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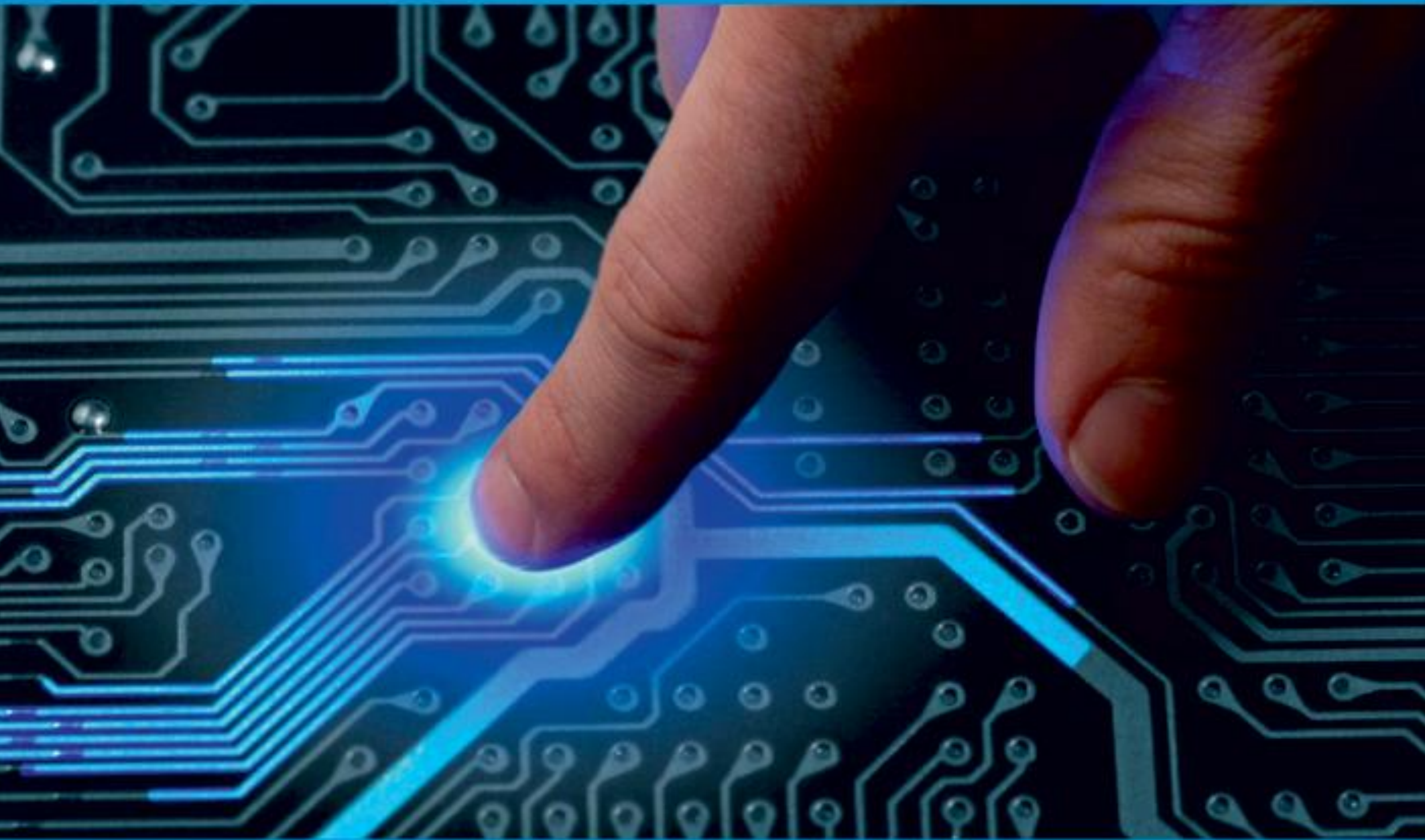

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Advancing Motorcycle Safety through Helmet Detection and Accident Avoidance

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ABSTRACT: This work addresses the pervasive issue of road accidents in contemporary society, attributing them to factors such as rash and drunken driving, as well as non-compliance with traffic regulations. This paper gives an overview of the existing systems and also introduces a newly developed system designed to enhance rider safety. Proposing an innovative solution, this system operates as a cost-effective and user-friendly protection mechanism, ensuring that the rider can only operate their two-wheeler when both sober and wearing the helmet. In the event of a severe accident, the system autonomously notifies emergency contacts, expediting the delivery of critical aid and medical care. The primary goal of this system is to significantly reduce injuries sustained by two-wheeler riders in road accidents. This system also incorporates a password based unlock and ignition system which enhances the security of the vehicle. This comprehensive approach addresses not only the prevention of accidents but also emphasizes the swift response and care necessary to mitigate the adverse consequences of such incidents.

