

Smart regeneration cloud service for rural resources

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ABSTRACT: The phenomenon of waste and waste of recyclable resources in rural areas is widespread, and the recycling system is not reasonable enough, and the degree of intelligent recycling is relatively low. Therefore, this system develops an online cloud service for rural resource intelligent recycling, providing users with a convenient mini-program recycling platform. In the design and implementation of the mini-program, VsCode tool is used for WEB development with Python language. The front end of the WeChat mini-program is developed based on the uni-ui template and the WeChat mini-program language, mainly using uni-app, wxml, wxss, and JavaScript for collaborative development, and the back end uses the Django+vue framework to build the main framework of the mini-program, using servers and MySQL database services. The foreground modules mainly include recycling interface, mall interface, and my interface. The background modules mainly include the input, modification, deletion, and retrieval of recycling resources, realizing the transformation of intelligent recycling of recycling resources.

KEYWORDS: Mini-program; Recycling resources; Intelligent regeneration

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I. Overview

I.I. There is a problem with recycling resources in rural areas

In the process of development, China's rural areas have produced a large number of recyclable resources, but these resources are often not fully utilized due to the imperfect recycling system and the villagers' weak awareness of environmental protection. The problems existing in rural recycling resources mainly include: first, the recycling channels are not smooth, resulting in the inability to recycle some resources; Second, the recycling process is cumbersome, which affects the recycling efficiency; Third, the villagers' willingness to classify recyclable resources is not strong, resulting in a small number of recycling.

I.II. Sources of ideas

For the improvement and optimization of the existing rural recycling methods, there are problems such as poor recycling channels, low recycling efficiency, and weak willingness of villagers to classify rural recycling resources. In order to solve these problems, we have designed a mini program to increase the willingness of villagers to recycle and simplify the recycling process, so as to promote the effective use of recyclable resources in the countryside and contribute to the green development of the village.

I.III. Requirements analysis

According to the functional requirements of the cloud service function of smart regeneration of rural resources, after preliminary investigation, the main user types of the Mini Program are users and administrators. The administrator uses the web terminal to operate, and the main business involved is to provide recycling services and maintain shopping-related maintenance of the recycling mall. Users use WeChat Mini Programs to operate, and their needs are to achieve easy recycling of waste products, effective use of resources, and convenient purchase of goods and services.

The administrator use case, as shown in Fig.1, contains the following requirement modules:

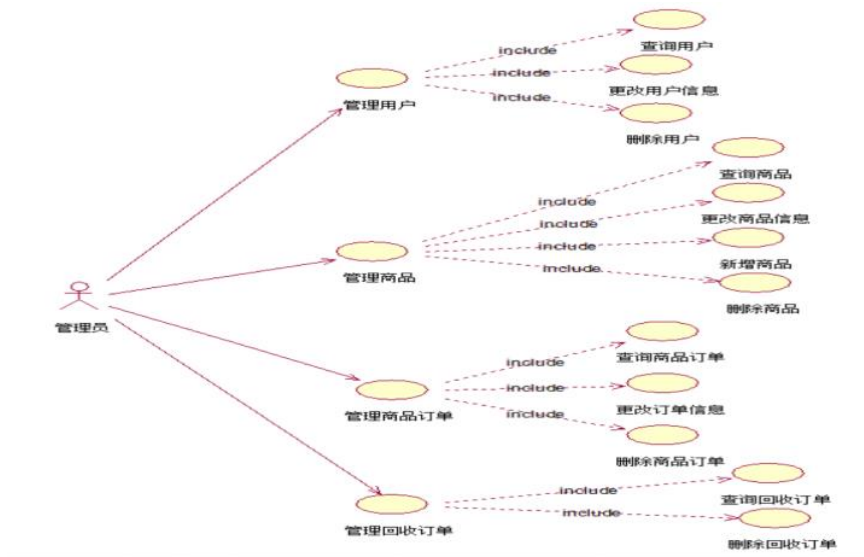


Fig.1.Admin use cases

The premise for users to use the module is that they have logged in to the Mini Program, and the user can use the recycling waste and shopping mall module.

