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Research on a Garbage Distribution Bucket Based on Intelligent Voice

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Abstract. With the development of economy and the improvement of people's living standards, the garbage problem has become increasingly prominent, and people's concept of environmental protection has been continuously enhanced. In response to the popularization of garbage classification and environmental pollution of garbage, the industry has seen innovative designs for traditional garbage bins. The intelligent waste distribution bin studied in this paper adopts micro-control chip, infrared detection device,mechanical transmission device and linkage mechanism, which can solve the difficulty in separation from the source, cultivate the public's awareness of waste separation and reduce the cost of waste disposal, It protects user privacy and improves security through blind processing.and thus has practical research significance.

Keywords. SCM, garbage classification, intelligent voice.

1. Introdution

China is a large country in terms of population and waste generation. With the steady development of economy and the continuous increase of people's living consumption level and urbanization rate,the amount of domestic waste generation continues to be high. Most of the municipal wastes are piled up in the open air, with dust rolling on sunny days, the sewage flowing on rainy days,mosquitoes and flies growing in warm seasons and stinking stench to the sky,which all bring hidden dangers to soil safety and water quality. Because of inappropriate waste disposal, people pay heavy environmental and health costs.

Unclassified garbage can cause the following hazards [1]. First,garbage occupies precious land resources and living space,thus seriously affecting industrial and agricultural production and people’s lives. Second, solid waste contains a variety of harmful substances,improper treatment can directly contaminate the soil, air and water, and its treatment costs are high and cause harm to humans themselves. Third, garbage contains a large number of microorganisms and is a breeding ground for germs, viruses, pests, etc., which seriously endangers personal health. Fourth,garbage leachate will change soil composition and structure. Also, garbage destroys the structure and

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physicochemical properties of the soil, which will greatly reduce soil fertilizer and water retention capacity.

Therefore, it is urgent to promote the garbage classification system. However, due to people's weak awareness of waste separation, the implementation of garbage classification policies is not enough. People need to go from the details of life to solve this problem, and an intelligent automatic garbage sorting bucket fully meets the needs. It is a product that transforms garbage sorting into a habit in people's consciousness. The bin can identify the type of garbage through voices, allowing users to strengthen their awareness of garbage separation during the use of the product.

2. Research Process

In order to overcome the problems in related technology, the project provides an intelligent voice classification garbage can. The intelligent voice classification garbage can is equipped with a voice recognition system, the user speaks the name of garbage to the system so that it can send information to the microcontroller according to the type of garbage. Then the microcontroller controls the transmission device to open the corresponding category of garbage can cover. At the same time, the user can say the direction of movement to the voice recognition system so that it can send a signal to the microcontroller according to the voice command, so as to control the movement of the bin.

Based on the Internet of Things, this intelligent voice sorting garbage can is composed of a micro control chip, infrared detection device, mechanical transmission device, and linkage mechanism. It can identify the type of garbage and open the lid automatically by voice control and is a new high-tech product integrating machine, light, and electricity, with the advantages of reliable performance, long service life, and low power consumption. Combined with infrared induction and a microcomputer, the induction flap with a fine streamlined appearance is designed to be flexible and convenient, so it is easy to put away the garbage without moving or stepping on it. In addition, the garbage can is convenient,hygienic,and practical, and can effectively prevent contact infection. Sensors are installed on each side of the trash can,and when the trash is collected there,the sensors will send the information to the development board, which will upload the information to the cloud via WiFi, and the user's cell phone will receive the information from the cloud. When the trash can is full, it can automatically pack and replace the trash bag, thus making it truly zero-touch and more convenient. It protects user privacy and improves security through blind processing. and thus has practical research significance. Blind processing Time-consuming is shown in figure 1.

