various risk factors connected to traffic accidents.

Impaired driving, whether from the use of psychoactive substances or alcohol, is one of the main causes of traffic accidents. Even low blood alcohol concentration (BAC) levels can dramatically increase crash risk; drivers with BACs of 0.04 g/dl or higher have a much higher chance of a serious incident. The hazards that riders face on a daily basis are starkly illustrated in Figure 1, which depicts a typical two-wheeler accident scenario. These risks are frequently exacerbated by things like impaired vision, delayed reaction times, or loss of control brought on by drugs or alcohol. These pictures effectively convey the seriousness of the situation and provide strong support for specific safety precautions. Notably, two-wheeler riders are particularly vulnerable to the combined risks of fatigue, poor vision, and drunk driving, necessitating customized solutions to increase their road safety.

Fig.1 Illustration of a Two-Wheeler Accident Scenario Demonstrating the High-Risk Factors for Riders

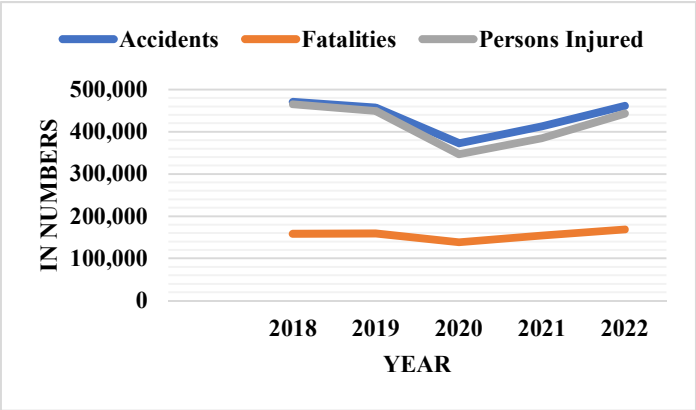

Fig.2 Trends in Road Accidents, Fatalities, and Injuries in India (2018–2022) [2]

This paper presents an innovative approach to these complex risks: an Internet of Things (IoT)-enabled smart helmet that can identify and stop two-wheeler riders from getting into accidents. This IoT-enabled smart helmet, in contrast to conventional helmets, incorporates a number of safety features to address major risk factors that frequently result in mishaps and fatalities. The smart helmet's main features include an alcohol detection sensor (MQ3) that tracks the rider's breath to stop drunk drivers from starting their cars, thereby directly preventing drunk driving. The common but often ignored problem of drowsy driving, which is a leading cause of traffic accidents, is combated by an anti-sleep infrared sensor. The system will sound an alarm and flash LEDs on the back of the helmet to warn other drivers if the rider's eyes are closed for more than five seconds. For long-distance or nighttime riders who might be more prone to fatigue, this feature is especially important.

Motorcycle safety technology has advanced significantly with the introduction of the IoT-powered helmet, which provides riders with an intelligent and proactive safety solution. In addition to offering complete protection, the helmet promotes safer riding practices by integrating several safety features into one unit. This study examines how each feature lowers the risk of accidents, showing how the helmet can significantly improve two-wheeler riders' road safety. The suggested remedy provides a model that could be used globally to protect motorcycle riders and is in line with international road safety initiatives that aim to lower traffic-related fatalities and injuries.

CHAPTER 2: LITERATURE SURVEY

Numerous smart helmet designs have been proposed to address safety concerns across various industries. Behr et al. [3] designed a helmet system for the mining sector that uses an accelerometer to detect high-impact events using the Head Injury Criterion, an IR sensor to detect helmet removal, and electrochemical sensors to monitor dangerous gases like CO, SO_2, and NO_2. In a similar vein, Elizabeth et al. [4] developed a smart helmet for motorcycle riders that can identify collisions and send prompt post-accident alerts to emergency contacts via an automated call system if the rider is not responding.

