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Food Connect: A CPS based Smart City Application

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Abstract

The The primary objective of the " FOODCONNECT " app is to bridge the gap between surplus food in restaurants and individuals in need. The app will facilitate the donation of excess food to poor people, ensuring that no food goes to waste and helping to alleviate hunger in the community. "FOODCONNECT" is an innovative Android application designed to help locate free food for the needy and provide a platform for restaurants and individuals to donate excess food. The app will serve as a real-time solution to hunger by connecting donors with recipients, thereby promoting food security and reducing food wastage.

Keywords: *Surplus Food, Food Wastage,Android Application,Food Connect*

1. Introduction

1.1 Objective

The primary objective of the " FOODCONNECT " app is to bridge the gap between surplus food in restaurants and individuals in need. The app will facilitate the donation of excess food to poor people, ensuring that no food goes to waste and helping to alleviate hunger in the community. " FOODCONNECT" is an innovative Android application designed to help locate free food for the needy and provide a platform for restaurants and individuals to donate excess food. The app will serve as a real-time solution to hunger by connecting donors with recipients, thereby promoting food security and reducing food wastage.

1.2 Major Modules

- User Module
- Donor Module
- Search and Map Module
- Notification Module
- Feedback Module

1.3 Functionalities of Modules

User Module can perform the following operations

- Registration and login
- Profile management (update user details)
- Location services (set and update location)

Donor Module can perform the following operations:

- Restaurant registration
- Food listing (add, update food items)
- Status updates (update availability of food)

Search and Map Module can perform the following operations

- Search for free food locations
- Map integration (view food locations on the map)

Notification Module can perform the following operations

• Send real-time notifications to users about available food

Feedback Module can perform the following operations

- Collect user feedback
- Manage enquiries and respond to feedback

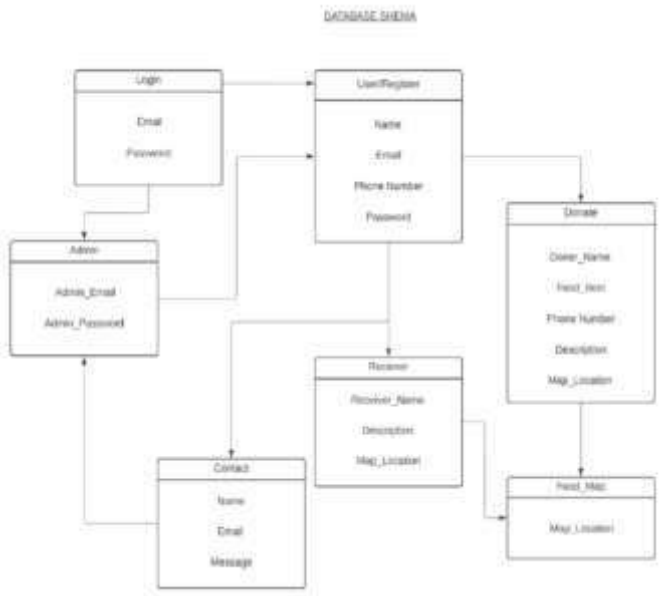


Fig:1.1

1.4 Desk Research

Food Sharing, Redistribution, and Waste Reduction via Mobile Applications

Key Insight: Digital platforms encourage food sharing and redistribution, reducing waste at community and industrial **levels.**

Relevance: Emphasizes the role of technology in tackling food insecurity through seamless donor-recipient interactions.

Designing a Mobile Application for Food Wastage Reduction

Key Insight: Using GIS & Google Web Services can help map food donors and receivers in real-time, improving logistics.

Relevance: Our app can incorporate location-based services to enhance food pickup and delivery efficiency.

Waste Food Management System and Donation Application

Key Insight: An easy-to-use interface increases participation from individuals, restaurants, and NGOs.

Relevance: UI/UX design is crucial for the app's success— simple, intuitive layouts can encourage food donors.

Food Wastage Reduction Mobile Application

Key Insight: Apps can integrate notifications & reminders for restaurants to donate surplus food before it spoils.

Relevance: Push notifications can remind restaurants to log surplus food, reducing waste proactively.

Mitigating Food Waste through Charitable Giving: An App- Based Approach

Key Insight: Blockchain can improve transparency & trust in food donations.

Relevance: We can implement tracking & verification features to ensure food safety and prevent misuse.

Tackling Food Waste and Supporting the Underprivileged Using Android Studio

Key Insight: Android-based applications can integrate AI driven food matching algorithms for efficient donations.

Relevance: AI can optimize food distribution by matching donor locations & food needs in real-time.

Online Food Donation Services: Challenges & Reduction of Food Waste

Key Insight: Managing logistics, transportation, and food safety are critical challenges in food donation platforms.