KEYWORDS: Alcohol Detection; Password based ignition; Accident Detection; Emergency Alert Message

I. INTRODUCTION

In today's tech-driven era, smart helmets are undergoing a significant transformation, moving beyond their traditional role of head protection. They are evolving into comprehensive safety solutions, blending advanced technology with a strong focus on promoting responsible behavior and ensuring safety standards. This project explores the enhanced safety features of smart helmets, particularly focusing on three key areas: alcohol detection, real-time emergency communication, and promoting helmet use.

The primary objective is to enhance user safety while encouraging responsible behavior. Integrating alcohol detection technology into smart helmets is a crucial step in reducing accidents caused by impaired riding. Real-time alcohol detection and instant alert systems ensure that riders do not begin their journey under the influence, thereby minimizing the risk of accidents.

Additionally, the automatic communication feature that notifies emergency contacts in case of an accident provides added reassurance to riders and their families. This project also emphasizes reinforcing safety measures throughout the riding experience by linking vehicle ignition with the helmet's condition and alcohol detection status, setting a high standard for secure vehicle operation.

Overall, this project underscores the importance of integrating advanced technology with a focus on safety and responsibility, positioning smart helmets as essential components in modern safety and transportation initiatives.
Objectives of the proposed work are:

- To allow ignition of the vehicle, only if the rider wears the helmet.
- To prevent ignition of the vehicle, if alcohol is detected.
- To send an alert SMS to a specified contact in case of alcohol detection and automatically dispatch an emergency alert message with the bike's location if an accident occurs.
- To implement a password-based ignition system for bike security

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II. BACKGROUND STUDY

Jeneetha Jebanazer et.al [1] proposed a system whose primary objective is to detect accidents and ensure timely assistance to the victims. The smart helmet utilizes sensors, cloud computing, and IoT connectivity to achieve this. The smart helmet system integrates multiple sensors to detect critical parameters such as the presence of the helmet using a touch sensor and alcohol consumption by the rider using an alcohol sensor. It uses an Arduino Uno microcontroller as the central processing unit to collect and process data from the sensors. The system also incorporates RF technology for data transmission between the helmet and the vehicle unit. This system uses a gyroscope sensor and a vibration sensor to detect accidents. In the event of an accident, the system automatically sends the location information to a server, enabling quick response and assistance using the GSM module for communication, a GPS module for location tracking, and Zigbee protocol for wireless data transmission.

Vivien Melcher et. al [2] proposed a system whose primary objective is to enhance emergency response by supplying health-related information to service centers and alerting riders about potential health risks. The user requirements for the system include advanced e-Call features, health monitoring capabilities, and feedback on physical activities. Key parameters considered in the system design include heart rate, pulse rate, respiration, consciousness level, impact on the head, stomach, and chest, preceding vital sign data, GPS data indicating accident location, speed before the accident, and a voice connection to the rider. The essential components of the i-VITAL system consist of an i-VITAL kit, which include helmets and garments equipped with bio-signal sensors, along with the user's mobile phone featuring an Android application. These components are interconnected through Bluetooth Low Energy technology to facilitate seamless communication. The helmet bio-signal sensor module incorporates sensors and signal conditioning circuits to capture vital signals from the user's head. Both the helmet and garment subsystems are equipped with Bluetooth communication modules, enabling wireless communication with the mobile phone for emergency call activation and data transmission.

Mohd Khairul Afiq Mohd Rasli et. al [3] developed a system whose primary objective is to enhance the safety of motorcyclists by integrating sensors into the helmet to prevent accidents and reduce fatalities. The smart helmet incorporates a Force Sensing Resistor to detect the rider's head and a Brushless Direct Current Fan as a speed sensor to monitor the motorcycle's speed. A 315 MHz Radio Frequency Module is used for wireless communication between the helmet and the motorcycle and the system is controlled by a PIC16F84a microcontroller. The helmet is designed to ensure that the motorcycle's engine starts only when the rider wears the helmet and buckles the safety belt. Additionally, an LED flashes to alert the rider if the motorcycle's speed exceeds 100 km/hour.