A helmet system with an accelerometer to detect accidents, an ALCHO-LOCK to prevent drunk driving, and a piezoelectric buzzer for overspeed detection was proposed by Vashisth et al. [5]. Additionally, the system has a fog sensor to enhance visibility and toll payments that are automatically deducted from a virtual wallet. In order to notify contacts in the event of an accident, Selvathi et al. [6] developed a helmet that detects whether the wearer is wearing a helmet and whether they have consumed alcohol before permitting engine ignition. In addition to ensuring helmet compliance prior to engine start, Archana D. et al. [7] developed a helmet that employs ultrasonic sensors to identify oncoming cars and vibrates the handlebars to alert the rider.

In order to increase the accuracy of accident detection over time, Tapadar et al.[8]proposed a methodology that makes use of accelerometer and pressure sensors. Data is then transmitted to a cloud-based support vector machine (SVM). By adding sensors to detect CO and methane and wirelessly sending data to the control room, Additionally, Vashisth et al. [9] added GSM alerts for speeding and an ALCHO-LOCK mechanism. Nataraja N. et al. presented a helmet with an accident-detection system that stops a bike from starting if it is not worn. Sarika K. et al. [10] created a helmet with an automated wiper to remove moisture and improve visibility in rainy conditions. Divyasudha N. et al. [11] demonstrated helmets for accident detection and miner safety, while Venkateswara Rao et al. [12] introduced IoT-based helmets with GPS tracking, Bluetooth, and mandatory helmet-wear to start the vehicle, improving response and compliance. Lakshmi et al. [13]designed a control system that prevents ignition without a helmet aiming to reduce road fatalities through automated safety measures.

CHAPTER 3: HARDWARE TOOLS

1. MQ-3 Sensor: A gas sensor called the MQ-3 is made to identify whether alcohol is present in the air. It is frequently utilized in systems that require alcohol detection, such as breathalysers. A tin dioxide (SnO2) layer that is sensitive to alcohol particles is used in the sensor to measure changes in resistance. A detectable current flow results from the sensor's resistance decreasing in the presence of alcohol. Both analog and digital outputs are available from the MQ-3; the analog output shows different alcohol content levels. This sensor checks for alcohol in the rider's breath in an Internet of Things-based accident detection helmet to make sure they are sober.

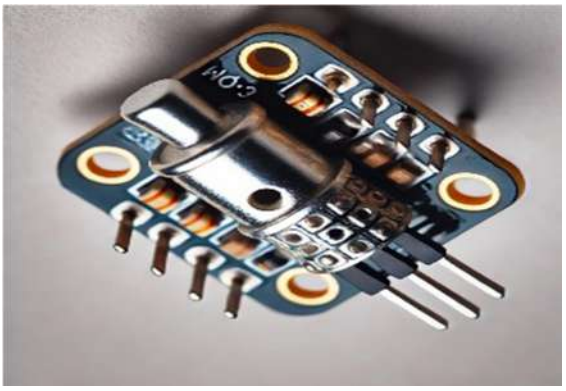

Fig.3 MQ-3 Sensor

2. IR Sensor: An IR sensor is an essential part of many automation and safety systems since it uses infrared light to identify objects, distance, or obstructions. Infrared light is emitted by an IR LED, and the reflected light from an object is collected by a photodiode. The intensity of the reflected infrared light rises with proximity to the item, causing the sensor to produce a signal. When it comes to helmets, the infrared sensor can be utilized to determine whether the rider is wearing them correctly. In order to ensure that safety procedures are followed, the system will prevent the motorcycle from starting if the helmet is not detected on the rider's head.

Fig.4 IR Sensor

3. Buzzer: A buzzer is a basic electronic device that emits a sound when electricity passes through it. IoT systems use it to send out warnings or alerts, as when anomalous situations are found. If the rider exhibits symptoms of fatigue, alcohol consumption, or improper helmet wear, the buzzer on an accident detection helmet may sound. This auditory alarm is an essential safety element to avoid accidents because it provides the rider or anyone nearby with an instant warning.

