Custom House

A platform that enables customizable operations of home appliances

Na Rim
College of engineering,
Hanyang University,
Dept. of Information system
skfla07@naver.com

Hyun Gyu Won
College of engineering,
Hanyang University,
Dept. of Information system
gyuwon255@hanyang.ac.kr

Jo So Youn
College of engineering,
Hanyang University,
Dept. of Information system
sylph727@gmail.com

Yang Kyung Hun
College of engineering
Hanyang University,
Dept. of Information system
ygh1254@hanyang.ac.kr

***Abstract*—'내멋대로ㅎLG' is a platform that enables a user to customize their routines. Core values of '내멋대로ㅎLG' are 'personalized experience', 'convenience', and 'data-based'. According to the Korea Communications Commission, the ownership rate of digital television was 94.9% in 2021. Also, as reported by the Korea Power Exchange, the number of refrigerators owned per household was 1.01 in 2019. These numbers indicate that home appliances are already widely distributed. Thus, offering user-customizable services has become a crucial factor for consumers in choosing products. As a result, making 'smart appliances' which offer personalized experiences has become an important market. The platform, '내멋대로ㅎLG', can attract potential customers by maximizing user convenience. '내멋대로ㅎLG' utilizes not only preset time, but also the user's voice as a trigger, using an AI speaker. Users can operate several smart appliances by speaking commands. According to Research and Markets, the global smart appliances market is estimated to reach US$65.3 Billion by 2027, with a compound annual growth rate of 14.1% throughout 2020-2027. Moving on, the platform '내멋대로ㅎLG', utilizes massive user data. Users can share their routines, and recommend several patterns using the acquired data. These data will accumulate into big data, which can be a significant resource for corporations. As a result, '내멋대로ㅎLG' can be a crucial factor for corporations in the future.**

Role Assignments

Roles	Name	Task description and etc.
User	Na Rim	Her daily routine is pre-planned and efficient. She orders a simple phrase and the application does the dedicated job. She customizes and shares her routine to the '내멋대로ㅎLG' application.
Customer	Jo So Youn	She is interested in the newest technologies and their convenient features. She uses the latest LG home appliances equipped with Wifi connection. Her morning routine is quite complex but she is only given a limited amount of time. Executing each device takes up too much time.
Software developer	Yang Kyung Hun	He is the one who creates the application's code. He stays up all night to keep up with the rapid growth of users.
Development manager	Hyun Gyu Won	He oversees the application's general development. He manages timetables and responds to feedback from clients and other developers.

I. INTRODUCTION

Motivation

According to the Korea Communications Commission, the customer ownership rate of digital TVs in 2021 was 94.9%, and according to the Korea Power Exchange, the number of refrigerators owned per household in 2019 was 1.01. These numbers show that home appliances are widespread nowadays. Without a doubt, home appliances are an indispensable part of our lives. According to the Korean Statistical Information Service, Korea's GNI has exceeded $30,000. As a result of this economic growth, living standards have improved as well. Therefore, consumer expectations for home appliances have also changed. In the past, home appliances used to be tools that solely performed the tasks that were assigned to them. For instance, the washing machine was simply used to do the laundry and wash clothes, the vacuum cleaner was simply used to vacuum dirt, and the television was simply used to display TV programs. However, people no longer want appliances to perform only simple functions. People hope that more convenient and innovative features will be used together in the future.

While factors such as design and color have been the criteria for selecting home appliances until now, connectivity between devices and ease of use are expected to be emphasized in the future. In particular, the purchase pattern of choosing between products of different brands with their respective strengths, such as refrigerators from Company A

and TVs from Company B, is also expected to shift to favoring a single brand that focuses on connectivity between devices. An industry official stated, “In the past, there was a clear preference for each product, such as favoring company A for TV and company B for refrigerator, but recently, more and more people are looking for a single brand.” In other words, consumers are focusing on the ‘convenience’ of devices being ‘connected’ to each other when purchasing home appliances.

At the ‘World’s Largest Consumer Electronics: IT Exhibition CES2022’, which opened an offline exhibition in Las Vegas, USA, the core idea of this year’s CES 2022 was ‘connection and expansion’. The main keywords were space tech, eco-friendly, artificial intelligence, robot, and metaverse, and regardless of various industries such as mobility, mobile, and home appliances, the most important part at this year's CES was 'future scalable technology based on connectivity. Regarding the home appliance market, Geun-ho Jeong, director of Atlas Research & Consulting Co., Ltd., commented that “The smart home is changing into health, convenience, entertainment, stability and security, commerce, communication and connection” at the KMA Global Trends Forum. In other words, homes are now developing smartly as complex cultural spaces for individuals rather than simply a place of residence, and artificial intelligence and robot technology are at the center of this change. Home appliances are linked to each other, increasing the convenience of consumers in their daily lives, such that TVs and tablet devices that become hubs are being customized to the user. In this way, everyday life in a smart home will naturally become a part of our society. We will join this trend by developing custom home appliance execution services and connecting them to AI.