Dr. M.Kiran Kumar et.al [4] explores the creation of a Smart Helmet-based Accident Detection and Notification System designed for two-wheeler motorcycles, leveraging the capabilities of the Internet of Things. The primary objective of the system is to address the prevalent issue of high road accident rates and the subsequent delay in providing emergency assistance, particularly for two-wheeler riders. The proposed Smart Helmet-based Accident Detection and Notification System comprises three essential modules: the Data Collection Module, the Accident Detection Module, and the Notification System Module. In the Data Collection Module, data on helmet rotation is gathered using the MPU6050 Accelerometer and Gyroscope Sensor affixed to the GISMO-VI Board, sending the collected information to the Accident Detection System. Abnormal rotation in all three axes signifies a potential accident, triggering the activation of the Notification System Module. The Accident Detection Module verifies significant changes in axis rotation indicative of an accident, confirming the incident and prompting the Notification System Module. In the event of a confirmed accident, the Notification System Module utilizes Python scripts to initiate calls and send SMS notifications to the designated emergency contacts through the Twilio API.

Nataraja N et.al [5] proposed the development of a smart helmet system to enhance safety for motorbike riders. The proposed system comprises various modules seamlessly integrated into both the helmet and the bike. These modules include a helmet detection system, an accident avoidance detection module, and a signboard detection module. The helmet module's primary function is to ascertain whether the rider is wearing the helmet. If the rider is wearing the helmet, the module transmits signals to facilitate the ignition of the vehicle. Moreover, an integrated alcohol detection feature prevents the vehicle from starting in the event that the rider is under the influence of alcohol. The signboard detection module serves the purpose of issuing advance warnings regarding obstacles on the road through voice output and display on an LCD screen. This feature is implemented to heighten the rider's awareness of potential hazards. Additionally, the accident detection system is crafted to autonomously notify emergency contacts in the event of a crash, with the capability to differentiate between minor and major casualties.

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Keesari Shravya et.al [6] proposed a smart helmet project designed to enhance the safety of bike riders through advanced features such as alcohol detection, accident identification, location tracking, hands-free functionality, and fall detection. The project consists of two main units: the helmet unit and the bike unit, both integrated with microcontrollers and connected via RF modules for communication. The working of the smart helmet involves several key steps. Firstly, the helmet unit initializes all ports and proceeds to accident detection using an accelerometer. If no accident occurs, it listens to the RF module continuously for data and checks whether the helmet is worn. If the helmet is not worn, a message is displayed prompting the rider to wear the helmet. The system also checks for alcohol consumption, and if the rider is found to be drunk, a message is sent to a registered number with the location, and the system prompts for a password to start the bike. In the event of an accident, the system stops all processes and sends a message with the location. The design and realization of the smart helmet involve the use of Arduino for the transmitter, which displays messages on an LCD and sends SMS to a registered number in the event of alcohol detection or an accident.

III. METHODOLGY

The methodology employed in this project is designed to integrate advanced technologies seamlessly, enhancing safety measures and promoting responsible behavior among riders. The steps involved are briefly explained below:

The project begins by incorporating a sensor to detect the presence of a helmet on the rider's head. This sensor is intricately integrated with the vehicle's ignition system, ensuring that the vehicle cannot be started if the helmet is not detected. This step not only encourages helmet usage, which is crucial for rider safety, but also sets a standard for responsible behavior on the road.

In addition to the helmet detection sensor, the project incorporates an alcohol detection system into the vehicle. This system, which utilizes an alcohol detection technology, is also directly linked to the ignition. If alcohol presence is detected, the system automatically disables the engine, effectively preventing impaired riding and reducing the risk of accidents caused by alcohol consumption.

A secure password system is integrated into the vehicle. Before starting the engine, riders are required to input the correct password, ensuring robust security and preventing unauthorized access to the vehicle.

Furthermore, a communication module is established using GSM technology. This module serves the purpose of dispatching a message to a predefined emergency number whenever alcohol presence is detected. This rapid communication mechanism ensures that appropriate emergency measures can be initiated promptly, potentially saving lives and minimizing the severity of accidents.

