Housit : Mobile Application for Household Care

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Abstract

This proposal outlines the development of a mobile application designed to streamline household management in shared living environments. The app includes essential features for managing communal tasks such as grocery lists, finance tracking, cleaning and event scheduling. With real-time notifications, a user-friendly interface, and integration of these key features, the application aims to enhance coordination among house members. The proposed solution addresses the current lack of a comprehensive tool that can efficiently handle multiple aspects of shared living management in one platform, promoting better collaboration and reducing conflicts in communal settings.

Keywords : Household Management, Co-living, Grocery Management, Expense Tracking, Cleaning, Event Scheduling, Optical Character Recognition(OCR)

1 Introduction

1.1 Importance of the suggested project

CO-LIVING is rapidly emerging as a popular housing option for young people within the one-person household market. Due to the increase in one-person households, high housing costs, and safety concerns, many individuals choose to live in dormitories or share houses.[21] However, living with others is not an easy task. In fact, a survey of share house residents revealed that 35% of them feel there is a need for improvement in conflict resolution among tenants. To address this issue, we have explored ways to enhance communication among the growing CO-LIVING population and have planned a service that helps manage shared spaces and items.

1.2 Introduction to previous approaches

There have been previous attempts to address living-related issues. Before introducing our service, we will take a look at earlier approaches, such as '*Flatastic*', '*유통기한 언제지? (When is the expiration date?)*' and *Tody*

Flatastic '*Flatastic*' is an application which is designed for managing shared living spaces. It provides some features for cost-sharing among housemates, scheduling cleaning tasks, and managing shopping lists. *Flatastic* supports communication between users and simplifies the management of communal living.

유통기한 언제지(When is the expiration date) This application helps users systematically manage the expiration dates of their foods. Users can register the expiration dates and receive notifications as the dates approach. This helps users keep their food items fresh and reduce unnecessary waste.

Tody '*Tody*' is a cleaning management application. This helps users to get motivated to clean their home by breaking down house chores into smaller tasks and making them feel like playing games.

1.3 Proposed solution

To enhance communication and management efficiency among the co-living population, we propose the application '*Housit*'. This application offers various features that help users to manage their communal living experience more effectively. First, the **task-sharing management** feature allows users to easily check their assigned chores and prevents conflicts through fair distribution with other residents. Second, the **expense management** feature provides a transparent way to handle shared costs, such as rent and utilities. Third, through a **shared schedule management** feature, residents can coordinate and schedule communal events ensuring everyone stays informed and engaged. Lastly, the **grocery management** feature enables efficient tracking of shared grocery lists and sends notifications for expiration dates, helping reduce food waste and supporting efficient meal preparation. By integrating these features, *Housit* aims to enhance the quality of communal living, minimize disputes among residents, and contribute to forming an efficient and harmonious community.

2 Motivation

While co-living offers economic advantages, the problems such as conflicts among residents and lack of communication remain unresolved. Existing approaches have addressed certain aspects of co-living management, but they lack integration and fail to provide a comprehensive solution. Features are typically offered in isolation, making it difficult for residents to manage their communal living experience effectively.

Therefore, we are committed to provide a service that includes all the necessary management and communication features in shared living spaces. Through this, we seek to enhance residents' living experience and create a positive community culture.

3 Background & Related Works

3.1 Shared Living Application

3.1.1 Flatastic

Flatastic is a household management application that comprehensively manages tasks necessary for communal living. This app includes features for managing cleaning areas, expenses, shopping lists, and also has a built-in chat feature.

In the **Chores** section, users can create cleaning areas and assign them to each household member. It allows users to set cleaning cycles and sends notifications when the assigned day arrives.

For **Expenses**, users can manually record and track spending, making it easy to see who paid for which event and how much. It also aggregates shared expenses and calculates how much a particular member needs to transfer to others.

The **Shopping list** feature allows users to list and share items that need to be purchased, which can be checked in real-time. Users can create items and tag them with categories, allowing them to filter or sort the list by specific categories.

Additionally, the app includes a **chat** feature, enabling communication among members without the need for a separate messenger, all within the integrated application.

With these features combined, *Flatastic* has become the most widely used service in the household management app market. However, it has some drawbacks, such as the lack of a food management feature essential for communal living, the inability to record account balances or budgets aside from expenses, and the limitation of not being able to add detailed descriptions for cleaning areas.

