A Web-Based Food Donation and Redistribution System to Minimize Food Waste and Support NGOs

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Abstract: The increasing levels of food waste alongside the persistent issue of hunger highlight the urgent need for efficient food redistribution mechanisms. However, conventional food donation processes often rely on manual coordination, leading to delays, miscommunication, and significant food spoilage before it reaches those in need. This paper presents a Web-Based Food Donation and Redistribution System designed to bridge the gap between food donors and non-governmental organizations (NGOs) through a centralized digital platform. The proposed system enables donors such as restaurants, event organizers, and households to register surplus food in real time, while nearby NGOs can view, accept, and coordinate collection efficiently. Location-based tracking and automated notification features ensure timely communication and reduce response delays. The system leverages modern web technologies and database management to maintain secure records of donations, users, and distribution activities. An administrative module oversees verification and system monitoring to ensure reliability and transparency. The system is evaluated using simulated operational scenarios, demonstrating improvements in coordination speed, reduction in food wastage, and increased distribution efficiency compared to traditional manual donation methods. The proposed platform offers a scalable and practical solution for addressing food waste while supporting hunger relief initiatives.

Keywords: Food Donation, Food Waste Management, NGO Coordination, Web Application, Real-Time Distribution, Smart Donation System

I. INTRODUCTION

Food wastage and hunger continue to be critical global challenges, with millions of people suffering from food insecurity while a substantial portion of produced food is discarded daily. Restaurants, households, events, and other food establishments generate significant quantities of surplus food that often go unused due to inefficient donation and distribution mechanisms. Traditional food donation processes primarily rely on manual coordination through phone calls, informal networks, or physical visits, which can lead to delays, miscommunication, and spoilage of perishable items before they reach those in need.

Digitalization and web-based systems provide an opportunity to streamline food donation processes, improve efficiency, and reduce wastage. However, most existing platforms lack features such as real-time donor–NGO matching, location-based alerts, and automated notifications, which are essential for timely and effective food redistribution.

1.1 Project Description

This project focuses on the design and implementation of a **Web-Based Food Donation and Redistribution System** that enables efficient coordination between food donors and NGOs. The system allows donors—such as restaurants, event organizers, and households—to register surplus food with details such as type, quantity, and location. Nearby NGOs can access these listings in real time, accept donations, and coordinate collection efficiently. Key features of the system include location-based tracking, automated notifications, and an administrative module to verify users and oversee operations. The platform leverages modern web technologies and database management to ensure secure, scalable, and reliable handling of donation data. The primary objective is to minimize food wastage, support hunger relief initiatives, and provide a practical solution for real-time food redistribution.

1.2 Motivation

Food wastage and hunger coexist as a paradox in today's world, highlighting the urgent need for systems that can bridge the gap between surplus food and needy populations. Manual food donation processes are time-consuming, error-prone, and often fail to deliver perishable food items in a timely manner. Additionally, many NGOs and volunteers struggle to identify available donations promptly, reducing the effectiveness of their efforts.

II. RELATED WORK

Paper [1] presents a mobile food rescue application that connects restaurants and households with nearby NGOs for surplus food distribution, demonstrating improved donor–NGO engagement through a digital platform.

Paper [2] proposes a web-based food donation system that uses automated notifications and real-time listing updates to reduce delays in food collection, thereby minimizing food spoilage during the donation process.

Paper [3] discusses the implementation of location-based tracking in food donation platforms, highlighting the effectiveness of GPS integration in optimizing distribution routes and ensuring timely delivery of perishable items.

Paper [4] reviews existing NGO coordination systems and food redistribution platforms, emphasizing the importance of scalable architecture, secure user data management, and automated verification processes to enhance reliability and trust.

Paper [5] introduces a cloud-based surplus food management system that integrates donor registration, NGO acceptance, and administrative oversight, focusing on performance optimization, transparency, and reduction of food wastage.

III. METHODOLOGY

A. System Architecture

The he proposed **Food Donation and Redistribution System** follows a **three-tier architecture** consisting of a **presentation layer**, **application layer**, and **data layer**:

