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Design and Implementation of a Web-Based Food Donation System Using ReactJS and Spring Boot

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ABSTRACT: Food wastage and hunger coexist as major social problems, especially in developing regions. Large amounts of surplus food generated by households, restaurants, and events are often wasted due to lack of proper coordination, while many people, NGOs, and shelters suffer from food scarcity. This paper presents the design and implementation of a web-based Food Donation Management System that digitally connects food donors and receivers through a centralized platform. The proposed system is developed using ReactJS for the frontend and Spring Boot for the backend, ensuring scalability, security, and responsiveness. The platform provides separate modules for donors and receivers with secure login and signup using mobile numbers. Donors can submit food details such as food name, quantity, expiry date, and availability, while receivers including NGOs, ashrams, and individuals can request food and track delivery status. The system also provides donation history and real-time status updates, ensuring transparency and accountability. Experimental results demonstrate that the proposed solution effectively reduces food wastage, improves donation management, and enhances accessibility for social welfare organizations.

KEYWORD: Food Donation System, Web-Based Application, ReactJS, Spring Boot, Food Wastage Reduction, Donor–Receiver Platform, NGO Support System, Role-Based Authentication, Real-Time Tracking, Social Welfare Technology

I.INTRODUCTION

Food insecurity remains a significant global challenge, while food wastage continues to increase due to inefficient distribution systems. According to various studies, a substantial portion of edible food is discarded every day, even though millions of people struggle to obtain regular meals. This imbalance highlights the urgent need for a systematic and technology-driven solution to manage surplus food distribution.

Traditional food donation processes rely on manual coordination through phone calls, social media, or local volunteers. These methods lack proper tracking, transparency, and timely communication, which often leads to delays and further wastage of food. Donors also have limited visibility regarding whether their donated food has reached the intended receivers.

With advancements in web technologies, digital platforms can play a vital role in addressing this issue. Web-based systems offer real-time interaction, data management, and accessibility across different user groups. ReactJS enables the development of dynamic and user-friendly interfaces, while Spring Boot provides a secure and robust backend for handling business logic and data processing.

This paper proposes a Food Donation Management System that digitally connects donors and receivers on a single platform. The system aims to simplify the donation process, ensure transparency, and improve coordination among stakeholders.

II. RELATED WORK AND EXISTING SYSTEMS

Several researchers have explored the application of information technology in managing food donation and redistribution processes. Existing studies highlight the importance of digital platforms in reducing food wastage and improving coordination among stakeholders.

Ghosh et al. proposed a community-based food sharing platform that allows users to post surplus food details and request food through a digital interface [1]. While the system improved communication efficiency, it lacked structured role-based access control and scalable backend architecture.

Patel and Shah designed a centralized food donation management system aimed at supporting NGOs and charitable organizations [2]. The system focused on manual verification and administrative control, which limited automation and real-time interaction between donors and receivers.

Kumar et al. developed a web-based surplus food redistribution system using basic web technologies [3]. Although the system reduced food wastage at a local level, it lacked modern frontend frameworks and advanced authentication mechanisms, affecting usability and security.

Singh et al. emphasized the role of modern web frameworks in enhancing responsiveness and scalability in social welfare applications [4]. Their study highlighted that systems built with component-based architectures provide better maintainability and user experience.

More recent research by Verma and Jain discussed the importance of structured requirement analysis and system architecture in developing scalable donation platforms [5]. However, many existing works focus on implementation outcomes rather than detailed design and architectural modelling. The proposed system addresses this gap by emphasizing requirement specification, modular design, and system architecture using modern web technologies.

Some mobile applications allow donors to post food availability, but they often lack structured data storage and proper verification mechanisms. Additionally, many systems do not provide clear separation between donor and receiver functionalities, which reduces usability and efficiency.

Research studies suggest that centralized web-based platforms with role-based modules can significantly improve food donation management. However, many existing solutions do not provide complete end-to-end workflow management, including donation tracking, request status updates, and delivery confirmation.

The limitations of current systems emphasize the need for a robust, scalable, and transparent food donation platform, which the proposed system aims to provide.

