IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 10, April 2025
Impact Factor: 7.67

A Novel Smart Ambulance System

Siten Jain, Siddhant Shinde, Shrikant Deshmukh, Prof.Minal Jungare
Indira College of Engineering and Management, Pune, India
siten.jain@indiraicem.ac.in, siddhant.shinde@indiraicem.ac.in
shrikant.deshmukh@indiraicem.ac.in, minal.jungare@indiraicem.ac.in

Abstract: *The smart ambulance system utilizes modern communication, processing, and sensing technologies to revolutionize emergency response services. It focuses on minimizing ambulance arrival time, patient transport duration, and hospital wait times by making intelligent decisions on ambulance dispatch, hospital selection, and route optimization [1]. These decisions are based on real-time road traffic conditions and hospital load data, ensuring faster response times and improved patient outcomes [2]. The system undergoes both analytical and simulation-based performance analysis to validate its accuracy, efficiency, and reliability [3]. The results demonstrate a strong agreement between simulation and analytical findings, confirming the effectiveness of the proposed approach [4]. Furthermore, a comparative study with existing methods highlights the superiority of this smart system in reducing drop-off delays and enhancing hospital coordination, ultimately improving overall healthcare service efficiency [5].*

Keywords: Smart ambulance, emergency services, response time, real-time data, route optimization, door-to-needle time, performance analysis, traffic conditions, algorithm validation

I. INTRODUCTION

Recently, a smart ambulance has been suggested to enhance the performance of the ambulance. Smart ambulances use cutting-edge technologies to enhance emergency services, reduce response times, and deliver medical assistance with the least amount of delay [1]. These technologies include the Internet of Things, real-time data communication and video streaming, connected vehicles, road traffic monitoring, big data, biomedical sensing, and body area networks [2]. However, in order to allow high-quality and real-time video, data, and voice connection between ambulances and hospitals, smart ambulances require high-speed data transmission [3]. The authors of [2] suggested a 5G-based wireless network to support the smart ambulance after demonstrating that current communication networks (such as Long-Term Evolution (LTE) wireless networks) cannot support the demands of the smart ambulance. Mobile apps were created by authors [5] to help patients find the nearest ambulance. The mobile app displays neighboring hospitals when the ambulance arrives at the patient's location, allowing the user to choose the closest hospital based on their location [6].

II. LITERATURE SURVEY

Sr no	Project Title	Description	Limitations	Scope	Outcomes
1.	A Novel Smart Ambulance System Algorithm Design, Modeling, Performance Analyse	This study designs and analyzes algorithms for a smart ambulance system to optimize emergency response.	High dependency on real-time traffic data quality.	This project develops a smart ambulance system to minimize response time using real-time data, an intelligent algorithm, and performance analysis for better emergency care.	The smart ambulance system optimizes routing and hospital selection, reducing response time and drop-off delays for efficient emergency care.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 10, April 2025 Impact Factor: 7.67

2.	Smart ambulance system using concept of big data and internet of things	Implements IoT for real-time monitoring of ambulances, enabling better tracking and coordination with hospitals.	High setup costs for cities to implement	The Smart Ambulance System uses Big Data and IoT It enhances emergency response, reduces delays, and improves healthcare efficiency.	The Smart Ambulance System enables faster emergency response with IoT and Big Data, improving patient care and hospital efficiency. It reduces delays, enhances treatment, and increases survival rates.
3.	Smart hospital emergency system Via mobile-based requesting services	Vehicle-to-Everything technology is used to adjust traffic signals in real-time, creating green corridors for ambulances	Relies heavily on past data, which may not predict unusual events.	The Smart Hospital Emergency System enhances emergency response through mobile-based requests, reducing wait times. It enables real-time triage, IoT-based patient monitoring, and AI-driven hospital resource management.	The system enables faster emergency response, real-time triage, and better hospital coordination, reducing wait times and optimizing resources for improved patient care and outcomes.
4.	Emergency Medical Services Response Times in Rural, Suburban, and Urban Areas	A deep learning framework predicts high-demand areas for ambulance services, allowing better positioning of emergency vehicles.	Relies heavily on past data, which may not predict unusual events.	The study of EMS response times helps identify delays in urban, suburban, and rural areas, improving emergency care efficiency. It aids in optimizing resource allocation, infrastructure planning, and policy development for faster medical response.	Analyzing EMS response times helps improve emergency care by identifying delays and optimizing resource distribution. It leads to faster response, better infrastructure planning, and improved patient survival rates.
5.	Intelligent Ambulance Management System in Smart Cities	In this project, a smart ambulance management system is proposed for a smart city. The system locates the nearest ambulance, traces its coordinates, and uses Google Maps to calculate the shortest path to the patient.	Relies on real-time internet access, impacting performance in low-connectivity areas.	Optimizing EMS response times improves emergency care across all areas. Smart ambulance systems enhance tracking, traffic management, and hospital coordination. This ensures faster response and better patient outcomes.	Improved EMS response times ensure faster emergency care and reduced mortality rates. Smart ambulance systems enhance tracking, traffic management, and hospital coordination.