- **Presentation Layer:** Provides a responsive web interface for donors, NGOs, and administrators to interact with the system.
- **Application Layer:** Hosts the business logic, notification services, and location-based tracking modules.
- **User Interface Module:** Allows donors to post surplus food, NGOs to view and accept donations, and admins to manage system operations.
- **Notification & Alert Module:** Sends automated alerts to nearby NGOs for new donations.
- **Administrative Module:** Verifies users, monitors activities, and ensures transparency and reliability.
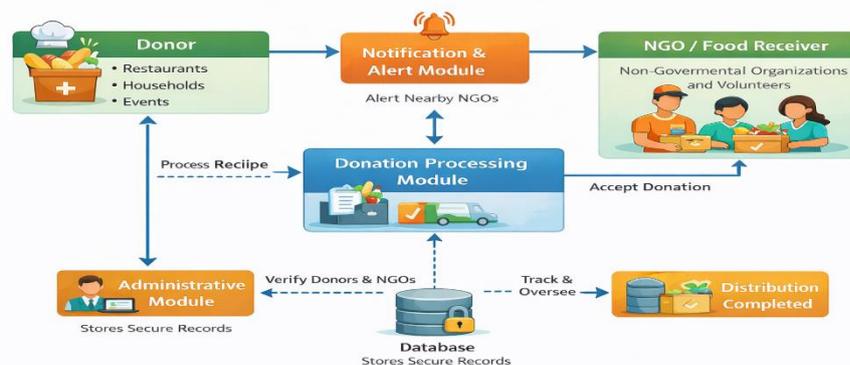- **Database and Security Layer:** Stores secure records of all users, donations, and distributions.

Fig. 1. Flowchart of methodology

B. Donation Processing Module

Donors (restaurants, events, households) register surplus food through the web interface by providing details such as food type, quantity, pickup location, and expiry time. The system stores this information securely in the database and forwards alerts to nearby NGOs. The module ensures that all donation records are complete, valid, and verified by administrators before being listed for pickup.

C. NGO Assistance & Notification Module

NGOs can view all active donations in real time and receive automated notifications when new donations are posted nearby. The system uses **location-based tracking** to help NGOs identify the nearest donation points and plan collection routes efficiently. Administrators monitor the donation process and ensure timely collection and distribution, reducing food spoilage and improving coordination.

D. Notification and Scheduling Module

The notification module plays a crucial role in ensuring timely food distribution. When a donor registers surplus food, the system automatically identifies nearby NGOs based on location data and sends real-time alerts through in-app notifications, email, or SMS. These alerts include details such as food type, quantity, pickup location, and expiry time.

E. Implementation Flow
1. Donor registers and logs into the system.
2. **Donor uploads food donation details** including type, quantity, location, and estimated expiry time.
3. **System stores the donation** and triggers the notification module to alert nearby NGOs.Chatbot assists the user throughout the process.
4. **NGO receives notification** and views donation details through the dashboard
5. **NGO accepts the donation request** and coordinates food collection.
6. **System logs all activities** for reporting, performance analysis, and future optimization.

F. Hardware and Software Components

Hardware Components: The system requires a standard computing platform with a minimum Intel Core i5 (or equivalent) processor, 8 GB RAM, stable broadband internet connectivity, and a web-enabled device such as a desktop, laptop, or smartphone for accessing the system and receiving notifications.

Software Components: The system is implemented using **HTML, CSS, and JavaScript (or React)** for the user interface, **Python / Node.js / PHP** for backend service development, and **MySQL or MongoDB** for database management. Location services are integrated using **Google Maps API** or similar mapping services.

IV.SYSTEM IMPLEMENTATION AND EVALUATION

This section describes the detailed implementation of the proposed **Web-Based Food Donation and Redistribution System** and presents the evaluation methodology adopted to assess its performance, reliability, and usability.

A. System Architecture and Deployment
The proposed system follows a **cloud-based client–server architecture**. The frontend provides a responsive web interface for donors, NGOs, and administrators to register, manage donations, and track distribution activities. The backend handles business logic, user authentication, donation processing, and notification services through secure RESTful APIs.

B. Donation Processing Implementation
The donation processing module allows donors to upload surplus food details, including food type, quantity, pickup location, and expiry time. The system validates the entered information and stores it in the database. Once a donation is registered, the module triggers the notification service to alert nearby NGOs.

C. NGO Interaction and Coordination Module
The NGO interface enables registered organizations to view available donations in real time. NGOs can filter donations based on location and urgency, accept requests, and coordinate pickup.

D. Notification and Alert System Implementation
The notification engine generates real-time alerts whenever a new food donation is posted. Notifications are sent to nearby NGOs via in-app alerts, email, or SMS.

E. Performance Evaluation Metrics
System performance is evaluated using the following metrics:
- Donation Matching Time – Time taken to connect a donor with an NGO
- NGO Response Time – Time between notification and acceptance
- Successful Distribution Rate – Percentage of donations successfully collected

F. Experimental Setup and Results Analysis
The system is tested using simulated donation scenarios involving multiple donors and NGOs operating simultaneously. Various donation entries were created with different locations and expiry times to evaluate notification efficiency and coordination speed.