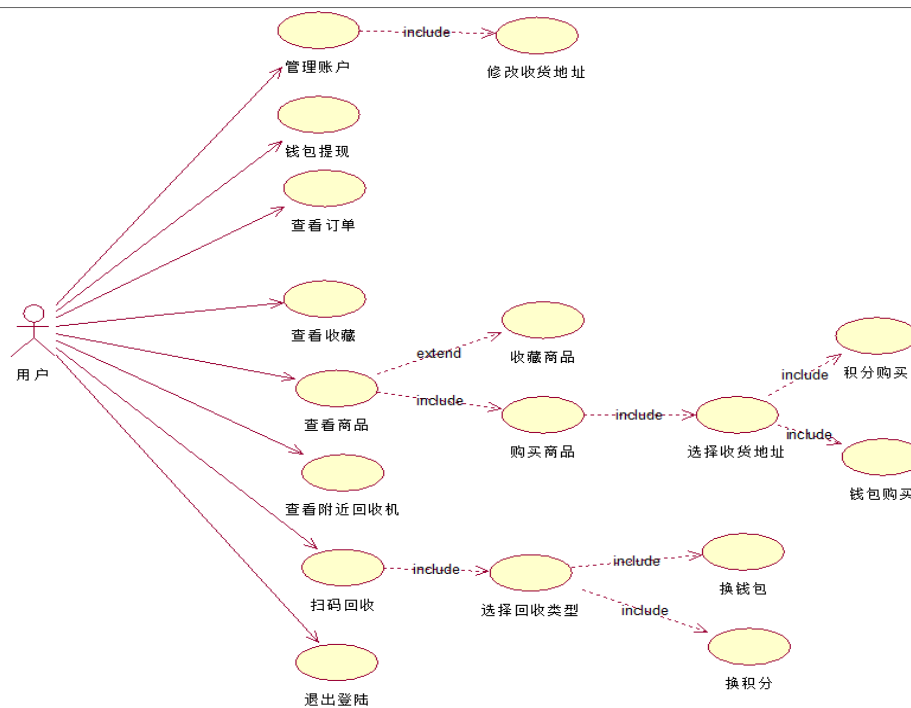


Fig.2.User use cases

II. System design

II.1. System framework model design

The system is divided into two modules according to the operating entity, the main module is two major plates, the main business is concentrated in the recycling module, and the other modules are designed and expanded according to the order requirements. The global relationship E-R is shown in Fig.3.

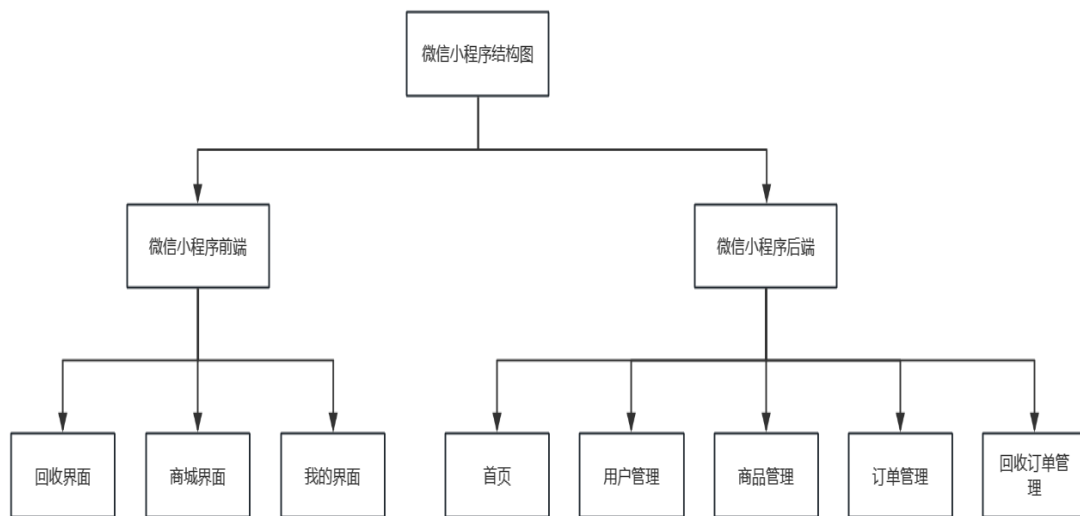


Fig.3.Global Relationship E-R Diagram

After logging in to the Mini Program, the user can perform the corresponding part of the operation. The back-office management steps are relatively invisible to the user. The main business in this system focuses on user recycling, which is the core part of the regenerative cloud service business, and the main business is for users to recycle resource points and realize them and purchase goods.

