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SMART ACCIDENT DETECT HELMET

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Abstract:-- A smart helmet is a special idea which makes motorcycle driving safer than before. This is implemented using Arduino. The working of this smart helmet using Arduino is very simple, we place vibration sensors in different places of helmet where the probability of hitting is more which are connected to Arduino board. So when the rider crashes and the helmet hits the ground, the sensors sense and the Arduino extract GPS data using the GPS module that is interfaced with Arduino. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or police or family members.

Keywords: Smart Helmet; IoT; Accident Detection; Safety System; GPS; GSM; Sensor Integration; Motorcycle Safety

1. Introduction

The thought of developing this project comes from social responsibility towards the society. As we see many accidents occurring around us, there is a lot of loss of life. According to a survey of India there are around 698 accidents occurring due to bike crashes per year. The reasons for the accidents may be many such as no proper driving knowledge, no fitness of the bike, rash driving, drink and drive etc. In some cases the person injured the accident may not be directly responsible for the accident, it may be fault of some other rider, but end of the day it's both the drivers involved in the accidents who is going to suffer.If accidents are one issue, lack of treatment in proper time is another reason for deaths. According to the saune survey if 698 accidents occur per year, nearly half the injured people die due to lack of treatment in proper time. The reasons for this may again be many such as late arrival of ambulance, no person at place of accident to give information to the ambulance.This is what is running situation in our day to day life, a thought of finding some. solution to this problem come up with this idea of giving the information about accident as soon as possible and in **TIME....!!!!** Because after all time matters a lot, if everything is done in time, at least we can save half the lives that are lost due to bike accidents.

2. Background

Road traffic accidents are a leading cause of injury and death worldwide, with motorcyclists being among the most vulnerable road users. According to the World Health Organization (WHO), more than 1.3 million people die each year due to road traffic crashes, and a significant portion of these fatalities involve two-wheeler riders. Despite widespread awareness campaigns and legislation mandating helmet use, non-compliance and improper usage continue to pose serious risks. Helmets have long been a fundamental protective gear for motorcyclists, yet traditional helmets offer only passive protection—providing safety during impact but lacking mechanisms for real-time monitoring, emergency response, or preventive actions. With the advent of the Internet of Things (IoT), it is now possible to enhance helmet functionality by integrating smart technologies for both accident detection and prevention. Smart helmets, powered by sensors, microcontrollers, and wireless communication modules, have the potential to revolutionize motorcyclist safety. These helmets can detect collisions through accelerometers and gyroscopic sensors, monitor the rider's state (such as drowsiness or alcohol intoxication), and automatically alert emergency services with real-time GPS data in the event of an accident. Moreover, such systems can incorporate features like speed monitoring, helmet-wear detection, and vehicle ignition control, thus preventing unsafe riding conditions from the outset. This research focuses on the design and implementation of a smart helmet system that leverages IoT technologies to detect accidents, monitor rider conditions, and communicate essential data to emergency responders and caretakers. By bridging the gap between passive safety gear and active safety systems, smart helmets aim to significantly reduce response times and improve survival rates following accidents, while also encouraging safer riding behavior.

3. Methodology

The idea of this project is to give information about the accident to the ambulance and family members, so we have chose GSM technology to give the information by sending SMS. We are using GSM module which has SIM card slot to place the SIM and send SMS. Sending SMS alone can't help the driver, if we send and an SMS saying that accident had occurred where the ambulance will come without knowing the location of the accident.. So we include GPS location in the SMS which we are sending so that the ambulance will have perfect information about where and when the accident has occurred, For this we use GPS module to extract the location of the accident, the GPS data will contain the latitude and longitude values using which we can find the accurate position of the accident place. To run the GPS and GSM module we use Arduino UNO board which has ATmega328 microcontroller. The Arduino is a very user friendly device which can be easily interfaced with any sensors or modules and is very compact in size. Now we are clear that the Arduino will send the SMS using the GSM module by keeping the GPS location in the SMS which is obtained from the GPS module. But when should all this be done? When accident occurs, how will the Arduino detect the accident? We use a vibration sensor which is placed in the helmet.The vibration sensor is placed in the helmet such that it detects vibrations of the helmet. When the rider crashes, the helmet hits the ground and the vibration sensor detects the vibrations that are created when the helmet hits the ground and then the Arduino will send an SMS containing information about the accident and location of accident. This is the methodology used in the project, let me once again give a brief description about the working of project, When the rider crashes, the helmet hits the ground, the vibration sensor senses the vibrations and asks the Arduino to send SMS, the Arduino will send SMS through GSM module containing information that accident has occurred and the GPS location obtained from GPS module.

