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ACCIRESCUE: Life Saver in Every Accident

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Abstract: ***Road traffic accidents represent a critical global public health challenge, claiming millions of lives annually. A significant factor contributing to fatalities is the delay between the occurrence of an accident and emergency medical response. This paper presents AcciRescue, an intelligent real-time accident detection and alert system designed to minimise response time and improve survival rates. The system integrates NEO-6M GPS and SIM800L GPS modules with an accelerometer and gyroscope sensor connected to an Arduino Nano microcontroller to continuously monitor vehicle movement and detect collision events. Upon detecting sudden velocity changes indicative of an accident, AcciRescue automatically transmits the precise incident location to emergency contacts and nearby hospitals. The proposed system offers a cost-effective, scalable solution that can be seamlessly integrated into vehicles or smartphones, addressing the critical need for rapid emergency response in traffic accidents.***

Keywords: Accident detection system, real-time monitoring, embedded systems, Arduino Nano, accelerometer, gyroscope, NEO-6M GPS module, SIM800L GSM module, emergency response, collision detection, automated alert system, traffic accident management.

I. INTRODUCTION

Road accidents are a major global concern, causing thousands of deaths and injuries every year. In many cases, victims do not receive timely medical assistance due to a delay in reporting the accident or the inability to communicate their location. This delay often increases the severity of injuries and can even result in preventable fatalities. With the rapid development of technology, there is a growing need for intelligent systems that can automatically detect accidents and immediately alert emergency services without relying on human intervention. The Accident Detection and Alert System is designed to address this problem by using sensors and communication technology to monitor the vehicle's condition in real time. Sensors such as accelerometers, gyroscopes, and cameras help detect sudden impacts, abnormal tilting, or collisions. A microcontroller processes this information and determines whether a real accident has occurred. Once detected, the system automatically collects the vehicle's GPS location and sends an alert message through the GSM module to hospitals, ambulances, police departments, and the user's emergency contacts. This system significantly reduces the time taken to inform authorities, enabling faster response and increasing the chances of saving lives. By integrating sensor technology, wireless communication, location tracking, and automated decision-making, this project contributes to improving road safety and ensuring timely medical help during emergencies.

II. LITERATURE SURVEY

Several studies have been conducted in the field of traffic accident detection and alert systems using advanced technologies such as deep learning, IoT, and embedded systems.

The study titled "Traffic Accident Detection and Classification in Videos based on Deep Network Features" introduces an intelligent automated system for rapid accident response using deep learning techniques. The approach employs Convolutional Neural Networks (CNNs), specifically GoogleNet, AlexNet, and VGGNet, to extract deep features which are then analyzed by a one-class Support Vector Machine (OCSVM). This enables anomaly-based accident detection, distinguishing between different types of collisions such as car-to-car and car-to-motorcycle crashes. The system provides continuous monitoring and improves emergency response efficiency by delivering precise incident details. [1]

Another work, "Traffic Accident Detection Analysis Using YOLOv9 Algorithm", presents an automated accident detection system based on the YOLOv9 (You Only Look Once) architecture integrated with Generalized Efficient Layer Aggregation Network (GELAN) for improved object detection. The methodology involves dataset collection, preprocessing, and annotation using Roboflow. The system demonstrates rapid detection of collisions, identification of accidents, and vehicle damage assessment, thereby facilitating faster emergency response and reducing casualties and property loss. [2]

A hardware-based approach focuses on immediate medical aid through accident alert systems. This system utilizes an Arduino Uno interfaced with an accelerometer to detect sudden impacts and a GSM module (SIM900) for communication.

Upon detecting an accident, the system sends SMS alerts with GPS coordinates to predefined contacts, including hospitals and family members. Additionally, a web-based dashboard is developed for real-time monitoring. Experimental results indicate 100% detection accuracy with zero false reporting, outperforming existing models. [3]

Another proposed system integrates an Android smartphone to enhance emergency response. The system employs sensors such as accelerometers and gyroscopes to detect sudden changes in motion. Upon detecting an abnormal event, a 5-second confirmation window is provided to the user to cancel false alarms. If no response is received, the system automatically sends alerts containing GPS coordinates, passenger details, and collision severity via GSM/LTE networks to emergency services and predefined contacts. [4]

Furthermore, a smart vehicle accident detection and alert system aims to minimize fatalities by monitoring real-time vehicle parameters such as speed, pressure, temperature, seatbelt usage, and driver sobriety. In case of an accident, the system automatically notifies emergency services and nearby hospitals. This approach not only ensures rapid medical assistance but also promotes safer driving practices and emphasizes the importance of regular vehicle maintenance. [5]