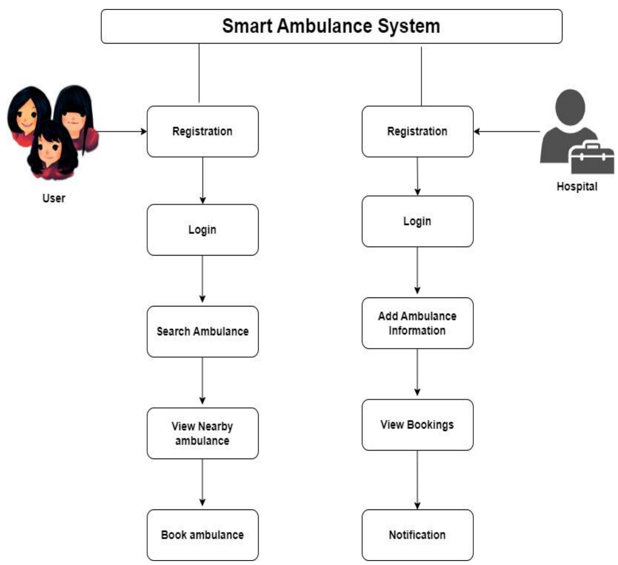
IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 10, April 2025 Impact Factor: 7.67

III. RELATED WORK

The need and demand for emergency medical response systems has created a push to develop more technology-based smart and efficient solutions for these systems. In view of this, authors are proposing a technology-based smart ambulance system. The proposed design uses technology such as wireless body sensor networks (WBANs), Internet of Things (IoT), big data analytics, and artificial intelligence[1].

In this Project, a smart ambulance management system is proposed in a smart city environment. If a patient needs an ambulance, the operator finds the nearest ambulance and direct it to the patient. The coordinates of ambulances are dynamically traced by the system, and Google Maps, as a third-party service, is used in order to calculate the shortest path to the casualty. After reaching to the patient, the expert (doctor or nurse) investigates the situation and finds the best available hospital by the proposed system[2].

IV. PROPOSED SYSTEM



This system can be extended to implement the shortest distance from the accident site to the hospital so that the patient reaches the hospital in minimum time.

Also, the patient's information could be sent to the hospital before the ambulance reaches the hospital.

By doing so, the arrangements could be made in the hospital according to the patient' s condition and the treatment could start as soon as the patient reaches the hospital.

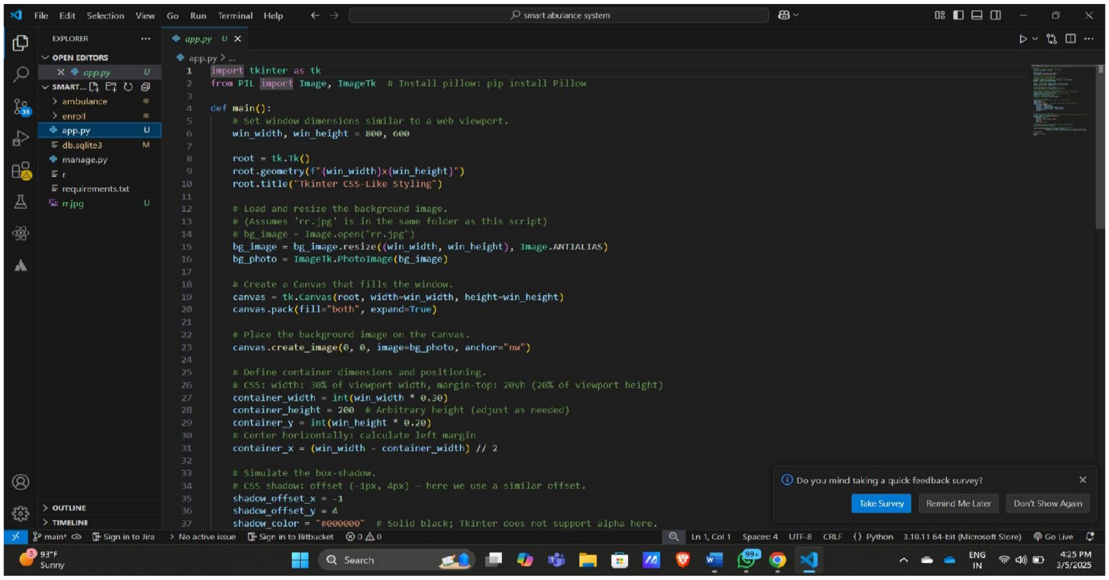
Information of several patients could be stored in the cloud server for a long period of time

