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Research on garbage sorting and smart bins

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Abstract: With the continuous innovation of science and technology, the quality of life of Chinese residents has been continuously improved. But behind the growing economy, there is a serious problem of garbage disposal. Aiming at the problems of garbage disposal and recycling, a Raspberry Pi is proposed as the base platform to build an intelligent garbage classification model to realize the design of intelligent garbage classification and recycling. With the help of AI to obtain garbage image recognition, improve the efficiency of garbage sorting, break through the limitation of space, minimize the investment of labor costs, realize smart construction, and have high promotion and application value.

Keywords: Garbage segregation; Raspberry Pi; Smart trash cans.

1. Research background

In his report to the 19th National Congress of the Communist Party of China, General Secretary Xi Jinping pointed out that it is necessary to "promote the comprehensive conservation and recycling of resources, strengthen the disposal of solid waste and garbage, and universally implement the garbage classification system".

According to statistics, nearly 500 million tons of garbage are generated globally every year, of which 150 million tons are in Chinese cities. The dry and wet garbage in the garbage can comes into contact with each other, causing secondary pollution, and the recyclable and non-recyclable garbage are mixed, making it difficult to sort and recycle. Garbage is a completely underutilized resource. Strengthening garbage classification and management is an important part of building a moderately prosperous society in an all-round way, accelerating urban modernization, and achieving sustainable economic and social development.

In the current social environment, most of the popular green garbage cans in the community are not intelligent sorting and automatic identification garbage cans. The reason for this situation is, of course, that most of the smart sorting bins on the market are high cost, the price is not close, and the current products are community garbage cans, and there are no small household smart sorting garbage cans.

Strengthening garbage classification and management is an important part of building a moderately prosperous society in an all-round way, accelerating urban modernization, and achieving sustainable economic and social development.

2. Problems with garbage separation

(1) Awareness issues

Many developed countries attach great importance to garbage classification, the implementation of garbage classification has become an attitude of their daily life, the garbage cans in the city are sorted and placed, and residents have also established a good awareness of domestic garbage classification. As a developing country, China still has many problems to solve in garbage classification. Although the Chinese government began to promote garbage classification as early as 2002, the effect was not significant, and many residents did not have a high awareness of garbage classification. Until today, although some cities have introduced regulations on garbage classification, we can also see that people's awareness of garbage classification is still poor, and many residents do not understand garbage classification very well, and everyone is not clear about how to classify garbage. Therefore, this has also led to many problems in our household waste sorting and collection

(2) Method issues

In 2004, China introduced municipal solid waste classification methods and evaluation standards, but these classification methods and evaluation standards did not make our urban waste better classified. Although many residents want to sort their garbage, they are powerless. Because of the cumbersome garbage classification, garbage classification in many places is very chaotic, so the implementation of garbage classification policies cannot be completed. In addition, the classification system of each city is different, which has led to a lot of garbage sorting phenomenon

(3) The question of way

At present, the main treatment method of garbage in China is incineration, if the garbage can be classified in advance, some available garbage can be recycled, then it means that a lot of garbage does not need to be incinerated, you can reduce the harm caused by incineration. Because the waste incineration treatment method itself has many hazards, which cannot be solved well in many developed countries. Therefore, it is of great significance to study a simple and inexpensive way of sorting and treating garbage, and our garbage disposal method must be innovative, so as to meet the development needs of today's society and reduce environmental pollution and deterioration.

(4) A matter of perception

Although China's economic construction and urbanization process have accelerated, people's awareness of garbage classification has not been generally improved. In the treatment of garbage, only the continuous investment in landfills and incineration plants has increased, and the implementation of garbage classification is still not in place. This backward way and backward concept of garbage disposal urgently needs to be improved.

3. Demand analysis and feasibility analysis

(1) User needs

Under the pressure of the policy of garbage classification,

and in the case of garbage classification knowledge and fragmentation, the potential consciousness of residents hopes to have a product to help them get out of the current dilemma, in a survey report on the recognition of intelligent sorting garbage cans, it is also well confirmed that more than half of the residents have a high degree of recognition of intelligent sorting garbage cans, and it can be considered that there is a high demand for intelligent garbage can classification.

