

# Accident Eye: Intelligent Accident Detection and Alert System for Enhanced Road Safety

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## Abstract:

Accident Eye is an innovative system designed to enhance safety on roads by leveraging the amalgamation of IoT technology and a mobile application. This project is centered around the development of an Accidental Detection System seamlessly integrated with a Smartphone Alert System and a dedicated Mobile Application for real-time monitoring. The primary objective of this system is to swiftly identify accidents or emergencies, promptly alert relevant stakeholders, and furnish them with vital information to facilitate quick response and assistance. Firstly, an alert is dispatched to a Smartphone Alert System, capable of establishing communication with authorized users' smartphones via dedicated mobile applications. These applications are meticulously designed to receive and promptly display notifications, offering critical details about the incident. This information includes the incident's location, severity, and potential risk factors, enabling users to make informed decisions and respond effectively. The integration of IoT technology not only enhances the speed of accident detection but also ensures a comprehensive and coordinated approach to emergency management through seamless communication and information dissemination.

**Keywords** —*iot, nodemcu, mpu6050, gps, components, flutter.*

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## I. INTRODUCTION

“ Accident Eye” is an innovative project leveraging IoT technology to enhance safety on the roadways. By utilizing a comprehensive array of sensors, including NodeMCU, gyro- sensor and accelerometer sensor, GPS module, and our system is designed to swiftly and accurately detect vehicular accidents or crashes in realtime and help alert officials and nearby hospitals about the accidents and reduce the probability of losing person life and the main aim is to provide victim rapid first aid. The primary objective of this project is to significantly reduce response times in emergency situations by immediately notifying the appropriate authorities, such as the police and nearby hospitals, when a crash occurs. This real-time alert system not only enhances the chances of survival for accident victims but also mitigates

property damage expediting the arrival of first responders. Revolutionize the way we respond to road accidents ensuring rapid assistance to those in need and ultimately creating a safer and more secure transportation environment. Accident eye works with iot and a flutter application which is user friendly and more tracable and robust. It is a cutting edge technology for vehicles for safety and the future of road and vehicle security .

This paper contains all the details about the Accident Eye project which is an iot based software project developed with flutter application . The paper is divided into seven or eight sections they are introduction , literature study, proposed system, components used in the project, module description, realtime database, user flow diagrams , conclusion acknowledgement and references , and some section even have sub- sections and also figures of

components used and user flow diagrams and database screenshots are included in this paper.

## II. LITERATURE STUDY

We have studied a lot of existing accident alert systems and referred articles of different authors. The traditional existing system for accident detection and emergency response typically relies on traditional methods, such as manual emergency calls, CCTV cameras, and human surveillance. When an accident occurs, someone at the scene needs to manually place an emergency call to the appropriate authorities. This process can be slow and may not always provide accurate information about the incident. CCTV cameras might capture accidents, but their alerts are often triggered after the event, and human surveillance can be limited in coverage and accuracy. This system lacks the ability to provide real-time, automated accident detection and alerting. The existing system for accident detection and emergency response typically relies on traditional methods, such as manual emergency calls, CCTV cameras, and human surveillance. When an accident occurs, someone at the scene needs to manually place an emergency call to the appropriate authorities. This process can be slow and may not always provide accurate information about the incident. CCTV cameras might capture accidents, but their alerts are often triggered after the event, and human surveillance can be limited in coverage and accuracy. This system lacks the ability to provide real-time, automated accident detection and alerting.

There are also accident alert system for detecting and preventing accident. We researched these type of articles which uses iot and new technologies some of them are Article by Rajvardhan Rish, Sofiya Yede, Keshav Kunal, Nutan V Bansode proposed a system which uses gps gsm accelerometer and adruino. The article states that delayed medical attention is the major cause of death even in accidents so they devoloped this iot system to alert the necessary officials and hospitals as fast as can so that the victim be saved. The system work as abrupt variations are happen sensor

triggers and send sms to emmergency contacts and hospital with the location details. Also article n IoT approach to vehicle accident detection, reporting, and navigation by Nasr, E.; Kfoury, E.; Khoury, D proposed an iot system with navigational and alert abilities to detect the vibrations and send alerts to necessary people on accident with location details, blood type etc.

