

Life Saver: Blood Donation Management System for Efficient Donor-Recipient Coordination

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Abstract - Blood donation plays a crucial role in saving lives during medical emergencies. However, the traditional process of finding suitable blood donors is often time-consuming and inefficient. This paper presents "Life Saver," a Blood Donation Management System designed to facilitate communication between blood donors, recipients, hospitals, and blood banks through a centralized web-based platform. The system enables donor registration, blood request management, donor search based on blood group and location, and real-time notification services. The proposed system improves the efficiency of blood donation management, reduces delays during emergencies, and ensures better utilization of available blood resources. The application is developed using modern web technologies and a relational database management system to provide secure and reliable services.

Keywords

Blood Donation, Web Application, Database Management System, Healthcare System, Donor Management, Emergency Blood Request.

I. INTRODUCTION

Blood is an essential component in healthcare services and is required for surgeries, accident treatments, and various medical procedures. Every year, thousands of patients require immediate blood transfusions. Despite the availability of blood donors, locating suitable donors during emergencies remains a major challenge.

Traditional blood donation systems depend on personal contacts, phone calls, and manual records maintained by blood banks. These approaches are often inefficient and may result in delays during critical situations.

The proposed "Life Saver" Blood Donation Management System aims to overcome these limitations by providing an online platform that connects donors, recipients, hospitals, and blood banks. The system allows users to search for donors based on blood group and location while maintaining donor records in a centralized database.

II. LITERATURE REVIEW

Blood donation management has become an important area of research due to the increasing demand for blood during medical emergencies. Traditional blood donation systems often rely on manual record maintenance and personal communication, resulting in delays and inefficiencies in locating suitable donors.

Several researchers have proposed computerized blood bank management systems to improve donor registration, blood inventory management, and donor-recipient communication. Abdullah et al. developed a blood bank management system that maintained donor information and blood inventory records digitally. Their study demonstrated the benefits of database-driven healthcare applications in improving data accessibility and reducing manual effort.

Shah et al. proposed a Blood Bank Management and Inventory Control System that focused on efficient storage and management of blood inventory data. The system improved blood availability monitoring and reduced errors associated with manual record keeping. However, the system primarily concentrated on inventory management and provided limited support for direct donor-recipient communication.

Sandaruwan et al. introduced a secure blood bank management platform that incorporated user authentication and secure data handling mechanisms. Their work highlighted the importance of information security in healthcare applications and demonstrated how secure web-based systems can enhance trust among users.

Dutta et al. developed an integrated blood donation campaign management system that facilitated donor registration and awareness campaigns. The study emphasized the role of digital technologies in increasing voluntary blood donation participation and improving donor engagement.

Recent advancements in web technologies, cloud computing, and database management systems have enabled the development of more efficient blood donation platforms. Modern systems provide real-time donor search, location-based donor identification, emergency notifications, and centralized data management. These features significantly improve response time during emergencies and enhance communication among donors, recipients, hospitals, and blood banks.

Despite the availability of existing solutions, many systems still face challenges such as limited donor search capabilities, lack of real-time notifications, and inadequate integration between stakeholders. To address these limitations, the proposed **Life Saver: Blood Donation Management System** provides a centralized web-based platform that supports donor registration, blood request management, donor search based on blood group and location, notification services, and administrative monitoring. The proposed system aims to improve blood availability, reduce emergency response time, and enhance overall blood donation management efficiency.

III. EXISTING SYSTEM

The existing blood donation process mainly relies on:

1. Manual donor record maintenance.
2. Phone-based communication.
3. Social media requests.
4. Hospital-maintained donor lists.

Disadvantages

- Time-consuming donor search process.
- Data redundancy and inconsistency.
- Difficulty in maintaining donor records.
- Lack of centralized information.
- Delays during emergency situations.

IV. PROPOSED SYSTEM

The proposed "Life Saver" system is a web-based application that provides a centralized platform for blood donation management.

Objectives

- Maintain donor information efficiently.
- Facilitate quick donor-recipient matching.
- Enable online blood requests.
- Provide secure data storage.
- Improve emergency response time.

Advantages

- Faster donor identification.
- Reduced manual effort.
- Improved data accuracy.
- Enhanced accessibility.
- Better coordination among stakeholders.

