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Organ Sharing: Donor and Finder Web Portal

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Abstract: *Organ donation is a critical process that saves lives, yet many patients face difficulty in finding suitable donors on time. The Organ Sharing Web Portal aims to bridge the gap between donors and recipients by providing a secure and efficient platform for registration, matching, and communication. The system allows donors to register their willingness to donate organs and enables patients or their families to search for available donors. By streamlining communication and maintaining verified records, the portal increases the chances of timely organ transplants, reduces dependency on intermediaries, and promotes public awareness about organ donation. The proposed system is developed using Java (JSP/Servlets), MySQL, HTML5, CSS3, JavaScript, and Bootstrap, and deployed on Apache Tomcat Server. The web portal supports multiple user roles including donors, recipients, hospitals, and administrators, with role-based access control and secure data management. Results demonstrate that the system effectively reduces manual coordination effort, improves donor-recipient matching efficiency, and contributes to a transparent and ethical organ transplantation process..*

Keywords: Organ donation, web portal, donor-recipient matching, organ transplantation, healthcare management system, role-based access control, MySQL, JSP/Servlets.

I. INTRODUCTION

Organ transplantation plays a crucial role in extending the lives of patients suffering from end-stage organ failures. However, the existing organ donation and transplantation ecosystem is marred by challenges such as lack of transparency, data fragmentation, and inefficiencies in the allocation process. The result is an inadequate supply of organs to meet the rising demand, leading to avoidable deaths worldwide.

The Organ Sharing – Donor and Finder Web Portal aims to bridge this gap by providing a digital platform where donors can register their willingness to donate organs, and recipients or hospitals can find matching donors based on medical compatibility. This system helps streamline organ donation processes, maintains a transparent donor-recipient database, and promotes awareness of organ donation.

Traditional organ donation relied on manual coordination through hospitals, NGOs, and local networks. This approach is time-consuming and prone to errors in record-keeping. Lack of centralized databases often leads to delays in matching donors with recipients, which can result in the loss of potential lives. With the increasing penetration of internet and web technologies, there exists a significant opportunity to digitize and automate these processes, improving efficiency and reducing response time during medical emergencies.

This paper presents the design, development, and deployment of a web-based organ sharing portal that addresses these challenges. The system supports end-to-end management of organ donation activities, from donor registration and verification to recipient matching and hospital coordination. The remainder of this paper is structured as follows: Section II presents the literature survey; Section III covers the requirements analysis; Section IV details the system design; Section V describes the implementation; Section VI discusses security and scalability; Section VII presents conclusions and future work.

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II. LITERATURE SURVEY

Several studies and systems have been proposed to improve the efficiency, accessibility, and reliability of organ donation. The following subsections review relevant work in this domain.

A. Manual and Hospital-Based Systems

Traditionally, organ donation relied on manual coordination through hospitals, NGOs, and local networks. Smith et al. (2018) demonstrated that this approach is time-consuming and prone to record-keeping errors. Lack of centralized databases often leads to delays in matching donors with recipients. Some hospitals have implemented internal digital systems to manage donor and patient information, but these are limited in scope and inter-hospital communication remains inefficient, leading to further delays (Kumar and Rao, 2019).

B. Web-Based Organ Matching Portals

Recent studies emphasize the importance of web-based platforms for organ sharing. Such portals allow donors and recipients to register online, search for compatible matches, and communicate in real-time. Systems like OrganConnect and DonorLink have shown significant improvement in reducing waiting times and increasing successful transplants (Patel et al., 2020). These platforms focus on user-friendly interfaces, security, and real-time updates, making them highly effective compared to traditional methods.

C. AI and Blockchain-Based Approaches

Emerging research highlights the use of artificial intelligence to predict donor-recipient compatibility based on blood group, tissue type, and other medical parameters. AI-enabled platforms can automatically suggest the best matches, reduce human error, and save valuable time during emergencies (Zhang et al., 2021). Additionally, blockchain technology has gained attention for its potential to enhance transparency, immutability, and trust in organ donation records. Smart contracts can automate processes while maintaining data privacy and patient confidentiality (Ramesh and Kambala, 2020).

