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Food Wastage Management and Tracking System

Prof. Snehal C. Shirbhate[1], Om P. Ingole[2], Devashish V. Gonde[3], Bhushan S. Gabhole[4], Aniket P. Gawande[5]
Department of Computer Science and Engineering, Sipna College of Engineering and Technology, Amravati, India

Abstract: ***In recent years, the issue of food wastage has garnered significant attention due to its adverse environmental, social, and economic implications. To address this challenge, technological innovations have emerged as powerful tools. This abstract provides a comprehensive overview of a Food Wastage Management Android App, offering an integrated solution to reduce food waste. The app leverages cutting-edge technologies to efficiently manage surplus food, promoting responsible consumption and minimizing waste generation. Food wastage is a pervasive issue in our society, and effective management is crucial for improving environmental and economic sustainability. Recognizing the potential of mobile technology in mitigating food waste, we have developed an Android mobile application. This app enables individual users or restaurants to donate and share their surplus food with those in need. Users can register, login, view available items, add new items, access donor details, and logout seamlessly. Utilizing a real-time database, the app allows users in need to browse through donated food images from various contributors and easily contact donors. By facilitating the redistribution of surplus food, the app aims to combat food wastage and promote a more sustainable food ecosystem.***

Keywords: Food Wastage Management, Android App, Sustainable Consumption, Food Distribution, User-Friendly Platform, Minimizing Food Waste.

I. INTRODUCTION

Many of us indulge in abundant meals and products, often resulting in leftover waste. Food wastage is a common occurrence, stemming from various reasons. Sometimes, it's due to unforeseen changes in plans beyond our control. However, more often than not, we find ourselves discarding food for two primary reasons: over-purchasing or neglecting to consume it before expiration. Regardless of the cause, the reality remains that wasted food comes at a cost.

To address this issue, a new system has been introduced through an Android application aimed at reducing food wastage. Individuals with surplus food can input details such as quantity and location into the application, with the admin overseeing and maintaining a database of food donors. Those in need can access this information through the app and collect the donated food to distribute it among the less fortunate. This project aims to manage food wastage effectively by leveraging mobile technology. Given the alarming rate at which food is wasted daily, it's imperative to tackle this issue through mobile platforms. Individuals with excess food can provide details such as food type, address, and contact information, seeking acknowledgement from nearby NGOs. Upon approval by the respective NGO, the donor is contacted for further coordination. This Android-based system facilitates seamless interaction between mobile users and NGOs, fostering a collaborative effort to combat food wastage and ensure food reaches those who need it most..

II. LITERATURE REVIEW

In the study "A Review of Mobile Applications for Food Wastage Management: Challenges and Opportunities", by Wang, Zhang, and Liu(2023) conducted a comprehensive review of existing mobile applications designed for food wastage management, . They identified various challenges faced by these applications, including user engagement, data accuracy, scalability, and integration with existing infrastructure(10). Despite these challenges, the authors highlighted numerous opportunities for improving food wastage management through mobile apps, such as leveraging IoT devices, incorporating machine learning algorithms for predictive analytics, and enhancing user experience through gamification and social networking features. The review serves as a valuable resource for researchers and practitioners interested in developing effective solutions for reducing food waste through mobile technology.

Y D

In the Paper "Utilizing Mobile Application for Food Waste Reduction: A Case Study in Urban Areas", by R. Sharma, A. Gupta, S. Kumar(2023), presented a case study evaluating the effectiveness of a mobile application for food waste reduction in urban areas(11). The study involved deploying the app in a densely populated urban setting and assessing its impact on consumer behavior and food wastage patterns. Through data analysis and user surveys, the authors found that the mobile app significantly increased awareness of food wastage issues among users and prompted them to adopt more sustainable consumption habits.

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Additionally, the app's features, such as expiration date reminders and recipe suggestions for leftover ingredients, helped users better manage their food inventory and reduce waste. The findings suggest that mobile applications have the potential to play a crucial role in addressing food waste challenges in urban environments by empowering individuals to make informed choices and take proactive measures to minimize wastage.

The Paper "Development of a Mobile Application for Food Waste Management in Household Settings" by J. Smith, A. Johnson, K. Brown(2021) described the development and implementation of a mobile application tailored specifically for food waste management in household settings(1). Through user-centered design principles and iterative feedback loops, the researchers created an intuitive and user-friendly app interface that allowed individuals to track their food inventory, set reminders for expiration dates, and receive suggestions for using up leftover ingredients. Field trials conducted with a diverse group of households demonstrated positive outcomes, with participants reporting a reduction in food wastage and an increase in overall awareness of consumption habits. The study underscores the potential of mobile applications as practical tools for promoting behavior change and fostering sustainable practices at the household level.

