

# Design and implementation of community garbage classification management system based on small program

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**Abstract :** *With the continuous acceleration of urbanization, waste classification management has become one of the important problems faced by the current society. In order to solve the challenge of garbage classification management, this study designed and implemented a community garbage classification management system based on applet. The system aims to help community managers improve the efficiency and accuracy of waste classification management, and encourage residents to actively participate in waste classification actions through incentive mechanisms. This paper will introduce the design idea, functional modules and implementation process of the system in detail, while evaluating the performance and user experience of the system.*

**Keyword:** *Garbage classification, community management, mini program, incentive mechanism, user participation*

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## I. Introduction

Garbage sorting is an important task related to environmental protection and sustainable development. With the increase of population and consumption level, waste production is increasing, which has caused serious impact on the environment and society. Therefore, local governments and communities have implemented garbage classification policies to reduce garbage pollution and waste. However, there are many problems in the traditional way of garbage classification management, such as low efficiency, opaque information, and low participation of residents.

In response to these problems, this study proposes a community garbage classification management system based on mini program, which aims to optimize the garbage classification management process, improve management efficiency, and encourage residents to actively participate in garbage classification actions. By combining the convenience and user friendliness of small programs, the system provides a convenient and quick garbage identification, placement and answer function, so as to encourage residents to form a good habit of garbage classification. At the same time, the system also provides data analysis tools and reward distribution functions for community managers, so that they can better understand the residents' garbage classification situation and encourage them to actively participate in garbage classification management.

### 1 The present situation of garbage classification in the community

There are some challenges and room for improvement in the current situation of community garbage classification. Although garbage classification facilities have been set up and some publicity measures have been carried out, there are still some residents who do not have a clear awareness of garbage classification, resulting in low classification accuracy.

Garbage sorting facilities, the community has set up recyclable garbage, kitchen waste, hazardous waste and other garbage classification garbage bin. However, sometimes the identification of these sorting buckets is not clear enough, which leads some residents to misplace them.

In terms of residents' awareness, some residents have insufficient understanding of the importance and methods of garbage classification and lack correct classification awareness. Some residents may mix recyclables with other waste, or kitchen waste with other waste. This mixed casting situation affects the accuracy of garbage classification.

In terms of publicity and education, although the community has carried out some publicity activities

of garbage classification, such as distributing publicity materials and holding lectures, it is still necessary to further strengthen the publicity and diversified publicity methods to improve residents' cognition and understanding of garbage classification.

In terms of supervision and management, the supervision and management of garbage classification in the community is not perfect. There is a lack of effective data statistics and analysis system to accurately evaluate the effect of garbage classification and the participation of residents. Property managers also need to strengthen the enforcement and supervision of garbage classification regulations.

In response to the above problems, the team designed a new scheme - the design of community garbage classification management system based on small program

## **2.Design of community garbage classification management system based on small program**

### **2.1 The status quo of garbage classification management**

Waste classification management is an important work of environmental protection and sustainable development. With the increase of population and the rapid development of urbanization, the amount of garbage generated is increasing, and garbage disposal and management are facing great challenges. In many areas, traditional waste disposal methods such as landfill and incineration have been unable to meet the requirements of environmental protection and resource utilization, and waste classification has become an important solution.

However, there are still some problems and challenges in the current garbage classification management. Firstly, the popularity of garbage classification awareness is low. Many residents have insufficient understanding of the importance and methods of garbage classification, which leads to inaccurate garbage delivery and affects the effect of garbage classification. Secondly, the traditional way of garbage classification is complex and cumbersome. Residents need to remember a large number of classification rules and classification criteria, which are prone to confusion and errors. In addition, there are some difficulties in the supervision and data statistics of garbage classification, and it is difficult to accurately understand the situation and effect of garbage classification.

In view of the above problems, the team takes the community as the breakthrough point, and uses a large number of residents and property management agencies in the community to effectively solve the above problems. Firstly, the system can help residents accurately judge the classification of garbage through the garbage recognition function of the small program. Residents only need to take photos of garbage, and the system can quickly identify and provide correct classification information to avoid the occurrence of classification errors. Secondly, the garbage delivery function and garbage classification answering function provided by the system can stimulate the active participation and learning of garbage classification knowledge of residents. Residents can put garbage through mini programs and participate in answering activities to increase the participation and accuracy of garbage classification. At the same time, the data analysis and reward distribution function of the system can help the property management agency to understand the garbage classification situation of residents in time, and formulate corresponding management strategies and incentives to promote the sustainable development of garbage classification management.

### **2.2 function module design**

The community garbage classification management system based on small program has four main functional modules (Figure 1) : garbage classification supervision module, reward and incentive module, garbage identification and classification module, garbage delivery and record module. The management end has garbage classification and supervision module, reward and incentive module, and the user end has garbage identification and classification module box garbage delivery and record module

The system uses Spring Boot as the back-end framework to process the collection, storage and analysis of data. Spring Boot is a Java-based development framework that offers the ability to simplify the development process and quickly build applications. With Spring Boot, the system can efficiently process user garbage distribution records and store the relevant data in a database.

