Clothes Tower: Smart Closet

More convenient clothes management

Jun Sung Kim
Dept. of Information Systems of Hanyang University
Seoul, Republic of Korea
jsistop16@naver.com

Seung Hwan Cheon
Dept. of Information Systems of Hanyang University
Seoul, Republic of Korea
dg7989@hanyang.ac.kr

Je Min Seo
Dept. of Information Systems of Hanyang University
Seoul, Republic of Korea
jemin3161@naver.com

Pyeong Soo Park
Dept. of Information Systems of Hanyang University
Seoul, Republic of Korea
ps3624@naver.com

***Abstract*— People have a lot of clothes. Did you forget anything? Are there clothes that you can't find when you need them? Clothes Tower is a smart closet that allows users to use clothes more conveniently by receiving the type and unique number of clothes through the application. Users will be able to wear the clothes they want in the best condition at any time through the Clothes Tower.**

Keywords—Clothes, Closet, management, Application

Role Assignments

Roles	Name	Task description and etc
User	**PyeongSoo Park**	**It analyzes and investigates which services customers want. It analyzes the purpose of the closet in detail and investigates how customers feel satisfied with the closet. It is in charge of various fields such as design and function.**
Customer	**JeMin Seo**	**It is in charge of the overall planning of ideas. From the customer's point of view, it contemplates and presents which parts are inconvenient and should be added. As the project progresses, problems are first discovered.**
Software developer	**SeungHwan Cheon**	**Create data that drives the closet and construct a draft on how to induce it to work. Design and implement applications. Overall, it is responsible for solving the driving method and software problems of the item.**
Development manager	**JunSung Kim**	**Identify and lead the overall flow of planning. Check the direction of the plan from time to time to see if it meets the original intention. In addition, it manages whether the tasks of the previous roles are being performed properly.**

I. INTRODUCTION

A. Motivation / Problem Statement (client's needs)

Recently, people's interest in fashion is getting hotter. Previously, there were many people who valued only expensive brand clothing. However, these days, each person buys and wears clothes according to their own personality. Wear many kinds of clothes such as outerwear, top, bottom, shoes, and accessories. In addition, as styles diversify, people share their own methods through SNS (Instagram or YouTube). Therefore, consumers sometimes forget the clothes they have organized in their closets because they repeatedly wear, buy, and throw away various clothes. Even once the season changes, there may be cases where you don't know which clothes were there. In addition, there will not be many people who manage many clothes with only one closet. We thought about how to manage many clothes in one space. And

we found the answer at the parking tower where the vehicle was stored.

The parking tower is a mixture of elevators and parking lots. The purpose of the parking tower is to maximize space utilization with the aim of parking many vehicles in a narrow space. For example, it is commonly used in high-rise buildings with many people due to the high floor of hotels and buildings where the circulation of cars is not fast. In addition, the advantage of the parking tower is that it is easy to monitor parking conditions, easy to operate equipment, and easy to operate and maintain as messages are printed in the event of a failure.

From now on, we will compare and analyze the 'Clothes Tower' and the parking tower to find client's needs.

i. Space utilization

- Parking tower.

As the number of vehicles to be accommodated increases, it is difficult to solve with the existing parking method (using the entire floor as a parking space). This is because it is far from design and utilization to divide one floor into parking and office spaces. Therefore, if you use it as a parking space, you have no choice but to use all floors as a parking space. Therefore, it was used vertically and long to increase the utilization of the building.

- Clothes tower

As clothes became more diverse and more diverse, there was a problem of lack of storage space. In addition, since clothes worn in different seasons vary depending on the season, clothes worn in different seasons often forget where they were placed when they were taken out and worn. Therefore, Cloth Tower, like the parking tower, adopted a horizontal extension method for use in the house. In the case of closets, it was judged that the entire space could be used, such as built-in cabinets and dress rooms.

ii. Easy to manipulate

- Parking tower.

The car is stocked and shipped through the screen. When the vehicle is put in at the time of warehousing and the number of the vehicle is entered, the machine remembers the information and places the vehicle in an empty space in the parking tower. When shipped, the vehicle is moved like an elevator to the position of the borrower with only a simple license plate input operation. Therefore, it is possible to relieve the hassle of driving separately or finding a vehicle.

- Clothes tower

Clothes can be taken out and put in through the display shown outside the closet. When putting clothes in, simply enter and store information about clothes. And store clothes in an empty space. When taking out clothes, the closet aligns corresponding clothes according to the style and needs desired by the user through previous data. This, like the parking tower, can solve the hassle of users wandering around looking for clothes.

iii. Operation and Maintenance

- Parking tower.

If there is a machine failure or error through the screen, it is delivered through message output. Therefore, the machine operator only needs to check the facility without having to check everywhere, so time and cost are saved.