Fig.5 Buzzer

4. Node MCU: A low-cost, open-source IoT development board with integrated Wi-Fi, NodeMCU is based on the ESP8266 microprocessor. In IoT-based systems, it acts as the hub, gathering sensor data and sending it to other devices or cloud services. The NodeMCU in an IoT helmet receives input from parts such as the anti-sleep modules, IR sensor, and MQ-3 sensor. After processing the data, it transmits it via Wi-Fi to cloud platforms, mobile apps, or other systems for additional action, such notifying emergency contacts in the event of an accident.

Fig.6 Node MCU

5. Jumper Wires: Jumper wires are straightforward electrical cables with connector pins on both ends that are used to connect parts of a microcontroller or a breadboard temporarily. Depending on the needs of the connection, they can be classified as male-to-male, female-to-

female, or male-to-female. The sensors (such as the MQ-3 or IR sensor) in an IoT helmet are connected to the NodeMCU via jumper wires, which facilitates seamless data transfer between the parts.

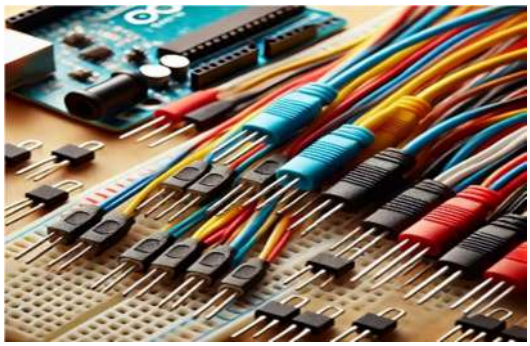

Fig 7: Jumper Wire

CHAPTER 4: METHODOLOGY AND ALGORITHM

METHODOLOGY

The multipurpose Arduino-powered accident detection helmet combines a number of hardware and software elements to improve motorcycle safety. An Arduino microcontroller, an alcohol sensor (MQ3), an infrared sensor, a relay module, a buzzer, LEDs, and a battery are among the essential hardware parts. The system's brain, the Arduino microcontroller, regulates all of its operations. While the IR sensor tracks eye movement to identify indications of tiredness, the alcohol sensor picks up alcohol vapors in the rider's breath. The motorcycle's ignition system is managed by the relay module, which stops it from starting if the rider is intoxicated. To alert the rider to possible dangers, the buzzer and LEDs give visual and auditory cues, respectively.

The Arduino processes sensor data to make decisions and activate responses. The alcohol detection algorithm prevents engine ignition if the alcohol level exceeds a threshold, the relay is activated to prevent engine ignition. The anti-sleep algorithm monitors the IR sensor data to identify periods of prolonged eye closure.[4]

ALGORITHM

Step 1: Component Initialization

This stage involves setting up the Arduino's digital and analog pins to interface with the LEDs, relay, buzzer, IR sensor, and alcohol sensor. Each pin is designated to either give output signals to control devices such as the relay and LEDs or accept input from the sensors.

Step 2: Setting Up a Baseline for Alcohol Sensors

To guarantee precise detection, a baseline reading is obtained from the alcohol sensor. The system will initiate safety measures, such stopping the engine from starting, if a threshold value is exceeded.

Step 3: Anti-Sleep Detection Configuration

The time length specifies how long the rider must keep their eyes closed in order for the anti-sleep detection to work. This aids the system in determining whether the rider is falling asleep.

Step 4: Main Loop Alcohol Level Monitoring

The alcohol sensor readings are continuously monitored in the main loop. In order to ensure that the rider cannot operate a motorbike while intoxicated, the relay module is triggered if the alcohol level over the predetermined threshold.

Step 5: Using an IR sensor to detect drowsiness

The rider's eyes are tracked by the infrared sensor. The buzzer alerts the rider if the eyelids stay closed for longer than the predetermined amount of time, reducing the likelihood of fatigue related accidents.