For the front-end interface, the system uses Vue.js as the development framework to build an intuitive user interface and realize the visual display of data. Vue.js is a popular JavaScript framework with a concise syntax and flexible component-based architecture that makes front-end development more efficient and maintainable. With Vue.js, the system is able to display data such as garbage classification accuracy, release time, etc., and draw graphs through the ECharts library to visualize the data more intuitively.

ECharts is a data visualization library based on JavaScript. It provides a wealth of chart types and interactive functions to meet the needs of the system for chart display. Through ECharts, the system can generate statistical reports based on garbage distribution data and display them to property managers in the form of charts.

The architecture of the whole system is separated from the front and back end, and the data is exchanged through the API interface. The backend uses Spring Boot for data processing and storage, and the

frontend uses Vue.js and ECharts for user interface and data visualization. This architecture makes the system have good scalability and flexibility, and can meet the requirements of garbage classification systems with different scales and requirements.

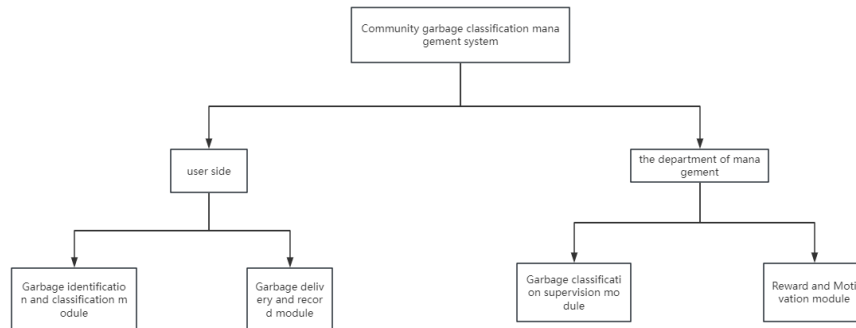


Figure 1 Structure diagram of community garbage classification management system based on applet

2.2.1 Garbage classification supervision module

The system will collect and analyze the garbage release data of residents according to the user's release records, including release time, garbage classification, and release person. (FIG. 2) provides an intuitive data display interface, which displays data such as garbage classification accuracy and release times in the form of tables. Use ECharts to draw graphs. In order to facilitate property managers to analyze data, the system provides data filtering and query functions, which enable them to filter and find specific data according to different conditions, such as time period, garbage classification, etc. Statistical report generation Report display: Provide report display interface to display the generated statistical report in the form of charts. Use ECharts to draw graphs. (Figure 3)

单元号	住户名称	当前状态	投放错误次数	操作
1	王小虎	正常	5	控制 删除
2	小明	异常	40	控制 删除
3	李华	正常	3	控制 删除
4	小白	异常	17	控制 删除
5	小新	正常	6	控制 删除
6	风间	正常	1	控制 删除

Figure 2 Data display of residential garbage delivery

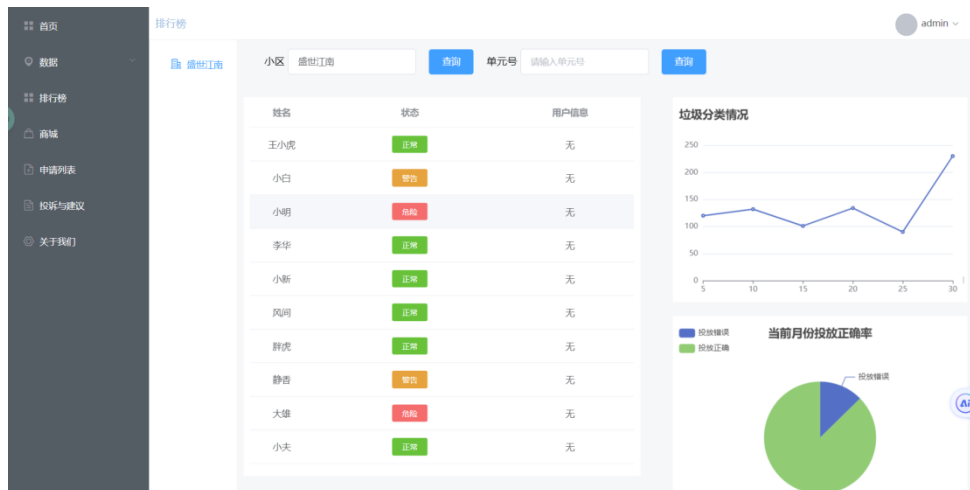


Figure 3 Graphic display of residential garbage release data

### 2.2.2 Reward and Motivation module

The system establishes a standard garbage delivery point system for residents, and gives points rewards according to their garbage classification contribution to encourage residents to actively participate in garbage classification activities. (Figure 4) The administrator can apply for materials and distribute them to the residents by himself after checking the release situation of the residents, and record the residents for garbage classification. (Figure 5)

