

Productive Food Waste Tracking Application

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Abstract

In the contemporary world, food waste has emerged as a critical global issue with profound consequences for the environment, economy, and societal well-being. The challenge at hand is the efficient management of food resources to combat this issue. Problem: Food waste, a significant problem, leads to the squandering of valuable resources, contributes to environmental degradation through greenhouse gas emissions, and exacerbates food insecurity, particularly among vulnerable populations. Solution: To address this problem, we have developed an innovative Android mobile application. This application harnesses the capabilities of modern technology to empower individuals and restaurants to contribute surplus food and leftovers to those in need. By bridging the gap between food surplus and food scarcity, our study demonstrates the app's effectiveness in reducing food waste and alleviating food poverty. Through a seamless process of food donation, collection, and redistribution, the application showcases its potential to make a substantial impact on both environmental conservation and social welfare.

Keywords: Food waste, environmental degradation, food insecurity, Android mobile application, surplus food, food redistribution, greenhouse gas emissions, vulnerable populations, community, user confidentiality, sustainable solution, global concern

INTRODUCTION

Background

Food waste is a pressing issue in modern society, posing significant challenges to both the environment and the economy. To combat this problem, we have developed a cutting-edge Android mobile application that harnesses the power of mobile technology to tackle food waste. This innovative app empowers individuals and restaurants to contribute surplus food and leftovers to those in need.

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Importance of the Study

The efficient management of food resources is crucial for our planet's environmental well-being and economic stability. Food waste not only squanders valuable resources but also contributes to environmental degradation through greenhouse gas emissions. Moreover, it exacerbates food insecurity and hunger for vulnerable populations. Our study addresses these critical issues by providing a practical solution that bridges the gap between food surplus and food scarcity.

Relevance and Functionality of the Results

The results of this Android application and the functionality of our research are highly relevant in

today's world. Our app redistributes the food to those who need it most. It will connect donors, agents, and beneficiaries. We aim to foster a sense of community and shared responsibility in the fight against food waste and hunger.

Purpose of the Study

The primary purpose of our study is to demonstrate the effectiveness of our Android application in reducing food waste and alleviating food poverty. Through the seamless process of food donation, collection, and redistribution facilitated by the app, we intend to showcase its potential to make a substantial impact on both the environmental and social fronts. Furthermore, we emphasize the importance of user confidentiality to ensure the security and privacy of all participants in this valuable initiative.

Motivation

Our motivations stem from the urgent need to combat food waste, alleviate food insecurity, and promote sustainability. The sheer scale of food waste and its detrimental effects on the environment and vulnerable populations drive our commitment to develop a practical and user-friendly Android mobile application. We are motivated by the potential to make a meaningful impact by reducing food waste, serving those in need, and minimizing the ecological footprint associated with discarded food. The desire to foster community engagement and ensure user confidentiality further fuels our dedication to this initiative.

Problem Definition

Food waste is a substantial and pressing issue with far-reaching consequences. When edible food is needlessly discarded, it not only represents the wastage of valuable resources like water, energy, and labor but also contributes significantly to environmental harm. Food rotting in landfills generates greenhouse gases, contributing to climate change. Moreover, this wasteful practice worsens food insecurity, leaving vulnerable populations without access to adequate nutrition. Food waste is a complex challenge that impacts sustainability, the environment, and social equity, making it imperative to address.

IMPORTANCE OF TECHNOLOGY

- *Reduce Food Waste:* Our primary aim is to significantly reduce food waste at the individual and restaurant levels by encouraging donations of surplus food.
- *Alleviate Food Insecurity:* We seek to alleviate food insecurity and hunger by efficiently redistributing surplus food to beneficiaries, such as low-income individuals and charitable organizations.
- *Promote Sustainability:* Our goal is to contribute to environmental sustainability by minimizing the environmental impact associated with food waste, including reduced greenhouse gas emissions.