III. METHODOLOGY

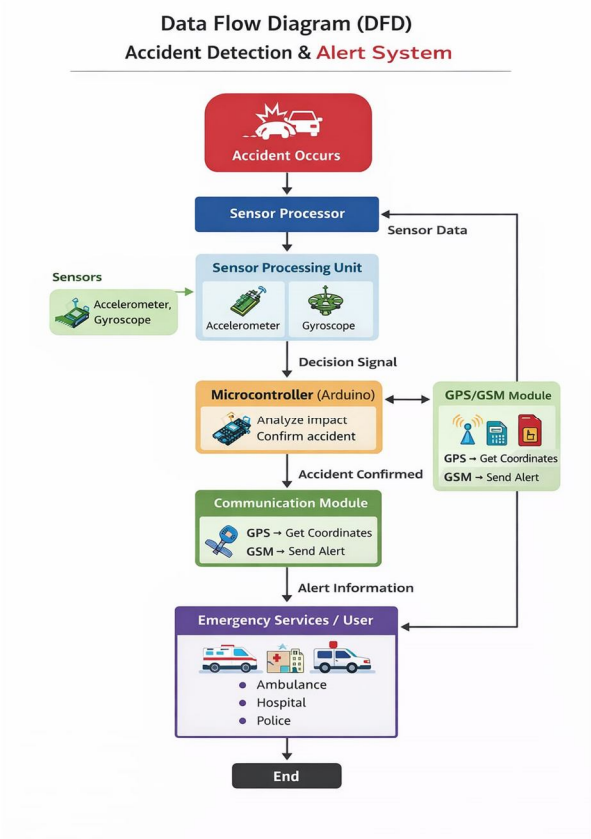

Fig 1: Block Diagram

1) System Architecture

The system is divided into four layers: Sensing Layer, Processing Layer, Communication Layer, and Response Layer. This layered approach ensures efficient accident detection and response.

2) Accident Detection Mechanism

The system uses accelerometer and gyroscope sensors to detect sudden impacts and abnormal movements.
Sensor values are continuously monitored and compared with predefined thresholds.
If values exceed limits, a potential accident is detected.

3) Decision and Validation Module

Sensor data is analyzed in real time.
Cross-verification reduces false alarms.
A 5–10 second delay allows user cancellation.
If not cancelled, the accident is confirmed.

4) Location Tracking

The GPS module retrieves real-time coordinates.
Coordinates are converted into a Google Maps link.
This ensures accurate location sharing.

5) Alert Generation and Communication

The GSM module sends SMS alerts to emergency services and contacts.
The message includes accident alert, location, date, and time.

6) System Workflow

1. Monitor vehicle parameters continuously
2. Detect abnormal motion
3. Process and validate data
4. Confirm accident
5. Fetch GPS location
6. Send alert via GSM
7. Initiate emergency response

7) Advantages of Proposed Methodology

Reduces false positives using validation logic.
Provides fast response within seconds.
Works automatically without user intervention.
Cost-effective and reliable.

8) Novel Contribution

Combines sensor fusion with validation logic.
Low-cost implementation.
Future extension to AI-based systems possible.

A. Modules

1.Accident Detection Module
Uses accelerometer and gyroscope
Detects sudden impact, tilt, or collision
2. Processing Module
Uses Arduino / Microcontroller
Analyzes sensor data and confirms accident
3. Location Tracking Module
Uses GPS module (NEO-6M)
Finds exact accident location (latitude & longitude)
4. Communication Module
Uses GSM module (SIM800L/SIM900)
Sends alert SMS to emergency contacts
5. Emergency Response Module
Receives alert (hospital, police, ambulance)
Helps in quick rescue and medical support

B. Tech Stack

1. Frontend (User Interface)
HTML → Structure of website
CSS (Bootstrap) → Design & styling
JavaScript → Buttons, booking logic, map, chat
Example from your code:

- "Emergency Rescue" button
- Login/Signup form
- Ambulance list
- Map showing location

2. Backend (Logic + Server)
Written using: Node.js, Python, Java, etc.
Handles:

- Login authentication
- Booking requests
- Sending ambulance data
- Managing users

3. Database (Data Storage)
MySQL, MongoDB, Firebase etc.
Stores:

- Users
- Bookings
- Ambulance data

4. Deployment (Making App Live)
Options:

- GitHub Pages (for frontend)
- Netlify / Vercel
- Firebase Hosting
- For backend apps:
- Render / Railway / AWS

IV. RESULT AND DISCUSSION

A. Home Page

The home page provides an emergency rescue button and navigation options for users.