V. SYSTEM MODULES

The proposed **Life Saver: Blood Donation Management System** consists of several functional modules designed to facilitate efficient blood donation and blood request management. Each module performs specific operations to ensure smooth communication between donors, recipients, blood banks, and administrators.

A. Donor Module

The Donor Module enables individuals to register as blood donors by providing personal details, blood group information, contact information, and location. Registered donors can log in to the system, update their profiles, view donation history, and respond to blood requests.

Functions:

- Donor Registration
- User Authentication
- Profile Management
- Donation History Management
- Blood Request Response

B. Recipient Module

The Recipient Module allows patients or their representatives to search for blood donors and submit blood requests during emergencies. The module provides quick access to donor information based on blood group and location.

Functions:

- Recipient Registration
- Blood Donor Search
- Blood Request Submission
- Request Status Tracking

C. Blood Bank Module

The Blood Bank Module manages blood inventory information and facilitates communication between blood banks and recipients. It helps maintain updated records of available blood units.

Functions:

- Blood Inventory Management
- Blood Availability Updates

- Blood Request Processing
- Donor Information Management

D. Admin Module

The Admin Module serves as the central management component of the system. Administrators monitor system activities, manage users, verify donor records, and generate reports.

Functions:

- User Management
- Donor Management
- Request Approval and Monitoring
- Report Generation
- System Maintenance

E. Donor Search Module

This module enables efficient donor searching based on blood group, location, and availability. It helps recipients quickly identify suitable donors during emergencies.

Functions:

- Blood Group Search
- Location-Based Search
- Emergency Donor Identification
- Donor Availability Verification

F. Blood Request Management Module

The Blood Request Management Module handles the complete lifecycle of blood requests, from submission to fulfillment.

Functions:

- Blood Request Creation
- Request Processing
- Request Approval
- Request Status Monitoring

G. Notification Module

The Notification Module provides alerts and notifications to donors and recipients regarding blood requests and system updates.

Functions:

- Email Notifications
- SMS Alerts
- Emergency Notifications

- Request Status Updates

H. Report Generation Module

The Report Generation Module generates analytical reports that assist administrators in monitoring system performance and blood donation activities.

Functions:

- Donor Reports
- Blood Request Reports
- Blood Availability Reports
- Statistical Analysis Reports

VI. TECHNOLOGIES USED

The proposed **Life Saver: Blood Donation Management System** was developed using modern web technologies to provide an efficient and user-friendly platform for blood donation management.

A. Front-End Technologies

The user interface was designed using **HTML5**, **CSS3**, and **JavaScript**. These technologies provide an interactive, responsive, and user-friendly environment for donors, recipients, blood banks, and administrators.

B. Back-End Technologies

The application logic and server-side processing were implemented using **PHP**, **Java**, and **Python**. These technologies facilitate secure data processing, user authentication, request management, and system administration.

C. Database Management System

MySQL was used as the backend database to store donor information, recipient details, blood requests, blood inventory records, and administrative data. The database ensures efficient storage, retrieval, and management of information

D. Development Tools

The system was developed using **Visual Studio Code** as the primary development environment. **XAMPP Server** was used to host the application locally and manage database connectivity during development and testing.

E. Operating Environment

The application was developed and tested on the **Windows Operating System** and can be deployed on standard web server environments.