Objectives

To achieve these aims, we have defined the following specific objectives:

- *Develop the Mobile Application:* Design and create a user-friendly Android mobile application that enables users to easily donate excess food and allows agents to efficiently collect and redistribute it.
- *Foster Community Engagement:* Promote community engagement and participation by encouraging individuals and restaurants to actively use the application for food donation and collection.
- *Assess Impact:* Measure the impact of the application in terms of the amount of food saved from being wasted, the number of beneficiaries served, and the reduction in greenhouse gas emissions associated with food waste.
- *Ensure User Confidentiality:* Implement robust security measures within the application to safeguard user information and maintain their privacy.
- *Evaluate Sustainability:* Evaluate the environmental sustainability of the system by analyzing its effectiveness in reducing food waste and associated ecological footprint.

By achieving these objectives and aims, we aim to develop a holistic solution that not only addresses the critical issue of food waste but also contributes to food security and environmental well-being while maintaining user confidentiality and security.

LITERATURE SURVEY

The Table 1 presents the literature survey for the proposed work.

Table 1. Previous literature studies.

S.N.	Authors	Year	Journal	Method	Key Findings
1	Smith, J. D., & Wang, L. [1]	2023	Food Research International	Structural equation modeling (SEM)	Factors influencing food waste in Harbin, categorized as one-person food and multi-person food, were empirically analyzed using SEM.
2	Gupta, A., & Patel, S. [2]	2022	Sustainability	Blockchain	Development of a sustainable food waste management and tracking system using blockchain technology.
3	Smith, E. [3]	2021	Unpublished application project	Android Studio	Details about an unpublished food wastage management application developed using Android Studio.
4	Wang, S. & Xu, J [4].	2022	International Conference on CoST	AHP-TRIZ method	Design of an intelligent household food waste product using the AHP-TRIZ method
5	Bhardwaj, S., Kumar, U., & Kumar [5]	2022	Proceedings of Advancement in Electronics & Communication Engineering	Not specified	Description of a food waste management Android app without specific methodological details.
6	Prova, R. R., Rayhan, A., Shilon, R. S., & Khan, M. M. [6]	2021	ICCCNT	Web and Mobile Based Approach	Development of a web and mobile-based approach to redistribute consumable food waste.
7	SardarMaran, P., Reddy, B. S., & Saiharshavardhan [7]	2021	Lecture Notes in Electrical Engineering	Not specified	Mention of an IoT-based air quality prediction system, not directly related to food waste.
8	Naveen Kumar, G. N., Jeevith, R., Nukala, S. S., Manoj. Kumar, V., Shankar, S. P., & S. Kandarp [8]	2021	IEEE Mysore Sub Section International Conference	Efficient hunger search techniques	Development of a leftover food management system using efficient hunger search techniques.
9	Apostolidis, C., Brown, D., Wijetunga, D., & Kathiarachchim E. [9]	2021	Journal of Marketing Management	Mobile applications	Use of mobile applications to reduce food waste and improve food security, particularly targeting the bottom of the pyramid.
10	Panchal, V., Kuchekar, K., & Tambe, S. [10]	2020	International Research Journal of Engineering and Technology	Not specified	Availability of food for non-governmental organizations (NGOs) through a mobile application.

PROPOSED SYSTEM

In this proposed system we try to reduce food wastage through this application. This project is about social innovation which tackles food waste and food poverty. The admin collects the food from the user and provide to nearest poor people or orphanages through this application. After receiving the food

from the users, admin will notify the users and through this way we can reduce the food wastage [11–13].

Modules

This project consists of different types of modules. The modules are:

- *Donator (NGO)*: Donator module, donator will give the wastage of food to the orphanage. The donator gives the request to the admin for the purpose of collecting the wastage food. The donator can see the orphanage details and agent details [14, 15].
- *User (Hotel)*: The user can see all details about NGOs, orphanages, etc. through this application.
- *Admin*: The admin module maintains the user details as well as donator details. The admin collects the food from the agent. The administrator gives the orphanage details to the donator.
- *Agent module*: In Agent module, all the details of orphanages are under the observation of agent. The agent gives the request to the admin for collecting the food from the donator. After collecting the food, the agent give the alert message for the donator.