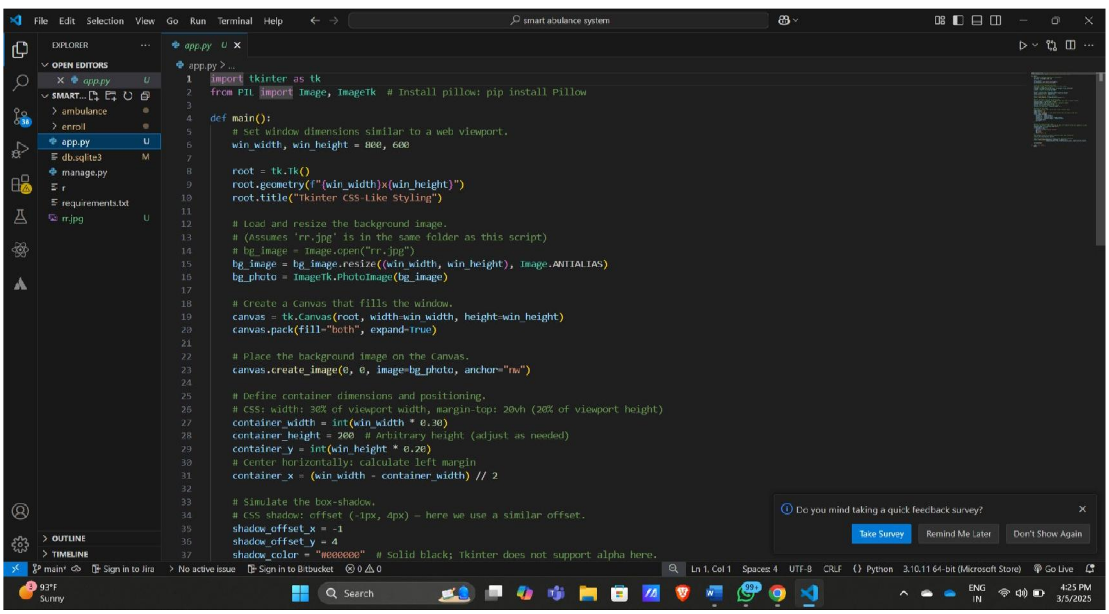
V. METHODOLOGIES

- Gather real-time traffic data using GPS and traffic sensors. Collect patient vitals through IoT-based medical devices inside the ambulance.
- Process traffic data to determine the fastest route using route optimization algorithms.
- Use cloud-based platforms to send patient data to hospitals, allowing doctors to prepare in advance.
- Users can provide details about the patient, which are forwarded to the hospital.

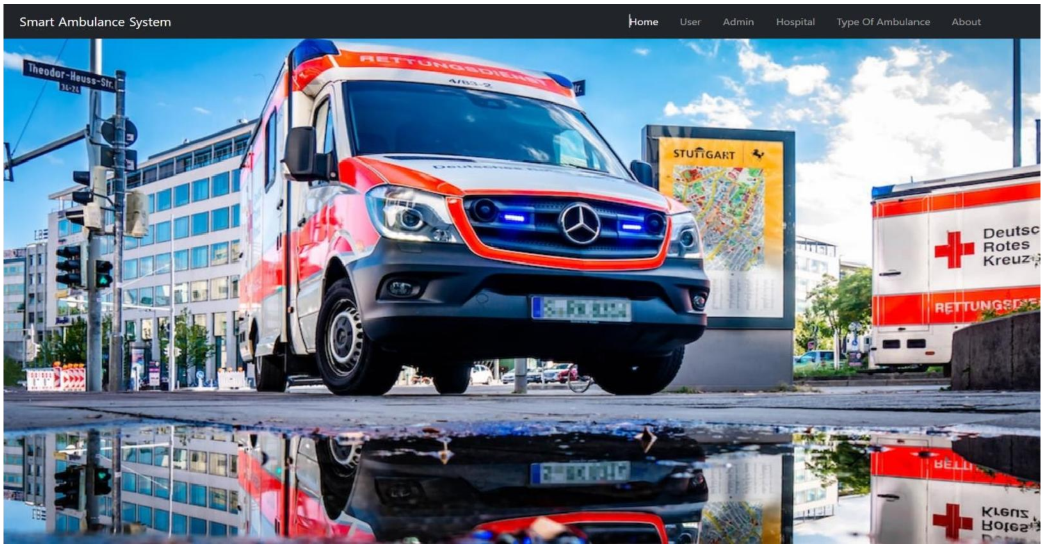
IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 10, April 2025
Impact Factor: 7.67