In the Paper "Smart Food Inventory Management System Using IoT and Mobile Application for Minimizing Food Wastage" by M. Garcia, R. Patel, S. Lee,(2021) presented a novel approach to food wastage management by integrating IoT technology with a mobile application to create a smart food inventory management system(2). The system utilized sensors embedded in food storage containers to monitor inventory levels, track expiration dates, and provide real-time notifications to users via the mobile app. Through a series of experiments conducted in simulated home environments, the researchers demonstrated the system's effectiveness in reducing food wastage by enabling users to optimize their purchasing decisions, minimize overstocking, and maximize utilization of perishable items. The study highlights the potential of IoT-enabled solutions in revolutionizing food management practices and offers valuable insights for future research and development in this area.

III. PROBLEM STATEMENT

The problem statement is to develop a Food waste management application in android. In that we are going to greatly simplify the process of food donation. System presents an interactive and up-to-date menu with all available options in an easy to use manner. If anyone has wasted food they can fill in details such as type of food, address, and their contact details and acknowledgement to the nearby NGO. Then the respected NGO will approve the donor's request and contact him. This system is an android based application that provides interaction between mobile users and NGO’s

IV. TECHNOLOGY STACK

A. *What is an Android Application?*

Android Studio and Firebase are used for developing our project which are available everywhere. It provides the technical guarantee of accuracy, reliable and security. The current system develop is technically feasible with all the resources need for development of the apps as well as the maintenance of the same is easy.

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse Android Development Tools (ADT) as primary IDE for native Android application development.

Android Studio was announced on May 16, 2013 at the Google I/O conference. It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0. The current stable version is 3.2, which was released in September 2018.

B. *Features*

The following features are provided in the current stable version:

1) Android-specific refactoring and quick fixes.
2) Lint tools to catch performance, usability, version compatibility and other problems.
3) Pro-Guard integration and app-signing capabilities.
4) Template-based wizards to create common Android designs and components
5) Support for building Android Wear apps.
6) Android Virtual Device (Emulator) to run and debug apps in the Android studio.
7) Gradle-based build support.

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C. Java Language

Java is the name of a programming language created by Sun Microsystems in 1995. This company was bought out by Oracle Corporation, which continues to keep it up to date. The latest version is Java SE 9, which came out in 2017.

Java, which was called Oak when it was still being developed, is object oriented, meaning it is based on objects that work together to make programs do their jobs. Java code looks like C, C++, or C#, but code written in those languages will not work in Java in most cases without being changed.

Java runs on many different operating systems, including Android, the world's most popular mobile operating system. This makes Java platform independent. It does this by making the Java compiler turn code into Java bytecode instead of machine code. This means that when the program is executed, the Java Virtual Machine interprets the bytecode and translates it into machine code.

D. Java Concepts

Java was developed to achieve 5 main goals. These are:

1) It should be simple, object-oriented, distributed and easy to learn.
2) It should be robust and secure.
3) It should be independent of a given computer architecture or platform.
4) It should be very performant.
5) It should be possible to write an interpreter for the language. The language should also support parallelism and use dynamic typing.

E. XML Language

In computing, Extensible Mark-up Language (XML) is a mark-up language that defines a set of rules for encoding documents in a format that is both human-readable and machine readable. The W3C's XML 1.0 Specification and several other related specifications all of them free open standards define XML.

The design goals of XML emphasize simplicity, generality, and usability across the Internet. It is a textual data format with strong support via Unicode for different human languages. Although, the design of XML focuses on documents, the language is widely used for the representation of arbitrary data structures such as those used in web services.

Several schema systems exist to aid in the definition of XML-based languages, while programmers have developed many application programming interfaces (APIs) to aid the processing of XML data.