Step 6: Managing LED Indicators in the Back

The rider's visibility to other drivers, particularly at night, is enhanced by the continual toggling of the back LEDs to produce a blinking pattern.

Step 7: Last-Minute Safety and Monitoring Procedures

The technology continues to track tiredness and alcohol consumption during operation. It ensures the rider's safety at all times by triggering alerts and blocking engine activation if any risky conditions are identified.

CHAPTER 5: MODELLING AND QUICK DESIGN

The modelling phase for the Arduino-powered accident detection helmet involved designing a system that integrates multiple sensors and components to function seamlessly. This included:

Component Selection and System Architecture:

- Alcohol Sensor (MQ-3): Detects alcohol concentration to determine if the rider is intoxicated.
- IR Sensor: Monitors eye closure for anti-sleep detection.
- Relay Module: Controls the ignition system to block the vehicle from starting when necessary.
- Buzzer: Alerts the rider during drowsiness events.
- LEDs: Enhance night visibility through a blinking pattern.

Design Process:

System Diagram: To illustrate how the Arduino board and peripherals interact, a conceptual block diagram was created which is shown in Figure.8. This stage made sure that communication protocols and pin assignments were clear.
Logical Flow: A flowchart was used to represent the system and show important processes such continuous monitoring, alcohol threshold detection, and sensor startup. All safety precautions were guaranteed to operate independently and in unison thanks to this flow.

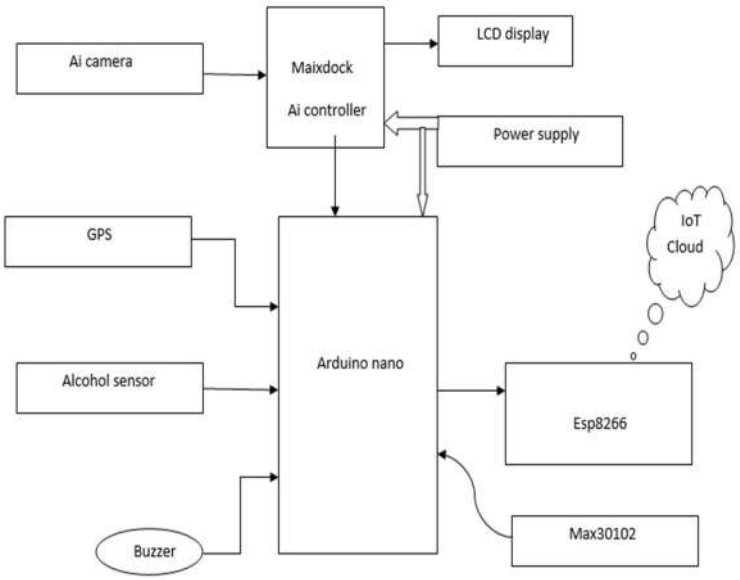

Fig.8 Design Process

CHAPTER 6: RESULTS ANALYSIS

System Initialization and Setup:
The Arduino successfully set up and initialized the sensors and parts (LEDs, relay, buzzer, alcohol sensor, and infrared sensor) without any problems. All devices responded successfully at starting, and the pins were able to interact effectively.

Alcohol Detection Accuracy:
The technology was able to precisely detect different alcohol levels after calibrating the alcohol sensor using baseline values. The relay appropriately prevented the engine from starting when the threshold was surpassed. Real-time safety enforcement was ensured by the relay's rapid reaction time between detection and activation.

Anti-Sleep Functionality:
Eye movements were successfully tracked by the infrared sensor. The buzzer sounded an alert if the eyes were closed for more time than was allowed. There were very few detection and reaction delays, and this feature operated consistently.

LED Visibility Performance:
The rear LEDs created a consistent blinking pattern to enhance visibility at night. This feature operated seamlessly, without interfering with other functions.

Continuous Monitoring and Integration:
The system maintained continuous monitoring of alcohol levels and drowsiness without crashes or malfunctions. It handled multiple conditions simultaneously (e.g., alcohol detection and LED toggling), demonstrating stability and robustness.