The user logs in through the login button, and the user will be asked to fill in the user's avatar and user nickname when logging in for the first time, and the front desk login process module of the rural resource smart regeneration cloud service is shown in Fig. 4 below.

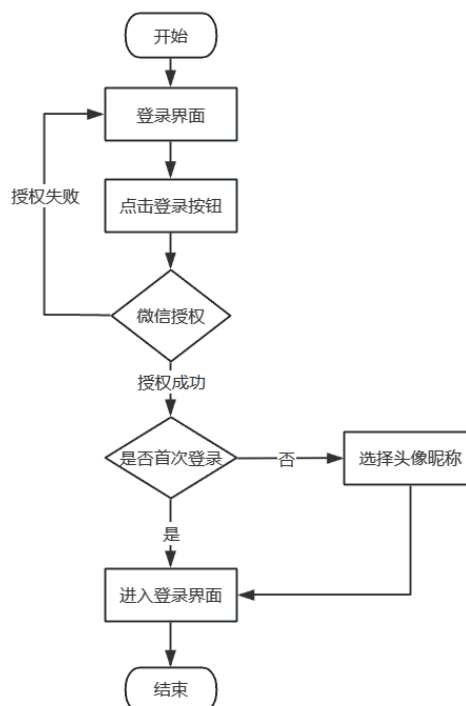


Fig. 4.Login flowchart

The background management module of the rural resource intelligent regeneration cloud service is shown in Fig.5 below.