## III. PROPOSED SYSTEM

Before you begin to format your paper, first write and save the content as a The proposed system is an Accidental Detection System integrated with a Smartphone Alert System and a dedicated Mobile Application. This system leverages IoT technology to enhance safety and security System and a dedicated Mobile Application. This system leverages IoT technology to enhance safety and security . The proposed system has two parts an iot part and an application part , the iot part deals with the hardware part which involves the iot components and sensors like gsm module, gps module, nodemcu, breadboard, power unit, mpu6050 sensor etc and the application is a flutter app which deals with user interaction and user details with navigations details of accidents. It is more fast and reliable with the use of iot sensors and Realtime monitoring and alert system.

The system work with the application for more effectivity. Whenever an accident occur the magnitude from mpu6050 sensor readings are analyzed and compared for various cases and if the result is fall then the alert goes to the emmergency contacts, near hospitals and near police stations by which the victim get first aid and medical care as soon as possible and this system help police to control traffic in accident areas.

### A. ADVANTAGES

'Accident Eye' has a lot of advantages of which its main one is that it can increase the chance of saving the injured people by providing fast medical care from fast alert system.

some of the other advantages are:

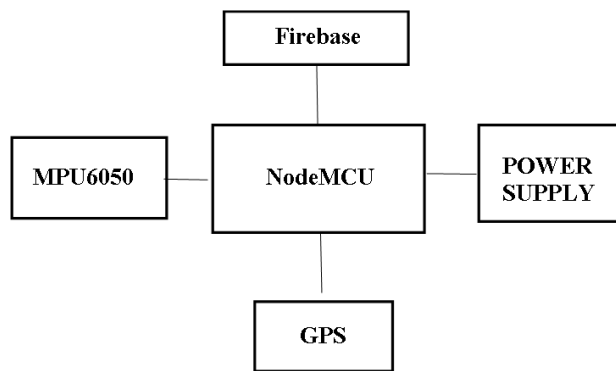


Fig. 1. proposed system

- The system offers real-time accident detection, enabling quick response and assistance. That is whenever accidents happen even if it is a remote place he can be saved by the accident eye alert system
- The system eliminates the need for manual emergency calls, ensuring faster response times, that is the process is automated and it may not need the victims action.
- Users receive crucial details about the incident, which helps them make informed decisions regarding response.
- IoT sensors can be strategically placed to cover a broader area, improving accident detection accuracy.
- The dedicated mobile applications ensure that only relevant stakeholders receive alerts, reducing unnecessary notifications
- It is more compatible system than traditional alert systems and can be used or installed on a lot of vehicles and work well with each cases as it is a monitoring and alert system it can be used with car, bikes and other modes of rides

**B. BLOCK DIAGRAM OF THE PROPOSED SYSTEM**

The Fig.1 shows the block diagram of the Accident eye alert system. It comprises of mainly five parts, nodemcu, mpu6050 sensor, power supply battery, gps and a realltimedatabase. Nodemcu is an open source development board which is the core of the system and it manage all other sensors, MPU6050 is

the gyro sensor which tract the magnitude change and send the data to nodemcu and gps is used to get the user location or accident location when the mpu6050 sensor is triggered and when it triggers the location data is sent to firebase and emmergency contacts are alerted through sms. The whole circuit is powered by a battery that can be compatible with the system components.

**C. CIRCUIT DIAGRAM OF THE SYSTEM**

The Fig.2 shows the circuit diagram of the Accident Eye alert system, the circuit diagram covers the iot part of the project which includes nodemcu which is an open source

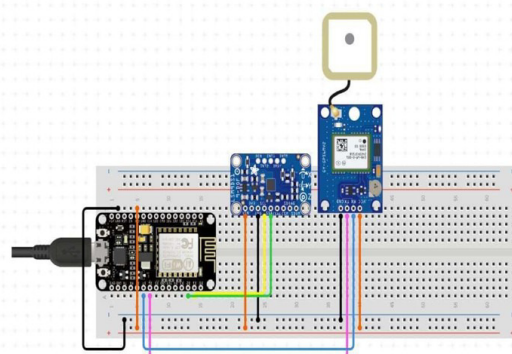


Fig. 2. system circuit diagram

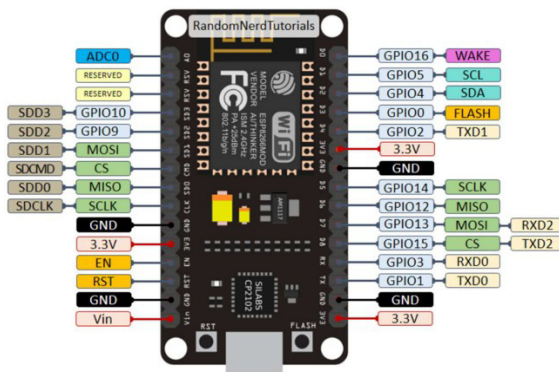


Fig. 3. NodeMCU

development board, MPU6050 sensor which is used to detect change in magnitude to detect crash from variations and a gps module to read the accident location details and sent it to emmergency contacts and near hospitals all of the components are connected via jumper wires on a breadboard.