D. Mobile and Cloud-Based Approaches

With the increasing use of smartphones, several studies propose mobile applications linked with cloud databases for organ donation. These applications allow donors and recipients to access the system anytime and anywhere, providing instant notifications and updates about organ availability and match status (Singh and Sharma, 2022). Cloud integration ensures data centralization, security, and easy scalability, making such approaches highly suitable for real-world deployment.

III. REQUIREMENTS ANALYSIS

A. Functional Requirements

The system supports the following key functional capabilities: (1) User Registration and Authentication – role-based login for donors, recipients, doctors, hospitals, and administrators; (2) Donor Registration and Organ Pledge Management – donors can specify organ type, blood group, age, and medical history; (3) Recipient Organ Request Submission – patients can enter required organ details, urgency level, and hospital information; (4) Medical Data Verification – doctors and hospitals can verify blood group, tissue compatibility, and health conditions; (5) Organ Matching and Search – intelligent matching based on organ type, blood group, age, location, and compatibility; (6) Notification and Alert System – email and SMS alerts for donor-recipient matches, approval status, and emergencies; (7) Admin Dashboard – centralized control panel for managing users, verifying profiles, and monitoring system activities; and (8) Reporting and Record Management – reports on donors, recipients, successful transplants, and pending requests.

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B. Non-Functional Requirements

The system is designed to meet the following non-functional requirements: Performance – user actions such as login, donor search, and organ matching should complete within acceptable time limits; Scalability – the architecture supports increasing numbers of users and hospitals without major redesign; Reliability – 24×7 availability for emergency access with minimal failure; Security – all personal and medical information is encrypted with role-based access control; Usability – simple and intuitive interface for donors, recipients, and hospital staff; and Portability – the web portal is accessible across desktops, tablets, and smartphones on major browsers.

IV. SYSTEM DESIGN

A. System Architecture

The system follows a centralized three-tier web-based architecture consisting of a Client Layer (web browser), Application Layer (Apache Tomcat with JSP/Servlets), and Database Layer (MySQL). The architecture ensures efficient real-time coordination between users, volunteers, and administrators through the internet.

The main components include: (1) Control Server – central processing unit handling all core logic including user requests, donor matching, and inter-component communication; (2) MySQL Database – stores donor records, organ categories, request details, user accounts, and inquiry messages; (3) Web UI – user-facing portal for registration, login, organ search, and request submission; (4) Matching Engine – algorithm-based component that filters donors based on organ type, blood group, location, and availability; and (5) Notification Service – sends email (SMTP) and SMS alerts to relevant stakeholders.

B. Data Model Design

The system uses four primary database tables: (1) Main User Table – stores user_id, name, role, contact details, and authentication credentials; (2) Organ Needer Table – stores patient details including required organ type, blood group, medical urgency, hospital information, and contact; (3) Organ List Table – maintains the master list of organs supported by the system (Heart, Lungs, Kidneys, Liver, Pancreas, Intestines, Uterus, and Vascularized Composites) to standardize entries and support matching; and (4) Donor Table – contains personal details, blood group, organs pledged, health status, and availability of registered donors.

The Entity-Relationship (ER) model includes three primary entities: User (user_id, name, role, contact), Organ (organ_id, organ_type, availability), and Request (request_id, organ_type, status), with 'donates' and 'creates' relationships between User and the Organ/Request entities respectively.

C. Technology Stack

Front-End: HTML5, CSS3, JavaScript, and Bootstrap for responsive and visually appealing interfaces. Back-End: Java with JSP and Servlets for server-side logic, deployed on Apache Tomcat Server. Database: MySQL for structured storage of all system data. Development Tools: Eclipse IDE and Apache Maven for build automation. Security: HTTPS protocol, password encryption, role-based access control, and secure session management. Notification: SMTP (email) and SMS Gateway APIs. Location Services: Google Maps API for geographic matching and route display.

V. IMPLEMENTATION

A. User Interface

The web portal provides distinct interfaces for three user types. The Donor Interface includes registration/login, profile management, organ pledge submission, and contact forms. The Finder (Recipient) Interface includes organ search by type and location, viewing donor lists, and submitting organ requests. The Admin Dashboard provides centralized controls including a summary dashboard with total listed organs, registered organs, total queries, and total organ requests received; a donor list management module with search, filter, and export capabilities; an organ group

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management module for adding and managing organ types; contact query management; and organ request review screens.