3.2 Food Management

3.2.1 유통기한 언제지 & BEEP

'유통기한 언제지(When does it expire?)' and ***BEEP*** are apps designed for refrigerator and expiration date management. Their key features include product registration through barcode scanning, receipt capture, and manual entry.

The apps send notifications based on the user-set date and time when an item's expiration date is approaching, which helps prevent food waste caused by expired goods. Additionally, a major advantage is that users can invite other members to manage the same virtual refrigerator in real time.

However, while it is possible to automatically add the name and quantity of products via barcode scanning and receipt capture, users still need to manually input the expiration date. If this feature were enhanced to automatically register expiration dates, the user experience would be significantly improved.

3.3 Finance Management

There are two main types of applications that help communal members manage their finances together: household accounting apps and digital banking apps. The following is an explanation of each type.

3.3.1 Financial Ledger Apps Apps

Financial Ledger Apps apps help users develop financial management skills by manually or automatically recording expenses, budgets, and balances. In South Korea, the three most widely used household accounting apps are ***뱅크샐러드(Bank Salad)***, ***편한 가계부(Simple Household Ledger)***, and ***유플래너(Uplanner)***.

The core functions of Financial Ledger Apps apps include: managing shared accounts/bank books, manually recording and managing balances/budgets/expenses, linking to actual bank accounts, and automatically recording expenses when they occur.

Each of these applications offers different features, as illustrated in the comparison figure below.

Table 1: Feature Comparison of Financial Ledger Apps

Feature/Service	뱅크샐러드	편한 가계부	유플래너
Shared Account/Linked Accounts	△ (up to 2 members)	✗	○
Manual Record of Balance/Budget/Expenses	○	○	○
Bank Account/Card Integration	○	✗	○
Automatic Expense Registration	○	✗	○

One downside of ***뱅크샐러드(Bank Salad)*** is that the number of members who can share a joint account is limited to two. ***편한 가계부(Simple Household Ledger)*** lacks the feature to invite members to manage shared accounts. On the other hand, ***유플래너(Uplanner)*** is the only application that provides all of the above-mentioned functions.

However, we aim to implement this feature of communal finance management within our integrated app, allowing users to manage all aspects of communal living.

3.3.2 Digital Banking Apps

Digital banking apps enable users to manage accounts, make transfers, and apply for loans via mobile devices. In South Korea, an increasing number of banks(such as *KakaoBank*) are starting to support group banking, allowing members to share and manage the transaction history of joint accounts in real-time.

However, the critical drawback of digital banking apps is that they require an additional method to manage budgets separately from income/expenses.

3.4 Cleaning(Chores) Management

3.4.1 Tody

Tody is a to-do list app designed to manage cleaning routines. *Tody* primarily includes a feature to set and manage cleaning cycles. Additionally, it allows users to create specific cleaning areas and, within those areas, set detailed tasks that need to be completed. This makes cleaning a more intuitive and concrete activity.

An interesting feature of *Tody* is the visualization of dust as a character. Users can eliminate the dust by completing cleaning tasks, earning credits in the process, making it feel almost like playing a

game. Another advantage of *Tody* is the ability to invite communal members to join and manage the cleaning tasks together.

However, since tasks are assigned in a way that allows users to earn credits by completing the cleaning themselves, it seems necessary to have a feature for assigning and distributing cleaning areas beforehand.

3.5 Event Management

3.5.1 카카오톡(KakaoTalk)

KakaoTalk is currently the most widely used messenger app in South Korea. *KakaoTalk* includes a group event feature that allows users to set dates, times, and notifications, as well as tag participants for the event. Additionally, it has a feature called **Talk Calendar**, where completed events can be viewed in a timeline format.

3.5.2 Google/Naver Calendar, TimeTree

Apps such as *Google Calendar*, *Naver Calendar*, and *TimeTree* offer shared calendar functionalities. These apps allow users to create and share calendars with family, friends, and colleagues, and manage tasks through the to-do function.

If we integrate these features from *KakaoTalk* and calendar apps into a unified household app, it would greatly enhance the ability to create, modify, manage, and track communal schedules.

