WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

VEHICLE TRACKING DETECTION USING MICROCONT-ROLLER ,GPS

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ABSTRACT :

In today's world, the rapid increase in the number of vehicles on the roads has led to a corresponding rise in traffic accidents. Many of these accidents result in severe injuries or even fatalities, primarily due to delayed emergency responses. Over-speeding and slow medical intervention are among the leading causes of death in such situations. Immediate detection and notification could save many lives by enabling quicker access to medical help. To address these challenges, this project proposes a Vehicle Accident Detection and Tracking System. The system is designed to detect accidents in real-time and alert emergency contacts without human intervention, ensuring a faster response to critical situations.

The proposed system integrates advanced sensors such as obstacle detectors and vibration sensors to identify collisions accurately. Once an accident is detected, the system automatically sends an alert message containing the exact GPS coordinates of the vehicle via GSM technology to pre-registered contacts, including family members, nearby hospitals, and police departments. This immediate notification allows emergency services to act quickly and reach the accident location without delay. Beyond accident detection, the system also offers real-time vehicle tracking, which is useful for both personal and commercial vehicle management. Owners can track their vehicles via SMS or an online platform. By combining GPS and GSM technologies with modern sensor data, the system ensures fast, reliable accident alerts and efficient emergency handling. It has the potential to significantly enhance road safety, reduce fatalities, and improve emergency response efforts, even in remote or less-trafficked areas.

Keywords: Vehicle tracking, accident detection, GPS mapping, Real-Time Monitoring, Microcontroller ESP 8266

Introduction

In recent years, various vehicle tracking, accident detection, and notification systems have been developed using different technologies, controllers, and sensors. These systems rely on diverse communication protocols to monitor parameters and manage system functionality. With the rapid increase in vehicle usage due to employment and urbanization, road accidents—often caused by over speeding—have also risen. The lack of advanced safety technologies has contributed to delayed emergency responses and a higher accident rate. To address this issue, the proposed project introduces an automatic accident detection and vehicle tracking system. The primary objective is to reduce accidents by sending immediate alerts via wireless communication to register mobile numbers, hospitals, and police stations.

Our system utilizes a combination of GPS modules, obstacle detectors, alcohol sensors, and other sensors to detect anomalies in vehicle behavior and driver condition. The integration of GSM technology allows for real-time transmission of alert messages to designated recipients, closing the gap between accident detection and emergency response. This system also aims to discourage unsafe driving through early warnings and constant monitoring of critical safety parameters. By implementing this solution, we aim to reduce the impact of road accidents, enhance emergency response times, and contribute to a safer transportation environment. The initiative highlights the role of technological innovation in advancing global road safety and improving public well-being.

Literature Survey

The surge in road accidents due to increasing vehicular density and delayed emergency response has driven the development of automated accident detection and tracking systems. These systems aim to reduce response times by using integrated sensors and communication technologies to promptly relay accurate location data.

Bansal and Garg (2021) conducted a comparative study of existing systems utilizing GPS, GSM, Wi-Fi, and IoT protocols such as MQTT and HTTP. Their research highlighted the use of microcontrollers like Arduino Uno, NodeMCU, and Raspberry Pi, along with accelerometers and vibration sensors. While effective, these systems often face issues like false alarms from speed breakers and high implementation costs. Acharya (2022) introduced a low-

cost prototype using a piezoelectric sensor, Arduino Uno, and GSM-GPS modules. The model features a manual override switch to cancel false alerts, enhancing practicality in regions with limited emergency infrastructure.

Methane et al. (2023) developed a system integrating an ADXL345 accelerometer, GPS, and IoT-based communication via Wi-Fi. Alerts are sent to both a cloud application and emergency contacts, with a local buzzer providing on-site warnings. The system achieved 80% detection accuracy but was prone to false positives during rapid acceleration on uneven roads.

These studies demonstrate substantial progress in accident detection technologies. However, challenges such as reducing false alarms, ensuring cost-effectiveness, and maintaining reliable performance in low-connectivity areas persist. Future enhancements may involve hybrid GSM-satellite systems and machine learning algorithms for improved accuracy and robustness.

System Design

A) Hardware Configuration

1.Sensor Array:)

- IR Sensor (detecting infrared radiation)
- Obstacle detector (detect the obstacle & send message
  GPS module)

2.GPS Module:

A GPS receiver is used to record geographic coordinates for every data sample, allowing spatial mapping of environmental conditions.

3.ESP8266 Microcontroller:

chosen for its dual-core processing, Wi-Fi/Bluetooth connectivity, and low power consumption

4.Power Supply:

The system is powered by a 18650 lithium-ion battery , ensuring 8+ hours of operation.

B) Software Architecture

The software system is designed for real-time air quality analysis, cloud integration, and user-friendly mobile visualization. It comprises four main modules:

ADT Plug-in-for Eclipse,

1. ADT Plug-in for Eclipse

- The Android Development Tools (ADT) is a plug-in for the Eclipse IDE.
- It provides a powerful, integrated environment for building Android apps.
- With ADT, developers can design UIs, use Android APIs, debug apps, and export .apk files.
- It is recommended for beginners as a fast and efficient way to start Android development.

