International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Literature Survey on Smart Ambulance Traffic Control System

Prof. Lakshmi R, Sharanya S Rigvedi, Chiranthan C, Varun Kashyap K, Sandeep B M

Department of Computer Science and Engineering (Artificial Intelligence and Machine Learning)
Vidyavardhaka College of Engineering
Mysuru, Karnataka, India

Abstract - This study introduces a Smart Traffic Signal Control System designed to streamline ambulance transit through congested urban areas. Integrating RFID, GPS, and LTE technologies, this system establishes a direct link between ambulances and traffic signals, enabling prioritized passage for emergency vehicles. GPS tracking triggers real-time signal adjustments as ambulances approach intersections, granting immediate green signals through cloud-based communication. RFID confirms passage, while predictive algorithms optimize upcoming signal timings based on ambulance speed and estimated arrival, effectively preempting traffic congestion. Initial trials demonstrate reduced transit times during peak traffic, ensuring prompt arrival at medical facilities. The system's automation minimizes delays without human intervention, highlighting its potential to revolutionize emergency services. However, seamless integration with existing infrastructure, data security, and scalability remains focal points for further development. This Smart Traffic Signal System signifies a crucial step toward optimizing emergency response in challenging urban settings, promising improved healthcare accessibility through efficient ambulance navigation.

Key Words: Smart Traffic Signal Control System, RFID, GPS, LTE technologies, ambulance transit, real-time signal adjustments, cloud-based communication, emergency services optimization, automation, data security, scalability.

1. INTRODUCTION

The existing traffic congestion in urban areas poses a critical challenge for ambulance services, jeopardizing timely patient care. Conventional traffic signal systems lack real-time adaptability and fail to accommodate the urgent needs of ambulances navigating through city traffic. Current traffic light systems employ fixed time intervals irrespective of varying traffic densities, leading to inefficiencies during emergencies.

Studies reveal the complex nature of traffic dynamics influenced by factors like peak hours, accidents, and pedestrian activity. Traditional traffic systems lack flexibility to address these variables, impacting adjacent junctions and causing gridlocks that hinder emergency vehicle movement. Reports citing fatalities due to traffic congestion underscore the urgent need for a solution.

To mitigate these issues, a Real Time Smart Traffic Control System integrating LTE-connected ambulances with cloud-enabled traffic signals is proposed. This system triggers emergency mode at traffic signals when anticipating` ambulance transit, reverting to normal operations post-passage confirmation. This live-tracking system ensures green signals align with ambulance proximity, expediting emergency response.

Furthermore, the integration of RFID technology allows direct communication between ambulances and traffic lights, streamlining signal changes as the ambulance approaches congested intersections. RFID tags, activated by ambulance personnel, trigger traffic signal adjustments, facilitating smoother ambulance passage through traffic.

The economic toll of congestion underscores the urgency for smart traffic solutions, predicting substantial financial losses due to traffic-related delays. The proposed system aims to minimize response time, ensuring efficient ambulance navigation and ultimately saving lives.

Overall, the integration of real-time tracking, cloud communication, and RFID technology offers a promising solution to mitigate traffic congestion for emergency vehicles, emphasizing the critical need for adaptive traffic control systems in modern urban environments.

2. Literature Review

1.“Ambulance Management System using GIS by Imtiyaz Pasha”

The proposed Ambulance Management System (AMS) Prototype leveraging GIS/GPS/GSM technologies aims to revolutionize emergency response systems. It facilitates real- time accident notifications to emergency services while locating the nearest ambulance and hospital based on the accident location. The system computes the fastest routes for ambulances by considering real-time traffic conditions, optimizing dispatch, and providing alternative paths during congestion.

Limitation: limited scope of the AMS prototype due to the lack of data for a small geographic area of Hyderabad city. This limitation could hinder the system's ability to provide a comprehensive and accurate representation of the entire city needs.

2.“Smart traffic control with ambulance detection by Varsha Srinivasan, Yazhini Priyadharshini Rajesh, S Yuvaraj and M Manigandan”

This delves into a cutting-edge system revolutionizing traffic signal control through dynamic vehicle detection, counting, and prioritization of ambulances. By leveraging optimized camera placement and Bluetooth technology, it precisely monitors traffic, adjusts signal timings in real-time, and facilitates swift emergency response. However, its efficacy relies on precise camera setups and detection algorithms, with potential limitations including Bluetooth range constraints. Future research avenues involve integrating advanced traffic prediction models.

Limitation: Its reliance on accurate detection of ambulance presence. If the ambulance detection system malfunctions or provides false positives/negatives, it could lead to incorrect signal adjustments.

3.“Smart Ambulance With Traffic Control Ability by Saujanya Mukkawar, Suraj Rathod, Shivshankar Gawai, Mayuri Magar”

This study pioneers a sophisticated ambulance system integrating real-time patient monitoring, streamlined traffic routing, and signal prioritization. By employing wearable sensors for cloud-transmitted vital data and a hospital- accessible web interface, it ensures prompt medical readiness. Utilizing Google Maps API for guided navigation and a dedicated signal network for green lights at intersections, it significantly reduces response times.