Lastly, the project integrates a Gyro sensor in the vehicle. These sensors are capable of detecting collisions, triggering an automatic emergency response. In the event of a collision, a message containing the vehicle's location is sent to a predetermined number. This feature facilitates swift emergency responses and enables timely assistance to riders involved in accidents. By implementing these advanced technologies and safety measures, the project aims to create a comprehensive safety ecosystem that prioritizes rider safety, encourages responsible behavior, and contributes to safer roads for all.

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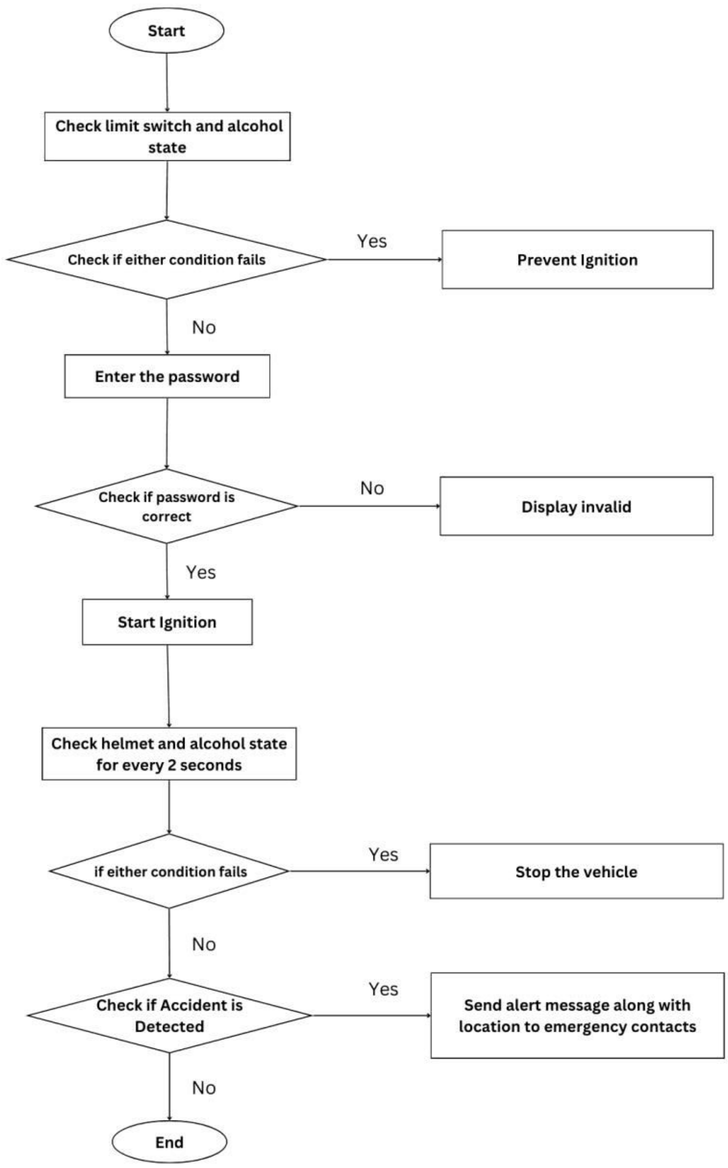

Fig 3.1: Flowchart of the Proposed Methodology

IV. IMPLEMENTATION

The proposed system is divided into two units: a Helmet unit and a Vehicle unit.
Helmet unit:

In the helmet unit, we utilize an MQ-3 alcohol sensor, a limit switch, and an HC-05 Bluetooth module, all connected to an Arduino Nano microcontroller. The alcohol sensor measures alcohol levels and sends analog values to the microcontroller. If the alcohol level surpasses the specified threshold, the microcontroller sends a fail message and sends a pass message if alcohol levels are below the threshold. Simultaneously, the limit switch detects the helmet's state. If the switch indicates that the helmet is worn that is if the limit switch is at 0 state, the microcontroller sends a pass message. Conversely, if the limit switch is at 1 state, it indicates that the helmet is not worn, and sends a fail

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message. The HC-05 Bluetooth module is used in facilitating communication between the helmet unit and the vehicle unit.