3.1 System Design and Architecture

The system consists of the following modules:

3.1.1 Helmet module:

- IR Sensor to detect helmet module

- Accelerometer for motion and impact detection
- GPS module for location tracking
- GSM module for alert messaging
- Gyro sensor MPU6050
- Rechargeable battery for power supply

3.2 Working Process

Step 1: System Initialization

When the system is powered on, the microcontroller initializes all the modules (sensors, GPS, GSM, etc.). A self-check is performed to ensure all modules are functional.

Step 2: Helmet Detection

The IR sensor inside the helmet detects if the rider is wearing the helmet. If the helmet is not detected, a signal is sent to the ignition system to keep the engine locked.

Step 3: Continuous Monitoring for Accidents

Once the bike is running, the accelerometer monitors the movement of the helmet. If it detects sudden abnormal motion or impact beyond a predefined "G-force" threshold, the system recognizes it as a potential accident.

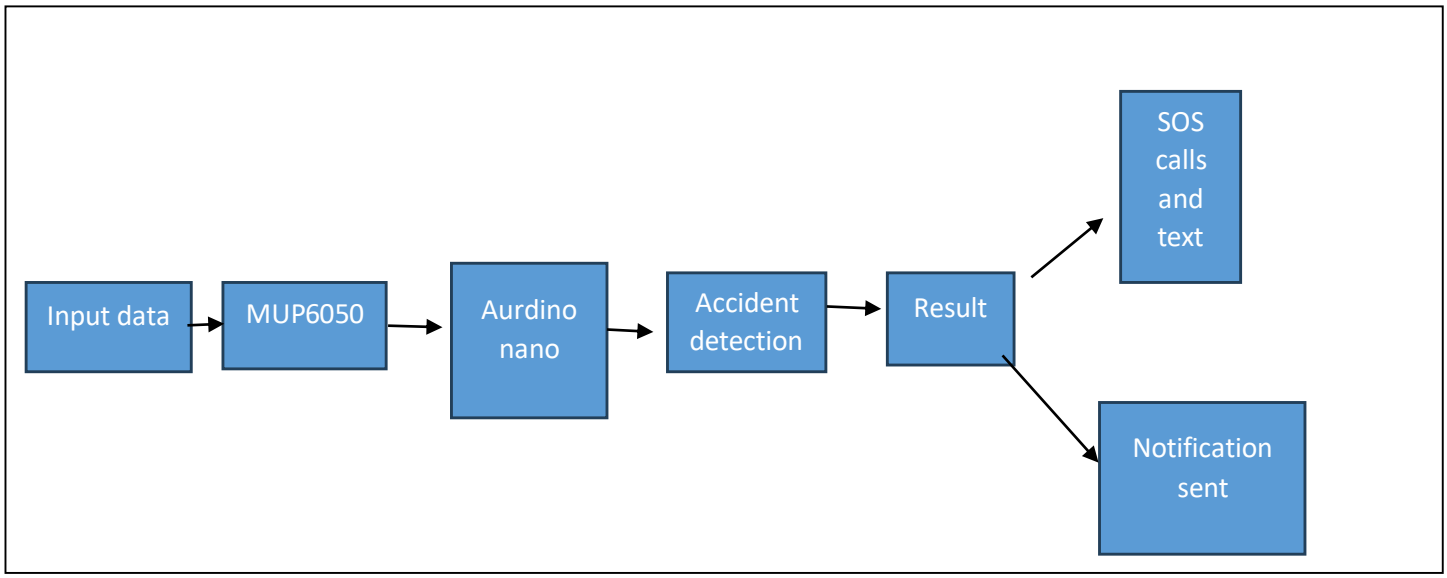
Step 4: Location Tracking and Emergency Alert

If an accident is detected:

- The GPS module retrieves the rider's current coordinates (latitude and longitude).
- The GSM module sends an SMS to emergency contacts containing:
- A predefined alert message
- GPS coordinates
- Google Maps link for easy location access

4. Architecture Diagram

When the Aurdino nano board is turned on, the MPU6050 sensor starts taking the readings of the rotation of helmet in 3 axes in degree per second. It constantly monitors the helmet's position. Based on the readings of the sensor, if the rotation of helmet is abnormal in all 3 axes, the accident detection system detects that the rider has met with an accident and sends



a message and makes a phone call to the registered emergency contacts and the nearest ambulance service prov ider along with the location of the accident. If there is no sign of an accident, no notification is sent.2 minutes of the accident.