F. Firebase

1) Firebase is a Backend-as-a-Service that started as a YC11 start up and grew up into a next-generation appdevelopment platform on Google Cloud Platform.
2) Firebase frees developers to focus crafting fantastic user experiences. You don’t need to manage servers. You don’t need to write APIs. Firebase is your server, your API and your data store, all written so generically that you can modify it to suit most needs. Yeah, you’ll occasionally need to use other bits of the Google Cloud for your advanced applications. Firebase can’t be everything to everybody. But it gets pretty close.
3) Real-time data is the way of the future. Nothing compares to it.
4) Most databases require you to make HTTP calls to get and sync your data. Most databases give you data only when you ask for it.
5) When you connect your app to Firebase, you’re not connecting through normal HTTP. You’re connecting through a Web-Socket. Web-Sockets are much, much faster than HTTP. You don’t have to make individual Web-Socket calls, because one socket connection is plenty. All of your data syncs automatically through that single Web-Socket as fast as your client’s network can carry it.
6) Firebase sends you, new data as soon as it’s updated. When your client saves a change to the data, all connected clients receive the updated data almost instantly.
7) Firebase Storage provides a simple way to save binary files—most often images, but it could be anything—to Google Cloud Storage directly from the client!!!
8) Firebase Storage has its own system of security rules to protect your G-Cloud bucket from the masses, while granting detailed write privileges to your authenticated clients.

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V. ALGORITHM

A. *Collaborative Filtering*

Collaborative filtering is a popular recommendation algorithm that is widely used in various applications, such as ecommerce, social networking, and movie or music recommendations. The basic idea behind collaborative filtering is to identify similarities between users based on their preferences and recommend items to a user based on the preferences of similar users. There are two main approaches to collaborative filtering: user-based and item-based. In user-based collaborative filtering, the algorithm identifies users who have similar preferences to the target user and recommends items that those similar users have rated positively. For example, if a user has given high ratings to action movies and other users who have similar preferences have also given high ratings to a particular action movie, the algorithm would recommend that movie to the user. In item-based collaborative filtering, the algorithm identifies items that are similar to the ones that the target user has previously rated positively and recommends those items to the user. For example, if a user has shown interest in science-fiction movies, the algorithm might recommend other science-fiction movies that have similar attributes, such as similar genre, cast, or director. Collaborative filtering can also be used in a hybrid approach that combines both user-based and item-based filtering to provide more accurate recommendations. The key advantage of collaborative filtering is that it can provide personalized recommendations to users based on their preferences and behavior. However, collaborative filtering also has some limitations, such as the cold-start problem, which occurs when there is insufficient data to identify similarities between users or items.

B. *Content-Based Filtering*

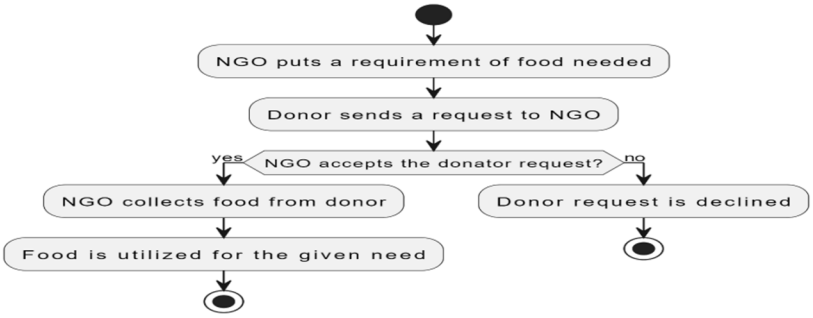
This algorithm recommends items based on their features or attributes. For example, if a user has shown interest in action movies, a content-based filtering algorithm might recommend other action movies based on their genre, cast, or plot. Content-based filtering is a type of recommendation algorithm that suggests items based on their attributes or content. In the context of food waste management, a content-based filtering algorithm can be used to suggest ways to reduce food waste based on the properties of the food item.

Here are the steps to develop a content-based filtering algorithm for food waste management:

1) *Gather Data:* Collect data on different food items, including their properties such as type, expiration date, nutritional value, and preparation method.
2) *Pre-process Data:* Clean and preprocess the data to ensure consistency and accuracy.
3) *Define Similarity Metrics:* Define metrics to measure the similarity between different food items. For example, you can use the Jaccard similarity coefficient to compare the nutritional value of different food items.
4) *Build a Recommendation Model:* Build a recommendation model that uses the similarity metrics to suggest ways to reduce food waste. For example, the model can suggest recipes that use ingredients that are close to their expiration date or provide suggestions for food preservation techniques.
5) *Evaluate the Model:* Evaluate the model by testing its accuracy and performance on a test dataset.
6) *Deploy the Model:* Deploy the model in a food waste management system to suggest ways to reduce food waste based on the properties of the food item.

By implementing a content-based filtering algorithm for food waste management, we can provide personalized recommendations to reduce food waste and promote sustainable food practices.