Fig 2: Main landing page

B. Login Page

The login page allows users to sign up or log in to access the system.

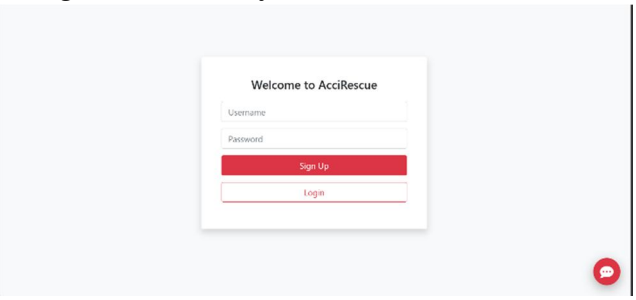

Fig 3: User authentication

C. Ambulance Selection Page

This page displays nearby ambulances with details and booking options.

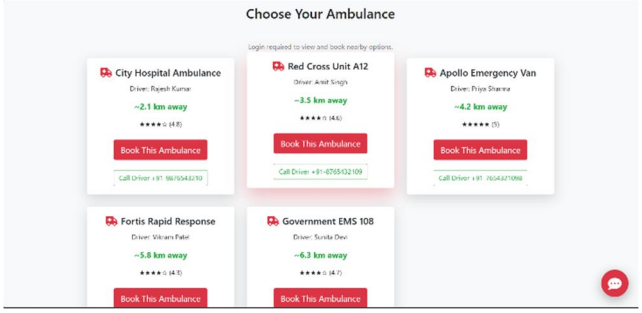

Fig 4: Available ambulance

D. Emergency Booking Page:

This page confirms the emergency request and shows the user's location for rescue.

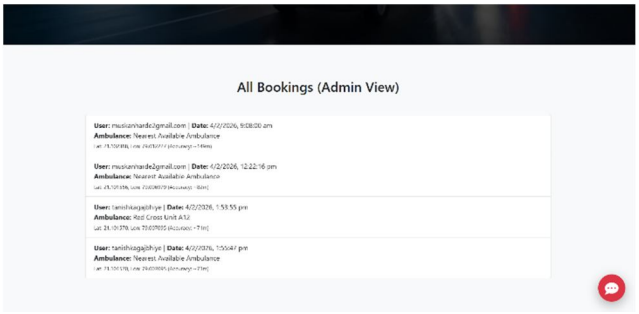

Fig 5: Emergency rescue

E. Booking History Page:

This page shows the user's past ambulance booking records.

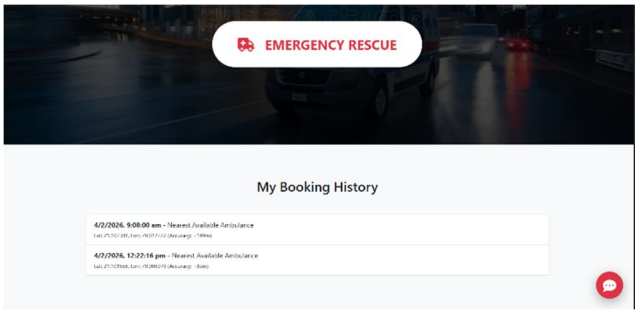

Fig 6: Previous bookings of the user

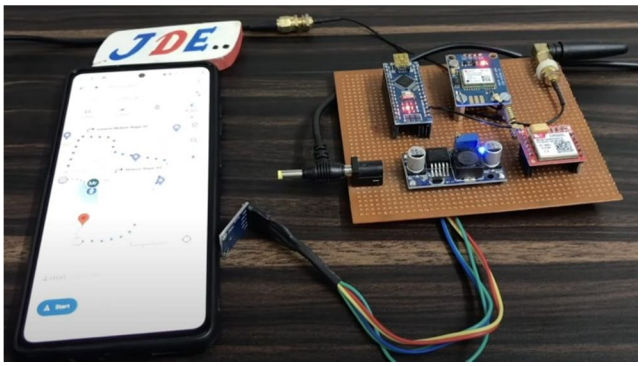

Fig 7: Accident detection hardware model

V. CONCLUSION

The proposed system, AcciRescue: Accident Detection and Alert System, successfully demonstrates an efficient and reliable solution for reducing emergency response time in road accidents. By integrating sensors such as accelerometer and gyroscope with a microcontroller, the The proposed system, AcciRescue: Accident Detection and
Alert System, successfully demonstrates an efficient and reliable solution for reducing emergency response time in road accidents. By integrating sensors such as accelerometer and gyroscope with a microcontroller, the system is capable of accurately detecting sudden impacts, collisions, and abnormal vehicle movements in real time.

