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 3, June 2025
Impact Factor: 7.67

Emergency Ambulance Network with Integrated Medical Assistance

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Abstract: *In emergency medical situations, the time it takes for an ambulance to reach a patient and transport them to the nearest healthcare facility is critical to the patient's survival. However, traditional emergency response systems often suffer from delayed response times,inefficient ambulance dispatch, and limited communication between ambulance personnel and hospital staff, leading to compromised patient care. This project aims to address these challenges by developing an Android-based application that integrates ambulance dispatch, real-time communication, and medical assistance features into a single platform. The proposed system will utilize real-time GPS tracking for dynamic routing of ambulances, ensuring the fastest possible response times. Ambulance personnel will have access to real-time patient data and communication tools, enabling them to inform hospital staff of the patient's condition before arrival. Additionally, the app will provide access to the patient's medical history, aiding first responders in delivering appropriate care during transit. The platform will also support communication between hospitals, ensuring that the nearest and the best-equipped facility is prepared to receive the patient. This integrated system is designed to improve the efficiency of emergency medical services by reducing delays, optimizing ambulance routes, and facilitating better-prepared medical care upon patient arrival. The ultimate goal of this project is to enhance the overall quality of emergency healthcare, saving lives by ensuring that critical time-sensitive decisions are made efficiently*

Keywords: Machine Learning, Wireless Communication, Real-time Systems, ICTs, GPS, Real-time Operating systems

I. INTRODUCTION

In emergency medical situations, swift ambulance response and efficient patient transport are crucial for saving lives. However, traditional systems face issues like delayed dispatch, poor routing, and inadequate communication between ambulance personnel and hospitals, leading to compromised patient care. This project aims to overcome these challenges by developing an Android-based application that integrates real-time GPS tracking, dynamic routing, and seamless communication between emergency responders and hospitals. The system will allow ambulance staff to access and share real-time patient data, including medical history, enabling them to provide appropriate care during transit. By facilitating better preparedness and communication between hospitals and ambulances, the platform seeks to reduce delays, optimize medical response, and enhance patient outcomes. Ultimately, the goal is to improve the efficiency and effectiveness of emergency medical services, ensuring critical decisions are made in a timely manner to save lives.

II. LITERATURE SURVEY

[1]This presents a solution to a significant issue faced in emergency medical services delayed ambulance response times. The application's core aim is to enhance the efficiency of ambulance services by integrating real-time tracking, route optimization, and direct communication between users (patients) and service providers (hospitals and ambulance drivers).

[2] This leverages real-time GPS tracking, machine learning for ambulance availability prediction, and traffic management integration to optimize dispatch and reduce response times. This system prioritizes emergencies,

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automates dispatch, and selects optimal routes, enhancing overall ambulance service efficiency and improving critical medical response.

[3]This examines the broader field of Android Application Development for Emergency Services, highlighting the role of mobile applications in delivering emergency services, especially in rural and underserved areas. Kale's work emphasizes how mobile technologies can make healthcare more accessible and efficient, aligning with the growing trend toward digital solutions in healthcare delivery.

[4]This furthering the idea of integrating smart technologies into emergency medical services. The system focuses on automating the response process, where ambulances are dispatched based on the severity of the patient's condition. This approach integrates machine learning techniques to predict ambulance availability and traffic conditions, enhancing overall service delivery.

[5]Proposes a dual-application solution for addressing the delays in emergency medical response in India due to traffic congestion and inefficient location-sharing mechanisms. It involves developing two Android applications: one for citizens (patients) and another for ambulance drivers. The core functionalities include the use of GPS and Google Maps API to share real-time locations and images of accident sites, facilitating prompt medical assistance

[6] It collectively highlights advances in real-time ambulance tracking, intelligent traffic management, navigation systems, and security protocols for emergency medical services. Together, they provide a technological foundation for developing comprehensive and responsive ambulance services.

III. PROPOSED SYSTEM

The Emergency Ambulance Network with Integrated Medical Assistance system is designed to improve ambulance services by utilizing machine learning and real-time data processing techniques. The system allows users to request ambulances via a mobile app, where they can upload emergency details and real-time location data. Using this information, the system matches the user's location with nearby available ambulances. The platform centralizes inputs, and the data is accessed and processed by a national healthcare network for quick ambulance dispatch.

The system also incorporates real-time traffic analysis, which optimizes routes for ambulances by predicting the fastest paths based on current traffic conditions. The app resizes and standardizes the user's location data and continuously updates ambulance drivers with the most efficient routes. By integrating deep learning models, including neural networks and machine learning algorithms, the system can learn from past data to improve predictions and response times for future emergencies.