(2) Market demand

In the "Implementation Plan of the Domestic Waste Classification System" released, it is clearly pointed out that many areas such as municipalities directly under the central government, provincial capitals and cities with separate plans implement compulsory classification of domestic waste, and Shanghai, which has implemented the garbage classification policy, even pointed out that the wrong classification of garbage will face fines or even more serious penalties, under the pressure of various policies; in the context of government enforcement; On the basis of people's relatively weak knowledge of garbage classification; Under the awareness of garbage classification has not yet been strengthened, the introduction of this policy has promoted the application of smart sorting garbage cans, and the market prospect is broad.

(3) Technical requirements

By searching for information, it is not difficult to find that the current intelligent sorting garbage can is mainly designed in the following three ways, through intelligent identification of garbage, telling the dropper the type of garbage belongs to the dropper by the dropper; The deliverer's voice tells the garbage bin what garbage is to be put, and then the garbage bin replies to the garbage category corresponding to the sender, and the dropper puts it by himself; Only based on the garbage already in the system, to identify the garbage put by the dropper, lack of deep learning.

At present, there is a lack of an intelligent sorting trash can that can intelligently identify, intelligently put in, can carry out deep learning, and better collect garbage throwers' putting habits, it can be seen that once put on, there will be a greater demand on the market.

In recent years, it has ushered in a new era of scientific and technological innovation, the state encourages scientific and technological innovation, encourages patented inventions, and formulates laws and regulations to provide entrepreneurs with a free, open and stable market environment for innovation and entrepreneurship to ensure the realization of the legitimate rights and interests of innovative enterprises and provide a fairer and more just environment for entrepreneurs ' operations.

4. System design

(1) Hardware design

The automatic sorting trash can based on Raspberry Pi's autonomous image recognition is composed of camera, infrared sensor, and steering machine stage. The garbage can has only one garbage input port, after putting in the garbage, the camera obtains the image, and the image is transmitted back to the data center by the communication device, and the data center autonomous image recognition technology judges the type of garbage after the garbage type is judged, and the garbage type information is fed back to the garbage can, and there are four inner cylinders in the garbage can (respectively kitchen waste, recyclable garbage, hazardous waste, and other garbage), and the trash can directs the stage shaft according to the feedback information and pours the garbage into the appropriate inner bucket. After using ultrasonic induction technology to detect that the garbage is full, the display screen displays and sends a cleaning command to the terminal, reminding that the garbage can is full and needs to be cleaned up. Truly realize garbage drop-off, regardless of after-drop, garbage automatic classification, and information can be monitored throughout the process.

In response to the large demand for intelligent classification of domestic waste, it is divided into several small systems to achieve, it needs a master control system to control the operation of the entire device, an image acquisition system to obtain the garbage image information put into the garbage inlet, a classification system for sorting garbage and put it into the corresponding garbage bin, a full load alarm system to detect whether each garbage bin reaches the capacity limit, a display system to reflect the internal information of the system in real time. Finally, a power supply system is required to power the entire unit.

(2) Categorized delivery system

The classified delivery system is controlled by the Raspberry Pi servo responsible for the steering of the inlet and the opening and closing of the baffle, and the two servos under the classified delivery system, one is responsible for rotating the angle to align with the garbage bin, and the other is responsible for opening the baffle.

(3) Fully loaded alarm system

The full load alarm system refers to the design of the scale, the sensor obtains the signal and amplifies the signal and is processed by the main control chip, and when it reaches full load, the display screen is fully loaded to alarm, and if it is not full, it returns to reacquire the signal.

(4) Networked identification

Thanks to the current convenient network environment, the sorting device can be connected to the Internet with the help of the API provided by Baidu public cloud, upload photos to the cloud album, and identify the garbage type by comparing the garbage characteristics with the model to achieve the purpose of garbage classification, and the cloud platform needs to create a model and upload a labeling dataset, train the model and verify the model and publish the model.

5. Conclusion

The device can realize the independent classification of garbage cans, truly realize garbage dropping, information can be monitored throughout the process, efficient and transparent technology has brought great convenience to people's lives. Through deep learning, machines can analyze and learn like humans, and can recognize text, image data, making full use of the convolutional neural network of classical deep learning. Full load intelligent detection uses ultrasonic sensing technology to monitor the condition in the bucket in real time, and sends a cleaning command to the terminal when it is fully loaded, reminding that the garbage can is full and needs to be cleaned up. At the same time, it has the characteristics of long service life, easy to use, accurate operation, precise design, health and environmental protection, energy saving and low consumption. It has certain practical application value.

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