VII. System Architecture

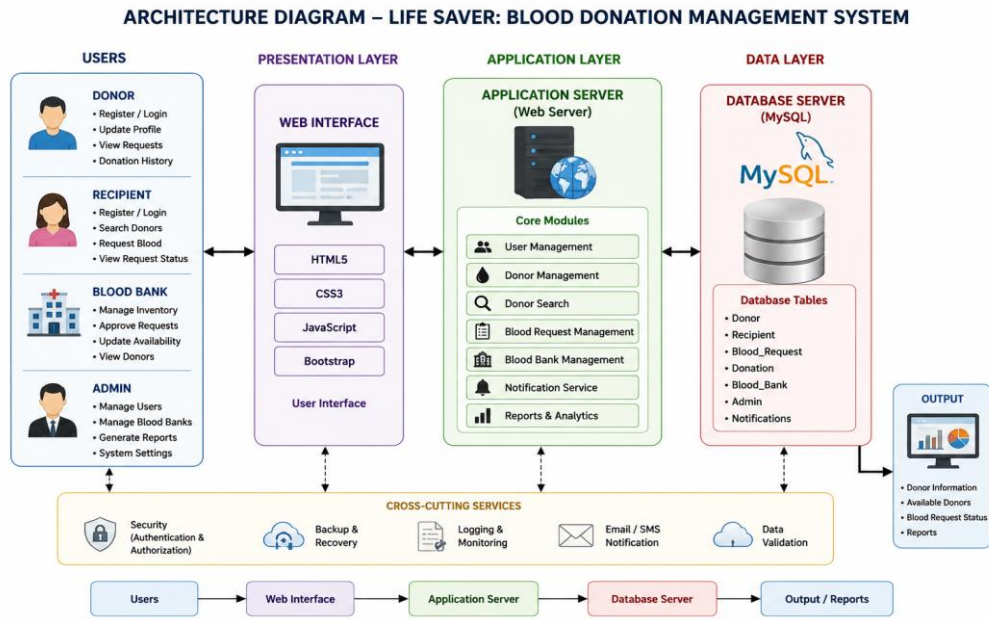


Figure 1. System Architecture Diagram.

VIII. USE CASE DIAGRAM

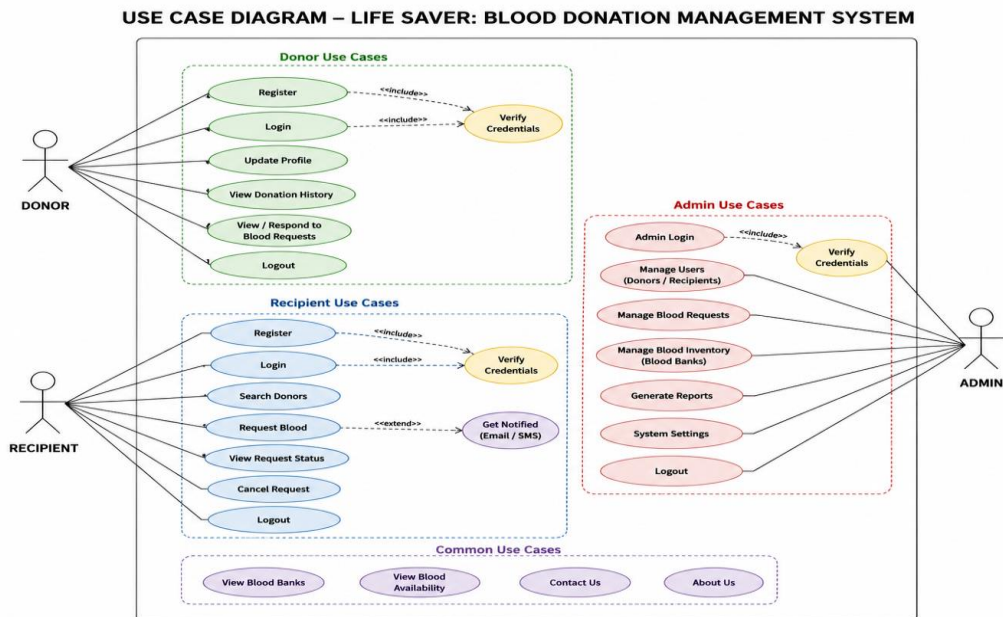


Figure 2. Use Case Diagram.