4 Problem Statement

The current solutions for household management in shared living environments suffer from a **lack of integration** and **limited functionality**. While there are apps available that manage cleaning schedules, track expenses, or create grocery lists, most of them only address a single aspect of communal living. As a result, residents face difficulties in coordinating their efforts, which can lead to conflicts, miscommunication, and inefficient management of shared spaces and responsibilities. The absence of a comprehensive platform that offers all necessary features under one roof presents a challenge in maintaining harmony and efficiency within co-living arrangements.

5 Objectives

The primary objective of our service is to provide a unified solution that effectively addresses the key aspects of household management in shared living environments. Our app offers a platform where users can manage their communal tasks such as cleaning, expense tracking, event scheduling, and grocery lists in an integrated and user-friendly way. By providing real-time notifications, role assignments, and easy access to shared information, our app aims to minimize conflicts, streamline communication, and enhance collaboration among house members. Ultimately, the goal is to create a seamless and harmonious living experience for all residents involved.

6 Proposed Solution

6.1 Room

Room Creation Process When the user selects 'Create Room', they set a room name and enter a 6-digit PIN number to create the room. At this point, a unique roomID is automatically assigned to the room, and all future room identification is done using this roomID. Users will need the roomID and password (PIN) to access the room again.

The first user to create the room and register themselves as a member becomes the room owner, and the **room owner** has the authority to ban users from the room.

Room Joining Process If the user wants to join an existing room, they can select 'Join Room', enter the roomID and password, and gain access to the room.

User Management When entering a room, the user will see a list of members in the room. If they have previously registered themselves, they can simply click on their name from the list to enter. If it's their first time in the room, they will need to add themselves to the list. Setting a user password is optional, not mandatory.

Login Information Storage Each room is uniquely identified, and within each room, the user's name (userName) must be unique, allowing individual users to be distinguished. To improve accessibility, login information is saved in LocalStorage so users do not have to re-enter the roomID and password every time they access the room.

User Ban (Expulsion) When roommate members change, there may be a need to delete a previous member or expel a problematic user. In such cases, the service ensures that the expelled user can no longer view room information. When a user is expelled, the room password would be changed by password reset process, preventing the expelled user from re-entering with a different account or creating a new user. The updated password is automatically distributed to the remaining users. The room owner has the sole authority to ban users from the room.

6.1.1 Simplicity of the Service

The room creation process is straightforward, and the absence of a signup process is a key feature of this service. This is because providing an easy initial experience is crucial for user retention. If users feel any inconvenience or annoyance during this process, they are likely to leave the service. To make access even easier, the service uses simple 6-digit PIN numbers instead of enforcing strict password rules.

The app's primary purpose is information sharing, such as cleaning duties or leftover food inventory, which is not highly sensitive information. Therefore, strict password rules were not applied, reducing user fatigue while maintaining sufficient security for the app's intended purpose.

Thus, the aim is to simplify and streamline the room creation and access process by eliminating unnecessary steps.

6.1.2 Importance of User Accessibility

The first time a user interacts with the service is the most critical moment. If they encounter difficulties or are required to go through complex procedures, they are likely to leave the service right away. Therefore, the service is designed to ensure that users can quickly and naturally join with minimal friction. Complicated sign-up or authentication processes can become barriers that lead to user drop-off, so these have been eliminated, allowing users to create and access rooms with minimal information.

Ultimately, simplifying the room creation and access process helps ensure that users do not feel inconvenienced and can naturally begin using the service, which is the core intent of this service.

6.2 Home

6.2.1 Information Overview

On the home screen, users can easily grasp various pieces of information at a glance. They can check if there are any events today, which food items are nearing their expiration date, which cleaning zone is assigned to them today, or if it's the payment day for fixed expenses. Even if the user doesn't need to use other features of the app today, simply opening the app and viewing the home screen allows them to immediately see what tasks need to be done.

6.3 Food

Users can manage the foods at home through 'Food' tab. They share the food condition, obtain food information that needs to be purchased, and discard the food after checking the expiration date. ***Housit*** provides a list of all foods at home, and these lists include information such as the name, purchase date, expiration date, and quantity of each food. In the case of food list, it may be added directly by users, or in the case of a product with a brand name, such as '서울우유', it may be automatically added through a camera. Each food on the food list can also be modified or deleted by users.

