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FOOD WASTE MANAGEMENT SYSTEM USING JAVA AND ANDROID

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ABSTRACT:

Food waste has become a pressing global issue, contributing to both environmental degradation and social inequality. While large quantities of edible food are discarded every day, millions of people continue to suffer from hunger and malnutrition. The Food Waste Management System is a digital platform designed to address this imbalance by connecting food donors—such as restaurants, households, and grocery stores—with receivers like NGOs, orphanages, and individuals in need. The primary goal of the system is to reduce food waste and promote a sustainable and equitable distribution of resources.

This project leverages a web and/or mobile application interface to facilitate seamless interaction between donors and receivers. Registered users can log in to donate excess food, browse available listings, or request food pickups. Administrators monitor transactions, ensure quality control, and manage system integrity. The backend stores critical information such as user profiles, donation records, request logs, and feedback, all while maintaining data privacy and security.

1. Introduction

Food waste has emerged as one of the most pressing global challenges of the 21st century. According to the Food and Agriculture Organization (FAO) of the United Nations, approximately one-third of all food produced globally—amounting to about 1.3 billion tons—is wasted every year. This wastage occurs at various stages of the supply chain, including production, handling, storage, retail, and consumer levels. While developed countries tend to waste food at the consumer level, developing countries suffer losses primarily due to inefficiencies in supply chains and storage infrastructure.
The consequences of food waste are both economic and environmental. Wasted food represents a loss of resources such as water, land, labor, and energy that went into producing it. Additionally, food waste that ends up in landfills produces methane, a potent greenhouse gas that contributes significantly to climate change. In a world where millions of people still suffer from hunger and malnutrition, the ethical imperative to reduce food waste becomes even more urgent.

2. Related Work

Currently, various methods and platforms attempt to address food waste, but many of them are either fragmented or lack sufficient integration with modern technologies. Existing systems can be broadly categorized as:

2.1Manual Processes

In many regions, especially in developing countries, food redistribution is done manually. Volunteers or staff at charitable organizations physically visit restaurants, homes, and stores to collect leftover food. Communication is often through phone calls, text messages, or word-of-mouth, leading to delays, miscommunication, and inefficient resource allocation.

3.System Analysis

3.1 System Architecture

- Restaurant RestaurantDashboard.java Submit new food, view status
- Agent AgentDashboard.java View donations, auto-remove expired, alert on ne
- Volunteer VolunteerDashboard.java View donations, mark as delivered
- Admin (opt) AdminDashboard.java (future) View all data, charts, analytics.
- DonationModel.java: Represents a donation with fields like foodName, address, timestamp, status, etc
- RecyclerView + Adapter: Used in dashboards to display donation entries.

- Alerts: Agent/Volunteer dashboards listen for onChildAdded and show alert dialogs for new entries.

3.2 Work Flow

The system involves three user roles (Restaurant, Agent, Volunteer) interacting through a login system with Firebase as the central backend.

3.2.1 Restaurant User Flow:

- Logs in via the Login Page.
- Submits a food donation (includes name, quantity, time, etc.).
- The donation is stored in the Firebase Realtime Database.
- A 2-hour timer is triggered.
- If no pickup occurs within 2 hours, the donation is automatically removed.