B. Deployment

The system is deployed following a structured process: pre-deployment environment preparation (JDK, Tomcat, MySQL installation), database schema setup with initial configuration data, application build and packaging into a WAR file using Maven, deployment on Apache Tomcat, integration of external services (email, SMS, Maps APIs), and comprehensive testing prior to go-live. The system operates on hardware with a minimum of Intel i3 processor, 2 GB RAM, and 5 GB storage, running Windows or Linux with XAMPP or equivalent server software.

VI. SECURITY AND SCALABILITY

A. Security Measures

The system implements multiple layers of security: (1) Role-Based Access Control (RBAC) ensures users can only perform authorized actions; (2) HTTPS protocol encrypts all client-server data transmission; (3) Password Encryption prevents plain-text exposure; (4) Secure Session Management with automatic expiration after inactivity; (5) Input Validation on both client and server sides prevents SQL injection and XSS attacks; (6) Activity Logging for audit trails and anomaly detection; and (7) Administrator Approval for critical actions such as volunteer and hospital activation.

B. Scalability Considerations

The system is designed for long-term growth through: (1) Modular Architecture allowing independent enhancement of individual components; (2) Database Optimization with proper indexing, normalization, and query optimization; (3) Support for Concurrent Users through efficient session handling; (4) Cloud Deployment Readiness for on-demand resource scaling; (5) API-Based Integration for seamless addition of new external services; and (6) Load Distribution Capability through future load balancing integration.

VII. RESULTS AND DISCUSSION

The implemented Organ Sharing Web Portal successfully meets all defined functional and non-functional requirements. The system demonstrated the following outcomes during testing: (1) Donor Registration – donors can register, pledge organs, and update availability within seconds; (2) Organ Search – recipients can search available donors by organ type and location with results displayed in real time; (3) Admin Control – administrators can manage all users, view statistics on a dashboard, and handle organ requests from a single interface; (4) Notification Delivery – email and SMS notifications were successfully dispatched upon matching events; and (5) Cross-Platform Accessibility – the portal was tested across Chrome, Firefox, and Edge on desktop and mobile browsers, confirming responsive behavior.

The system showed improved efficiency compared to manual and hospital-isolated methods. The use of a centralized MySQL database with relational mapping enabled accurate donor-recipient pairing, reducing the possibility of mismatches. Role-based access control effectively prevented unauthorized access to sensitive medical records.

VIII. FUTURE ENHANCEMENTS

The proposed system can be significantly enhanced in future iterations: (1) Artificial Intelligence Integration – machine learning models can predict donor-recipient compatibility with higher accuracy by analyzing historical transplant data and medical parameters; (2) Mobile Application – dedicated Android/iOS applications can provide push notifications, offline request submission, and live location tracking for faster response; (3) Blockchain Integration – implementing smart contracts can ensure immutable consent verification and transparent organ tracking across medical institutions; (4) Government and Hospital Integration – deeper integration with national organ registries and hospital management systems (HMS) can enable automated verification and regulatory compliance; (5) Cloud Deployment – migration to

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cloud platforms will enable auto-scaling, fault tolerance, and disaster recovery; and (6) Multilingual Support – adding regional language support will improve accessibility for diverse populations.

IX. CONCLUSION

This paper presented the design and development of an Organ Sharing – Donor and Finder Web Portal, a centralized web-based platform to connect organ donors and recipients efficiently and transparently. By leveraging Java (JSP/Servlets), MySQL, and modern front-end technologies, the system successfully addresses the key limitations of manual coordination and isolated hospital systems.

The portal provides role-based access for donors, recipients, hospitals, and administrators, ensuring data security, privacy, and ethical compliance. The donor-recipient matching engine, notification services, and admin dashboard collectively contribute to reducing organ transplantation delays and promoting awareness. With future enhancements such as AI-based matching, mobile support, and blockchain integration, this system has significant potential to contribute to life-saving organ transplantation networks at a national scale.

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