Relevance: Our app should include quality control checks and coordinate with NGOs for efficient food handling.

2. Proposed Methodology

2.1 Coding, Testing and Implementation

Check if all the interactions between these servers are executed properly. Errors are handled properly. If a database server returns any error message for any query by application server then application server should catch and display these error messages appropriately to users. Check what happens if a user interrupts any transaction in-between? Check what happens if the connection to the web server is reset in between?

Implementation Steps:

- Ensure Firebase is correctly initialized in your app's Application class or onCreate() method of the first activity.
- Create a mock Firebase database for testing environments to prevent

altering production data.

- Test fetching and updating data through the repository classes (DealsRepository and CheckUpdate).

Testing:

Unit Testing:

- Mock Firebase API responses using libraries like Mockito.
- Check if the correct callbacks (onSuccess/onFailure) are invoked for fetching deals.
- Simulate database errors to validate the handling of failures (e.g., no internet, Firebase fetch error).

Integration Testing:

- Test the flow from the database to the view (RecyclerView) using Espresso to ensure the UI displays data correctly.
- Verify that the RealtimeDeals fragment displays a loading spinner and handles empty responses correctly.

Errors:

- No Internet Connection: Ensure Snackbar for retry appears when there's no network connectivity.
- Firebase Fetch Failure: Ensure the app logs the error using Log.e(TAG, errorMessage) and displays an appropriate message via Toast to the user.
- Null or Empty Data: Handle cases where the data may not exist in Firebase (empty lists or null references).

2.2 Testing and Errors

Compatibility of our Application is a very important testing aspect. See which compatibility test to be executed

- Android Device compatibility
- Operating system compatibility **Android Device compatibility:**

Android device compatibility is crucial for the "FOODCONNECT" application to ensure it functions effectively across a diverse range of smartphones and tablets. Testing will focus on various screen sizes, hardware specifications, and resolutions to guarantee a consistent user experience. This includes verifying that the app's layout, features, and performance are optimized for different devices, enabling users to access food donation services seamlessly.

OS compatibility:

Operating system compatibility is vital for the "FOODCONNECT" application to function correctly on different versions of the Android platform. The application will be tested on multiple Android versions to ensure that all features and functionalities perform as intended, regardless of the user's device. This testing will help identify any version-specific issues and ensure that users have a reliable and consistent experience, promoting accessibility for all potential users of the app.

Implementation Steps:

- Use a GridLayoutManager with item decorations for spacing.
- Ensure that the DealsAdapter populates each view holder correctly, especially for images and text views.
- Lazy-load images using Picasso or any other image loader library.

Testing:

Unit Testing:

- Mock the DealsModel and verify that the correct data is set in each view holder (ImageView, TextView, etc.).
- Validate that image loading uses fallback URLs when the provided image URL is invalid or empty.

UI Testing:

- Use Espresso to scroll through the RecyclerView and verify that all items are loaded and displayed.
- Test dynamic data addition by simulating API calls and verifying that RecyclerView updates when new data is appended using addDeals().

Errors:

- Null Images or Invalid URLs: Ensure placeholder images are shown when URLs are broken or missing.
- RecyclerView Overlapping: Check if spacing between grid items is maintained properly using GridSpacingItemDecoration.

3. Implementation

3.1 Present System

Currently, there is no centralized platform to manage and distribute excess food from restaurants to those in need, leading to significant food wastage. Many restaurants end up discarding edible food due to the absence of an organized donation process. While some volunteer groups and organizations attempt to coordinate food donations, these efforts are often fragmented and inefficient, lacking the scale needed to make a significant impact. The process is largely manual, making it difficult for restaurants to identify where to donate, and for recipients to access available food.

Additionally, without a real-time mechanism for communication, many opportunities for food distribution are missed. The lack of a streamlined approach makes it challenging to track donations, ensure food safety, and effectively match surplus food with those who need it most. This disorganization results in a substantial amount of food being wasted daily, highlighting the need for a solution like "FOODCONNECT" to simplify and improve the food donation process.

3.2 Proposed System

The "FOODCONNECT" app will effectively address food wastage and hunger by providing a centralized, realtime solution connecting food donors and recipients. Key features of the system include:

User-Friendly Interface: The app will offer an intuitive interface, allowing easy navigation for users to find free food locations. Both donors (restaurants and individuals) and recipients will have streamlined access to the platform.

Surplus Food Listings: Restaurants can register and list surplus food with details like type, quantity, and expiry, making food donations fast and efficient.

Real-Time Updates: Users will receive real-time notifications when new food is available, ensuring quick access to fresh food before it is wasted.

Map Integration: The app's map feature will help users locate nearby donation points, with directions provided for convenience.

