iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** VIII **Month of publication:** Aug 2023

DOI: https://doi.org/10.22214/ijraset.2023.55003

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue VIII Aug 2023- Available at www.ijraset.com

RTO Web Portal for Vehicle Crash Reporting and Rescue System

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Abstract: ***Road traffic accidents (RTAs) are increasing, resulting in a high mortality rate among victims. Delays in reaching the hospital and traffic congestion worsen the situation. Immediate aid is crucial in reducing deaths caused by RTAs. To address this, the RTO Dashboard system is proposed. It utilizes VANET technology in urban environments to promptly identify and report accidents. Operating through a website, the system eliminates the need for specialized hardware and utilizes cloud computing for efficient data processing. It enables quick accident location and provides vital information to emergency responders, improving rescue operations. The RTO Dashboard aims to minimize fatalities and enhance the effectiveness of accident reporting and rescue efforts.***

Keywords: Road traffic accidents, increasing frequency, dependency on others, delayed assistance, high mortality rate, ambulance delays, traffic congestion.

I. INTRODUCTION

Movement on the road carries the inherent risk of road traffic injuries, which unfortunately occur quite frequently despite being unwanted. Many accidents are the result of common human errors such as over speeding, drunk driving, distractions, red light violations, and neglecting safety gear. These behaviors contribute to a wide range of motor vehicle accidents, including those involving cars, motorcycles, trucks, bicycles, buses, boats, passenger vans, pedestrians, ATVs, and incidents related to driving under the influence (DUI). The increasing use of vehicles and traffic congestion further compound the challenges faced on the road, including delays in ambulance arrival and complications in accident investigations.

Post-crash care is a critical aspect of mitigating the impact of road traffic injuries. However, inadequate care and delays in detecting and providing medical assistance exacerbate the severity of injuries. Prompt response and timely provision of prehospital care and hospital trauma care are crucial, as even minutes can make a significant difference in saving lives. Moreover, the economic losses associated with road traffic injuries are substantial, including the cost of treatment, lost productivity for those injured or disabled, and the need for family members to take time off work or school to care for the injured. To address these issues, a comprehensive approach is necessary, encompassing improvements in infrastructure safety, enhancements in vehicle safety features, advancements in post-crash care, effective law enforcement, and extensive public awareness campaigns.

Addressing road traffic injuries requires a systems approach that considers the interconnected nature of risk factors, determinants, impacts, and interventions. This approach involves collaboration and coordination among multiple sectors, such as transportation, law enforcement, healthcare, education, and government agencies. By designing safer infrastructure, incorporating road safety features into urban planning, improving vehicle safety standards, enhancing post-crash care services through specialized training, enforcing laws to address key risks, and raising public awareness about safe road behaviors, a significant reduction in road traffic injuries can be achieved. Additionally, the development of an intelligent system that facilitates rapid response and efficient first aid is crucial. While various information communication technologies (ICT)-based solutions have been proposed, there is a need for cost-effective and universally compatible systems to address these challenges effectively.

II. EXISTING SYSTEM

The existing system includes various accident detection and safety measures. This includes the LVASM system, which utilizes the Android platform for location-based accident safety. Vehicle tracking and accident detection systems using Microcontroller, Raspberry Pi, and Accelerometer technology are also part of the existing systems. The EBM system focuses on monitoring driver fatigue through eye blink patterns. IoT-based accident detection systems leverage cloud resources for data processing. The ERDMS system aims to reduce response and rescue time through fog computing. These systems utilize GPS speed, accelerometers, mobile phones, and sensors for accident detection. However, limitations include manual notification delays, reliability issues, false alarms, and discomfort for users. Improvements are needed for greater reliability, accuracy, and user-friendliness.

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III. PROPOSED SYSTEM

The proposed RAD (Reporting and Accident Detection) system is a cloud-based solution that doesn't require special hardware, making it cost-effective. It utilizes real-time data from vehicles equipped with accident detection sensors, focusing on speed to enhance accuracy. The collected information is processed for accident identification, and a navigation system notifies relatives, police stations, and the nearest hospital. The system can be implemented in various vehicles, minimizing ambulance arrival delays and improving the investigation and treatment processes. The project is divided into three phases: Accident Detection, Location Tracking, and Notification Sending. The advantages include faster rescue operations, reduced costs and injuries, easy installation, fast recovery, and wireless monitoring.