As the form of furniture becomes more diverse, the lifestyle of each household is also becoming more unique rather than having common characteristics. Some people want multiple home appliances to operate automatically at a certain time, some want to operate with a simple command, while others want home appliances to operate automatically according to their location or status. A common recommendation system and a manual system provided by a company cannot satisfy each individual's preferences and needs. Our service respects and accepts the uniqueness of individuals, allowing users to create their own home appliance operation manuals. The goal is to increase consumer convenience by linking devices beyond simple control through mobile applications. This will provide users with more convenience than directly operating the product, and will allow users to have a positive experience with smart homes and personalized systems.

Problem statement (client’s needs)

- While using a voice assistant on a smartphone is prevalent and accessible, doing so with household appliances is not the case.

- It is a hassle to operate or set up each appliance in particular situations common in everyday use.

- It is difficult to execute routine tasks by using voice recognition in existing applications.

- There may be useful commands that people may not realize they need.

- Given the importance of data collection in the twenty-first century, it would be advantageous to make the most of this technique to target the needs of specific customers.

Research on any related software

A. Amazon Alexa

Alexa is a virtual personal assistant from Amazon. This program is similar to what our team is looking to build and improve on. It executes simple tasks such as "turn on the lights" to being able to create customizable routines with only a few words.

B. LG ThinQ

LGThinQ is an application for LG Smart Appliances. With recent LG home appliances being equipped with wifi connection, LG ThinQ allows the user to manage all related appliances with a single application. Also, the more you use your application, your patterns will be remembered and analyzed using machine learning, making your usage more convenient.

C. SmartThings

Samsung SmartThings is an umbrella control and automation platform for appliances. It does not only provide service for Samsung but just like what an umbrella symbolizes, it provides services to tons of first and third-party devices. Hundreds of brands and thousands of devices such as lights, cameras, voice assistants, and certain home appliances are compatible with this service.

II. REQUIREMENT ANALYSIS

A. Sign up

After users download and open the application, the splash screen will appear for a while. After the splash screen, users can move to the login page. If they are first-time visitors and non-members, they should go through the sign up process. There are two ways to the sign-up process. First is general sign-up. Users can sign up by typing their name, phone numbers, age, gender, the size of their households, email address, ID, and password. They also need to go through the identity verification process. The second way is by signing up with their social account. In this case, users must provide additional information on household size. Additionally, social login is possible using the social ID of Naver, Kakao, and Google.

B. Log in

After the sign-up procedure, users’ data is stored in the database. If users enter their ID and password and this corresponds to the information in the database, their login is successful and the screen will move on to the following screen. If the information they entered is wrong, a message window will appear saying “Your ID or password is incorrect”. If users forget their ID, they can find it by typing their name and email address. If they forget their password, they can reset their password after phone authentication.

C. Analysis of user's routines

This function enables users to receive recommendations from routines implemented multiple times under certain conditions. For instance, the platform will suggest the chance to add the trigger, "Cleaning at 11 PM every Sunday", if a user does the cleaning routine every Sunday at 11 PM for a specific period. Additionally, by analyzing the frequency and sequence of home appliance usage, the platform will recommend new routines based on the usage. For example, if the user tends to use the air-conditioning system after switching on the ventilation system, these steps will be recommended as a routine.

D. Set user's own pattern

If the recommended patterns are not satisfying, users can customize and add their own routines through a series of processes:

1. A user can select which household appliances to include in a new routine from the predefined product list.
2. After the first procedure, the user can set up some options. For instance, the user can power on and off the air cleaner, set the temperature of the air conditioner, and so on.
3. The user has to enter a keyword or a time as a trigger to operate predefined home appliances. For example, if the user sets a keyword as 'Cleaning', the home appliances operate by predefined settings when the user speaks the keyword, 'Cleaning'. Else, the user sets a time to 11 am, and the home appliances operate at the time, 11 am.
4. Press the 'Add' button to finish the setting process. The customized routine can be identified on the "My routine" page.

E. Operation using a speaker

Users can execute a preset command by giving an instruction to the speaker. The speaker recognizes the user's command and performs operations set in the corresponding command. That is, a specific pattern may be easily executed through a command preset at the desired moment by the user. The speaker provides a brief description of the operation followed by the execution. Speakers can not only perform commands but also can stop the operating process.

F. Recommend patterns to users

We know information about the user's gender, age, and household size. Using these three key informations, our platform recommends a pattern suitable for each piece of information. Recommendations are made on the Routine List page. If the user's gender is a woman, our platform recommends patterns that women often use or like. Users can be recommended and used immediately for their situation without much effort. The user just needs to add his or her favorite recommended routine to his or her list of routines.

G. Sharing routines amongst users

Through this platform, users can share their schedules and download those made by others. The ability to see trending routines in real time is also another feature. For instance, when the air quality is poor, the platform will advise utilizing the air purifier and styler since other users also carry out these actions.

H. Trending routines

Users can check real-time popular routines. Just like in *F. Recommend patterns* to users, they can add their favorite routine to their own routine lists. The ranking of *Trending routines* reflects the amount added by other users.

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