IX. ER DIAGRAM

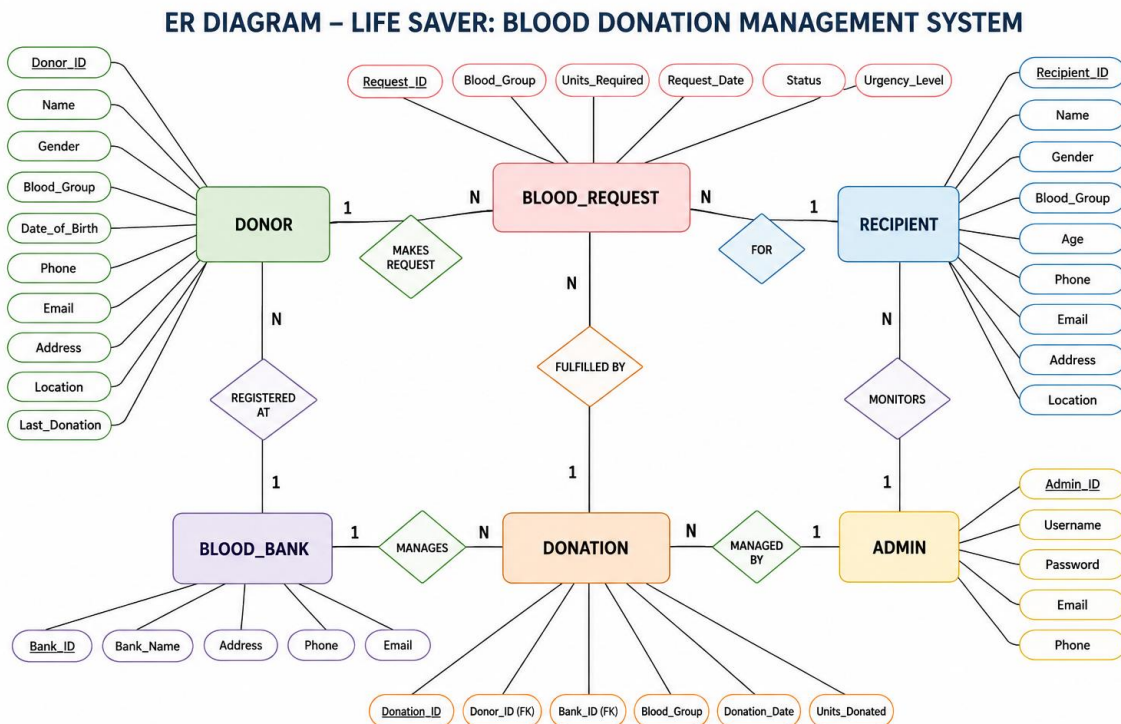


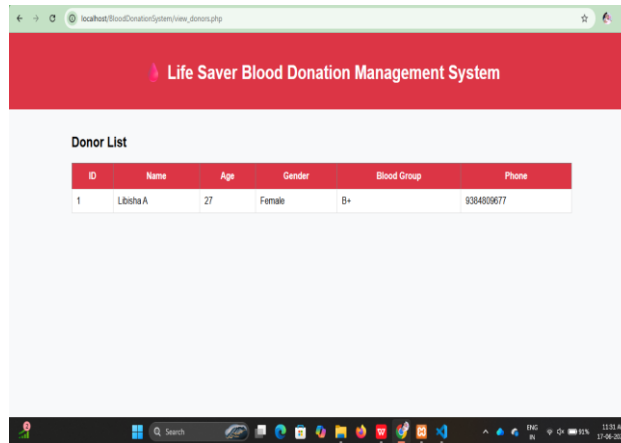
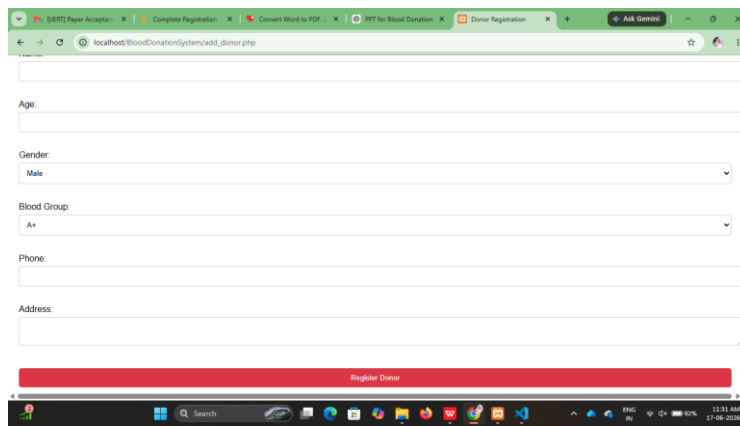
Figure 3. ER Diagram.