G. Results and Observations
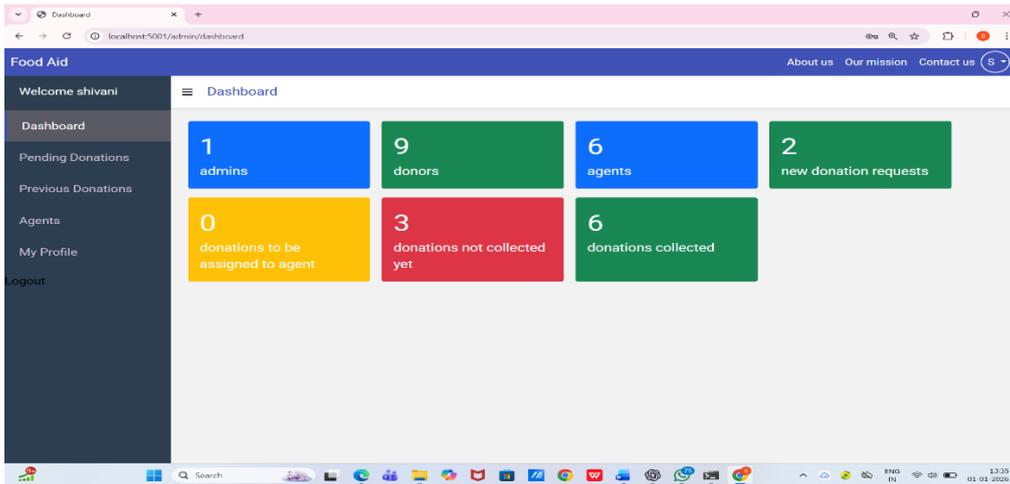1.System Home / Dashboard
2.Pending Donations
3.Assignement Details

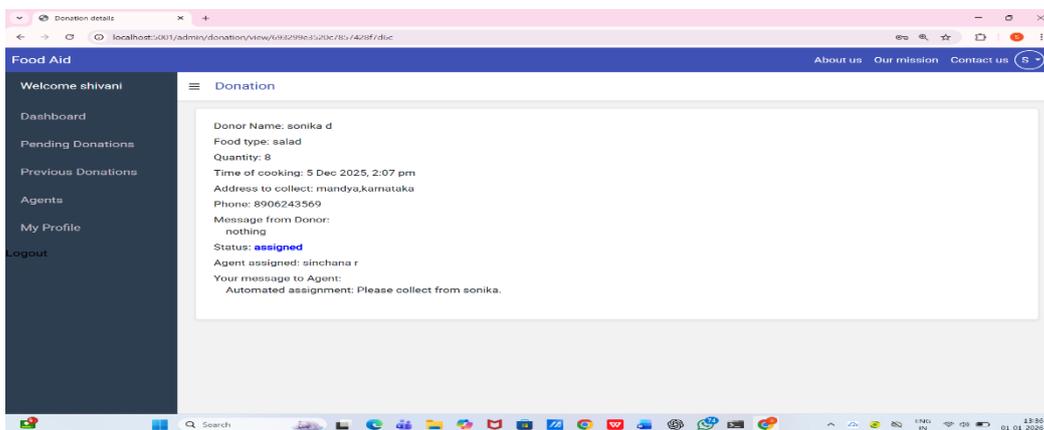FIG. 2. SYSTEM HOME / DASHBOARD

Fig. 3. Pending Donations

Fig. 4. Assignement Details

V. RESULTS AND DISCUSSION

The experimental evaluation demonstrates that the proposed Food Donation Management System successfully streamlines the process of connecting food donors with needy recipients through an intelligent and automated digital platform. The system effectively reduces food wastage by enabling real-time donation listings and quick matching with nearby collection centers or volunteers.

The notification system provides instant alerts to volunteers and organizations whenever a new donation is available, significantly improving response time. The admin monitoring dashboard allows efficient oversight of donations, users, and distribution activities, reducing manual coordination efforts.

Overall system performance shows improved operational efficiency, faster food redistribution, reduced communication gaps, and higher user satisfaction among donors, volunteers, and beneficiary organizations.

VI. CONCLUSION

This paper presents a **Smart Food Donation Management System** designed to reduce food wastage and improve food distribution to underprivileged communities. The system integrates real-time donation tracking, location-based matching, automated notifications, and centralized administration to ensure efficient food redistribution.

By leveraging web technologies and intelligent coordination mechanisms, the platform provides a reliable, scalable, and user-friendly solution for managing surplus food donations. The results indicate that the system significantly decreases response time, improves logistical coordination, enhances transparency, and increases successful donation fulfillment rates.

VII. FUTURE WORK

Future enhancements can focus on integrating **AI-based demand prediction models** to forecast food requirements in different regions and optimize distribution planning. Image recognition can be incorporated to automatically classify donated food items and assess their condition.

The platform can be extended with **multilingual support** to increase accessibility for diverse user groups. Integration with **IoT-enabled temperature monitoring sensors** in transport vehicles can help ensure food safety during delivery.

Blockchain technology can be adopted to improve transparency and traceability in donation records. Additionally, a mobile application version of the system can enhance accessibility and allow real-time volunteer coordination. Cloud-based analytics can further help organizations analyze donation trends and improve resource planning.

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