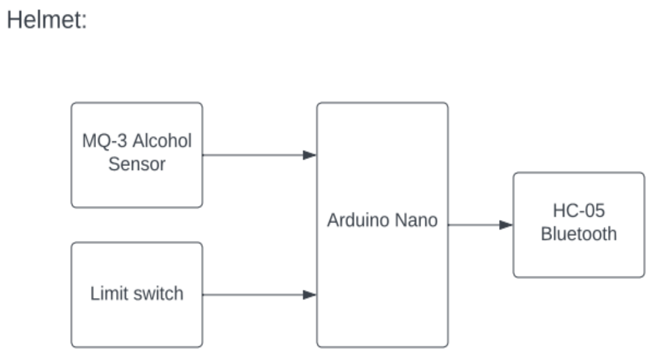

Figure 4.1: Helmet Unit

Vehicle unit:

The vehicle unit consists of several components connected to an Arduino ATMega microcontroller. These include a gyroscope, GSM module, GPS module, DC motor-driven wheel, buzzer, 20x4 LCD, HC-05 Bluetooth module, and keypad. The Bluetooth module receives data regarding helmet and alcohol states from the helmet unit, which is then given to the Arduino Mega and displayed on the LCD screen. If both the helmet states are passed the system requests to input the password. A valid password input through the keypad initiates the DC motor, causing the wheels to start rotating. The system continuously monitors the helmet and alcohol states, checking every 2 seconds. If the helmet unit returns a fail state while the motor is on, the buzzer activates and the motor stops after 5 seconds. The gyroscope measures the tilt angle of the vehicle unit. This data is continuously transmitted to the Arduino ATMega microcontroller. If the tilt angle surpasses 50 degrees, the Arduino ATMega interprets it as an accident and activates the GSM module to send an alert message along with the GPS location detected by the GPS module, ensuring prompt notification in case of accidents to the pre-registered emergency contacts.

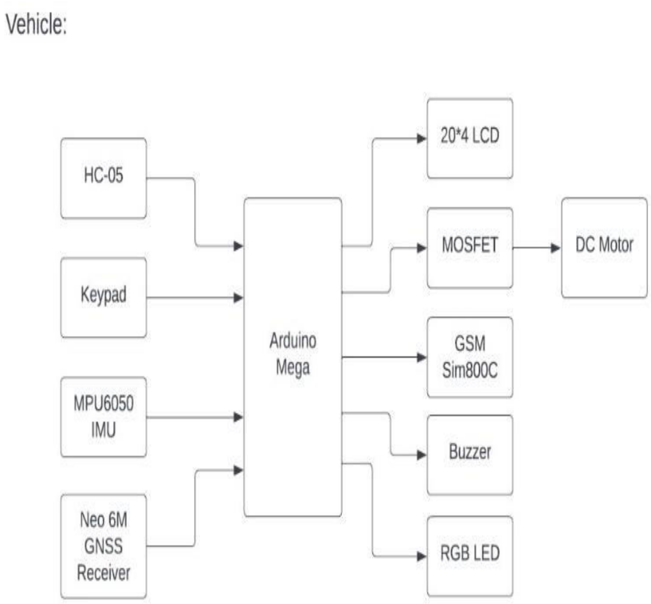

Figure 4.2: Vehicle unit

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V. RESULT

Helmet unit:

Fig 5.1: Helmet

The output from the helmet unit shows the pass or fail state of alcohol sensor and helmet detection module.

Limit Switch State: 1 MQ3 Value: 601 Fail,Pass;	Limit Switch State: 1 MQ3 Value: 826 Fail,Fail;
Limit Switch State: 1 MQ3 Value: 601 Fail,Pass;	Limit Switch State: 0 MQ3 Value: 822 Pass,Fail;

Fig 5.2: The above table shows all the four cases of outputs from the helmet unit.