VI. EXPERIMENTAL RESULTS





IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 10, April 2025
Impact Factor: 7.67



VII. CONCLUSION

In this initiative, our goal was to transfer the casualty to the hospital that could provide the interventions most effectively while also quickly reaching the patient who required an urgent intervention. In the firebase database we built for these purposes, we have established an interface that displays hospital data and locations online so that if a patient contact is received, the nearest ambulance admin user will be pointed in the right direction. In order to expedite the processes once the ambulance arrives at the patient, we kept records of the hospitals' locations and the types of interventions that can be performed in our database. With the help of this filtering feature, we were able to arrange the best hospitals according to how quickly they could be reached and direct patients there. When taking into account the reaction and transportation times, this investigation has yielded successful outcomes. More data can be gathered from hospitals and other high-tech IoT components, such as smart traffic devices, to improve this project. This project proves that human life is more valuable than anything else, and that the more people that step in to rescue lives, more lives will be saved.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 10, April 2025
Impact Factor: 7.67

REFERENCES

[1] V. Meena. City Forms. Accessed: Sep. 10, 2021. [Online]. Available: https://www.slideshare.net/vjspa/city-forms?next_slideshow=1

[2] Y. Zhai, X. Xu, B. Chen, H. Lu, Y. Wang, S. Li, X. Shi, W. Wang, L. Shang, and J. Zhao, ''5G-network-enabled smart ambulance: Architecture, application, and evaluation,'' IEEE Netw., vol. 35, no. 1, pp. 190–196, Jan. 2021, doi: 10.1109/MNET.011.2000014.

[3] M. Aideen, M. H. Ahmed, H. Saleem, M. El Niamey, and T. R. Shelta mi, ''Improving the performance of ambulance emergency service using smart health systems,'' in Proc. Workshop Artif. Intel. Internet Things Digit. Health Conjunct. (IEEE/ACM CHASE), Washington DC, USA, Dec. 2021, pp. 205–209

[4] M. Li, A. J. E. Carter, J. Goldstein, T. Hawco, J. Jensen, and P. Vanberkel, ''Determining ambulance destinations when facing offload delays using a Markov decision process,'' Omega, vol. 101, pp. 1–14, Mar. 2020.

[5] T. Akca, O. K. Sahingoz, E. Kocyigit, and M. Tozal, ''Intelligent ambulance management system in smart cities,'' in Proc.Int. Conf. Electr. Eng. (ICEE), Sep. 2020, pp. 1–7

[6] X. James. (Apr. 2021). Smart Ambulances: The Future of Emergency Healthcare. The Healthcare Guys. [Online]. Available: https://www. healthcareguys.com/2021/04/01/smart-ambulances-the-future-ofemergency-healthcar/

[7] A. Ayesha and K. Chakravarthi, "Smart Ambulances for IoT Based Accident Detection, Tracking and Response," Journal of Computer Science, vol. 19, no. 6, pp. 677–685, May 2023, doi: 10.3844/jcssp.2023.677.685

[8] S. B. Bharatharam, M. Dhayalini, V. Gowthamram, and P. Suresh, "Adaptive Ambulance Management System," International Research Journal on Advanced Engineering Hub (IRJAEH), vol. 2, no. 5, pp. 1166–1173, May 2024, doi: 10.47392/IRJAEH.2024.0160.

[9] N. Kumar, H. Shukla, and P. Rajalakshmi, "V2X Enabled Emergency Vehicle Alert System," arXiv preprint arXiv:2403.19402, Mar. 2024.

[10] W. Han, W. Yeung, A. Tung, J. T. A. Meng, D. Ryanputera, M. Feng, and S. Arulanadam, ''An Emergency Medical Services Clinical Audit System Driven by Named Entity Recognition from Deep Learning,'' arXiv preprint arXiv:2007.03596, Jul. 2020.