3.2.2 Agent User Flow:

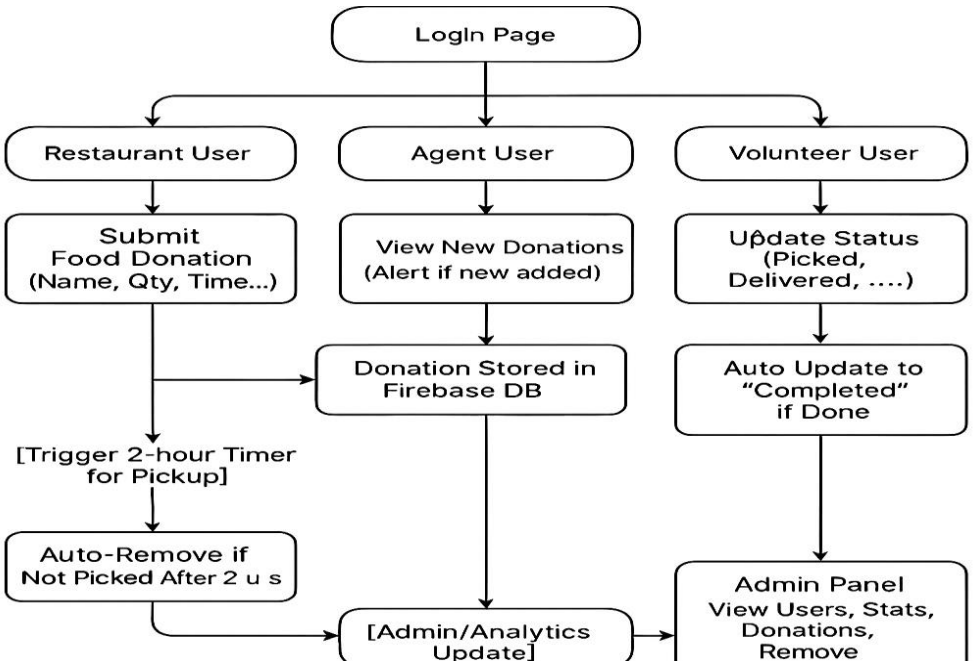
- Logs in via the Login Page.
- Views new donations.
- Alerts are shown if new donations are added.
- Donation data is read from Firebase.
- Updates are tracked in the admin/analytics section.

3.2.3 Volunteer User Flow:

- Logs in via the Login Page.
- Views and updates the status of donations (e.g., Picked, Delivered).
- Once delivered, donation is auto-marked as "Completed".
- Status changes are synced to the admin system.

3.2.4 Backend & Admin:

- All donations are stored in Firebase DB.
- Admin Panel allows: Viewing users, donation stats, and active/completed donations.
- Removing expired or invalid entries.
- Donation data updates also feed into analytics for future tracking.



3.2 Modules:

1. User Module:

This module handles user registration, login, and authentication. Users are classified into three roles: Donor, Receiver, and Admin. Based on their role, users are granted appropriate access and functionality. The system ensures secure login with form validation and redirects users to their respective dashboards upon successful authentication.

2.Donor Module:

This module **allows** donors (e.g., individuals, restaurants) to contribute surplus food by filling in donation details such as food type, quantity, expiry date, and pickup location. Donors can also track the status of their donations (pending, accepted, or picked up).

Receiver Module

Receivers (e.g., NGOs, shelters) can browse a list of available donations and request food items. They are notified when their requests are accepted, and they can track donation pickup details through their dashboard.

Admin Module

The Admin module provides a backend control panel to monitor system activity. Admins can view all users, donations, and requests. They are also responsible for managing reports, deleting invalid data, and ensuring the system is used ethically.

4. Experimental Results

4.1 Test Cases & Results

- User Authentication
- .Donor – Add Food Donation
- .Receiver – Request Food
- .Admin Panel
- .Database Validation

5. Conclusion and Future Work

The Food Waste Management System has been developed with the core objective of reducing food wastage by connecting donors with receivers in a structured, efficient, and user-friendly manner. Through the design and implementation of features such as donor registration, donation uploads, real-time listing views, and request tracking, the system facilitates timely and impactful redistribution of surplus food.

Thorough testing was an essential part of this project to ensure that all modules—user login, food donations, pickup requests, database operations, and administrative functions—perform reliably under various scenarios. By implementing unit tests, integration tests, UI tests, and database validations, we confirmed that the system meets functional and non-functional requirements. These tests helped identify and rectify bugs early, strengthen data integrity, and validate user interactions across different roles. And the Future Works are as follows,

- Food Waste Management System While the current Food Waste Management System successfully facilitates food donation and distribution between donors and receivers, there are several areas for future improvement and enhancement. These enhancements can improve scalability, user engagement, and impact. Future work may include:
- Mobile Application Development Create a full-featured Android/iOS app for better accessibility. Include push notifications for donation updates and pickups. AI-Based Food Quality Prediction Integrate AI/ML models to assess food quality and freshness based on images and metadata. Automatically flag expired or spoiled food donations.

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