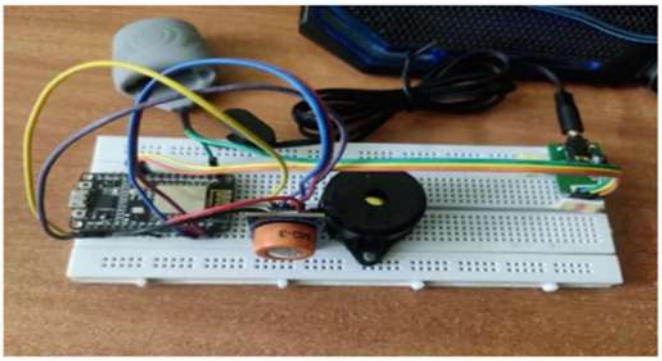

Fig-9 Prototype Design

CHAPTER 7: CONCLUSION AND FUTURE SCOPE

Alcohol detection, anti-sleep alert, and improved visibility are just a few of the safety features that the Arduino-powered accident detection helmet skilfully combines to mitigate the main risks of motorcycle riding. By precisely identifying intoxication and preventing engine start, tracking rider weariness with prompt alarms, and enhancing night vision with blinking LEDs, the system proved to be dependable during prototype.

This research provides a workable way to lower the number of accidents brought on by drunk driving and sleepiness, two major causes of traffic fatalities, particularly in places like India. Future improvements are also possible because to the modular design, including adding GPS modules for accident alerts or using more energy-efficient parts to optimize power usage. Even though the prototype produced encouraging results, issues like power management and the alcohol sensor's sensitivity to environmental changes require more work. This technology has the potential to significantly improve motorcycle safety with further development and field testing, giving riders a complete safety tool that encourages cautious driving and lowers the likelihood of accidents.

REFERENCES

[1] "Data – World Road Statistics." Accessed: Nov. 04, 2024. [Online]. Available: https://worldroadstatistics.org/data/

[2] "Press Release: Press Information Bureau." Accessed: Nov. 04, 2024. [Online]. Available: https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1973295

[3] C. J. Behr, A. Kumar, and G. P. Hancke, "A smart helmet for air quality and hazardous event detection for the mining industry," *Proceedings of the IEEE International Conference on Industrial Technology*, vol. 2016-May, pp. 2026–2031, May 2016, doi: 10.1109/ICIT.2016.7475079.

[4] S. Chandran, S. Chandrasekar, and N. E. Elizabeth, "Konnect: An Internet of Things(IoT) based smart helmet for accident detection and notification," *2016 IEEE Annual India Conference, INDICON 2016*, Jan. 2017, doi: 10.1109/INDICON.2016.7839052.

[5] R. Vashisth, S. Gupta, A. Jain, S. Gupta, Sahil, and P. Rana, "Implementation and analysis of smart helmet," *4th IEEE International Conference on Signal Processing, Computing and Control, ISPCC 2017*, vol. 2017-January, pp. 111–117, Sep. 2017, doi: 10.1109/ISPCC.2017.8269660.

[6] D. Selvathi, P. Pavithra, and T. Preethi, "Intelligent transportation system for accident prevention and detection," *Proceedings of the 2017 International Conference on Intelligent Computing and Control Systems, ICICCS 2017*, vol. 2018-January, pp. 442–446, Jul. 2017, doi: 10.1109/ICCONS.2017.8250761.

[7] D. Archana, G. Boomija, J. Manisha, and V. K. G. Kalaiselvi, "Mission on! Innovations in bike systems to provide a safe ride based on IOT," *Proceedings of the 2017 2nd International Conference on Computing and Communications Technologies, ICCCT 2017*, pp. 314–317, Jul. 2017, doi: 10.1109/ICCCT2.2017.7972296.