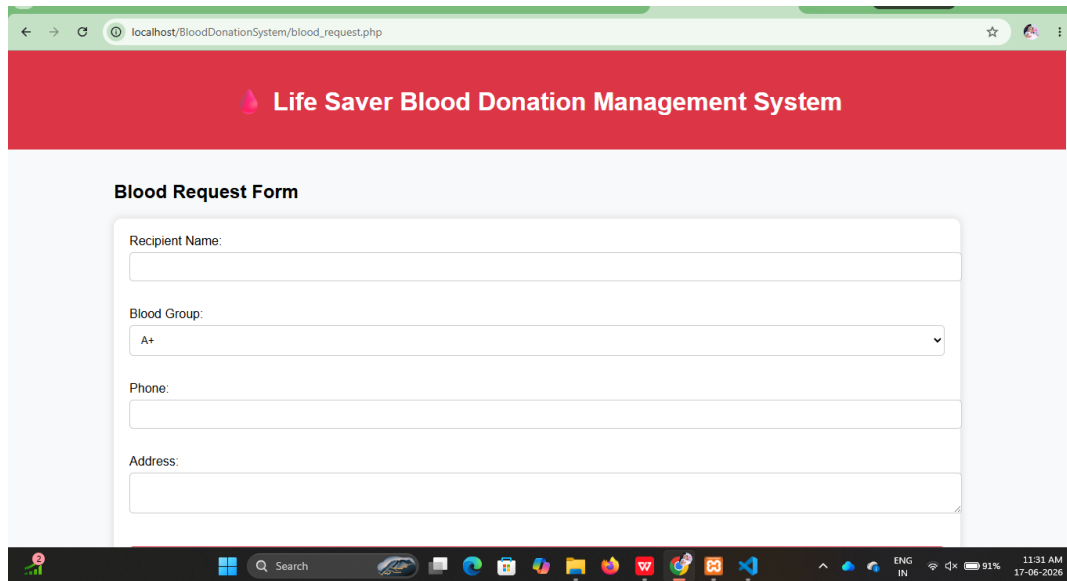
X. IMPLEMENTATION SCREENSHOTS

Admin Login

Username:

Password:





XI. RESULTS AND DISCUSSION

The developed **Life Saver: Blood Donation Management System** was tested to evaluate its functionality, reliability, and performance. Various test cases were executed to verify the correctness of system operations.

The testing process demonstrated successful execution of all major functionalities, including donor registration, user authentication, donor search, blood request submission, and administrative management. The system accurately stored and retrieved donor information from the database and provided efficient donor-recipient matching based on blood group and location.

The donor registration module successfully validated user information and stored records without data loss. The login module authenticated registered users and restricted unauthorized access. The donor search module efficiently displayed available donors according to the specified blood group requirements. The blood request management module enabled recipients to create and track blood requests effectively. Furthermore, the administrative module allowed administrators to monitor users, manage requests, and generate reports.

TEST RESULTS

Module	Test Case	Expected Output	Result
Donor Registration	New Donor Registration	Donor Record Created	Pass
Login Module	Valid Credentials	Successful Login	Pass
Donor Search	Search by Blood Group	Donor List Displayed	Pass
Blood Request Module	Submit Blood Request	Request Created Successfully	Pass
Admin Module	Manage Users	User Information Displayed	Pass
Report Module	Generate Report	Report Generated Successfully	Pass

The test results indicate that the proposed system performs efficiently and satisfies the functional requirements of blood donation management. The implementation reduces manual effort, improves response time during emergencies, and enhances coordination among donors, recipients, and blood banks.

XII. CONCLUSION

The proposed **Life Saver: Blood Donation Management System** provides an efficient and reliable platform for managing blood donation activities and emergency blood requests. The system successfully integrates donors, recipients, blood banks, and administrators through a centralized web-based application.

The implementation of the system enables quick donor identification, efficient blood request processing, secure data management, and effective communication among stakeholders. By automating the blood donation process, the system reduces manual effort, minimizes response time during emergencies, and improves the availability of blood resources.

The testing results demonstrated that the system performs all major functionalities successfully, including donor registration, user authentication, donor search, blood request management, and administrative operations. The proposed solution enhances the overall efficiency of blood donation services and contributes to better healthcare support.

Therefore, the Life Saver Blood Donation Management System serves as a practical and scalable solution for improving blood donation management and ensuring timely access to blood during critical situations.

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