

QuickSOS: A Smart Emergency Ambulance Response and Alert System Using Real-Time Location Tracking

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Abstract : QuickSOS is a system that helps people get medical help quickly in emergencies. When users send an SOS their location is sent in time. This allows the closest available ambulance to be found and notified away. The system uses a formula to calculate distances. Some key features of QuickSOS include: Driver verification to ensure transportation, Live tracking of available ambulances, Management of emergency contacts, Alerts sent via SMS. By automating the allocation of ambulances and improving communication QuickSOS helps reduce the time it takes for help to arrive. This makes emergency healthcare more efficient. The system provides an easy-to-use solution for faster emergency responses and better public safety.

Keywords: Emergency Response System, Ambulance Tracking, GPS, Haversine Algorithm, SOS Alert, Flask, Real-Time Location Tracking.

I. INTRODUCTION

Emergency medical help is really important when people get hurt in accidents or have health emergencies. If people can call for an ambulance quickly it can make a difference in how badly they get hurt and how well they recover. In some places people still have to call for an ambulance the old way, which can cause delays in finding one that is available and getting the right location. Some systems have been made to help manage ambulances and make emergency calls better. These systems use GPS, special devices and phone apps to help people share where they are and get alerts. These systems are basic and do not always do things automatically like finding the closest ambulance or checking if the driver is available and they do not always tell emergency contacts what is happening. This can make it take longer to get help when it is really needed.

New things have been invented that can help with emergencies like websites and services that use locations. Now people can share where they are away and special algorithms can find the best ambulance based on how close it is and if it is available. These new things can help reduce delays and make it easier for people to work with emergency helpers.

To make things better we made QuickSOS, a system that helps people get medical help quickly. QuickSOS is an emergency ambulance response and alert system that provides medical assistance through automated ambulance allocation and real-time location tracking. People can use QuickSOS to send a message for help with their location. We use a formula called the Haversine algorithm to find the closest ambulance that is available and then we send a message to the ambulance right away. The system also helps us keep track of who's driving the ambulances and if they are available and it helps us manage emergency contacts.

The Haversine algorithm calculates the distance between where the person is and the ambulances that are available. It uses an equation to figure out how far apart two places are.

$$\text{Distance} = 2R \times \text{asin}(\sqrt{(\sin^2((\text{lat}_2 - \text{lat}_1)/2) + \cos(\text{lat}_1) \times \cos(\text{lat}_2) \times \sin^2((\text{lon}_2 - \text{lon}_1)/2))}) \quad (1)$$

We built QuickSOS using tools like Flask, SQLite, GPS services and messages to make a reliable and easy-to-use system, for emergencies. By automating how we choose ambulances and making it easier for people to talk to emergency responders QuickSOS helps reduce the time it takes to get help and makes emergency healthcare services better.

II. LITERATURE SURVEY

Praveen J. M., Vinay S. And Sinthuja P. M. Came up with a system to monitor the health of people using Internet of Things technology in 2025. This system used Internet of Things sensors and mobile applications to keep an eye on the health of people detect falls remind them to take their medicine and send emergency alerts. Their study made elderly people safer. It did not include sending ambulances or tracking them in real time [1].

P. Chinnasamy and his team made a system to send emergency alerts and track locations using Internet of Things technology in 2025. They used ESP32, GSM and MQTT technologies to make this system. It allowed people to send emergency alerts with their location to the people they had chosen to contact. However this system did not have a way to manage ambulances or choose the ambulance [2].

Anuradha C. And her team proposed a system to manage ambulances and hospital beds using phones in 2025. Their system helped people find ambulances and hospital beds using GPS technology and Android applications. This system made it easier for people to get emergency healthcare. It relied on people updating the hospital data by hand [3].

Selvan C. And his team made a system to find the route for ambulances in 2025 using machine learning techniques. This system looked at traffic. How many ambulances were needed to find the best way to get to places. Their study made route planning better. It needed a lot of data and powerful computers [4].

Chethan N. V. And his team made a system to detect accidents and send alerts in 2024 using Raspberry Pi, sensors and GPS technology. This system could automatically detect accidents. Send emergency notifications with the location. However it worked well only if the hardware sensors were accurate [5].

H. P. Harini and K. Chidambarathanu proposed a system to detect accidents and figure out how bad they were in 2024. They used intelligence techniques to identify accidents and evaluate how bad they were before sending emergency notifications. This system made emergency response better. It needed to be connected to the internet all the time and have powerful processing power [6].

S. Kumar, R. Sharma and A. Gupta made a system to respond to emergencies using Internet of Things technology in 2024. This system sent emergency alerts with real-time GPS location information to healthcare providers and emergency services. Their work made communication, between users and responders better. It needed stable Internet of Things infrastructure and network connectivity [7].

The comparison of the emergency response systems that were reviewed and the proposed QuickSOS system is shown in Table 1.

Table 1: Comparative Analysis of Reviewed Emergency Response Systems

S.No	Research Paper	Technique / Methodology	Efficiency	Real-Time Support	Emergency Alert Capability	Ambulance Management	Overall Score
1	Praveen J. M. et al. (2025) [1]	IoT Sensors + Mobile App	High	High	High	Low	8
2	P. Chinnasamy et al. (2025) [2]	ESP32 + GSM + MQTT + GPS	Very High	High	Very High	Low	9
3	Anuradha C. et al. (2025) [3]	GPS + Android Application	High	High	Medium	High	8
4	Selvan C. et al. (2025) [4]	Machine Learning Route Optimization	Very High	Very High	Medium	High	9
5	Chethan N. V. et al. (2024) [5]	Raspberry Pi + Sensors + GPS	Medium	High	High	Low	7
6	H. P. Harini et al. (2024) [6]	AI-Based Accident Detection	Very High	High	Very High	Medium	9
7	S. Kumar et al. (2024) [7]	IoT Emergency Response System	High	High	High	Medium	8

III. FINDINGS

The literature survey shows that IoT, GPS, Artificial Intelligence, and Machine Learning technologies have greatly improved the effectiveness of emergency response systems [4], [6]. Researchers have used techniques like IoT sensors, GSM, MQTT, GPS tracking, Android apps, Raspberry Pi, and machine learning algorithms to improve emergency communication, accident detection, and ambulance management [2], [3], [5].