#### IV. COMPONENTS USED

The system uses a wide variety of IoT sensors and technologies, the main components used in the system are:

- **NodeMCU:** It is an open source development board that can be used to make IoT (Internet of Things) products. It is based on the ESP8266 WiFi module and integrates a microcontroller unit (MCU), making it easy to connect your devices to the internet or other WiFi networks. NodeMCU provides an easy-to-use programming interface, typically using the Lua scripting language or the Arduino IDE. Fig.3 shows the picture of a NodeMCU
- **MPU6050:** The MPU6050 is a popular motion-tracking device commonly used in electronic projects. It combines a 3-axis gyroscope and a 3-axis accelerometer on a single chip, allowing it to measure both rotational and linear motion.

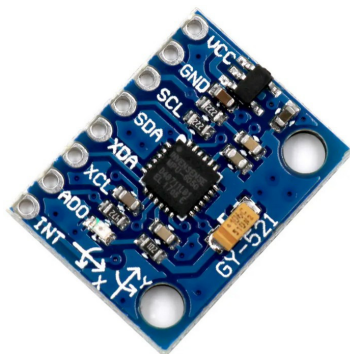


Fig. 4. MPU6050

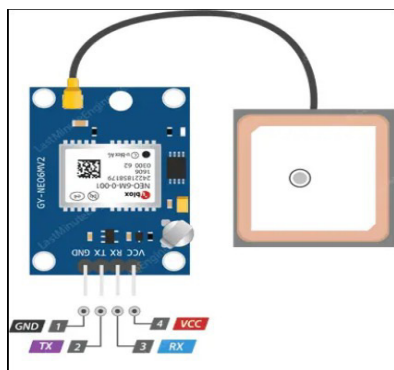


Fig. 5. GPS Neo-6

This module is commonly used in applications such as robotics, drones, gaming controllers, and motion-based user interfaces. Fig.4 shows the picture of a MPU6050

- **GPS-Neo 6 module:** The GPS-Neo 6 module is a compact and lightweight GPS receiver module that is used to receive signals from GPS satellites to determine precise location, time, and other information. It typically communicates with other devices, such as microcontrollers or computers, through serial communication protocols like UART (Universal Asynchronous Receiver-Transmitter). GPS modules like the Neo 6 are commonly used in projects involving location tracking, navigation systems, and geo-tagging applications. Fig.5 shows the picture of a GPS module
- **Jumper Wires:** Jumper wires are wires used to connect all of the sensors to the nodemcu. It is used as it is easy to work with while connecting a lot of components and it comes in different colours and connector types which make it easy for many occasions



Fig. 6. firebase realtime database

#### V. MODULE DESCRIPTION

'Accident Eye ' have three modules, they are as follows:

- **USER MODULE:** In the user module we can see map of the accident location where the crash occurred, we can set prompt messages which will be automatically sent in accident alert to nearby hospitals, relatives and police and can add emergency contact information for every user

accounts so that the emergency alert reach right persons

- **HOSPITAL MODULE:** This module can receive alert about nearby accidents with location and already set prompt message and can react out to the location for emergency first aid and Serve Ambulance to the needy. It can also register patients with patient details and store these data in the realtime firebase database

- **POLICE MODULE:** This module can receive alert about nearby accidents and can react out to the location and can do necessary actions (Legal, traffic congestions). Police module can make use of the accident information to control the traffic congestion by taking necessary actions.