Location-Based Matching: Geolocation services will match users with nearby food donation points, promoting quick and efficient distribution.

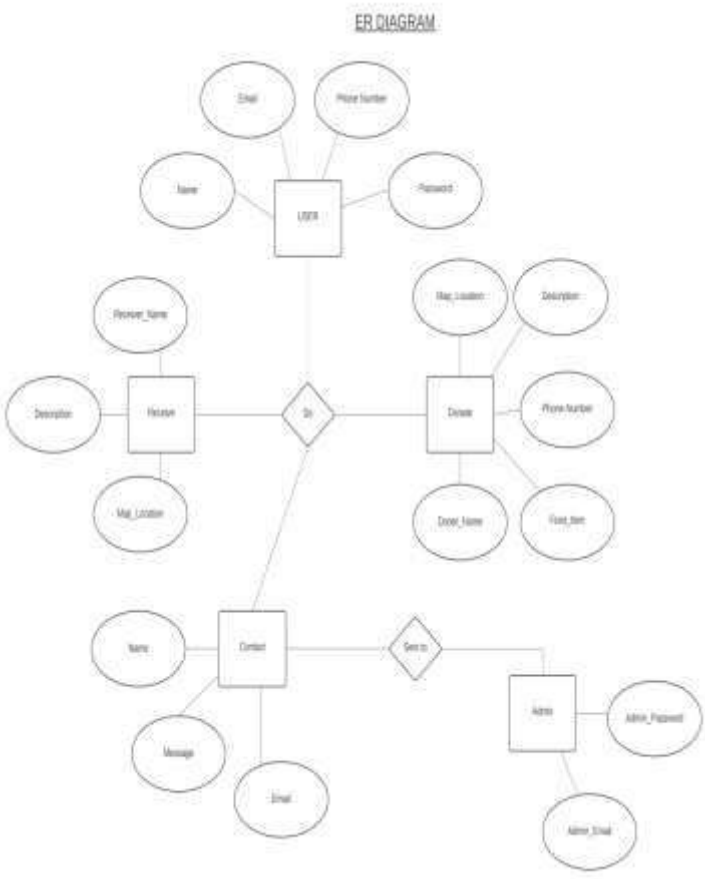
Donation Tracking: Donors and recipients can track their activity, maintaining transparency and accountability within the platform.

Feedback System: Recipients can provide feedback on donated food, ensuring safety and quality standards are maintained.

Multi-Language Support: The app will offer support for multiple languages to cater to diverse users.

By simplifying the donation process and offering realtime solutions, "FOODCONNECT" will reduce food wastage while efficiently distributing surplus food to those in need.