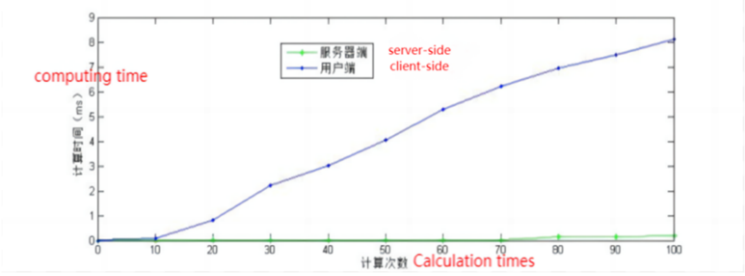

Figure 1. ProcessingTime-consuming

Using this smart garbage bin can solve the difficult problem of classification at the source and cultivate the public's awareness of garbage classification. It can reduce the cost of garbage disposal, return a forest to nature and improve the ability of science and technology innovation. At the same time,the product is in line with the national waste classification promotion policy. It reinforces users' brain behavior through voice, cultivates environmental thinking, and allows users to develop an awareness of garbage classification.

The invention provides an intelligent speech classification trash can, which comprises a trash can body, a trash can cover, a single-chip microcomputer, a mechanical transmission device, a linkage mechanism, a mobile device, and a speech recognition system. At present, the project has obtained 1 patent for scientific and technological invention and 1 patent for appearance invention. Through the voice recognition system, the user speaks the name of garbage to the system when using it, and the system can send a signal to the microcontroller according to the type of garbage. Subsequently,the microcontroller will control the transmission device and open the lid of the corresponding category of garbage can. At the same time, if the user speaks the direction of movement to the voice recognition system, then the system will send signals to the microcontroller according to the voice command, thus controlling the movement of the bin. The bin will facilitate residents to achieve proper garbage disposal and efficient garbage sorting, thus allowing users to empty and sort garbage anytime and anywhere.

Implementation example. The existing technology can identify the type of garbage by voice, so as to open the corresponding type of garbage can lid,but it fails to control the movement of the garbage can by voice. When the user needs to throw the garbage that should not be moved from a long distance or does not want to walk around, wants to throw the garbage anywhere, or is not convenient to control the movement of the garbage can by other operations, the garbage can that can be controlled by voice to move the position will bring great convenience to the user.

In view of the above problems, the embodiment of the application provides an intelligent voice classification trash can. Through the voice recognition system, the user speaks the name of garbage to the system when using it, and the system can send a signal to the microcontroller according to the type of garbage. Subsequently, the microcontroller will control the transmission device and open the lid of the corresponding category of garbage can. At the same time, if the user speaks the direction of movement to the voice recognition system, then the system will send signals to the microcontroller according to the voice command, thus controlling the movement of the bin.

The technical scheme of the embodiment of the present application is described in detail with reference to the accompanying diagrams.

Figure 2 and figure 3 are structural schematic diagrams of the intelligent speech classification trash can shown in an embodiment of the present application; figure 4 is a technical schematic diagram.