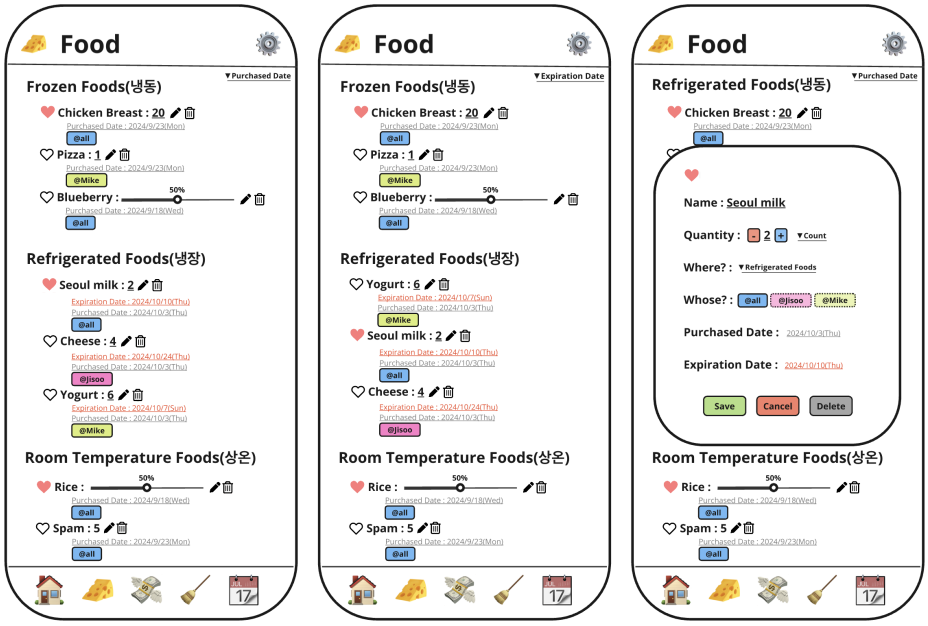

Figure 1: Food views : (1)sorted by purchased date, (2)sorted by expiration date, (3)modify the item information

'Food' tab categorizes the food list based on three storage methods: room temperature, refrigeration, and freezing. Food list can be sorted by purchase date or expiration date. When users add food themselves, they can input storage method, quantity, expiration date, and purchase date. The purchase date defaults to the day the food is added, and it is also possible not to enter an expiration date. For the quantity, users can enter a count, or if it cannot be counted, it can be represented as a percentage(%). Additionally, users can choose whether each food is for personal or for communal. Depending on whether the food is personal or communal, tags will be added when the food is displayed in the food list. Therefore, it is also possible to filter and view food items designated for a specific individual. If a user wants to edit the information for each food item, they can click the brush icon to modify the information for that food item. After making the edits, clicking the save button will apply the changes.

For certain foods, users can click on the heart icon next to each food item in the list to set a minimum amount that should always be maintained. When the quantity of a food falls below the set amount, the items that need to be purchased will appear in the 'home' tab for quick buying.

The special feature of *Housit* is that it alerts users when food is near expiration day and displays it at the top of the 'Food' tab N days in advance. This allows users to check for food items that are nearing their expiration date, enabling them to consume or dispose of the items quickly.

Figure 2: Displaying foods near the expiration date at the top of Food view

6.3.1 Optical Character Recognition (OCR)

Housit will use OCR to automatically recognize the product name and expiration date when the brand name is printed on the surface, adding them to the food list for user convenience. While there are various OCR libraries available, *Housit* plans to implement this using 'Tesseract' to recognize the product name and expiration date. Tesseract was first developed in 1985 and is a free API used by many developers, so it seems possible to utilize it for text recognition. However, since the current recognition rate for Korean in Tesseract is not high, efforts are being made to improve accuracy through language data training and image preprocessing.