Limitation: One potential drawback of the described system is the reliance on real-time and accurate data transmission. If there are issues with data communication or delays in transmitting vital patient information to the nearest hospital, it could impact the promptness of medical assistance.

4.“Chattaraj, A., Bansal, S., & Chandra, A., “An intelligent traffic control system using RFID”, IEEE Potentials”

An intelligent traffic management system leveraging RFID technology was developed by Chattaraj, Bansal, and Chandra in 2009. This system involves equipping vehicles with RFID tags and installing RFID tag readers in traffic signals to tally vehicle numbers. Using a microcontroller, the system prioritizes the busiest lane by switching the signal to green, effectively alleviating traffic congestion.

Limitation: reliability issues and delays due to potential malfunctions in GPS

5.“Nandini Kiran P, Suraya Mubeen., “A New Approach for Intelligent Traffic Control System using Raspberry pi”, International Journal of Innovative Research in Technology”

Kiran and Mubeen pioneered a sophisticated traffic control system utilizing Raspberry Pi technology. Their approach involves securing unmodifiable RFID tags within vehicles, read by a dedicated system-on-chip RFID reader. This reader enables accurate vehicle counting at signals, dynamically adjusting green signal durations along congested routes to manage traffic flow.

Limitation: using technologies like Raspberry Pi is their susceptibility to technical failures or malfunctions, potentially leading to disruptions in traffic management.

6.“Janani Saradha, B., Vijayshri, G., & Subha, T., “Intelligent traffic signal control system for ambulance using RFID and cloud” 2nd International Conference on Computing and Communications Technologies”

The 2017 study by B. Janani Saradha and team introduced an intelligent traffic signal control system tailored for ambulance prioritization. RFID technology

affixed to both ambulances and traffic signals tracks ambulance movements, sending data to the cloud. Via a mobile app, users can request temporary green signals along the ambulance route, expediting emergency response. While effective in reducing time during emergencies.

Limitation: the system's reliance on user input indicates a partial automation, requiring human interaction for operation, which is a notable limitation.

7."Providing Accident Detection in Vehicular Networks Through OBD-II Devices and Android-based Smartphones by Jorge Zaldivar, Carlos T. Calafate, Juan Carlos Cano, Pietro Manzoni"

By combining smartphones with existing vehicles through an appropriate interface we are able to move closer to the smart vehicle paradigm, offering the user new functionalities and services when driving. In this paper we propose an Android based application that monitors the vehicle through an On Board Diagnostics (OBD-II) interface, being able to detect accidents. Our proposed application estimates the G force experienced by the passengers in case of a frontal collision, which is used together with airbag triggers to detect accidents. The application reacts to positive detection by sending details about the accident through either e-mail or SMS to predefined destinations, immediately followed by an automatic phone call to the emergency services.

Limitation: Any accident detection system faces the challenge of minimizing false positives (incorrectly identifying accidents) and false negatives (missing actual accidents).

3. CONCLUSION

In summary, the Real-Time Smart Traffic Control System offers a transformative solution to the pressing issue of urban traffic congestion affecting ambulance services. By seamlessly integrating LTE-connected ambulances with cloud-enabled traffic signals, the system dynamically adjusts signal timings in real-time, ensuring swift and unobstructed passage through congested intersections during emergencies. The inclusion of RFID technology facilitates direct communication between ambulances and traffic lights, streamlining signal adjustments and optimizing traffic flow. Beyond technological advancements, the system addresses the economic impact of delays, emphasizing its potential to save lives through efficient emergency responses while minimizing costs associated with congestion. In essence, this integrated solution represents a crucial step towards adaptive and efficient traffic control systems in modern urban environments.

REFERENCES

1. "Ambulance Management System using GIS by Imtiyaz Pasha (2011)"

2. "Smart traffic control with ambulance detection by Varsha Srinivasan, Yazhini Priyadharshini Rajesh, S Yuvaraj and M Manigandan (2018)"

3. "Smart Ambulance With Traffic Control Ability by Saujanya Mukkawar, Suraj Rathod, Shivshankar Gawai, Mayuri Magar (2019)"

4. "Chattaraj, A., Bansal, S., & Chandra, A., "An intelligent traffic control system using RFID", IEEE Potentials, vol 28(3), 2009"

5. "Nandini Kiran P, Suraya Mubeen., "A New Approach for Intelligent Traffic Control System using Raspberry pi", International Journal of Innovative Research in Technology, vol 4(6), 2017"

6. "Janani Saradha, B., Vijayshri, G., & Subha, T., "Intelligent traffic signal control system for ambulance using RFID and cloud", 2017 2nd International Conference on Computing and Communications Technologies, 2017"

7. "Providing Accident Detection in Vehicular Networks Through OBD-II Devices and Android-based Smartphones by Jorge Zaldivar, Carlos T. Calafate, Juan Carlos Cano, Pietro Manzoni (2011)"