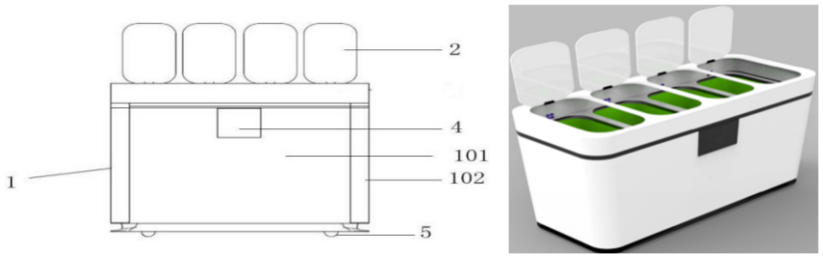

Figure 2. Product structure diagram

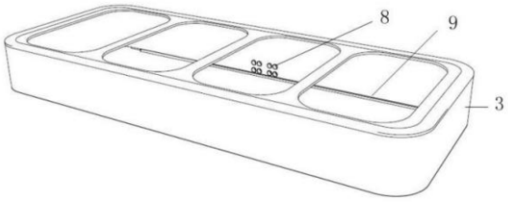

Figure 3. Schematic diagram of infrared sensing area

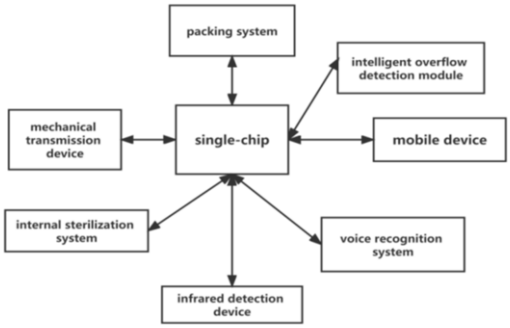

Figure 4. Schematic diagram of product

The speech recognition system is communicated with the single-chip microcomputer[2], and the single-chip microcomputer is respectively communicated with the mobile device 5 and the mechanical transmission device in sequence. The speech recognition system is used for operating the mechanical transmission device through the single-chip microcomputer to open the trash can cover 2 of the corresponding classified garbage. The speech recognition system is also used to operate the moving device 5 through the single-chip microcomputer to control the trash can body 1 to move.

The speech recognition system,including the speech model library and the speech recognition module, uses the open-source code of voice control technology. First, the system performs signal pre-processing on the speech input,then performs feature extraction of the voice, training, modification, and debugging, and finally matches the

signal to the model library and outputs the recognition result, thus building to realize automatic garbage classification.

When using, the user needs to say the name of the garbage. The voice recognition system will pre-process the voice signal according to the voice input, then carry out the feature extraction of the voice and match it to the model library. Then, the microcontroller starts to calculate and output the recognition result, while connecting the mechanical drive. Once the system successfully identifies the garbage category,the microcontroller will send a signal to start the mechanical actuator and open the corresponding garbage can lid 2.

When using it, users need to name the garbage. The speech recognition system preprocesses the speech signal according to the input, and then extracts the speech features and matches them with the model bank. The microcontroller then starts computing and outputs the identification results, while connecting the mechanical driver. Once the system successfully identifies the garbage category, the microcontroller will send a signal to activate the mechanical actuator and open the corresponding bin lid 2.

At the same time, the voice is analyzed and stored to obtain the user's analysis and to record the behavior of the voice print information. The analysis is uploaded to the server through data-blinded processing,thus protecting the privacy of users.

We design an improved fast blind modular index security outsourcing calculation scheme[3]. Generate two groups of random number pairs by using Rand subroutine (t_1, g^{t_1}), (t_2, g^{t_2}), $h = g^{t_1} \bmod p$ and $\mu = g^{t_2} \bmod p$. First complete the decomposition of the base number u and the exponential a, and the logic decomposition process is:

$$\begin{aligned} u^a &= (hv)^a = \mu g^r v^a \\ v &= u / h \\ r &= (at_1 - t_2) \bmod q \end{aligned} \tag{1}$$

To achieve secure outsourcing of a single server,blinding of the index and base numbers is required. First, for v^a, blinding treatment is performed. T randomly generates a number that satisfies the $r_1 \in [1,10]$. Simultaneously, the randomly given number l_2, s_2 satisfy $r_1 a = l_2 + s_2$. At this point, T generates a random combination of $D' = (l_2, s_2)$. Given a mapping function φ, the φ mapping handles D' then obtains a new set defined as the blinding index $D = (d_1, d_2)$.

Second, for g^r blinding treatment is performed. T randomly generates two numbers, satisfying the $r_2, r_3 \in [1,10]$, so as to make $a = l_1 + r_2, a = l_1' + r_3$. Then a random combination of $A' = (l_1, l_1')$ is generated. A' is processed by using the mapping function p to get a new set defined as the blinded index $A = (a_1, a_2)$.

Thus, the encrypted output information of the T terminal is: blind index $\{A, D\}$, and blind base number $\{g, \mathrm{v}\}$. Then T sends the encrypted blinding index and base number to the server U.

U uses the encrypted information sent from T to complete the calculation:

$$\begin{aligned} U(d_1, g) &\to g^{d_1} \\ U(d_2, g) &\to g^{d_2} \\ U(a_1, v) &\to v^{a_1} \\ U(a_2, v) &\to v^{a_2} \end{aligned} \tag{2}$$

After U returns the information to T, T performs the verification calculation, details are as follows.