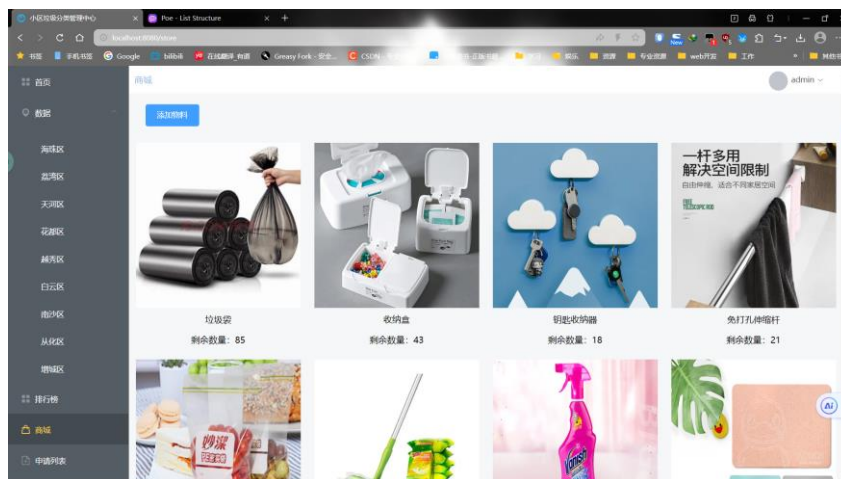


Figure 4 Material reward presentation

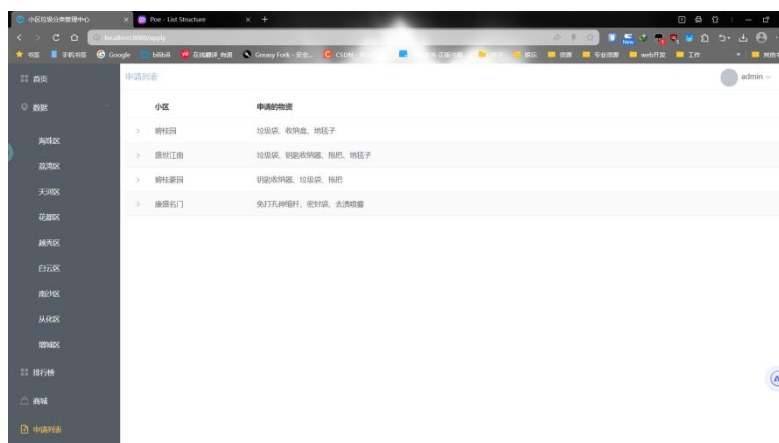


Figure 5 Material claim display

### 2.2.3 Garbage identification and classification module

When residents use the applet to take garbage photos, the photos are preprocessed, including steps such as image cropping, resizing and color standardization, to ensure that the input image meets the requirements of the residual neural network. Next, the photo will be transmitted over the network to the classification model on the cloud server for processing.

On the cloud server, the residual neural network will perform a series of convolution, pooling and full connection operations on the photo to extract the feature information of the image. The feature information is used to determine the type of garbage, such as recyclable garbage, kitchen waste, hazardous waste, or other garbage. Through the training process, the residual neural network can learn the feature differences between different garbage categories and use them for classification decisions.

Once the classification model has finished processing the photo, it generates a classification result indicating which category the trash in the photo belongs to. This result is passed back to the applet and then displayed to the residents. According to the classification information provided by the system, residents can put their garbage into the corresponding classified trash cans, so as to achieve accurate garbage classification.

Using residual neural networks for garbage identification and classification has several advantages. Firstly, the residual connection allows deeper modeling of the network, thus improving the representation ability of the model for complex junk images. Secondly, the residual neural network is trained by the back propagation algorithm, which can automatically learn the best feature representation and classification decision method. Finally, the model is trained and verified on a large-scale data set, and has high accuracy and robustness.



Figure 6 Display of garbage identification function

### 2.2.4 Garbage delivery and record module

In the process of garbage delivery, residents can choose the correct classification and put their garbage into the corresponding trash cans according to the guidelines provided by the system. The system will record the garbage disposal behavior of residents, including the release time, classification type, etc., so that residents and property management personnel can view and evaluate.

### 3 Application and Prospect

The community garbage classification management system based on small program has a wide range of application prospects. Firstly, the system can be widely used in various residential areas and communities to help residential managers realize intelligent and efficient waste classification management. Through the garbage recognition function provided by the system, residents can easily identify the classification of garbage and carry out accurate garbage classification operations through the garbage delivery function. At the same time, the garbage classification answering function can also improve residents' understanding and mastery of garbage classification knowledge. Through the data analysis and reward distribution function, managers can monitor residents' garbage classification in real time, and formulate corresponding management strategies and incentive measures according to the data analysis results.

Secondly, the system can also be applied to schools, enterprises, institutions and other places to help organization managers to implement garbage classification policies and improve the efficiency and accuracy of garbage classification. Through the data analysis function provided by the system, managers can understand the situation of waste classification within the organization, and carry out targeted publicity, education and training to encourage employees and students to form good waste classification habits.

In summary, the community garbage classification management system based on mini program has great potential and application prospects in improving the efficiency of garbage classification management and residents' participation. Future research and practice will further promote the development and optimization of the system and make greater contributions to the sustainable development of the waste sorting cause.

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