[8] S. Tapadar, S. Ray, H. N. Saha, A. K. Saha, and R. Karlose, "Accident and alcohol detection in bluetooth enabled smart helmets for motorbikes," *2018 IEEE 8th Annual Computing and Communication Workshop and Conference, CCWC 2018*, vol. 2018-January, pp. 584–590, Feb. 2018, doi: 10.1109/CCWC.2018.8301639.

[9] R. Vashisth, S. Gupta, A. Jain, S. Gupta, Sahil, and P. Rana, "Implementation and analysis of smart helmet," *2017 4th International Conference on Signal Processing, Computing and Control (ISPCC)*, vol. 2017-January, pp. 111–117, Sep. 2017, doi: 10.1109/ISPCC.2017.8269660.

[10] S. Gupta, K. Sharma, N. Salvekar, and A. Gajra, "Implementation of Alcohol and Collision Sensors in a Smart Helmet," *2019 International Conference on Nascent Technologies in Engineering, ICNTE 2019 - Proceedings*, Jan. 2019, doi: 10.1109/ICNTE44896.2019.8945979.

[11] N. Divyasudha, P. Arulmozhivarman, and E. R. Rajkumar, "Analysis of Smart helmets and Designing an IoT based smart helmet: A cost effective solution for Riders," *Proceedings of 1st International Conference on Innovations in Information and Communication Technology, ICIICT 2019*, Apr. 2019, doi: 10.1109/ICIICT1.2019.8741415.

[12] C. Venkateswara Rao, S. Chegondi, K. Myla, S. Murala, S. S. Myla, and D. R. Kalava, "IoT Based Smart Helmet for Bike Rider Safety," *7th International Conference on Electronics, Communication and Aerospace Technology, ICECA 2023 - Proceedings*, pp. 1445–1448, 2023, doi: 10.1109/ICECA58529.2023.10394802.

[13] A. Bhagya Lakshmi, C. Ragunath, R. Yeswanth, and M. Rajkumar, "Smart Helmet for Riders to Avoid Accidents Using IoT," *2024 2nd International Conference on Computer, Communication and Control, IC4 2024*, 2024, doi: 10.1109/IC457434.2024.10486574.

ANNEXURE

SELF-EVALUATION OF THE PROJECT

Month	Start date – End date (DD/MM/YY) - (DD/MM/YY)	Progress of Project
Month- 1	05/08/24 - 31/08/24	Topic Selection and Project planning
Month- 2	01/09/24 - 30/09/24	Hardware selection and Prototype Development
Month- 3	01/10/24 - 31/10/24	Data Analysis and Results
Month- 4	01/11/24 - 18/11/24	Documentation of the Project

Dr.Aftab Ahmed Ansari
Assistant Professor
Center for IOT
MITS, Gwalior

15% Overall Similarity

Top sources found in the following databases:

- 9% Internet database
- Crossref database
- 13% Submitted Works database
- 1% Publications database
- Crossref Posted Content database

TOP SOURCES

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	**mitsgwalior on 2024-11-16** Submitted works	6%
2	**mitsgwalior on 2024-05-27** Submitted works	3%
3	**web.mitsgwalior.in** Internet	2%
4	**ijraset.com** Internet	<1%
5	**construction.jisc.ac.uk** Internet	<1%
6	**University of Central Lancashire on 2024-04-15** Submitted works	<1%
7	**indianexpress.com** Internet	<1%
8	**Liberty University on 2024-06-09** Submitted works	<1%

9	Mahagave Somnath, D Dhanalakshmi, Vuppulapu Sai Sripath, Shanmu... Crossref	<1%
10	Somaiya Vidyavihar on 2023-05-06 Submitted works	<1%
11	Sotiris Athanaselis, Artemis Dona, Stavroula Papadodima, Giannis Pap... Crossref	<1%
12	dynlab.mpe.nus.edu.sg Internet	<1%
13	ijircce.com Internet	<1%
14	ijisae.org Internet	<1%
15	kscst.iisc.ernet.in Internet	<1%