RESEARCH METHODOLOGIES

Creating a food waste tracking app with detection capabilities involves various research methodologies to ensure its effectiveness, usability, and accuracy. Here are some research methodologies we considered:

- *Literature Review*: Conducted a thorough review of existing literature and research related to food waste tracking, food detection technologies, and mobile app development. These helped us to understand the state of the art, identify gaps, and build on existing knowledge.
- *Market Research*: Analyzed the competitive landscape to identify existing food waste tracking apps and their features. We have identified strengths and weaknesses in the current solutions to find opportunities for improvement.
- *Food Waste Data Collection*: Collected data on food waste to understand its patterns and causes. This could involve working with individuals, households, or restaurants to track and document their food waste over a period of time.
- *Image Processing Technology Research*: Our app will include food detection capabilities using images, conduct research on image recognition technologies like machine learning. We experimented with different algorithms and models to determine their effectiveness in food recognition.
- *Data Collection*: Our app uses image processing to detect food items quality, so there is a need to gather dataset.
- *Sustainability Impact Assessment*: The potential environmental and economic impact of reducing food waste can be assessed through our app. This could involve collaboration with environmental organizations or researchers.

By combining these research methodologies, we can create a food waste tracking app with detection capabilities that effectively addresses user needs, minimizes food waste, and contributes to a more sustainable future.

ARCHITECTURE DIAGRAM

The "Food Waste Reduction App," with a focus on the user and restaurant logins and their functionalities:

User and Restaurant Logins

The app offers two distinct types of logins: one for regular users and another for restaurants. This differentiation ensures that the app caters to the needs of both individuals looking for surplus food and restaurants wishing to contribute excess food.

User Registration and Authentication

Users can register for an account by providing their email address and choosing a secure password. Firebase's email and password authentication system is utilized for user registration and login, ensuring a high level of security.

User Profile Creation

Upon successful registration, users are prompted to create their profiles. They can input personal information such as age, name, and gender. This profile data is associated with a unique user ID generated by Firebase. Storing this information in the real-time database enables personalized experiences for each user.

User Authentication

After registration, users can login using their credentials. The Firebase authentication system verifies their identity, and users gain access to their accounts and personalized profiles.

Logout Functionality

Users can securely log out of their accounts when they have finished using the app. This feature is essential for protecting user data and privacy.

Viewing Available Food Listings

Users can browse through a list of available surplus food items. These listings typically include details such as food images, titles, and descriptions, allowing users to make informed choices.

Cart Management

Users have the capability to add food items to their virtual shopping carts. This feature enables users to select multiple food items they wish to acquire and later proceed to confirm their selections.

Emptying the Cart

In cases where users change their minds or decide not to proceed with selected food items, they can easily empty their shopping carts. This action removes all items, providing a clean slate for making new selections.

Restaurant Registration

Restaurants or food establishments interested in participating in food donation can also register for accounts. The registration process for restaurants likely involves providing their business details and agreeing to terms and conditions.

Unique User IDs

Each user is assigned a unique user ID by Firebase. This ID serves as a key to access and update the user's profile information stored in the real-time database. This ensures data separation and privacy for individual users as shown in Figure 1.

The app's design accommodates both user and restaurant needs, offering an intuitive user experience while addressing the critical issue of food waste reduction. User profiles, authentication, and real-time database integration contribute to a personalized and secure platform, making it easier for users to access surplus food and for restaurants to contribute to the cause [16].

Geo-fencing Algorithm: Geo-fencing location-based alerts: The user can see the location of nearest NGOs, orphanages. The user can get notification through this geo-fencing. The admin can see the pickup point of agent and drop-off point of agent, that agent working for poor communities, which is provided by the NGO or orphanages. Through this geo-fencing the complete tracking system will proceed. Overall geo-fencing in food waste tracking application will help in improving accuracy of data collection and encourage donation of food as shown in Figure 2.