C. *Flow Diagram*



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VI. MODULE DESCRIPTION

A. NGO's Role

1) Setting Requirements: The NGO plays a central role in the food wastage app by identifying and setting requirements for the types and quantities of food needed to address specific needs. These needs could vary based on factors such as the target population (e.g., homeless shelters, orphanages, low-income families) and dietary considerations.
2) *Publishing Requirements:* Once the requirements are determined, the NGO publishes them within the app, making them visible to potential donors. This could include details such as the type of food needed, quantity required, and any specific instructions or preferences.
3) *Reviewing Donor Requests:* When a donor expresses interest in donating food that matches the NGO's requirements, the NGO reviews the request to ensure that it aligns with their needs and guidelines.
4) *Accepting or Declining Requests:* Based on the compatibility of the donor's offer with the NGO's requirements, the NGO has the discretion to either accept or decline the donor's request. If the offer is accepted, the NGO proceeds to coordinate the collection of the donated food.

B. DONOR's Role

1) *Browsing NGO Requirements:* Donors use the app to browse through the list of requirements posted by NGOs. They can view details such as the types of food needed, quantity required, and any specific preferences mentioned by the NGOs.
2) *Sending Donation Requests:* If a donor has food that matches the requirements specified by an NGO, they can initiate a donation request through the app. This typically involves providing details about the type and quantity of food they wish to donate, along with any additional information requested by the NGO.
3) *Awaiting NGO Response:* After sending a donation request, the donor awaits a response from the NGO. During this time, they may be required to keep the donated food in appropriate storage conditions to ensure its freshness and safety.
4) *Coordinating Donation:* If the NGO accepts the donor's request, the donor coordinates with the NGO to arrange for the collection or delivery of the donated food. This may involve scheduling a pickup time or dropping off the food at a designated location specified by the NGO.
5) *Providing Feedback:* Once the donation process is complete, donors may have the opportunity to provide feedback through the app, sharing their experience and any suggestions for improvement.

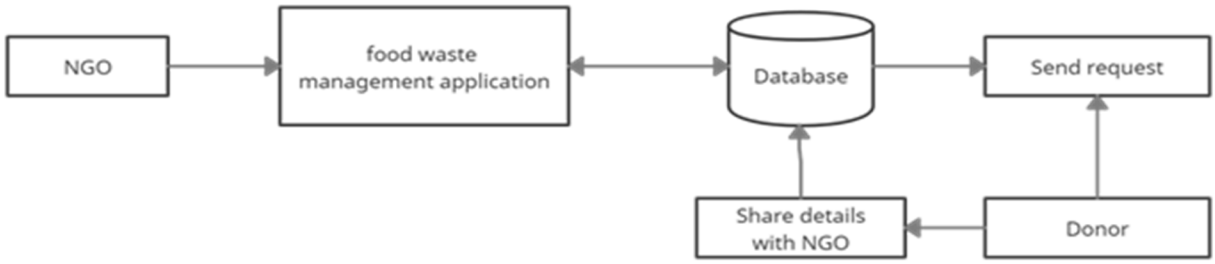


Fig: System Architecture

C. Advantages

1) *Reduction of Food Waste:* The app can help users track their food consumption and expiration dates, thereby reducing the amount of food wasted.
2) *Cost Savings:* By managing food waste more effectively, users can save money by purchasing only what they need and using up what they have before it spoils.
3) *Environmental Benefits:* Less food waste means less strain on landfills and reduced greenhouse gas emissions associated with decomposing food.
4) *Convenience:* Users can easily track their food inventory and receive reminders/alerts about items nearing expiration, making it convenient to plan meals and use up perishable items.
5) *Promotes Sustainable Practices:* Encourages users to adopt more sustainable habits by being mindful of food consumption and waste.

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D. Disadvantages

1) *Dependency on Technology:* Users may become overly reliant on the app and neglect basic food management skills, such as meal planning and proper storage techniques.
2) *Data Privacy Concerns:* Depending on the app's features, users may have to input personal data, raising concerns about privacy and data security.
3) *Technical Issues:* Bugs, glitches, or compatibility issues with different devices may hinder the app's functionality and user experience.
4) *Limited User Adoption:* Not everyone may be inclined to use a food waste management app, especially if they perceive it as unnecessary or inconvenient.
5) *Resource Intensive:* Developing and maintaining a sophisticated app requires resources such as time, money, and skilled personnel, which may not be feasible for all developers or users.

