Design Of A Classification Model For The Extraction And Collection Of Garbage Information Based On The Internet Of Things

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Abstract: As an effective way to alleviate the current problem of garbage in China, garbage classification has been vigorously promoted by relevant government departments in recent years, but its actual performance is still not satisfactory. Therefore, in view of the current difficulties in the treatment of domestic garbage and the promotion of garbage classification in China, we have implemented the extraction of household garbage information based on the Internet of Things technology and mechanical design. Through management methods and information management systems, we can achieve the traceability of household garbage to individuals and follow up in the process of treatment. An innovative garbage collection and transportation treatment model was designed to solve the social pain points to the greatest extent, promote residents to carry out garbage classification independently, and increase the proportion of garbage resource treatment. The current design products mainly include two-dimensional code sorting garbage bags, recognizable sorting household barrels, intelligent split type garbage bins and garbage information management system, and have established a relatively complete management and operation system and points reward and punishment system, which effectively promote the national garbage classification process.

1. Introduction
The data shows that our country’s domestic waste disposal volume in 2016 reached a staggering 200 million tons, accounting for 30.6% of the world’s annual waste generation, and the annual per capita output of urban waste reached 440 kg\textsuperscript{[1]}. For the time being, there are close to more than 1,900 landfills nationwide, and the proportion of landfill garbage accounts for 60% of the total garbage disposal. As of the end of 16 years, there were nearly 300 waste incineration power plants built and in operation across the country, five times as much as in 2006. The proportion of waste incineration treatment accounts for 35% of the total waste removal volume. At present, 2/3 of the cities in China are trapped in garbage, and 1/4 of them have no landfills for waste storage. Taking Dalian as an example\textsuperscript{[2]}, the annual removal volume of domestic garbage in its central urban area has reached 812,600 tons in 2015, and is growing at a rate of about 3% per year\textsuperscript{[3]}. At present, landfill and incineration are the main waste disposal methods in China. However, landfills occupy land resources, and China’s population distribution is extremely uneven. In areas with high population density, the contradiction between urban domestic waste and land resources is becoming increasingly acute. The incineration capacity is far less than the speed of garbage generation. If such a huge amount of garbage cannot be dealt with in a harmless and reduced manner in time, it will...
pose a major threat to people's health and the sustainable development of society and become a huge negative problem that hinders the harmonious development of society. My country urgently needs to introduce garbage classification to optimize the current domestic garbage disposal model[4]. In response to the social pain points behind these phenomena, we tried to use the innovative design based on the Internet of Things technology to propose several effective measures that are feasible and easy to implement, to promote the effective and rapid implementation of garbage classification[5].

2. Design

Delivery mode design. We introduce the Internet of Things technology into the process of collecting and transporting municipal solid waste, that is, attaching identity labels to the domestic waste discarded by residents. Residents can collect degradable two-dimensional code sorting garbage bags from the community by using urban residents' payment accounts (unique identification numbers for payment of water and electricity bills, etc.) to achieve accurate binding of garbage information to households and traceability tracking, thereby improving domestic garbage classification. The management model and laws and regulations really improve and implement the relevant laws and regulations and the reward and punishment system to promote the promotion and implementation of garbage classification.

Residents can use the urban residents' payment account number (the unique identification number for paying water and electricity bills, etc.) to the community to receive a degradable QR code sorting garbage bag with a unique code to achieve accurate binding of garbage information to households. In order to solve the problem of different amounts of different types of garbage generated in normal family homes, and considering that reducing the use of garbage bags can save materials and optimize the user experience, we have also designed a recognizable sorting household bucket, which can be used in two ways with QR code sorting garbage bags. The delivery mode is parallel. It is divided into four bins to collect different types of garbage, and multiple bins can be used to collect the same kind of garbage[6]. Just turn the turntable on the surface of the bin to the current type of garbage before dumping the garbage.