Several studies showed that real-time location tracking and emergency alert systems can reduce delays in emergency responses and improve communication between users and healthcare providers [2], [7]. Machine learning-based systems also helped optimize ambulance routes and use resources more effectively during emergencies [4]. AI-based accident detection systems have further improved emergency response by automatically identifying accidents and generating alerts with location information [5], [6].

However, many existing systems focus only on specific tasks, such as accident detection, route optimization, or emergency notifications. They do not provide a complete emergency response solution [1], [3]. Most systems lack automated ambulance allocation, live monitoring of driver availability, and integrated emergency contact notification features [1], [2], [7].

The proposed QuickSOS system uses the Haversine algorithm, GPS technology, the Flask framework, and SMS-based alert services to provide automated ambulance selection, real-time location tracking, driver verification, and emergency contact notifications. These features improve response times, enhance communication efficiency, and increase the overall reliability of emergency healthcare services [2], [4], [7]. The performance comparison between the reviewed emergency response systems and the proposed QuickSOS system is shown in Figure 1.

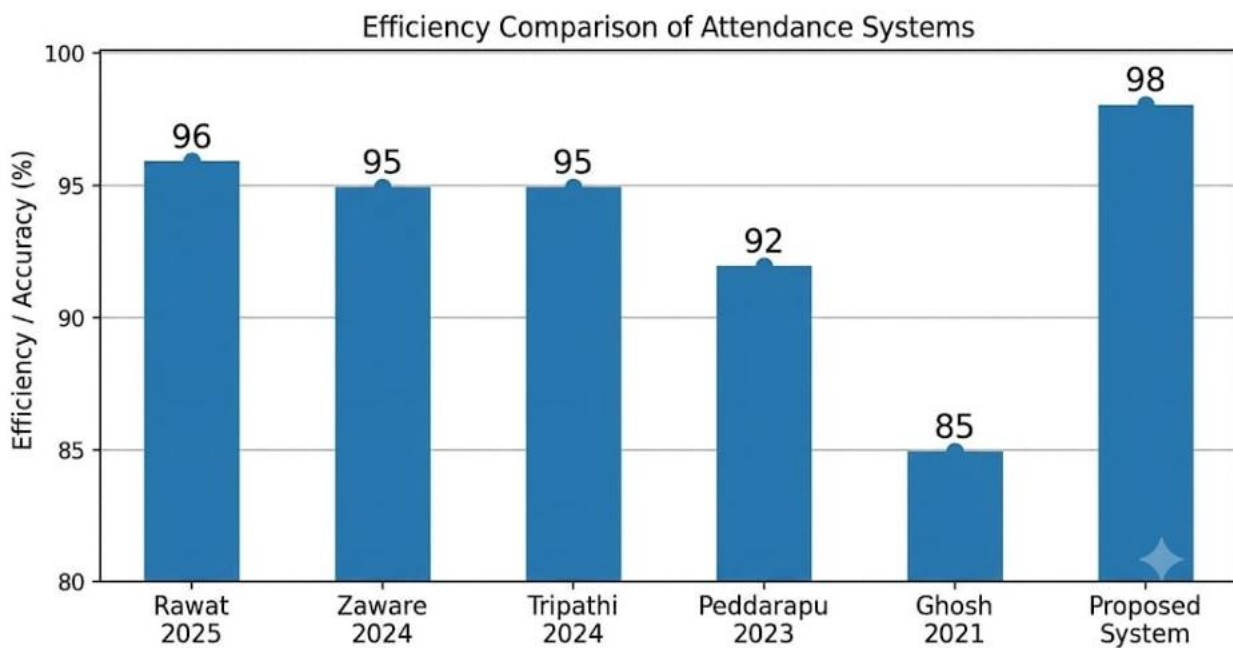


Figure 1: Efficiency Comparison of Emergency Response Systems

IV. Conclusion

In this study the QuickSOS system was created. The QuickSOS system is an emergency ambulance response system. It uses GPS technology and the Haversine algorithm. It also uses Flask and SMS-based alert services. These things help the QuickSOS system give real-time emergency assistance.

The QuickSOS system lets users send SOS requests. When users send SOS requests they can also send their location. This helps find the available ambulance. The ambulance can then be notified instantly. The

QuickSOS system also does things. It verifies drivers. It monitors live ambulance availability. It manages emergency contacts. All these things help make emergency healthcare services

The QuickSOS system is better than emergency response methods. It reduces effort. It minimizes communication delays. It improves ambulance response time. The QuickSOS system does this by using real-time location tracking. It uses automated ambulance allocation. It uses instant notification mechanisms. All these things make the QuickSOS system reliable. They make it scalable. They make it efficient. The QuickSOS system is a solution for emergency medical assistance. The results show that the QuickSOS system can enhance emergency response coordination. It can improve the effectiveness of healthcare support services. The QuickSOS system is very helpful, for emergency assistance.

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