2. Android Open Source Project

- The Android Open-Source Project (AOSP) is managed by Google for maintaining Android.
- It aims to develop a real-world, open-source mobile platform for users.
- AOSP ensures device compatibility with apps developed using Android SDK and NDK.
- This helps avoid fragmentation by supporting universal app functionality.

3. Android

- ANDROID (Automated Numeration of Data Realized by Optimized Image Detection) is an operating system for smartphones and tablets.
- It was developed by the Open Handset Alliance led by Google.
- Android is based on the Linux kernel, with middleware, libraries, and APIs written in C.
- Apps run using Embedded C compatible libraries via the Dalvik virtual machine with just-in-time (JIT) compilation.

4.Linux Kernal

- Android's kernel is built on the Linux kernel with modifications by Google.
- It lacks the X Window System and standard GNU libraries, limiting Linux app portability.
- Some Google-introduced features, like wake locks for power management, were rejected by Linux maintainers.
- This is partly because Google didn’t maintain those code changes long-term.

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Methodology

1.Data Collection and Preprocessing

The system collects data from multiple onboard sensors, including GPS for location tracking, accelerometers for detecting sudden movements or impacts, obstacle sensors for detecting objects, and alcohol sensors for monitoring driver condition. This raw data is often noisy or inconsistent, so preprocessing steps such as filtering, normalization, and labeling are applied. These steps ensure that the data is clean, structured, and suitable for training machine learning models. Preprocessed data is also stored for real-time tracking and future analysis.

2.Machine Learning Model

A machine learning model is developed to recognize patterns in the sensor data that indicate specific events like sharp turns, collisions, or erratic driving behavior. The model is trained on labeled data, where different driving events are categorized (e.g., normal driving, potential accident, unsafe alcohol level). Depending on the complexity, models such as decision trees, support vector machines, or lightweight neural networks can be used. The model learns to classify real-time input from sensors and predict whether an accident or unsafe condition is occurring.

3.Edge Deployment

The Vehicle Tracking System using the ESP8266 microcontroller enables efficient and real-time location monitoring directly on the device. The ESP8266 processes GPS data locally and transmits vehicle coordinates over Wi-Fi with minimal latency, ensuring timely updates without heavy reliance on cloud services. Its compact size and low power consumption make it suitable for integration into vehicles, even in constrained environments. The system is capable of storing data during network outages and forwarding it once connectivity is restored, enhancing reliability. Overall, this edge-based solution offers a cost-effective, lightweight, and responsive approach to vehicle tracking.

Results & Discussion

The proposed vehicle tracking and accident detection system was rigorously tested in real-world conditions to evaluate its performance in monitoring vehicle movement, detecting accidents, and delivering timely alerts and actionable insights to users.

1.Real-Time Processing:

Edge devices process data locally, enabling faster accident detection and response

2Reduced Latency:

Minimizes delay in sending alerts to emergency services without relying on cloud connectivity

3. Network Independence:

Works efficiently even in areas with poor or no internet by processing data on-site.

4. Energy Efficiency:

Optimized hardware reduces power consumption, ideal for remote or mobile deployments.

5.Personalized User Alerts :

- Speed Limit Alerts: The system sends alerts when the vehicles exceeds user-set speed limits.
- Emergency alerts: panic button feature sends immediate SMS to the user during emergencies

Applications

- **Emergency Response –** Automatically notifies emergency services after a crash.
- **Driver Monitoring –** Tracks unsafe driving behavior like over speeding or sudden braking.
- **Smart City Integration** – Connects with IoT systems for centralized traffic control.
- **Vehicle Tracking –** Provides real-time location of the vehicle.

Conclusion & Future Work

Vehicle tracking systems improve fleet management and route planning, enabling higher job efficiency and increased profits. The main goal of the accident alert system is to reduce fatalities by ensuring paramedics quickly reach the accident site, increasing the chances of saving lives.

Future enhancements include:

- Enhanced traffic management in smart cities
- Data-driven analysis for road safety improvements
- Integration with autonomous vehicle systems

REFERENCES:

1. 1.Sharma, A., & Saini, R. K. Intelligent Accident Detection and Tracking System Using IoT. In 2022 12th International conference on cloud Computing
2. N. N. Hlaing, M. Naing, and S. S. Naing, ―GPS and GSM Based Vehicle Tracking System
3. 3.A.Anusha, Syed, Musthak Ahmed, "Vehicle Tracking And Monitoring System
4. 4.Ricardo Salazar Cabrera, Álvaro Pachón de la Cruz, "Public Transport Vehicle Tracking Service for Intermediate Cities of Developing Countries
5. 5. Zhu, Y., Yang, H., Li, C., & Chen, Y. (2023). Intelligent Vehicle Accident Detection and Tracking System Based on Big Data Analytics.
6. 6.Sharma, S., & Gupta, P. (2023). Smart Vehicle Tracking and Accident Detection system using Internet of Things