III. PROPOSED SYSTEM AND METHODOLOGY

The proposed Food Donation Management System is designed as a web-based application that automates and streamlines food donation activities.

System requirements

A. Functional requirements

The system must allow users to register and log in using their mobile numbers.
The system must provide role selection during signup for donors and receivers.
Donors must be able to add food donation details such as food name, quantity, and expiry date.
Receivers must be able to view available donations and place food requests.
The system must track the status of food donations and requests.
The system must store and retrieve donation and request data securely.

B. Non-Functional Requirements

The system should be user-friendly and accessible through standard web browsers.
The system should ensure data security and privacy.
The system should be scalable to support multiple users.
The system should provide fast response times.
The system should be maintainable and modular.

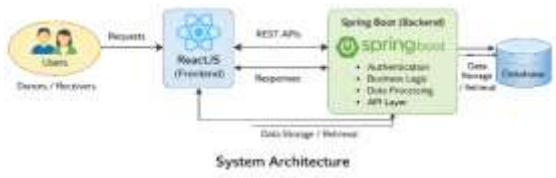
System architecture

The system follows a client-server architecture. The ReactJS frontend acts as the client, providing interactive interfaces for donors and receivers. The Spring Boot backend acts as the server, handling authentication, validation, and database operations.

User requests are sent from the frontend to the backend through REST APIs. The backend processes the request, interacts with the database, and sends responses back to the frontend. This architecture ensures secure and efficient data flow.

The system workflow begins with user registration and login. After authentication, users are directed to dashboards based on their roles.

Donors enter food donation details, which are stored in the database. Receivers view available donations and submit requests. The system updates the donation and request status accordingly.



System Architecture

IV. EXPERIMENTAL SETUP AND DATA COLLECTION

The experimental setup for the proposed Food Donation Management System was designed to evaluate the effectiveness of the web-based platform in managing food donations and requests between donors and receivers. The primary objective of the experimentation was to analyze the system's ability to accurately store donation information, process food requests, and provide real-time status tracking with minimal manual intervention.

Dataset Preparation

The dataset used for experimentation consisted of user-generated data collected through the system interface. This included donor registration details, receiver registration details, food donation records, and food request records. Donor data included information such as food name, quantity, expiry date, and availability status. Receiver data included organization type such as NGO, ashram, or individual, along with food request details.

Sample datasets were created to simulate real-world scenarios involving multiple donors and receivers. Various test cases were prepared to represent different donation quantities, food types, expiry dates, and request statuses. This dataset preparation approach ensured realistic testing conditions and proper evaluation of system functionality.

Development Environment

The proposed system was implemented using modern full-stack web development technologies. The frontend was developed using ReactJS, which provides a dynamic and responsive user interface. The backend was developed using Spring Boot, which handles authentication, business logic, and database operations.

The development and testing environment included: Visual Studio Code as the primary development tool, Spring Boot REST APIs for backend services, Web browsers such as Google Chrome for testing responsiveness and usability The system was tested locally to ensure secure and reliable data handling and smooth interaction between frontend and backend components.

Evaluation Criteria

The system was evaluated using both functional and performance-based criteria. These included: Accuracy of donor and receiver registration, Correct storage and retrieval of food donation data, Successful processing of food requests, Real-time status updates for donated and received food, Response time of the system, Overall usability and user experience

The evaluation focused on determining whether the system met functional requirements and provided a transparent donation process.

Experimental Procedure

During experimentation, multiple users were simulated as donors and receivers. Donors registered on the platform, logged in using their mobile numbers, and added food donation details. Receivers logged in, selected their organization type, and placed food requests. The system's ability to update donation and request statuses was observed and analysed.

Each test case was executed under controlled conditions to ensure consistent results. The experimental setup provided a practical evaluation of the system's capability to manage food donation

VI. CONCLUSION AND FUTURE SCOPE

This paper presented the design and implementation of a web-based Food Donation Management System using ReactJS and Spring Boot. The system provides a transparent, efficient, and user-friendly platform for managing food donations.

Future enhancements may include mobile application integration, GPS-based matching of donors and receivers, notification systems, and advanced analytics to support large-scale food distribution initiatives.

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