DESIGN & IMPLEMENTATION OF IOT BASED SMART HELMET FOR ROAD ACCIDENT DETECTION

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Abstract
As the number of bikes and motorbikes rises, it has been noted that an alarming number of traffic accidents happen annually in various countries. Unforeseen incidents or blunders that may happen and cause harm or, in extreme circumstances, death are referred to as accidents. Compared to other vehicle types, collisions involving two wheels occur more often. Helmet use and abstaining from alcohol while driving help prevent this. The accident rate keeps rising even when the government puts in place sufficient laws and regulations to prevent traffic accidents. It's important to bring up issues like riding while intoxicated and not wearing a helmet. When motorcycle riders ride while intoxicated or fail to wear helmets, they create serious traffic accidents that end in fatalities.
Keywords: Prevention, Detection, Recovery, Smart helmet, IoT, MQ3 Sensors, Integrated Technology.

I. Introduction

In an era where technological innovation intersects with safety concerns, the emergence of smart helmets stands as a pioneering solution, amalgamating cutting-edge technology with paramount protective gear. Smart helmets, fundamentally, are an evolution beyond traditional headgear, integrating advanced sensors, connectivity features, and intelligent systems to redefine the very essence of protective headgear.

The Smart Helmet Project embarks on a journey to revolutionize safety standards by harnessing the potential of these sophisticated helmets. This project envisions not just a mere upgrade to conventional head protection but a holistic transformation of safety paradigms. By infusing state-of-the-art technology into the very fabric of helmets, the project seeks to enhance not only the protective aspect but also the interactive and intuitive functionalities, catering to diverse user.

II. Literature

The Internet of Things has enabled us to join our everyday objects in a network for the sole purpose of exchanging data. A handful of countries now require riders to wear helmets when riding. In this paper, I describe a smart helmet created using the newest IOT technology. This helmet provides numerous capabilities for the convenience of users, including as listening to music while riding, sending SOS signals in an emergency, and using navigation services.

Accidents are becoming more common, thus attempts are being undertaken to avoid them and minimise their repercussions. We live in a world where the laws of the road have no meaning for individuals and are often broken. Furthermore, it is human nature to oppose what is placed on them. Thus, from a different angle, we give safety with luxurious and intelligent characteristics by employing a smart helmet. Two modules, one on the helmet and one on the bike, will work in tandem to ensure that the biker is wearing the helmet.

Drunk driving situations are avoided with the use of the ALCHO-LOCK function. Accident detection is improved by adding a GSM module to our circuit, which uses an accelerometer. In the event of smog or fog, a fog sensor is also utilized to improve visibility. The device is intended to

automatically notify one personal contact and one concerned authority about the individual's accident. An additional feature called EHELMET allows the necessary money to be wirelessly deducted from the user's virtual wallet, saving the rider from having to stop and make the payment.

The processor receives the accelerometer measurements and keeps an eye out for any unusual fluctuations. When something goes wrong When this occurs, the emergency contacts are informed of the pertinent information.

III. Applications

a) Safety and Protection:

They enhance safety for motorcycle riders, cyclists, and workers in industries like construction by incorporating features like impact detection, lights for visibility, and even airbag systems for head protection.

b) Health Monitoring:

Smart helmets can monitor vital signs such as heart rate, temperature, and even detect fatigue levels, aiding in the health tracking of users, especially athletes or workers in strenuous conditions.

c) Communication and Connectivity:

They enable hands-free communication via Bluetooth, allowing users to make calls, receive navigation prompts, or listen to music without distracting them from their surroundings.

d) Augmented Reality (AR) and Data Display:

Some smart helmets integrate AR displays to provide real-time information like navigation, speed, weather updates, and more directly within the user's field of vision.

e) Industrial Applications:

In industries like construction or manufacturing, smart helmets can improve worker safety by integrating features such as sensors to detect hazardous gases, smoke, or even alert systems for potential accidents.

f) Emergency Services:

Emergency responders and fire fighters can use smart helmets equipped with thermal imaging cameras, communication systems, and vital data displays to aid in their operations during emergencies.
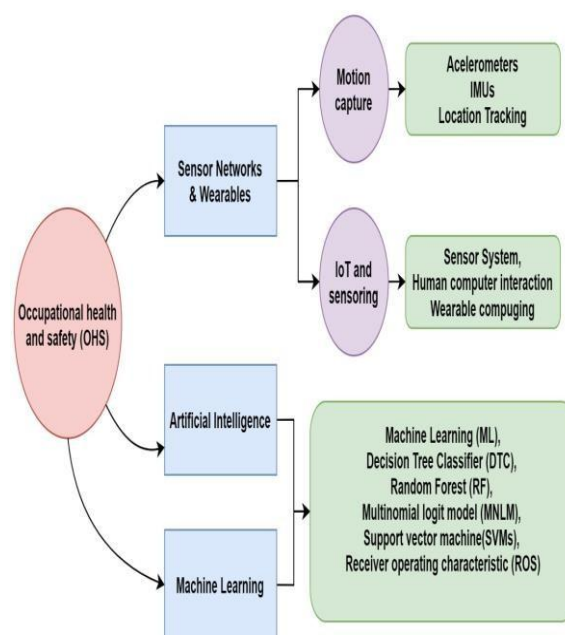
IV. System Architecture