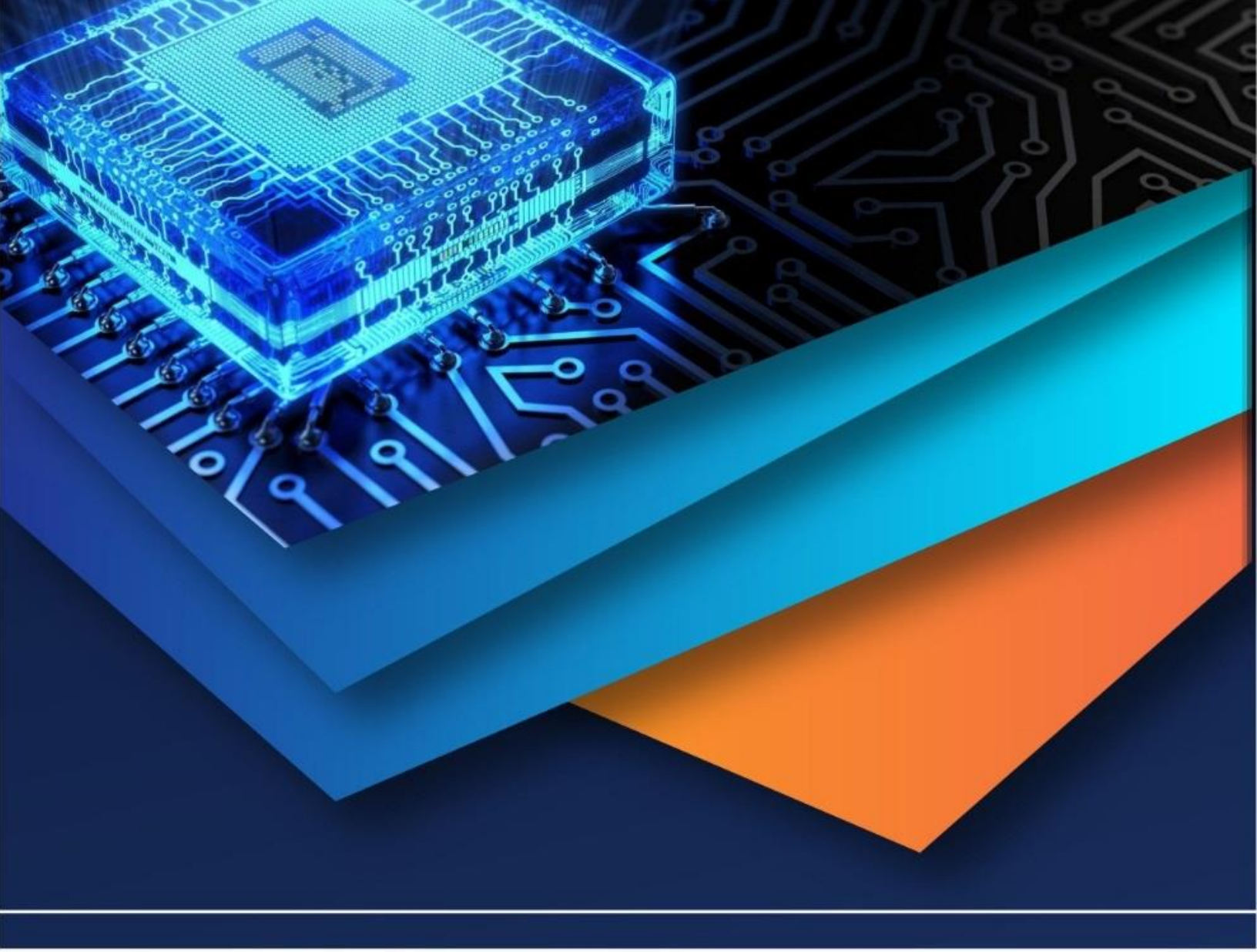
VII. CONCLUSION

This project focuses on an online system designed to manage food distribution for individuals in need. The primary goal is to streamline the process of food management efficiently. The Android application acts as a bridge between users and NGOs, facilitating direct communication between the two parties. Through this app, users can notify NGOs about the availability of surplus food in their area, thereby aiding in the reduction of food wastage. Upon receiving this information, NGOs can contact the users directly to arrange for food collection. The Android app serves as the intermediary platform, enhancing communication and coordination between users and NGOs. This innovative approach, utilizing the simplicity and effectiveness of Android technology, is poised to achieve the core objectives of the project. In the future, enhancements could include accommodating various user types and expanding the system to include registration and integration with multiple NGOs and food establishments. This ongoing development holds promising prospects for further improving the efficacy of food distribution management.

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