Vehicle unit:

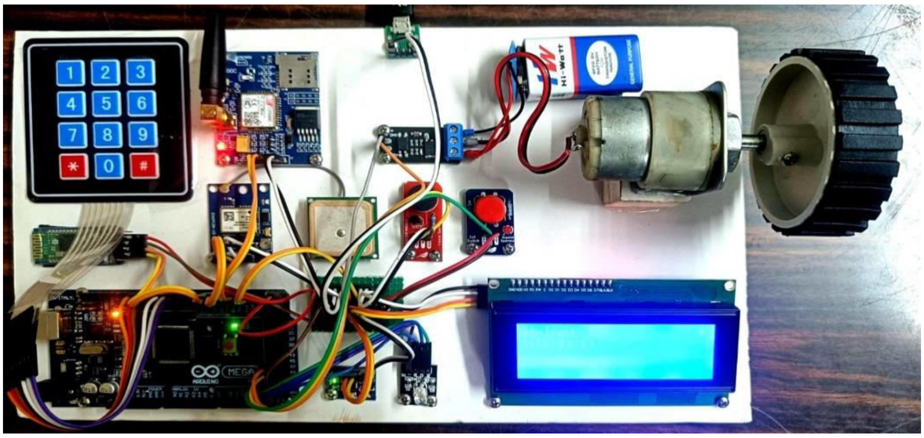

Fig 5.3: Vehicle unit

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Fig 5.4: When both the helmet and alcohol detection systems register a pass state and ignition button is pressed, the system requests for a PIN to initiate the ignition process

Fig 5.5: Once the correct PIN is input, the system displays valid and starts ignition.

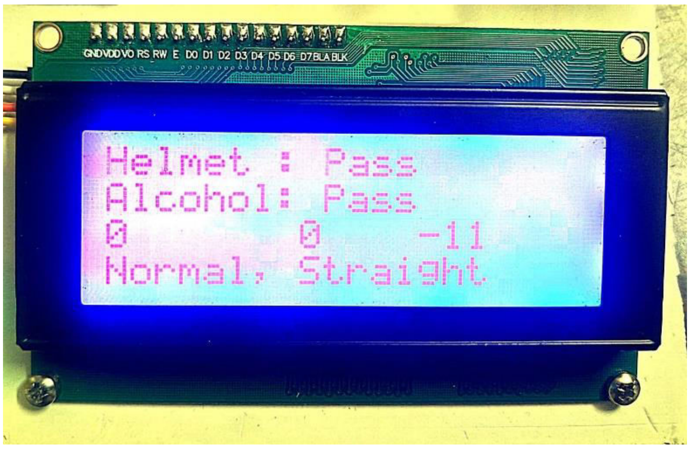

Fig 5.6: The Gyroscope constantly measure the tilt angle of the system and is displayed on the LCD screen.

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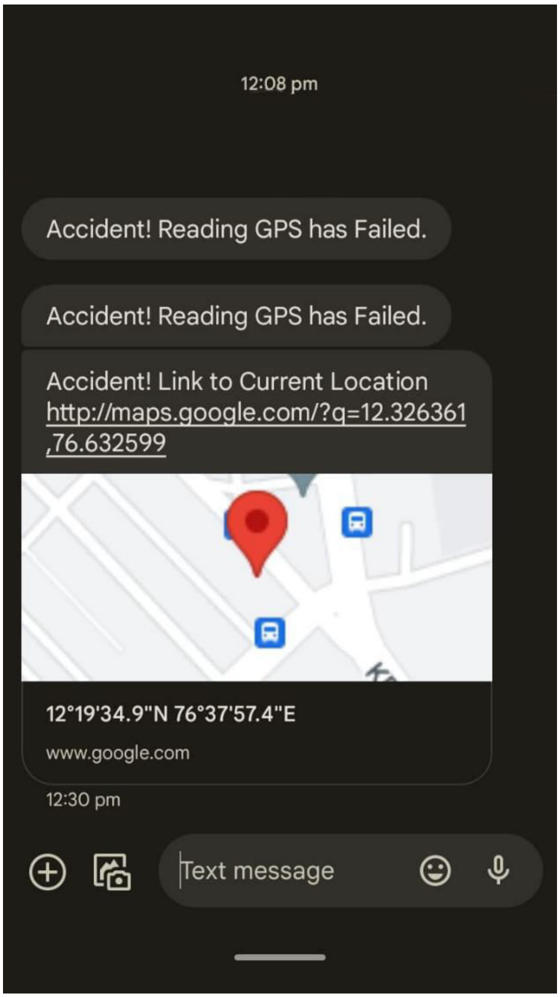

Fig 5.7: In case of accident detection an alert message indicating accident along with the GPS location where the accident occurred is received by the emergency contact