IV. MODULE DESCRIPTION

1) Traffic Management Server
2) End User Control Panel
3) Accident Management
4) Vehicle Tracking in case of Theft
5) Emergency Services
6) Broadcast Services
7) Notification Phase

A. Traffic Management Server

The Traffic Management Server (TMS) is a secure web-based system designed for collecting, managing, and analyzing road traffic crash data. It incorporates Geographic Information System (GIS) formats and GPS integration to accurately map crash locations. TMS follows strict IT and security standards, ensuring the protection of sensitive data stored in a central database. It provides intuitive modules for data collection, storage, management, analysis, and reporting, catering to various road safety stakeholders including national road safety centers, ministries, local authorities, police forces, and health services. TMS enhances data-driven decision-making and facilitates collaboration among stakeholders, supporting effective road safety management.

B. End User Control Panel

The End User Control Panel consists of three modules that serve specific user roles. The Vehicle Registration module allows users to log in or register their vehicles. The Traffic Department module is designed for authorized personnel within the department to log in or register their accounts and manage incident reports related to road traffic. The Police Department module provides login and registration capabilities for authorized personnel in the police department, facilitating the maintenance of reports. These modules collectively contribute to effective control and management of user activities within the system, ensuring smooth functioning and organized data handling for each respective user group.

C. Vehicle Tracking in case of Theft

The Accident Management module of the system includes accident detection, reporting, and record management functionalities. It classifies alarms based on accident severity and allows quick monitoring and management of alarms by staff in the district command monitoring center. GPS technology is used to identify accidents and calculate vehicle speed accurately. The system also provides automated management, notification, tracking, and documentation of accident-related actions. An online accident records library stores comprehensive accident data for analysis and reporting purposes. Overall, this module ensures efficient accident management and facilitates timely response and remedial actions.

D. Emergency Services

The Emergency Services module offers an emergency call system for vehicles, allowing contact with police, fire departments, and personal contacts during emergencies. It provides detailed information about the vehicle's situation and can automatically or manually make emergency calls. Additionally, the module includes features for notifying family members about the accident through SMS messages with the accident location. Authorized emergency responders can access the accident notifications stored in a database. The module comprises units for control, ambulance, and traffic junction, which facilitate communication, patient monitoring, and signal control for efficient emergency response.

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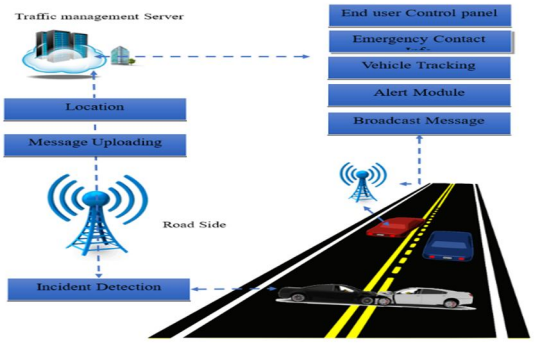
E. Broadcast Services

The Broadcast Services module in the system focuses on transmitting emergency messages to nearby vehicles in order to alert them about potential dangers on the road. It emphasizes the importance of ensuring reliable and timely message reception to prevent accidents, especially in high-speed mobile networks like VANET. Additionally, the module includes Accident Prevention, which involves real-time information exchange between vehicles through M2M communication. This enables automatic operations such as speed control, lane change, and steering control, aiming to enhance safety in both highway and dense urban traffic environments.

F. Notification Phase

In the Notification Phase, the system swiftly notifies the relevant parties about an accident by utilizing the vehicle's GPS to determine the location and the Google Maps API to pinpoint the collision site. The nearest hospital is identified, and collision information, such as the vehicle number and accident location, is transmitted to the hospital via a Wi-Fi/3G/4G connection for immediate response. The system updates the existing database to reflect the accident occurrence and provides the hospital with the owner's information and precise accident location. This phase ensures timely and effective communication in the event of an accident.