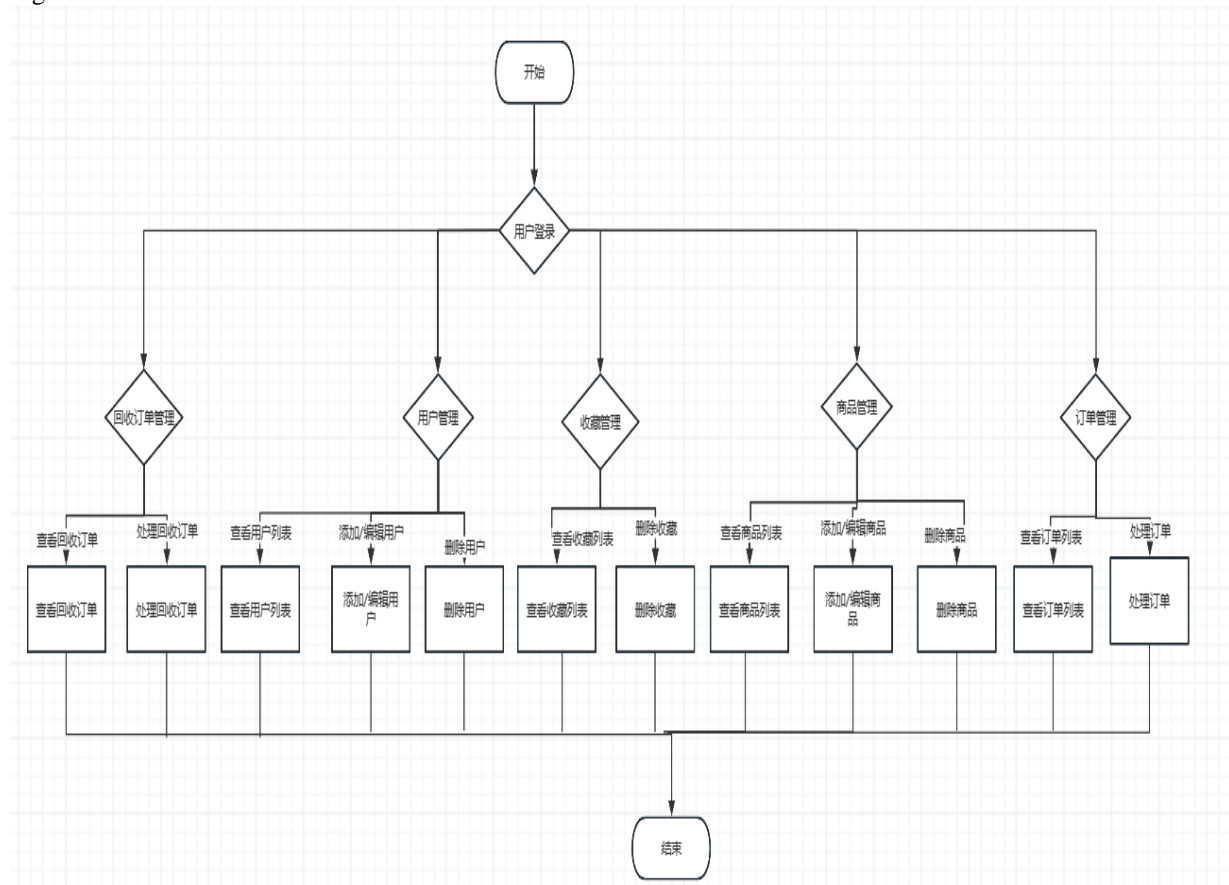


Fig.5.Back-office management flow chart

II.II.Database design

Through requirements analysis, the database model is built based on the relationship between administrators, user needs, and entity objects, as shown in Fig.6.

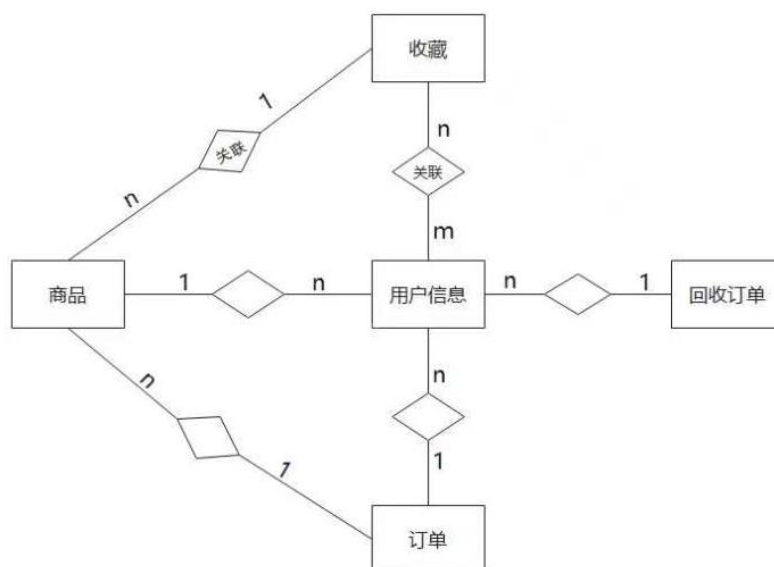


Fig.6.Database relationships

III. The main typical functions of the system are realized

III.I.Recycle garbage resources

The group of users is consumers. When using the recycling mall function, users first need to select the recycling type, which can be selected by clicking the button of different categories. After selection, the system will recognize, if the recognition is successful, the user will be directed to the next checkout page, otherwise it will prompt that the recognition fails and needs to be re-selected. On the checkout page, users can view the name and weight of the recycled item and confirm the recycling. This is shown in Fig.7.