VI. CONCLUSION

In conclusion, the proposed system represents a significant step forward in enhancing rider safety and promoting responsible behavior on the roads. By integrating advanced technologies such as alcohol detection systems, helmet presence detection, password-based ignition, accident detection mechanisms, and real-time communication with emergency services, the project addresses critical safety concerns for motorcyclists and riders. The integration of these features into the helmet and vehicle units ensures a comprehensive safety solution, reducing the risks associated with impaired riding, lack of helmet usage, and delayed emergency response. Moving forward, the proposed project underscores the importance of continuous innovation in safety equipment to create safer and more secure environments for riders worldwide.
Future Scope:

- Integrating advanced sensors to improve the accuracy of accident detection, leading to greater operational efficiency.
- Upgrading the communication system between the helmet and vehicle unit.
- Integrating a camera module in the helmet to monitor driver activity.
- Integration of cloud computing to monitor, store and analyze the data.

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REFERENCES

1. Aayush Doshi, Bhavya Shah and Jubin Kamdar, “Accilert – Accident Detection And Alert System.” International Journal of All Research Education and Scientific Methods (IJARESM), vol. 9, no. 11, 2021
2. K. Rajat, F. Swaleha, T. Shubham, and S. K. Apte, “Life Saving Device: A Smart Helmet,” International Research Journal of Engineering and Technology, vol. 06, no. 03, Art. no. 2395–0056, Mar. 2019.
3. Vivien Melchera, Frederik Diederichs, Rafael Maestre, Christian Hofmann, Jose-Maria Nacenta, Jos van Gent, Dragan Kusić, Boštjan Žagar, “Smart vital signs and accident monitoring system for motorcyclists embedded in helmets and garments for advanced eCall emergency assistance and health analysis monitoring”, Procedia Manufacturing, 3, 3208–3213. https://doi.org/10.1016/j.promfg.2015.07.871
4. Nataraja N, Mamatha K S, Dr. Keshavamurthy, Dr. Shivashankar, "Smart Helmet", 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT-2018), May 18th and 19th, 2018.
5. Dr. M. Kiran Kumar, Aniruddha Balbudhe, CH Sai Karthikeya, “Smart Helmet based Accident Detection and Notification System for Two-Wheeler Motor Cycles” E3S Web of Conferences. https://doi.org/10.1051/e3sconf/202339101149
6. A. Suman, A. Parashar, A. Shukla and K. R. Shobha, "Aagaahi - A Smart Helmet," 2020 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT), Bangalore, India, 2020, pp. 1-6, doi: 10.1109/CONECCT50063.2020.9198395.
7. M. Anthony, R. Varia, A. Kapadia, and M. Mukhrjee, “Alcohol Detection System to Reduce Drunk Driving,”, International Journal of Engineering Research & Technology, vol. 9, no. 3, Art. no. 2278–0181, 2021.
8. Jebanazer, A. Dhanasekaran, Y. Chinnaraj, and Y. Ravanan, “Smart Helmet for Accident Prevention and Detection,” International Research Journal of Engineering and Technology, vol. 08, no. 04, Art. no. 2395–0056, Apr. 2021.
9. M. K. A. Mohd Rasli, N. K. Madzhi and J. Johari, "Smart helmet with sensors for accident prevention", 2013 International Conference on Electrical, Electronics and System Engineering (ICEESE), Kuala Lumpur, Malaysia, 2013, pp. 21-26, doi: 10.1109/ICEESE.2013.6895036.
10. Mathavan, J. J., Wijesekara, V. K. D., Satheeskanth, N., Wanasinghe, W. M. U. J., Maathushan, M., & Wijenayake, V. V. (2022) “Smart helmet to start the motorbike and to prevent accidents” IOP Conference Series, 1258(1), 012051. https://doi.org/10.1088/1757-899x/1258/1/012051
11. Deekshitha, K. I., & Pushpalatha, S. (2018) “Implementation of smart helmet”, International Journal of Engineering Research and Technology, 6(13). https://www.ijert.org/research/implementation-of-smart-helmet-IJERTCONV6IS13009.pdf
12. K. Shravya, Y. Mandapati, D. Keerthi, K. Harika, and R. K. Senapati, “Smart helmet for safe driving,” E3S Web of Conferences, vol. 87, no. 01023,https://doi.org/10.1051/e3sconf/20198701023.

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