If accessed through the internet or mobile devices, the system will automatically match users with the closest available ambulance, ensuring that the nearest emergency service is notified immediately. The app also provides real-time updates to both the ambulance team and the user, allowing for seamless communication. Strict privacy controls are implemented to protect sensitive user data, allowing only authorized medical professionals and personnel access to patient information

IV. SYSTEM ARCHITECTURE

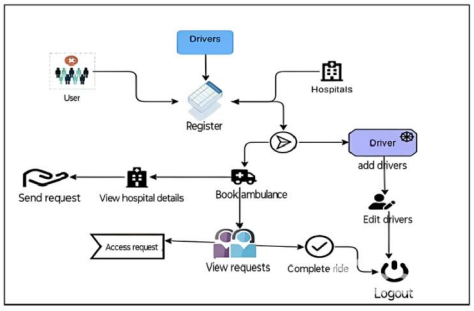

Fig. 1 Proposed System Architecture

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MODULE WISE DESCRIPTION

1. User Module

The User module is the entry point for individuals who require emergency medical services. Users begin by registering on the platform, ensuring their identity and details are stored for further use. Once logged in, they can view a list of registered hospitals nearby. In case of an emergency, the user can initiate an ambulance request. This request is routed to the selected or nearest hospital, which then processes the request by assigning it to an available driver. The user's role is primarily to submit accurate location and emergency details, enabling a fast and efficient response from the hospital and driver.

2. Hospital Module

Hospitals are essential stakeholders in this system. A hospital must first register on the platform to gain access to its features. After successful registration, the hospital has administrative privileges to add ambulance drivers into the system, maintaining a database of active responders. Hospitals can also edit driver information if updates or corrections are necessary. When a user sends a request, the hospital receives it, views the details, and delegates the task to an appropriate driver. This module acts as the control hub for managing resources and coordinating emergency responses effectively.

3. Driver Module

The Driver module is responsible for executing the emergency response. Once a hospital adds a driver, they can register or log in to access their dashboard. Drivers are notified when a request is assigned to them. They can view the request details, including the user's location and nature of the emergency. After picking up the user and reaching the destination (typically a hospital), the driver marks the ride as complete. Post-ride, the driver has the option to log out. This module ensures that drivers are seamlessly integrated into the request lifecycle and can act quickly when needed.

4. Registration Process

The registration process is a common entry point for all system users—patients (users), hospitals, and ambulance drivers. This process verifies and stores relevant information, which is critical for authentication, recordkeeping, and future interactions. For drivers, registration typically happens through hospitals that manage their onboarding. For users and hospitals, the process is initiated independently, allowing them to gain system access and start using the relevant features.

5. Request and Booking Flow

Once users send a request for an ambulance, the system triggers a series of actions behind the scenes. The request is first sent to hospitals, where it is viewed and evaluated. Hospitals then assign the request to a driver based on availability and proximity. The driver is notified and proceeds to the location, picking up the user and completing the ride. This flow represents the core logic of the application, ensuring timely and accurate dispatching of emergency medical services.

6. View and Access Requests

Hospitals and drivers have access to dashboards where incoming and pending requests are visible. Hospitals can view user information, assess the request, and assign it accordingly. Drivers can access only the requests delegated to them. This segregation ensures role-based access and prevents confusion or duplication of effort. Timely access to accurate information is crucial to ensuring a swift emergency response.

7. Ride Completion and Logout

Once the emergency ride is completed, the driver marks the ride as finished in the system. This status update allows for proper logging and closure of the request in the backend. Following this, the driver can log out from the system,

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ensuring session security. This final step is vital for maintaining the integrity of the ride lifecycle and enabling analytical tracking of completed emergency services.

V. FIOW DIAGRAM

The flow diagram outlines a smart emergency alert system that begins when a user sends an alert with their name and location. This sensitive data is immediately encrypted to ensure privacy and is securely transmitted over the network to both the hospital and ambulance systems. The alert acts as a trigger to initiate the emergency response process, ensuring that the relevant authorities are informed promptly.

Once the alert is received, the system checks for ambulance availability. If no ambulance is available, the system waits or retries the request until one becomes accessible. When an ambulance is available, the data is preprocessed and then passed into a K-Nearest Neighbors (KNN) machine learning model. This model evaluates the user's live coordinates and selects the nearest suitable driver or ambulance based on location proximity.

