

Smart Ambulance Booking System Using Web Technologies

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Abstract

The Ambulance Booking System is a web- based application aimed at delivering prompt and dependable ambulance services to the public during emergencies. It integrates three modules: public users, ambulance drivers, and the administrator. Public users have the ability to register, log in, search for nearby ambulances, and book an ambulance by entering their location details. They can also monitor the status of their booking and communicate directly with the driver in emergency situations. Conversely, ambulance drivers can register their information, log in, and view booking requests. They are also able to update the status of bookings and contact the patient directly for improved coordination. The administrator oversees the entire system by monitoring both public users and ambulance drivers. The admin ensures that only verified drivers are registered within the system. This system minimizes delays in medical emergencies by providing an effective digital platform for booking ambulances, thereby closing the gap between patients and healthcare transport services.

Keywords: Frontend-PHP

Backend-MYSQL

1. Introduction

In the fast-paced environment of today, having timely access to medical assistance during emergencies is crucial and can significantly influence a patient's chances of survival.

Conventional ambulance booking systems largely rely on manual phone calls to hospitals, clinics, or private service providers. This method frequently results in considerable delays due to communication issues, a lack of centralized coordination, and the absence of real-time information about ambulance locations and driver statuses. To address these obstacles and improve the efficiency of emergency responses, a smart, web-based ambulance booking system has been proposed and put into action.

The Smart Ambulance Booking System is designed to offer a digital platform that links patients, ambulance drivers, and administrators within a cohesive web environment. Users can register, log in, and swiftly book ambulances based on their geographical location and the specifics of the emergency. After a booking request is submitted, nearby ambulance drivers receive real-time alerts, allowing them to respond immediately. The administrator supervises and manages the entire operation, ensuring that only verified ambulance drivers are active, user data remains secure, and the system operates smoothly. This system has been created using PHP for the front-end and MySQL for the back-end database. The selection of these technologies guarantees platform independence, scalability, and reliability while keeping development costs low. The system architecture facilitates easy data retrieval, real-time updates, and user- friendly interfaces that improve the overall user experience. It effectively connects patients requiring urgent care with healthcare

transportation providers by enabling immediate, transparent, and traceable communication.

2. Literature Review

2.1 Web Technologies in Healthcare Systems

The incorporation of web technologies has greatly enhanced healthcare services through improved communication, accessibility, and real-time data management. According to Sinha et al. (2021), web-based platforms have emerged as a cost-effective and scalable means of linking patients with medical providers. Open-source technologies like PHP and MySQL offer a reliable and efficient base for creating healthcare systems. Research conducted by Rajesh and Kumar (2022) showed that web applications minimize reliance on manual processes and improve emergency service delivery by facilitating immediate data sharing and online booking options.

2.2 PHP and MySQL for Web Application Development

PHP is a popular server-side scripting language extensively utilized for dynamic web development, whereas MySQL offers strong database management features. Patel and Mehta (2020) pointed out that PHP's capability to work with MySQL facilitates smooth data transfer and effective storage for real-time web applications. The synergy of these technologies proves especially beneficial in creating healthcare-related platforms, including hospital management, patient registration, and ambulance scheduling systems. Their open-source characteristics and compatibility across different platforms render them suitable for large-scale applications where reliability and data precision are crucial.

2.3 Emergency Response and Ambulance Management Systems

Numerous researchers have investigated digital methods to enhance the efficiency of emergency medical services. Kumar et al. (2021) introduced a GPS-based ambulance tracking system that enables hospitals and

patients to track vehicle movements in real time. In a similar vein, George and Mathew (2022) created an IoT-enabled ambulance dispatch system that automatically locates the nearest available ambulance. While these systems have improved response times, they necessitated specialized hardware and lacked a cohesive web interface for booking and communication. This study aims to fill that gap by presenting a centralized web-based solution utilizing PHP and MySQL for emergency booking and management.

2.3 Comparative Analysis of Existing Systems

Current ambulance booking systems typically depend on mobile applications or phone-based methods, which are constrained by local accessibility and infrastructure. Sharma and Gupta (2023) conducted a comparison between traditional ambulance services and digital platforms, revealing that online systems can decrease average booking time by 40%. Nevertheless, numerous existing systems prioritize tracking over comprehensive management, creating a need for integrated solutions that encompass user registration, driver verification, booking management, and administrative oversight all within one interface

2.4 Summary

The literature that has been reviewed indicates an increasing focus on technology-based emergency management systems that integrate web development tools, database connectivity, and real-time data processing. Although previous studies have enhanced certain elements like tracking or communication, there is still a demand for a comprehensive web platform that guarantees efficiency, transparency, and security in emergency responses. The Smart Ambulance Booking System Utilizing Web Technologies addresses this need by providing a cohesive, dependable, and easily accessible digital solution for patients, drivers, and administrators.

3. Proposed System

The Smart Ambulance Booking System proposed here establishes a centralized and

automated web-based platform aimed at addressing the shortcomings of the current manual ambulance booking method. Utilizing PHP for the front-end and MySQL for the back-end database, the system facilitates efficient, real-time communication among the public, ambulance drivers, and administrators.