The first concern is stopping riders from not donning helmets and identifying drunk drivers, as these factors are the main reasons for collisions. When the rider wears a helmet, the bike's ignition is blocked appropriately and will not start. It will also detect whether the rider has consumed alcohol and will instantly stop the ignition for this module. IR and MQ-3 sensors are employed. The helmet's inbuilt infrared sensor detects the rider's head. By doing this, the risk of the rider leaving the helmet atop the bike's fuel tank is eliminated. The front is where the MQ-3 gas sensor is situated. The rider mouth of the helmet is where the MQ3 gas sensor is mounted.

When alcohol is detected, it sets the value to HIGH, signalling that the bike's ignition will be shut off. The bike unit and the helmet unit communicate wirelessly via a Radio Frequency (RF) Module.

The second challenge is that riding a motorbike has a lot of blind spots, making it impossible for the rider to see if a car is approaching or not.

Even riders who follow the rules to avoid this problem still have serious accidents because of this. The voice module and speakers are used to alert the rider of approaching automobiles by the installation of ultrasonic sensors on the left, right, and back sides.

The final difficulty is that when a rider gets in an accident, it takes longer to receive medical care and the rider's friends and family are unaware of what has happened to him. GSM and GPS modules are used to determine the position of the accidents and relay the location to the emergency contacts stored within the device.
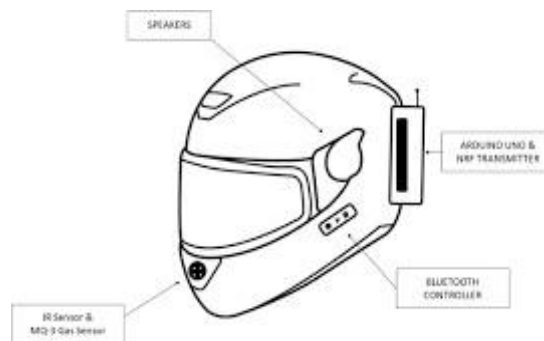
The methodology of the proposed IoT based Smart Helmet system contains two interconnected units that is separated using wireless communication between the Helmet Unit (Arduino UNO) act as transmitter and the Bike Unit (Arduino MEGA) act as receiver. NRF24L01 Transmitter & Receiver Module is used to establish these two wireless connection. Smart helmet system is planned and implemented in such a way that the twowheeler will not ignite until the rider wear worn the helmet properly using IR sensor and pass an alcohol test by MQ-3 sensor which will help to solve the problem of drink and drive. To prevent accident by alerting the rider of nearby vehicles coming using Ultrasonic Sensor. Detecting the accident and tracking the location of the accident using GPS neo6m and sends SMS to emergency contact by GSM800L.This system contains three modules are explained below Helmet detection – Accident Prevention, Vehicle detection and Accident and fall detection, GSM800L sends SMS to emergency contacts after an accident using GPS neo6m.

V. Scope of Improvement

We can use numerous bioelectric sensors on the helmet to measure various actions and examine the rider's statistics. To control the fundamental bike functions, we can utilise voice commands. Without any specific actions or security precautions, the rider can now leave the helmet on the two-wheeler when parking. Solar energy can be used on two-wheelers to charge electric automobiles and mobile gadgets. Self-driving motorcycles with artificial intelligence can be created in the future, keeping the rider safe and preventing accidents.

a) Advanced Sensor Integration
One crucial avenue for improvement lies in advanced sensor integration. Incorporating impact detection sensors that can swiftly analyse and respond to potential hazards, alongside environmental sensors for real-time data collection, could significantly enhance the helmet's safety features.

b) Improved User Experience
Enhancing user experience stands paramount. Intuitive interfaces and enhanced connectivity can streamline interactions, making the helmet more user-friendly and adaptable to various scenarios.

c) Artificial Intelligence Integration
Moreover, integrating artificial intelligence could revolutionize smart helmets. Real-time analysis and predictive maintenance systems powered by AI could pre-emptively identify potential issues and ensure optimal performance.

d) Augmented Reality Features
Augmented reality features like enhanced visualization and interactive HUD can further augment the user experience, offering a more immersive and informative interface.

e) Battery Life and Power Management
Addressing concerns about battery life and power management through the incorporation of energy-efficient components and innovative charging solutions is pivotal for prolonged and reliable use.

VI. Conclusion

Lastly, the System is made to guarantee rider safety by requiring the usage of safety gear. Moreover, it guarantees that no alcohol is ingested while on the journey.

The ignition mechanism stops a rider from starting the bike if they break any of the security rules. Numerous issues with the previous system are resolved by this method. Once the bike reaches its maximum speed, the device assists the rider by identifying nearby vehicles and alerting them vocally. In the event of an accident, the reporting system also helps notify family members for emergency treatment by SMS with location.

By doing this, we can prevent a lot of accidents in this world. The majority of accidents are caused by failure to wear.

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