Fig.1. Collection and transportation processing mode based on spam information extraction

The information management system will summarize all the information, which can improve the domestic garbage classification-related management models and laws and regulations, truly implement the reward and punishment system, and promote the promotion and landing of garbage classification. And design and realize the rapid and efficient planning of garbage collection and transportation vehicle classification collection and transportation path to improve the efficiency of urban planning management.

Garbage classification design. In view of the current lack of environmental protection knowledge, in order to enable residents to easily classify waste, we temporarily classify waste according to four categories: recyclable waste, kitchen waste, non-recyclable waste and hazardous waste. We have designed auxiliary classification marks and classification identification turntables for two-dimensional code classification garbage bags and recognizable classification household barrels. Through the
implementation of the innovative garbage collection and transportation treatment model we designed, we will realize the residents' independent garbage classification from the source, and then complete the urban household garbage classification collection, collection and transportation vehicle classification and transshipment, and realize the domestic garbage classification treatment at the treatment site Complete the classification process.

**Point reward system design.** In order to promote the model and promote the classification of garbage, an incentive system should be established at the current stage to encourage residents to use our innovative model for garbage disposal. At present, we temporarily use the garbage classification point quantification system to achieve points rewards for residents. The points will be combined with personal credit records in the later period to ensure that after the model is popularized, there will be enough coercive force to encourage residents to learn and correctly classify garbage.

![Garbage classification design](image)

**Mechanical design.** The intelligent split type trash can is provided with a dedicated trash input port on the upper surface, and a QR code scanning port is installed to facilitate the garbage bin to extract trash information. After successfully obtaining spam information, the trash bin will accurately put the trash into the designated sub-bin through the internal mechanical movement, and upload the trash placement information and the current status information of the trash bin to the cloud. In addition, in order to solve the problem of different amounts of different types of garbage generated in the normal family home, at the same time, in order to save garbage bag materials and optimize the user experience, a recognizable and classified household bucket is designed so that residents can carry out simple and rapid garbage classification at home. The intelligent split type dustbin can identify the surface turntable and carry out automatic mechanical movement through circuit design, and put the garbage in each warehouse into the corresponding sub-bucket of the dustbin.

**3. Discussion**

We propose a systematic and innovative design for the classification of municipal solid waste in accordance with the three basic processes and management modes of garbage collection, transshipment, and garbage disposal. We innovatively use the "resident payment account number" as the unique identification number, and attach an identification mark to each piece of garbage through technical means (the current technology is: two-dimensional code classification garbage bags + identifiable classification household barrels + intelligent split type trash bins), To achieve traceability of spam information to households, can assist in the implementation of relevant management methods or policies and laws. At the same time, we adopt two garbage throwing modes, garbage bags and household barrels, which are suitable for most scenarios.
We start from the source of domestic waste generation, give full play to the residents' subjective initiative to carry out autonomous waste classification, ensure the classification of waste collection, and provide protection for the classification of transshipment and classification of waste. We use the trash can as a medium to extract garbage identity information and upload it to the database along with our current information such as weight and full storage rate. At the same time, the system can plan the running path of garbage collection and transportation vehicles in real time according to the garbage information, improve the collection and transportation efficiency, and realize the classification collection and transportation. After completing the garbage classification collection and classification transfer, this system can achieve special special treatment, such as bio-fermentation or physical composting of kitchen waste to complete garbage recycling. Our design can quickly adjust the specific classification of waste with the development of the current waste disposal technology in the region, and only need to change the QR code to sort the garbage bags, without affecting the subsequent process, without huge equipment replacement costs, to ensure sustainable development.

4. Conclusion
Our design is based on the collection and transportation mode of garbage information extraction. The implementation of this design does not require extensive changes to the current urban domestic garbage collection and transportation system, and the promotion cost is low. Through innovative design, it can ensure the traceability of garbage to individuals, assist in the formulation and implementation of relevant laws and regulations during the promotion process, and can promote garbage classification knowledge and cultivate residents' garbage classification awareness, which will generate higher social benefits and have good application prospects and promotion value.

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