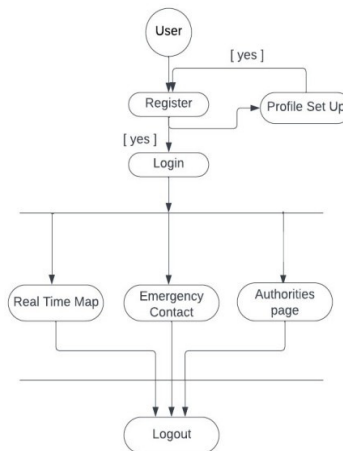


Fig. 7. user flow diagram

### VI. REALTIME DATABASE

A real-time database structure refers to the organization and arrangement of data within a database that supports real-time updates and synchronization across multiple users or systems. Real-time databases are designed to handle and propagate changes instantly, allowing all connected clients to receive the most up-to-date information in real time. Firebase Realtime Database is one example of a service that provides real-time capabilities. The system also uses firebase realtime database and save datas in collection. In the project we use collections to store various user data include vehicle and user details prompt and other details. The Fig.6 shows the firebase realtime database

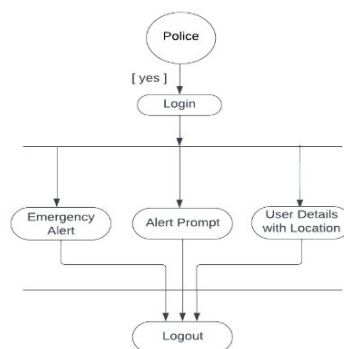


Fig. 8. user flow diagram

### VII. USER FLOW DIAGRAM

A user flow diagram is a diagram or visual representation of steps a user take to finish a specific goal within a digital

product or service. It outlines the sequence of actions or interactions between the user and the system, typically starting from the user’s entry point and ending with the completion of the task. Fig.7 show the user flow diagram of the user and fig.8 and fig.9 shows user flow diagrams of police and hospital respectively. There are mainly three users they are normal user

,police and hospital and have their respective roles

- **User:** The user logs in and can view the map displaying accidents. In case of an emergency, the user sends an alert with their location to both the police and hospital modules. The user can update their emergency contact information if needed. The user is registered first then login using login credentials to set account and emergency contact and prompts



- police: Receives the emergency alert from the user. Accesses user details and location. Dispatches a police team to the location and confirms the assistance sent.
- hospital: Receives the emergency alert from the user. Accesses user details and location. Prepares medical assistance and confirms its dispatch

- Wearable Device Integration: Extend the system to work with wearable devices, such as smartwatches or health monitoring devices. These devices can provide real-time health data and enhance the accuracy of accident detection.

role in saving lives and making our roads safer for all. This project not only addresses a critical issue but also embodies the spirit of using IoT for the betterment of society

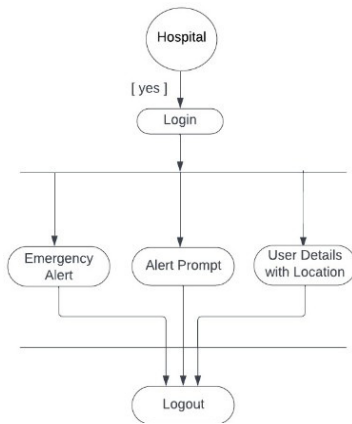


Fig. 9. user flow diagram

### VIII. FUTURE SCOPE

Accident Eye is a project for the safety of citizens from road accidents and have a high relevance in the society. As it can grow and scale so much in the safety of people in a couple of years. It is famous for its compactable and portability as its circuit is small and can be encased and can be used on a wide range of vehicles and can use its functions. There is a lot of room for this project. Some of the possible future scope for our project are as follows:

- Integration with Emergency Services: Establish partnerships or integrations with emergency services to enable direct communication and coordination. This could involve automatic notification to local emergency services, providing them with relevant information about the incident.
- Global Positioning System (GPS) Enhancement: Enhance the GPS capabilities to provide more precise location data. This could be especially valuable in areas with complex or dense urban environments.

### ACKNOWLEDGMENT

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### CONCLUSION

In conclusion, the "Accident Eye" project represents a pioneering solution in the realm of IoT based safety and accident detection. By harnessing a suite of sensors like NodeMCU, gyro sensor, GPS module, and SIM module, this project showcases a commitment to leveraging technology for the greater good. Its primary objective, the swift

detection of accidents and immediate alerts to the relevant authorities, serves as a beacon of hope for enhancing the survival rate and minimizing damage in the event of a crash. With its potential to provide prompt assistance to victims, "Accident Eye" exemplifies the fusion of innovation and compassion, offering a glimpse into a future where technology plays a vital

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