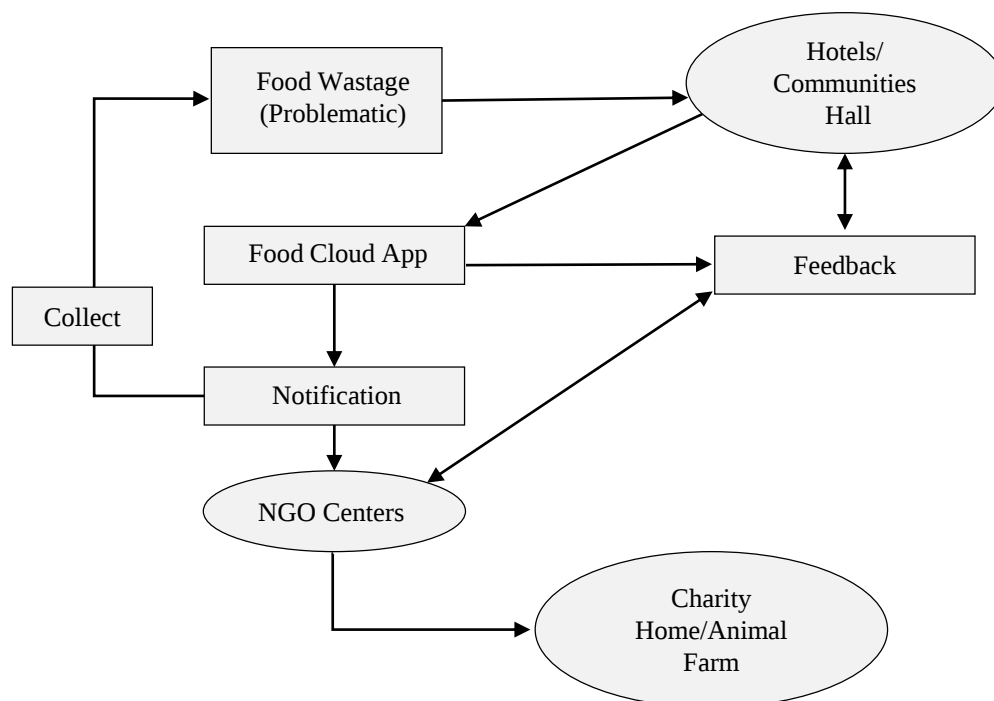


Figure 1. Architecture diagram of the proposed system.

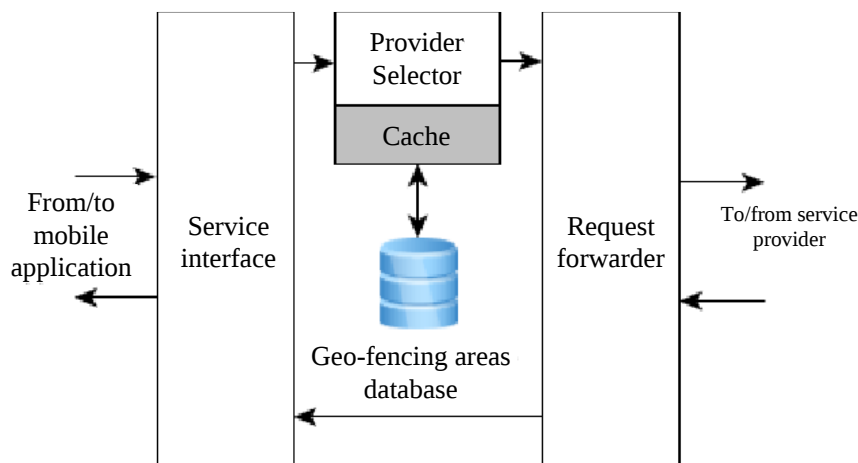


Figure 2. Geo-fencing architecture.

RESULTS AND DISCUSSION

The study explores the issue of food waste, which has significant economic and social impacts. It highlights the importance of prevention and reduction through political regulations and technological advancements. Mobile applications are highlighted as a practical and effective tool for tackling food waste, providing a convenient means for better food management and sharing. The primary goal of the proposed mobile app is to promote improved food management by reducing food wastage through facilitating food sharing within communities. The app aims to simplify the process of sharing surplus food with those in need, reducing food waste. The application also encourages active participation from communities, fostering a sense of shared responsibility. The study acknowledges that the proposed mobile application is just the beginning of a broader effort to create a more efficient system for reducing daily food waste as shown from Figures 3–7. Addressing this complex problem requires ongoing efforts and collaboration among various stakeholders. In summary, the study highlights the role of mobile applications in mitigating food waste, with the app's main objective being to encourage better food management by facilitating food sharing within communities.