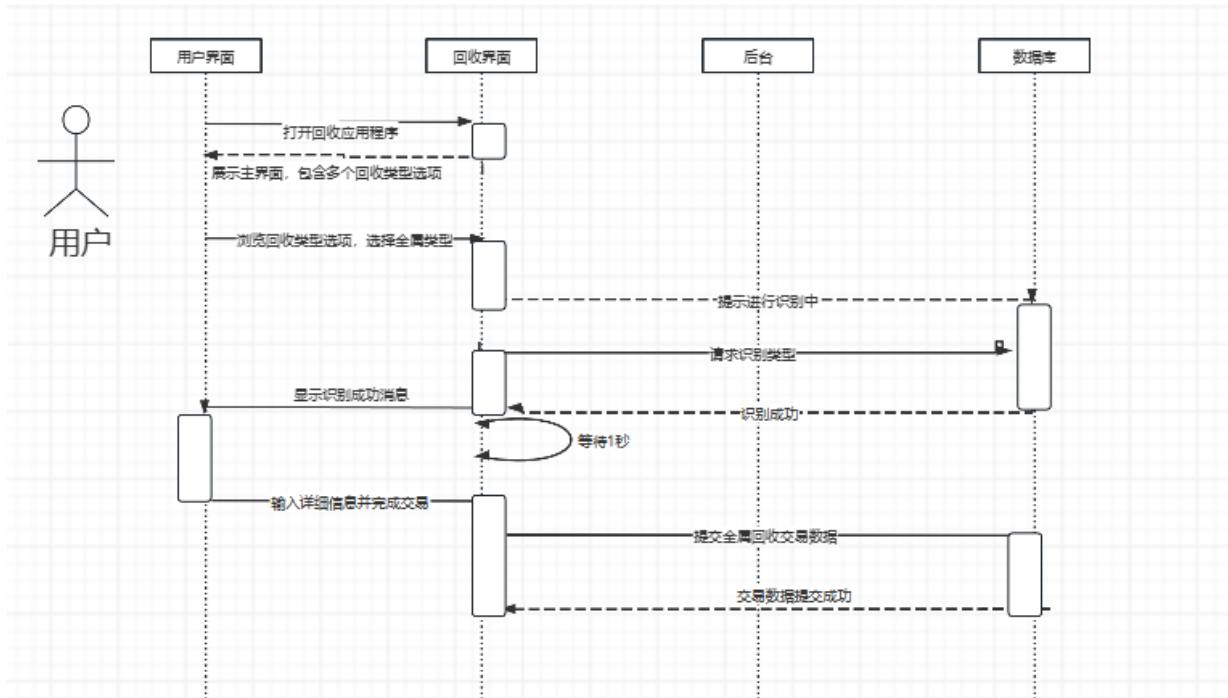


Fig.7.Timing diagram of the recycling function

III.II.Recycle the mall feature

On the product detail page, users first see a carousel area that displays the product image, and click on the image to preview the larger image. The product name is displayed in the center of the page, next to the price and points information, and the price is accurate to two decimal places. Users can add items to their favorites list through the Favorites button.

The product navigation component includes "Buy Points" and "Buy Now" buttons, which are clicked to direct users to the purchase process. The drawer-style shopping cart interface allows users to select a shipping address and complete the purchase via the "Submit" button. If the user's points or balance are insufficient, there will be a corresponding notification. Feature actions include carousel image previews, favorites, and purchases based on points or balance. Users who are not logged in will see a countdown prompt and will be automatically redirected to the login page. This is shown in Fig.8.

