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A Smart Web-Based Food Rescue Platform Using GPS Tracking, OTP Verification, and Voice-Enabled Food Donation Management

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Abstract: *Food waste has become one of the major global challenges, resulting in significant economic loss, environmental degradation, and food insecurity. In India, millions of tonnes of edible food are discarded every year, while a large population continues to face hunger and malnutrition. The lack of efficient coordination between food donors and charitable organizations often leads to the wastage of surplus food. Existing food donation systems largely depend on manual communication through phone calls or messaging applications, which causes delays, poor coordination, and the absence of proper verification mechanisms. To address these challenges, this research proposes* ***Food Bridge****, a smart web-based food rescue platform that digitizes and automates the complete food donation process. The system connects restaurants, hotels, NGOs, and volunteer runners through a unified platform with dedicated role-based dashboards. It incorporates real-time GPS tracking to monitor food delivery, dual One-Time Password (OTP) verification to ensure secure pickup and delivery confirmation, voice-enabled food listing using the Web Speech API, automated email notifications, countdown timers for food expiry, and MongoDB cloud storage for efficient data management. The platform is developed using Python Flask, MongoDB Atlas, HTML5, CSS3, JavaScript, and Leaflet.js. The proposed system improves operational efficiency, reduces food wastage, enhances transparency, and ensures accountability throughout the donation lifecycle. Experimental implementation demonstrates that FoodBridge provides a reliable, scalable, and user-friendly solution for surplus food redistribution. The platform has the potential to support sustainable food management practices and contribute to achieving the United Nations Sustainable Development Goal 2 (Zero Hunger) by facilitating timely distribution of surplus food to needy communities*

Keywords: Food Rescue, Food Waste Management, GPS Tracking, One-Time Password (OTP), Flask Framework, MongoDB Atlas, Voice Recognition, Web-Based Application

I. INTRODUCTION

Food waste has emerged as one of the most pressing global challenges affecting economic development, environmental sustainability, and food security. According to the Food and Agriculture Organization (FAO), nearly one-third of all food produced worldwide is either lost or wasted each year, despite millions of people suffering from hunger and malnutrition. In India, approximately 68 million tonnes of food are wasted annually due to inefficient food distribution, improper storage, and lack of coordination between food donors and charitable organizations. This imbalance highlights the urgent need for innovative technological solutions capable of connecting surplus food providers with communities in need.

The rapid growth of information and communication technologies has transformed various sectors by enabling real-time communication, automation, and digital service delivery. Web-based platforms, cloud computing, Global Positioning System (GPS) technology, and mobile internet have created new opportunities for addressing social challenges through

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smart applications. Digital food rescue platforms can significantly reduce food wastage by automating the donation process, improving communication among stakeholders, and ensuring timely delivery of surplus food to beneficiaries. However, many existing food donation systems still rely on manual coordination through phone calls or messaging applications, resulting in delayed pickups, poor accountability, and inefficient resource utilization.

To overcome these limitations, this study proposes **FoodBridge**, a smart web-based food rescue platform designed to streamline and digitize the complete food donation lifecycle. The system integrates modern web technologies with real-time GPS tracking, dual One-Time Password (OTP) verification, voice-enabled food listing, automated email notifications, and role-based dashboards for restaurants, non-governmental organizations (NGOs), and volunteer runners. By incorporating these intelligent features, FoodBridge enhances transparency, improves coordination among participants, and ensures secure verification of food pickup and delivery.

The application is developed using **Python Flask**, **MongoDB Atlas**, **HTML5**, **CSS3**, **JavaScript**, **Leaflet.js**, and the **Web Speech API**, providing a lightweight, scalable, and user-friendly architecture suitable for deployment in urban and semi-urban environments. The proposed system not only minimizes food wastage but also supports sustainable development by improving food redistribution efficiency and reducing operational delays.

Overall, FoodBridge demonstrates how digital technologies can contribute to social welfare by connecting food donors with beneficiaries through a secure, transparent, and efficient platform. The proposed solution supports the United Nations Sustainable Development Goals (SDGs), particularly **SDG 2 (Zero Hunger)** and **SDG 12 (Responsible Consumption and Production)**, by promoting sustainable food management practices and reducing avoidable food waste.