3.3 Model Implementation



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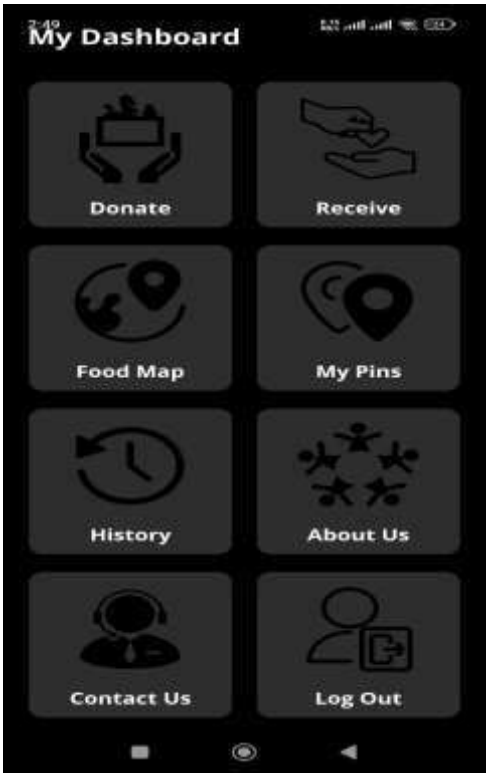
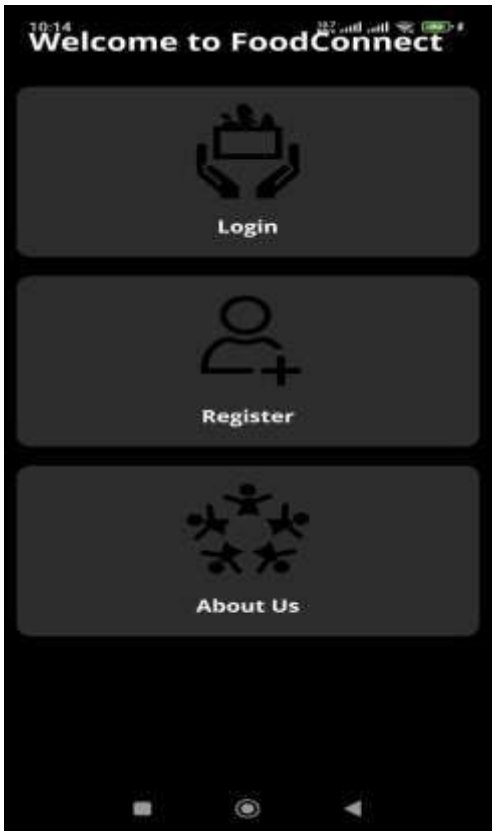
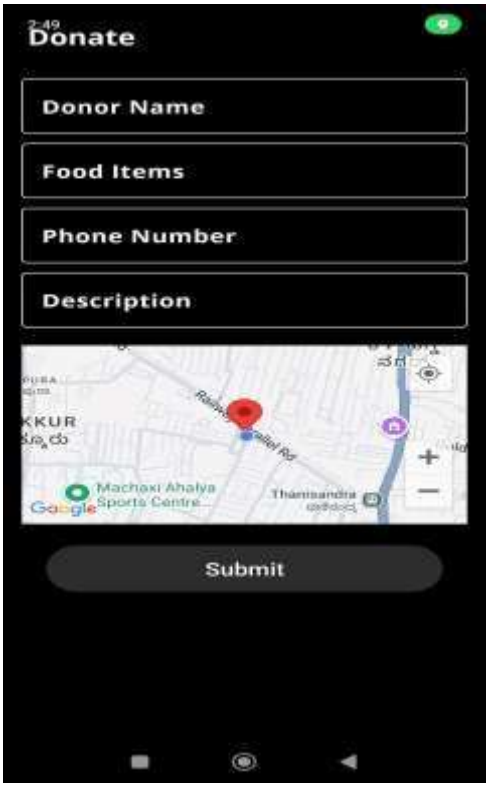
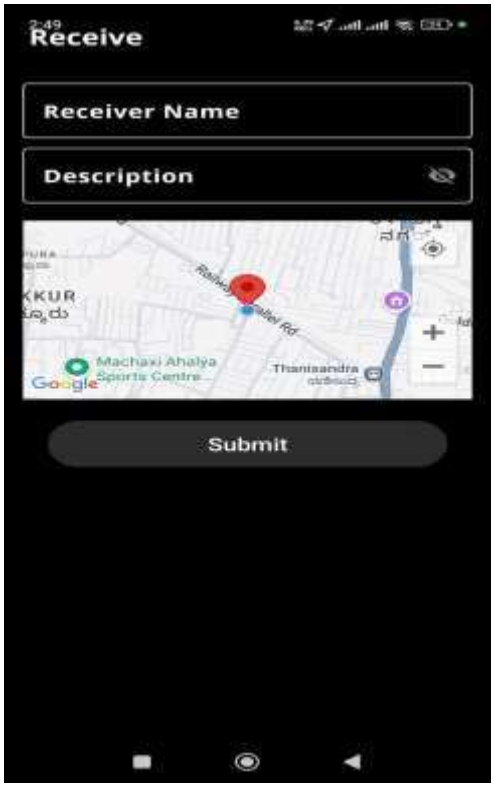
4. Results and Discussions

4.1 Results









4.2 Future Enhancements

Broader Donation Categories: Expand the platform to support donations beyond food, such as clothes, books, and other essentials.

User Interface and Experience Enhancements: Based on user feedback, further refine the UI/UX to improve ease of use, visual appeal, and overall experience.

Advanced Analytics and Reporting: Integrate more advanced analytics to track food donations, identify trends, and report on the impact of the platform, helping both donors and recipients.

Geographical Expansion: Expand the app to other cities, regions, or even countries to increase its reach and impact, providing more people access to surplus food.

Collaborations with NGOs and Local Organizations: Build partnerships with nongovernmental organizations and local community groups to streamline food distribution and increase visibility of the platform.

Sustainability Initiatives: Add features to promote sustainable practices among users and donors, such as tracking the environmental impact of reducing food waste. These enhancements will further strengthen Bhojan Saajha's role in reducing food wastage and fostering community welfare while scaling up to support a broader range of social needs.

5. Conclusion

The "FOODCONNECT" app was developed to address the critical issue of food wastage by connecting restaurants with individuals in need. By providing a userfriendly platform, it bridges the gap between excess food and those who can benefit from it. The app successfully integrates various functionalities like user and donor registration, food listing, real-time notifications, and mapbased search for nearby donations. This project not only promotes food security and reduces wastage but also fosters community support by facilitating easy food sharing. The successful development of the app highlights its potential for largescale implementation, helping to make a positive impact on society. Going forward, FOODCONNECT can be further improved and scaled to achieve even greater outcomes.

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