The implementation of GPS and GSM modules ensures that the exact location of the accident is immediately transmitted to emergency services, hospitals, and registered contacts. This eliminates the dependency on manual reporting, which is often delayed or impossible in critical situations where victims are unconscious or unable to communicate.

The system's multi-sensor approach combined with decision-making logic improves detection accuracy while minimizing false alarms. Additionally, the inclusion of automated alert mechanisms ensures rapid communication, which plays a crucial role in saving lives during the "golden hour" of medical emergencies.

Overall, the proposed model is cost-effective, easy to implement, and highly scalable. It can be integrated into various types of vehicles and extended with advanced technologies such as machine learning, cloud connectivity, and smart city infrastructure. The system contributes significantly to improving road safety and provides a practical solution for real-time accident monitoring and emergency response.

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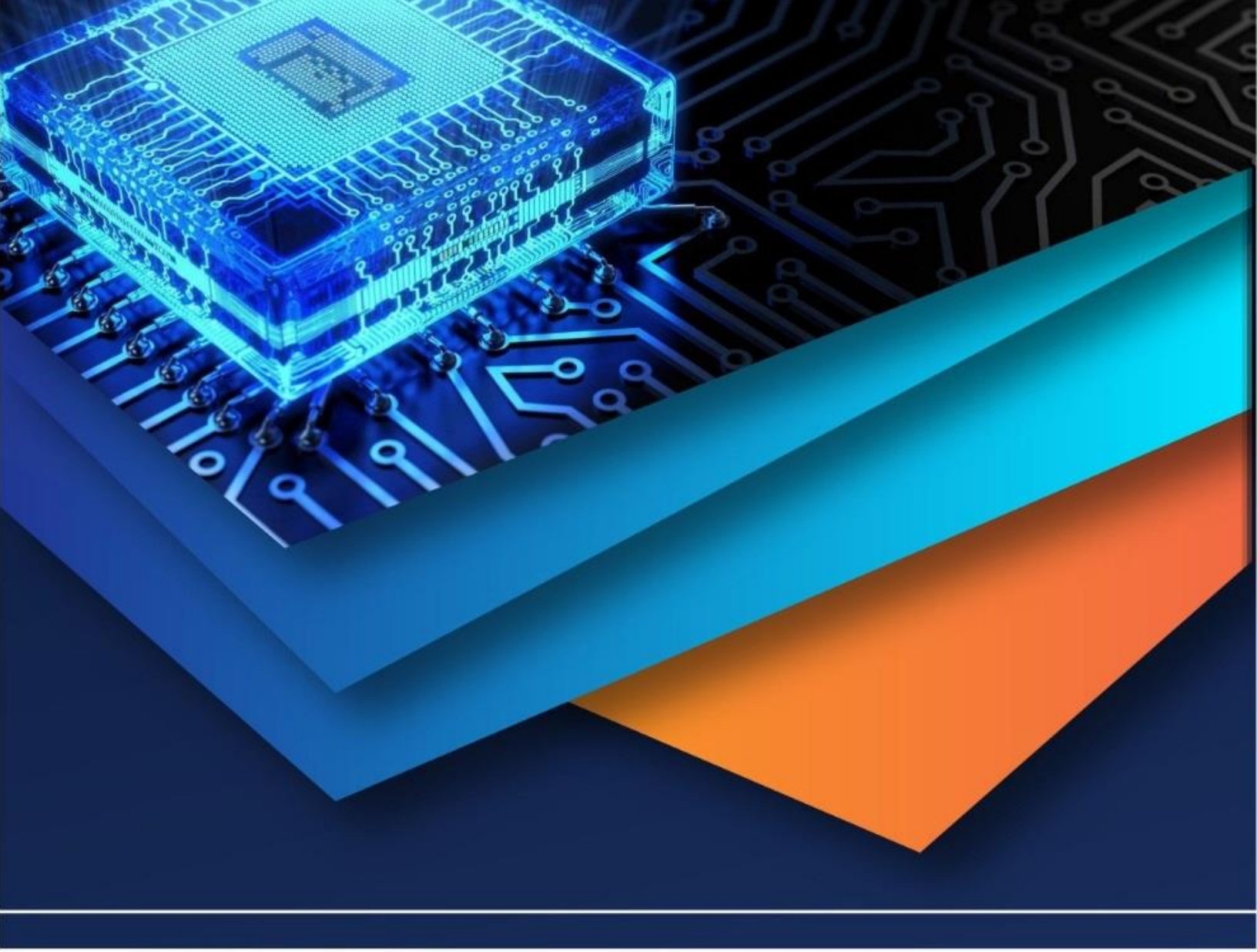

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