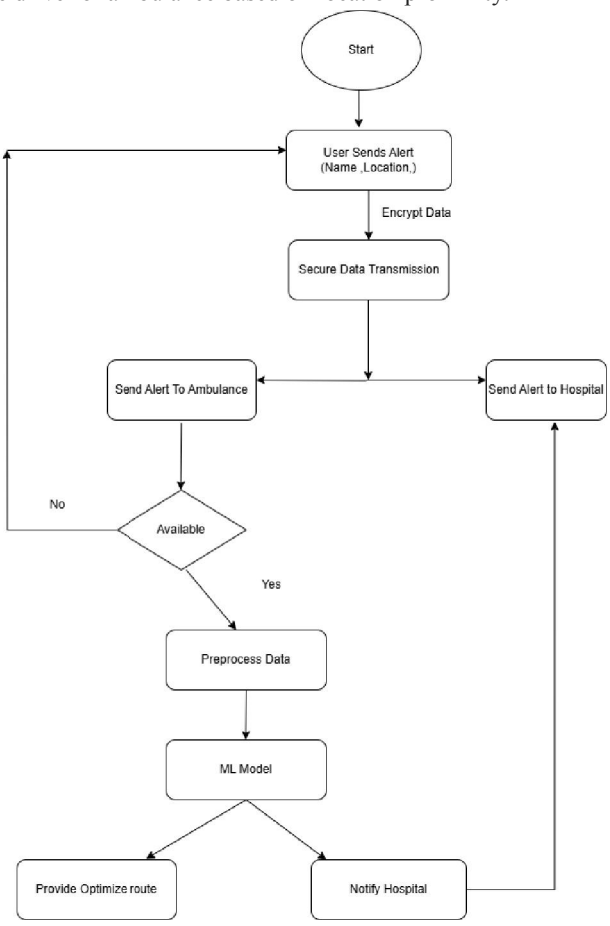

Fig.2 Flow Diagram

Based on the KNN model's output, the hospital is notified, and an optimized route is generated for the selected ambulance to reach the user quickly. This integration of secure communication, real-time GPS tracking, availability checks, and ML-based proximity matching ensures a fast and intelligent emergency response system, improving the likelihood of timely medical support.

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VI. EXPECTED OUTPUT

Emergency Ambulance Network with Integrated Medical Assistance project is a streamlined and efficient system that ensures the nearest ambulance is dispatched quickly, taking real-time traffic conditions into account. Users will have access to real-time tracking of the ambulance's location, with continuous updates on its estimated arrival time and route.Additionally, the system will facilitate seamless communication between the patient, paramedics, and hospital staff, enabling hospitals to prepare in advance for the patient's arrival. This communication also allows paramedics to receive crucial medical information before reaching the emergency site, significantly improving the response and treatment process. Ultimately, the project aims to reduce emergency response times and enhance the coordination of medical assistance during critical situations.

VII. RESULT

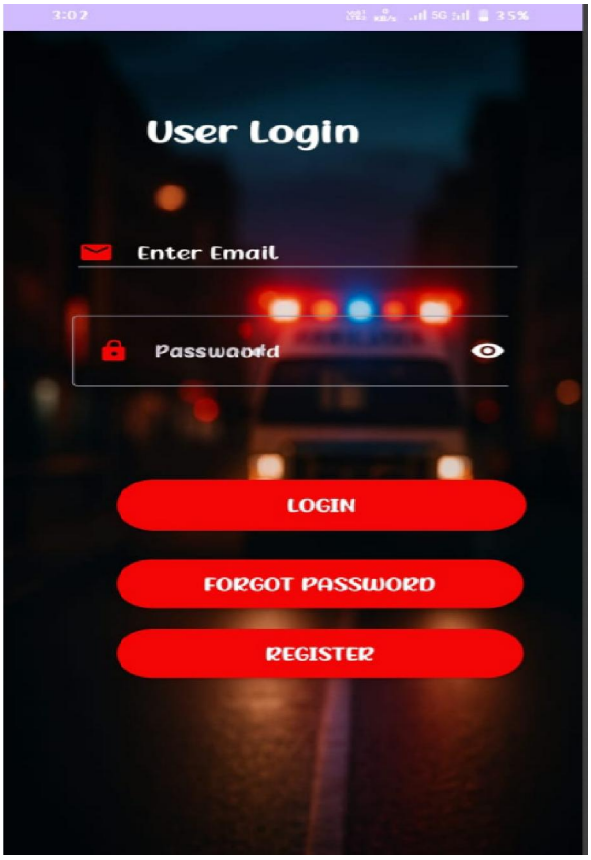

Fig.3 Login

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Fig 4 List Of Hospital

Fig 5 Send Alert

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Fig 5 Receive Alert

VIII. CONCLUSION

The proposed Android-based emergency ambulance network focuses on improving response times by allowing individuals near an accident to quickly generate a response, directing the nearest ambulance to the accident site. By utilizing GPS-based navigation and hospital selection algorithms, the app ensures efficient ambulance dispatch and patient transport to the closest medical facility. This software-driven approach eliminates the need for additional hardware, providing a practical and accessible solution for emergency medical services. Future enhancements may explore optimizing route planning and integrating real-time traffic data to further improve response efficiency.

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