V. SYSTEM ARCHITECTURE



VI. CONCLUSION

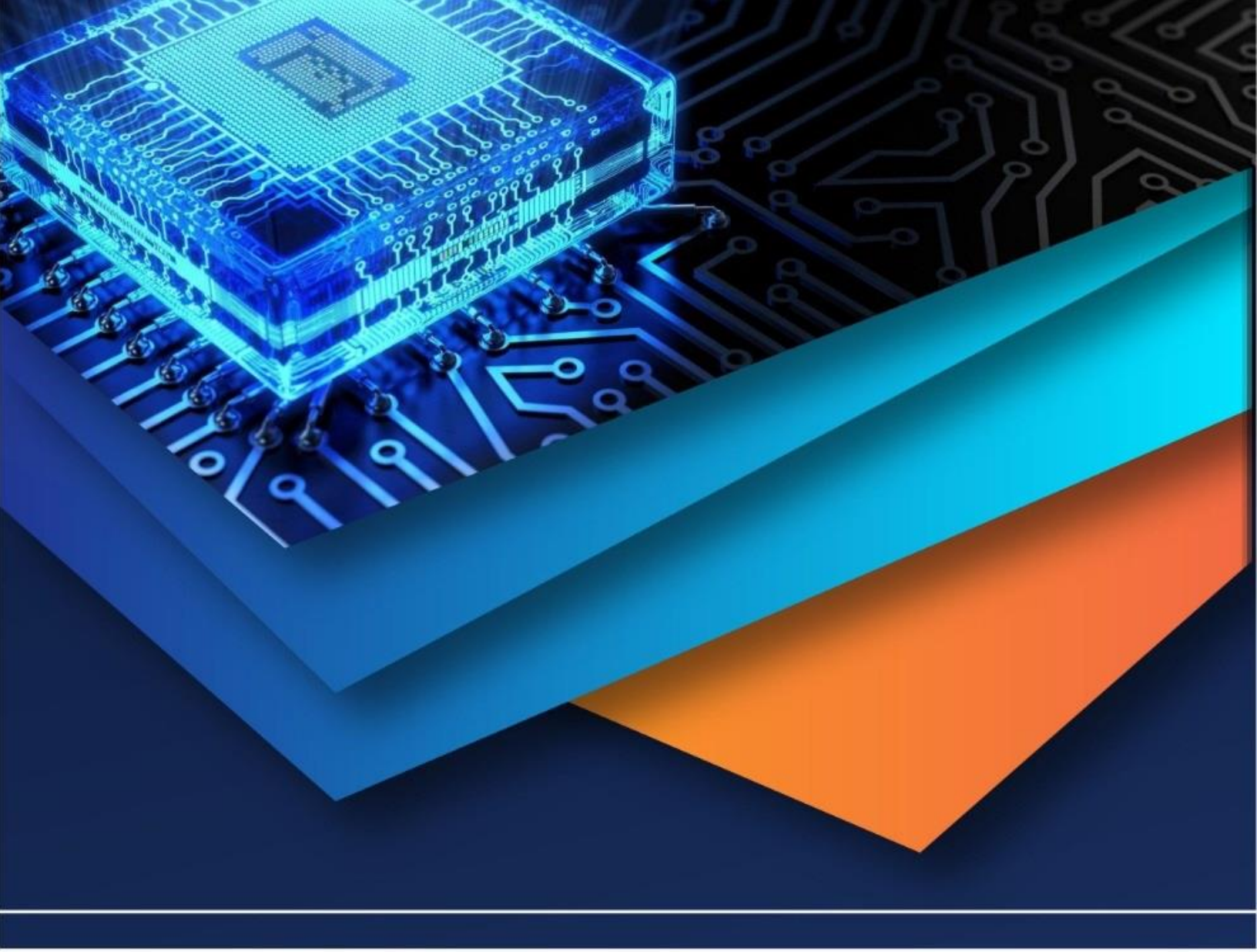
The number of vehicles on the road in today's society is steadily increasing. As a result, the number of accidents is rising. Despite the fact that there are numerous technologies for accident detection, the death rate continues to climb. The inaccuracy of accident detection and poor notification methods are to blame for the late response to catastrophic accident.We introduced 5G and VoLTE-based technologies to identify an accident to address the aforementioned challenges. The technology recognizes the accident and the nearest hospital in real-time.It immediately sends an emergency notification to the nearby hospital and a family member or friend. For our system to work, it needs to be connected to the internet.

VII. FUTURE ENHANCEMENT

The proposed approach implements to control the vehicle theft by using GPS and GSM. Real time data logging and analysis will be implemented that allows the system to monitor traffic situations in various regions. Various safety warnings can be issued to the owner of car if car crosses certain defined speed limits. The real-time alarms can also be set for the unauthorized vehicle movements and other exceptions using a series of geographic zones together with the time-based rules for vehicle in/out.

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