II. OBJECTIVES OF THE STUDY

The primary objective of this research is to design and develop a smart web-based food rescue platform that efficiently connects food donors with organizations serving people in need. The specific objectives of the study are:

To develop a web-based food rescue platform that facilitates the efficient donation and redistribution of surplus food from restaurants, hotels, and catering services to NGOs, orphanages, old-age homes, and community kitchens.

To implement role-based dashboards for Restaurants, NGOs, and Runners, enabling each stakeholder to perform specific functions such as food listing, donation acceptance, delivery management, and monitoring.

To integrate real-time GPS tracking for monitoring food transportation, allowing NGOs and donors to track the runner's location, estimated arrival time (ETA), and delivery progress.

To implement a secure dual One-Time Password (OTP) verification mechanism that confirms both food pickup and final delivery, ensuring transparency, accountability, and preventing fraudulent transactions.

To develop a voice-enabled food listing system using the Web Speech API, enabling restaurant staff to create food donation listings quickly through voice commands while automatically capturing location information.

III. REVIEW OF LITERATURE

Food waste is a major global challenge with significant economic, environmental, and social impacts. According to the Food and Agriculture Organization (FAO, 2019), nearly one-third of all food produced worldwide is lost or wasted, contributing to resource depletion, greenhouse gas emissions, and food insecurity. The report emphasizes the importance of digital technologies in improving food redistribution and reducing waste.

Harvard Food Law and Policy Clinic (2021) highlighted that technology-enabled food rescue platforms improve coordination between food donors and charitable organizations. Their study found that digital systems reduce food wastage by enabling faster communication, timely pickups, and better documentation of donations.

Grinberg (2018) explained that the Flask framework is a lightweight and flexible platform for developing scalable web applications. Its modular architecture and ease of database integration make it suitable for building intelligent food donation management systems. Similarly, Chodorow (2013) described MongoDB as a flexible NoSQL database capable of efficiently managing dynamic data such as user profiles, donation records, and location information.

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Real-time GPS tracking has become an important feature in logistics and delivery systems. Bansal et al. (2022) reported that GPS-based tracking improves delivery efficiency, transparency, and coordination between service providers and recipients. These findings support the use of live location tracking in food rescue platforms to ensure timely food collection and delivery.

Secure delivery verification is another essential requirement. OTP (One-Time Password) authentication is widely used in e-commerce and logistics to prevent fraudulent deliveries and confirm successful handovers. The proposed FoodBridge system adopts a dual OTP mechanism to verify both food pickup and final delivery, ensuring accountability throughout the donation process.

Voice-enabled technologies such as the Web Speech API simplify data entry by allowing users to create food listings through speech, reducing manual effort and saving time. Additionally, Leaflet.js, OpenStreetMap, and Nominatim provide cost-effective solutions for interactive maps, route visualization, and automatic address detection.

The reviewed literature indicates that while existing food donation platforms address donor-recipient matching, many lack integrated features such as GPS tracking, OTP verification, voice-based listing, and automated notifications. Therefore, the proposed FoodBridge system combines these technologies into a single web-based platform, providing an efficient, transparent, and user-friendly solution for reducing food waste and improving food distribution.

Null Hypothesis (H0):

The implementation of the FoodBridge platform does not produce any significant improvement in the efficiency, transparency, security, or coordination of surplus food donation and distribution compared with existing manual food rescue practices.

These hypotheses are appropriate for an MCA/Computer Science research journal and can be tested through system evaluation, user feedback, or performance analysis.

IV. CONCLUSION

FoodBridge demonstrates how modern web technologies can effectively address the challenges of food waste and food insecurity through a smart, technology-driven food rescue platform. The system integrates role-based dashboards for restaurants, NGOs, and delivery runners with real-time GPS tracking, dual OTP verification, voice-enabled food listing, and automated email notifications to create a secure and efficient food donation ecosystem.

The implementation and testing results indicate that the proposed system reduces manual coordination, improves transparency in food collection and delivery, and ensures that surplus food reaches beneficiaries in a timely manner. The use of cloud-based data management through MongoDB, together with Flask-based web development, provides a scalable, secure, and cost-effective solution. Features such as GPS-enabled tracking and OTP-based verification enhance accountability, while voice-assisted listing improves usability for restaurant staff.

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