- Clothes tower

In case the closet fails to properly show the clothes the user wants, the application linkage method was chosen. Since clothes can be managed and maintained through applications as well as displays in the closet, users can prepare clothes in advance regardless of location. Therefore, it guarantees time saving for the user.

B. Research on any related software

i. Acloset

'Acloset' is an application that manages clothes that users have. There are four categories in total. It consists of a home screen, a shopping screen, a registered clothes management screen, and a style management screen. The home screen shows an analysis of the weather, recommended styles, clothes worn this week, and styles. On the shopping screen, products that customers need are sold by classifying them by type of clothes. The screen for managing registered clothes shows the current status of clothes that users have by adding and deleting clothes themselves. The style management screen shows how the user will dress in advance by adding style.

ii. OTTOK

'OTTOK' is an application that analyzes the style when the user registers the clothes and matches the coordination. When registering clothes, you can register them separately by type. In addition, you can register by item or by coordination when registering. When a user coordinates clothes registered, the AI of the application analyzes them. Based on this information, it

is possible to compare or watch coordination styles with other users.

iii. Amazon Echo Look

'Amazon Echo Look' is an AI and camera that advises users on what clothes look good on them through machine learning after performing a 360-degree 3D scan. It is equipped with AI, so you can ask about the weather or schedule. Photos or videos taken through a camera can be checked through a smartphone, saved, or shared on SNS. Also, sending photos to AI recommends clothes that suit users better through machine learning.

II. REQUIREMENT

A. Application Operation order

1) Upload a picture of the clothes the user wants to register.

2) Fill in the information according to the characteristics of the clothes. ex) Top/bottom, length, color, material, specific clothes, outerwear, pattern, etc.

3) Clothes that have been classified store basic data such as unique numbers and registered dates.

4) Registered clothes may be added and deleted through an application.

B. Application function

i. Clothes selection

Store the data of the clothes and configure the layout with a list view. When using a list view, the adapter, a memory space that stores data, is used to show the data contained in the adapter in the layout format called the list view.

ii. Clothes storage

Clothes that have been classified are stored in the DB including the corresponding date. Data stored for each category is stored in String and then transmitted in json format. Clothes registration date is automatically generated through ORM's created At option.

iii. Add and delete functions

Registered clothes may be added and deleted through an application. Flip the screen through the intent object from the screen configured for each category. In this case, data added to each screen is also handed over through the intent object.

When the save button is pressed on the last screen, the synthesized data is transmitted to the DB. The delete function also sends a DELETE request through a button.

iv. Reservation system

A list-view showing a list of clothes shows a screen for setting clothes you want to reserve. After selecting the clothes, go to the screen to set the reservation date. The reservation date for the corresponding clothes is added to the data DB. Start the steam iron and styler function and deliver the progress and completion message to the user through the app.

v. Favorites

The favorite function is implemented so that a star button can be added to the right side of each list in the list view to register a favorite. Favorite registered clothes are visualized separately in a separate favorite layout.

C. Structure of furniture (3D modeling by CATIA)

i. Drawer-type space

It is a space for six drawers and is constructed in the form of 1*2*3 (width*length*height). As for the drawer driving method, the elevator-type operation is adopted like the parking tower. The bottom of the drawer-type space is drilled to the size of one drawer and used as a connection passage with the input and outlet spaces. Drawers can control moisture and temperature, respectively, like refrigerators, and use ventilation systems. Therefore, it is easy to classify and manage clothes in the manner desired by the user, such as the type and use of clothes. The space is sealed, and countermeasures are prepared to open it in case of an emergency such as failure/repair.

ii. Hanger-type space

It is largely divided into three spaces. It has the form of a long closet and a short closet on the left and right, respectively, and an accessory drawer is placed under the short closet. The space is sealed, and countermeasures are prepared to open it in case of an emergency such as failure/repair.

- Long / Short closet

Long padding, coats, and pants are stored in long closets, while short clothing such as short padding and outerwear are stored in short closets. The reservation system is available and each clothes is managed by rail. The rail movement method adopts conveyor belt operation. The arrangement of clothes is horizontal and moves along the U-shaped rail when requested by the user.

- Accessory drawer

It is the same shape as a drawer-type space. Precious metals and scarves can be stored.

iii. Clothing entrance

It is largely divided into two spaces, and the upper side discharges clothes in a hanger-type space and the lower side discharges clothes in a drawer-type space.

- When put in

It operates the dust or odor removal function of the clothes. Unlike the styler function, it is operated for cleanliness when stored in the closet and is mainly ventilated. (Only hanger-type space clothes are available)

- When discharging

When using the reservation system, simple steam iron and styler functions can be used. It can be executed through the application and the display of the closet.

iv. Display

It is configured so that you can see the storage and management status of clothes in the closet at a glance. You can designate access to the desired clothes and use the reservation system function. It simply shows user information such as current time, today's weather, and schedule.