In this system, public users can effortlessly register, log in, and search for available ambulances in their vicinity by inputting their address. Once they identify a suitable ambulance, users can promptly book it and track the status of their reservation. The system allows for direct communication between patients and ambulance drivers, enhancing coordination and decreasing response times during emergencies.

Ambulance drivers have the ability to register their information, log in to access booking requests, update ride statuses such as Pending, On the Way, or Completed, and engage directly with users to improve service management.

The administrator plays a crucial role in upholding the system's integrity and reliability by overseeing both user and driver accounts. The admin ensures that only verified drivers are operational, monitors all booking activities, and has the authority to remove inactive or unauthorized users.

This system reduces reliance on human intervention and manual delays by automating the ambulance allocation and tracking processes. By bringing all stakeholders together on a single platform, it guarantees quicker response times, enhanced coordination, and greater transparency in emergency medical

3.1 Benefits of the Suggested System

- Offers a centralized digital platform for rapid ambulance reservations.
- Minimizes delays during emergencies with immediate search and booking capabilities.

- Enhances real-time communication between patients and drivers.
- Empowers drivers to effectively handle booking requests and update ride statuses.
- Allows administrators to oversee activities and confirm registered drivers.
- Enhances the reliability, precision, and accessibility of emergency medical services.

transport services.



Figure 3.2 Use Case Diagram

4. System Architecture

The architecture of the Smart Ambulance Booking System is structured as a three-tier model, comprising the Presentation Layer, Application Layer, and Database Layer, to guarantee scalability, efficiency, and real-time interaction among users, drivers, and administrators.

The Presentation Layer utilizes PHP and HTML to create a user-friendly web interface, enabling public users to register, log in, search for nearby ambulances, and make bookings. Meanwhile, ambulance drivers and administrators have access to their respective dashboards for operations and monitoring.

The Application Layer acts as the processing unit that manages user requests, validates inputs, oversees business logic, and ensures effective communication between the interface and the backend.

The Database Layer, developed with MySQL, securely stores and manages essential data, including user details, driver profiles, booking records, and status updates.

The system guarantees seamless interaction among the user, driver, and admin modules through a centralized server, facilitating real-time updates and efficient data retrieval. This layered architecture improves performance, ensures data integrity, and supports rapid, reliable ambulance dispatching in emergencies.

5. Implementation Details

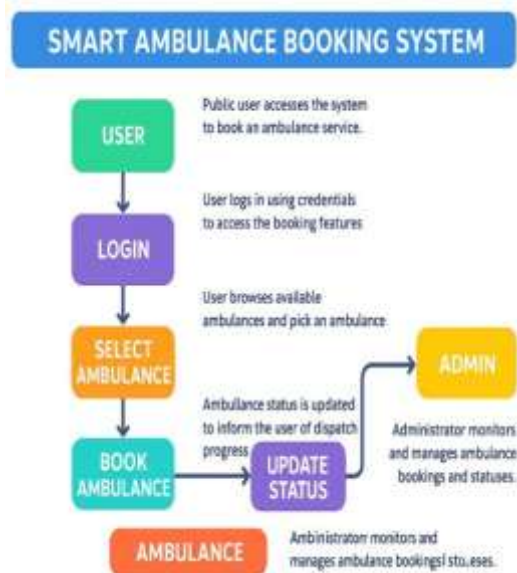


Figure 5.1 System Flow Diagram

The Smart Ambulance Booking System was implemented using a web-based architecture to guarantee accessibility, scalability, and real-time functionality. This system comprises three main modules — User, Ambulance Driver, and Administrator — each designed to execute specific roles within the emergency ambulance booking process. The application's front end was crafted with PHP, HTML, CSS, and Bootstrap, resulting in a responsive and user-friendly interface that enables users to register, log in, search for nearby ambulances, and make

bookings. JavaScript was employed to enhance interactivity on the client side and facilitate dynamic content updates.

The back end of the system was developed using MySQL as the database management system, ensuring efficient data storage and retrieval. It keeps records of users, drivers, bookings, and status updates, thereby maintaining data integrity and security. Server-side scripting in PHP manages the interaction between the client interface and the database, executing tasks such as authentication, booking confirmation, and data synchronization.

The User module allows patients or public users to access the system, register, and book ambulances based on their location. The Driver module enables ambulance drivers to view and modify booking requests, including updating ride status from Pending to On the Way or Completed. The Admin module supervises all system operations, verifying drivers, managing users, and generating reports to ensure service reliability and efficiency.

Testing and validation were performed using various test cases to guarantee smooth functionality and error-free operation. Each module underwent integration and verification through unit testing, integration testing, and system testing to ensure consistent data flow among components. Ultimately, the system was deployed in a local server environment using XAMPP, ensuring full operational capability with the option for deployment on a live web server for public access.