In many accidents the victim's life could have been saved, if someone is informed about his accident as quickly as possible, but due to remoteness of the area of accident and unavailability of fellow citizens nearby, they lost their life. This helmet constantly monitors the rider's condition through the cloud. If any anomaly is detected an SOS message and phone call is sent to the emergency contacts registered by the rider.

when the GISMO-VI board is turned on, the MPU6050 sensor starts taking the readings of the rotation of helmet in 3 axes in degree per second. It constantly monitors the helmet's position. Based on the readings of the sensor, if the rotation of helmet is abnormal in all 3 axes, the accident detection system detects that the rider has met with an accident and sends a message and makes a phone call to the registered emergency contacts and the nearest ambulance service provider along with the location of the accident. If there is no sign of an accident, no notification is sent. The proposed solution is divided into three modules, which

4.1 Data Collection Module

* Here the MPU6050 accelerometer and gyroscope sensor is used to measure the rotation in axes in a time frame.
* The MPU6050 accelerometer and gyroscope sensor monitors the rotation of the helmet in X- axis, Y-axis and Z-axis and sends the data to the firebase continuously.

4.2 Accident Detection Module

* If there is abnormal change in rotation of axes i.e., there is a significant change in of the axes which is greater than normal, then it is considered as an accident.

4.3 Notification System Module

* When a rider meets with an accident, immediately the emergency contacts and the nearest ambulance service provider registered by the rider receive a notification about the person's accident contacts. The python script uses Twilio API to perform those actions.

5. Significance of this work

This project is very useful in day to day life and adds extra safety while driving. It's like a virtual person at the place of accident which sends the information to the ambulance.

This is not only useful in bike accidents only but also in car accidents, it can be implemented in car accidents by placing this device in the car and changing some threshold values of the vibration sensor.

Use of this project makes your life secure at crucial times, especially when the accident occurs at a no man place, where there is no person to notice the accident. It helps in the situation where u can't even move your body and in critical position. It automatically sends the information.

6. Conclusion

As the concluding part of this project, I would like to say that-**"Without proper action at proper time, danger awaits with bigger face."** We must act on time when a person is injured. We must take care of person the way it is meant, otherwise, a valuable life might be lost We need to understand how precious lives of people are and what importance first-aid carries in saving these precious lives.

7. References

[1] Kamdi, R., Vaidya, R., Borakhade, D., Thakre, P., Nilawar, A., Panchbhai, V. - "An IoT-Based Intelligent and Smart Helmet for Bike Riders Using Arduino," International Journal of Intelligent Systems and Applications in Engineering, 2024.

[2] Alim, M. E., Ahmad, S., Dorabati, M. N., Hassoun, I. - "Design & Implementation of IoT-Based Smart Helmet for Road Accident Detection," IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), 2020.

[3] Hamza, A., Rauf, M. H., Hashir, M., Kounain, M. - "IoT-Based Smart Helmet for Unsafe Event Detection in the Mining Industry," Journal of Artificial Intelligence and Computing, 2021.

[4] Nagpure, L., Darode, S., Bagde, S., Kalbagwar, S. - "Implementation of Smart Helmet Based on IoT," International Journal for Research in Applied Science and Engineering Technology (IJRASET), 2023.

[5] Nandhini, M. V., Priya, P. G. V., Nandhini, S., Dinesh, K. - "IoT-Based Smart Helmet for Ensuring Safety in Industries," International Journal of Engineering Research & Technology (IJERT), 2018.

[6] Impana, H. C., Hamsaveni, M., Chethana, H. T. - "A Review on Smart Helmet for Accident Detection Using IoT," EAI Endorsed Transactions on Internet of Things, 2019.

[7] Chandran, S., Chandrasekar, S., Elizabeth, N. E. - "Konnect: An IoT-Based Smart Helmet for Accident Detection and Notification," IEEE Annual India Conference (INDICON), 2016.