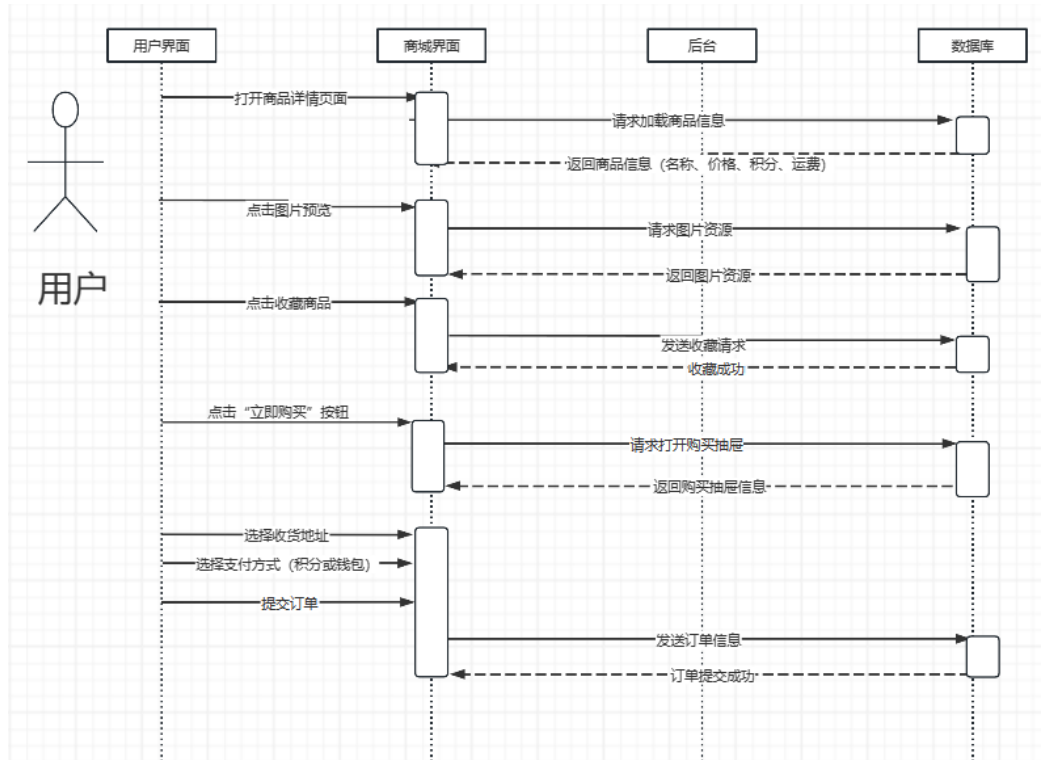


Fig.8. Recycle the mall feature

IV. System testing

Test Cases:

This test case is designed to verify that the Mini Program is working as expected, while revealing potential errors so that they can be corrected in a timely manner. The system uses policy tables and black-and-white tests to process complex logic, set conditions to obtain results, and optimize and merge them.

The foreground administrator logs in to the test case, as shown in Table I.

The test cases of the recycled module are shown in Table II.

Table I. Administrator login test case

| Serial number | Test items | Enter a description | Enter a description of the data | Output description |
|---------------|------------------|--|-------------------------------------|--|
| 1 | Login failed | The username was not entered | Username: Password: admin | Prompt: Please enter your account password!, and stay on the login page |
| 2 | Login failed | The password was not entered | Username: admin Password: | Prompt: Please enter your account password!, and stay on the login page |
| 3 | Login failed | The username and password were not entered | Username: Password: | Prompt: Please enter your account password!, and stay on the login page |
| 4 | Login failed | Incorrect username or password | Username: admin Password: 123456 | Prompt: Please enter your account password!, and stay on the login page |
| 5 | Login successful | Correct username and password | Username: admin Password: admin | Log in successfully, and you will be redirected to the corresponding interface |

Table II. Recycle module test cases

| Serial number | Description of the operation | Input | Expected output | Actual output | Whether it is passed or not |
|---------------|--------------------------------------|-----------------------------|--|---|-----------------------------|
| 1 | Once you have successfully logged in | Click on the image page | Output the corresponding action page | It shows that the code was scanned successfully! Output the recycling menu | passed |
| 2 | Once you have successfully logged in | Click Select recycling type | Outputs the corresponding recycling type | Refresh the page of the recycling type | passed |
| 3 | Once you have successfully logged in | Confirm the recycling type | Output recognition! The Recycling Rebate screen is displayed | The display recognition is successful! Enter the rebate interface | passed |
| 4 | Once you have successfully logged in | Click Identify type | Output recognition failed! Please select Identify again | The Refresh Save Jump Rebate screen is displayed | passed |
| 5 | Once you have successfully logged in | Click on the Rebate option | Output Recycling Successful!! | Refresh and save to jump back to the home page of the Mini Program | passed |

V. Conclusion

This system combines the technologies of the Django backend and the Vue frontend to build a basic framework for Mini Programs. In terms of architectural design, it has multiple patterns and maintains stability. As a network application, it supports users to log in through IP addresses in the same network, which realizes the collaboration between users and is practical. IN TERMS OF DATA MANAGEMENT, MYSQL DATABASE IS USED FOR DATA STORAGE, WHICH CAN MEET DAILY DATA MANAGEMENT NEEDS. There are also some problems with the system, such as the relatively simple function, and the data confusion of some functions in the test, which fails to get the expected calculation results. The interface design is relatively simple, and the login process does not use verification code encryption technology, which may increase the risk of being attacked.

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