Figure 3. Home page.

Donate

Donor Name

Food Items

Phone Number

Description



SUBMIT

Figure 4. Donor's page.

My Pins



Figure 5. Admin location.

Food Map

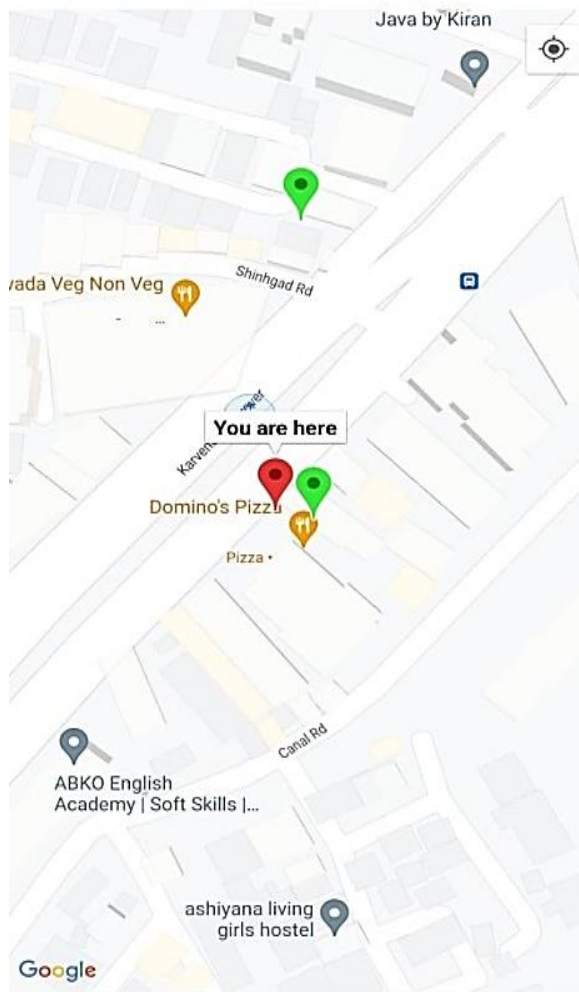


Figure 6. Food tracking.

Receive

Receiver Name
Your Name

Description
Type here...

SUBMIT

Figure 7. Receiver's location.

CONCLUSION

The study explores the issue of food waste, which has significant economic and social impacts. It highlights the importance of prevention and reduction through political regulations and technological advancements. Mobile applications are highlighted as a practical and effective tool for tackling food waste, providing a convenient means for better food management and sharing. The primary goal of the proposed mobile app is to promote improved food management by reducing food wastage through facilitating food sharing within communities. The app aims to simplify the process of sharing surplus food with those in need, reducing food waste. The application also encourages active participation from communities, fostering a sense of shared responsibility. The study acknowledges that the proposed mobile application is just the beginning of a broader effort to create a more efficient system for reducing daily food waste. Addressing this complex problem requires on-going efforts and collaboration among various stakeholders. In summary, the study highlights the role of mobile applications in mitigating food waste, with the app's main objective being to encourage better food management by facilitating food sharing within communities.

Future Scope

The proposed mobile application aims to address the issue of food waste by enhancing features, promoting wider adoption, and utilizing data analytics to provide insights into food consumption patterns and preferences. The app can also be assessed for its environmental impact, quantifying the

reduction in greenhouse gas emissions and other ecological benefits. The app can be scaled to different regions and countries, tailoring it to local needs and addressing specific challenges related to food waste. Community engagement can be fostered through shared responsibility and active participation in food sharing initiatives. The app's sustainability can be improved through partnerships with food producers, retailers, and logistics companies. Education and awareness features can be implemented to raise awareness about food waste and provide tips on reducing it in daily life. The app can also be integrated into the broader food supply chain, connecting surplus food directly with redistribution channels. Policy advocacy can be achieved by collaborating with policymakers to advocate for regulations and incentives that promote food sharing and reduce barriers to surplus food donations. In conclusion, the future scope of the mobile application is vast and holds great potential for significant progress in reducing food waste.

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