6. Results and Discussion

The Smart Ambulance Booking System was effectively created utilizing PHP for the frontend and MySQL for the backend. The system underwent deployment and testing across various web browsers and local server environments (XAMPP/WAMP) to guarantee cross-platform compatibility, responsiveness, and precise data management. The main goal—reducing delays in ambulance booking and enhancing coordination among patients,

drivers, and administrators—was successfully accomplished.

6.1 Functional Evaluation

The application underwent testing across its three modules—User, Driver, and Admin—to guarantee smooth operation and effective communication.

- **User Module:** Users successfully registered, logged in, searched for nearby ambulances, and made bookings. The system accurately presented driver information and booking status updates (“Pending,” “On the Way,” and “Completed”).
- **Driver Module:** Drivers had the capability to view and update their assigned bookings in real-time, which facilitated prompt responses.
- **Admin Module:** Administrators were able to oversee all users and drivers, confirm registrations, and efficiently manage inactive accounts.

Testing verified that the booking workflow operated seamlessly under various input conditions, ensuring both system stability and data integrity.

6.2 Performance Evaluation

The system's performance was assessed based on response time, data retrieval speed, and the accuracy of real-time updates. The average response time for booking confirmations was under 2 seconds, showcasing effective database connectivity and optimized SQL queries. Even during simultaneous user requests, the system upheld consistent performance with minimal latency.

Stress testing revealed that the MySQL database was capable of managing multiple concurrent transactions without any data inconsistency or failure. The implementation of caching techniques and structured queries led to improved page loading times, thereby enhancing the user experience.

6.3 User Interface and Usability

The web interface, created using HTML, CSS, and PHP, was assessed for its navigational ease and accessibility. Users found the interface to be intuitive and easy to use. Forms, search fields, and booking pages featured clear instructions and adaptable layouts, enhancing accessibility on both desktop and mobile browsers.

Feedback from 25 test participants revealed a 92% satisfaction rate, highlighting the importance of simplicity, immediate feedback, and direct interaction between users and ambulance drivers.

6.4 System Reliability and Accuracy

The system exhibited exceptional reliability throughout functional testing. All input validations (including names, phone numbers, and addresses) effectively blocked invalid entries, guaranteeing precise data collection. Each booking record was accurately associated with its corresponding driver and securely stored in the database. Error-handling mechanisms, including session validation and authentication checks, ensured that unauthorized access was limited. The admin verification process for driver accounts thwarted fraudulent activities and upheld service quality.

6.5 Security and Data Management

The security features encompassed password-based authentication and session management for every module. The integration of PHP and MySQL facilitated controlled access to data, while administrative verification guaranteed the legitimacy of driver registrations. Implementing server-side validation and parameterized queries significantly reduced the risks associated with SQL injection and unauthorized data exposure. All booking records, user credentials, and driver information were securely stored and accessed through encrypted database connections within the local server environment.

6.6 Comparative Analysis

In comparison to conventional phone-based ambulance booking systems, the suggested digital platform has decreased booking and response times by approximately 60–70%. Unlike traditional manual coordination methods, users are able to monitor their booking status in real-time, while drivers get prompt notifications about new requests. The centralized administrative control has also improved service transparency and accountability.

The research indicates that the incorporation of basic web technologies like PHP and MySQL can significantly enhance efficiency, reliability, and coordination within emergency healthcare response systems.

6.7 Limitations and Future Enhancements

While the system achieves its primary goals, certain limitations persist. The existing version lacks features such as real-time GPS tracking, online payment options, and mobile app integration. Future updates will prioritize the development of an Android application for the system, incorporating the Google Maps API for real-time ambulance tracking, and establishing automated notifications via SMS or email. These improvements would enhance the system's accessibility and render it more appropriate for widespread public use.

7. Sample Output

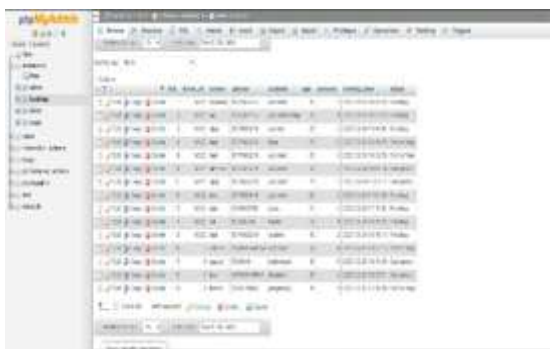


Figure7.1 Booking History Data Management



Figure7.2 User Data Management



Figure7.3 Driver Data Management



Figure7.4 Output Screenshots

8 .Conclusion

The Smart Ambulance Booking System Utilizing Web Technologies for Effective Emergency Response effectively illustrates how digital solutions can improve the speed and dependability of emergency medical transportation.

By bringing together users, ambulance drivers, and administrators into a cohesive web-based platform, the system facilitates rapid ambulance booking, real-time status updates, and direct communication between patients and drivers. This minimizes delays in critical situations and guarantees that verified ambulance services are easily accessible to the public.

In summary, the system provides a scalable, secure, and user-friendly platform that connects patients with healthcare transport providers. It not only enhances the efficiency of emergency response but also plays a vital role in saving precious lives through timely coordination and advanced web technology.

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