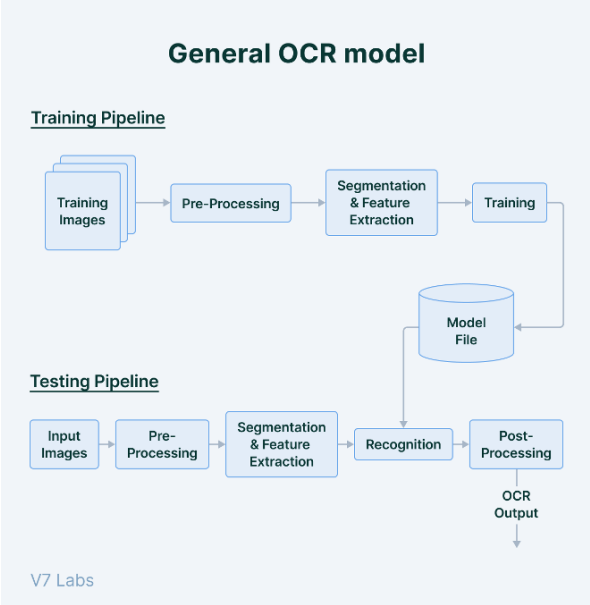

Figure 3: General OCR model[Ban21]

Concept OCR is a technology that recognized and extracts text from images or scanned documents. The process typically involves the following steps: **Image Preprocessing**: Optimizing the image for

recognition by removing noise, binarizing, and correcting skew. **Character Segmentation**: Separating individual characters from image for recognition. **Feature Extraction**: Extracting features from each character to convert them into a recognizable format. **Character Recognition**: Identifying characters based on the extracted features and converting them into text.

The main feature of *Housit* is not AI-based, so *Housit* will focus on improving Korean recognition accuracy by using existing API, Tesseract, along with preprocessing functions.

Implementation Plan *Housit* plans to use a webcam to read frames at regular intervals. After preprocessing each frame, it will recognize Korean text using Tesseract. If a product name and expiration date are recognized, it will send a POST request with the recognized data to allow a new food item to be added to the food list. Since brand names often use various fonts, difficulties in character recognition are expected. Therefore, to improve Tesseract's recognition rate, we plan to experiment with a combination of different preprocessing steps, such as grayscale conversion, binary conversion and noise removal, to find the optimal preprocessing method.

6.4 Finance

Adding and Managing Accounts Users can add their sharing accounts. They can create multiple accounts tailored to specific purposes and check the balance and transaction history for each account monthly. If you have fixed expenses like rent or various subscription services, you can mark the payment date and view it on the home screen on the due date. Users can easily see which categories they spent the most on through the total amount spent per category.

6.5 Clean

Adding and Managing Cleaning Zones Users can first add cleaning zones and assign members responsible for cleaning each zone. These added cleaning zones can be viewed in the 'Cleaning Zone Guide' section, and users can edit existing zones using the edit button if necessary.

Random Cleaning Zone Assignment Function For cleaning zone assignments, a random assignment feature is available. The process follows these simple steps:

1. Select the members to be assigned
2. Select the cleaning zones to be assigned
3. Random assignment (ladder method)

This ensures that cleaning zones are assigned fairly.

Cleaning Request/Reminder Notification Feature A feature to send cleaning requests or reminders to the members responsible for specific cleaning zones will also be added. This ensures that cleaning requests are efficiently communicated.

Setting Cleaning Frequency and Dates When assigning cleaning tasks, users can set a specific frequency or date for cleaning. This allows cleaning to be managed automatically according to a set schedule.

6.6 Event

Shared Event Addition Feature

- Date and Time Settings: Users can set the date and time of the event, with an option to select all-day events.
- Attendee Check (Tag): Users can tag roommates to mark who will attend the event.
- Notification Feature: Event notifications can be set, with options to remind attendees either on the day of the event or a specified number of hours/days before.

7 Planning in Detail

7.1 Role Distribution

Table 2: Team Members and Roles

No.	Name	Role
1	김민수	Planning, Document Management, UI/UX
2	조서영	OCR Feature Implementation
3	진서영	UI/UX Design
4	최진욱	Frontend
5	황수영	Backend

7.2 Brief Schedule

Table 3: Weekly Schedule for Development

No.	Task Description	Schedule (Weeks)												
		3	4	5	6	7	8	9	10	11	12	13	14	15
1	Detailed Function Ideation	■	■	■	■									
2	Proposal Writing		■	■	■									
3	Proposal Presentation				■									
4	API Specification Writing				■	■								
5	DB Structure Design					■	■							
6	Mobile App Workflow Design						■	■						
7	Mobile App Design						■	■						
8	Frontend Implementation							■	■	■				
9	Backend Implementation								■	■	■			
10	OCR Scan Function Implementation									■	■	■		
12	Mid-progress Check											■	■	
13	Presentation												■	■

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