First, calculate the value of d_φ^{-1}. If satisfied with the $d_\varphi^{-1} = l_2$, then there is $g^{l_2} = M$. In compliance with $d_\varphi^{-1} = s_2$, then there is $g^{s_2} = R$. Next, calculate the value of a_φ^{-1}.If satisfied with the $a_\varphi^{-1} = l_1$, then there is $g^{l_1} = Q$; if satisfied with $a_\varphi^{-1} = l_1^{'}$, then there is $g^{l_1^{'}} = P$.

When T uses the results of M, R, Q and P above, the final result can be calculated as:

$$u^a = \mu\eta g^{l_2} v^{l_1} \tag{3}$$

While verify:

$$\eta g^{l_2} v^{l_1} = \eta^{'} g^{r_1 a} g^{s_2} v^{l_1^{'}} \tag{4}$$

If equation (4) can be satisfied,then T completes the calculation output, otherwise,the output conclusion is wrong. It protects user privacy and improves security through blind processing.

The database retrieves verification information to verify the data. If the verification is passed,it will detect whether the user's voice is cast correctly. If the voice is cast correctly, 1 point will be added to the environmental account of the background server database,and if incorrectly, 3 points will be subtracted from the environmental account.

When a person comes to the trash can and commands it by voice, the system will verify the voiceprint information. It will match the voiceprint of the database after single-mode blind processing,and then identify whether the voiceprint information is in the server database. If not, it will record the voiceprint in the database,and set the initial environmental protection score. If it is in the database,then the system will query the environmental protection score value of the voiceprint account. When the value of environmental protection score is lower than a certain threshold, user needs to learn the garbage classification information forcibly,that is,the garbage can will be opened only after playing the audio of the correct classified garbage category knowledge.

The trash bin not only can recognize the trash category by voice and open the corresponding trash can cover 2, but also is provided with an infrared detection device, which can detect and control the opening of the trash can cover 2.

The infrared detection device includes an infrared sensor, which is set on the garbage bin body 1, and also can be set on the outer surface of the garbage bin inner liner 101. The inner liner 101 separates a plurality of spaces, each space will be placed with different kinds of garbage while each type of garbage placed on the space is provided with an infrared detection device. The infrared sensor senses the garbage and sends the information to the microcontroller, which controls the mechanical transmission device to open the corresponding garbage can cover 2, thus completing the garbage sorting and throwing.

Through the voice recognition system, the user speaks the name of garbage to the system when using it, and the system can send a signal to the microcontroller according to the type of garbage. Subsequently,the microcontroller will control the transmission device and open the lid of the corresponding category of garbage can. At the same time, if the user speaks the direction of movement to the voice recognition system, then the system will send signals to the microcontroller according to the voice command, thus controlling the movement of the bin. The bin will facilitate residents to achieve proper garbage disposal and efficient garbage sorting, thus allowing users to empty and sort garbage anytime and anywhere.

3. Conclusions

The intelligent voice sorting garbage can is composed of a micro control chip, infrared detection device, mechanical transmission device, and linkage mechanism. It can identify the type of garbage and open the lid automatically by voice control and is a new high-tech product integrating machine, light, and electricity, with the advantages of reliable performance,long service life,and low power consumption. When using the "AI Automatic Waste Separation Bin", the user only needs to say the type of waste, and the corresponding bin will be opened. This will help people to better sort the garbage, and people can put out the garbage without touching any part of the garbage can. It is featured as environment-friendly and hygiene, thus can effectively prevent cross-contamination. At the same time,the garbage cans are well sealed, so that various germs in life are reduced.

Solve the problem of difficult classification from the source and cultivate the public's awareness of garbage classification; Reduce the cost of garbage disposal, keep a forest naturally, innovate in science and technology,conform to the national garbage classification promotion policy, strengthen the brain through voice, cultivate behavior to escort environmental protection, and let users cultivate garbage classification awareness. Use thousands of trees to classify trash cans intelligently, Just tell the garbage type, and the trash can of the corresponding garbage type will be opened. The user's memory will be strengthened through repeated prompting and repeated stimulation during daily use, which will reduce the thinking load when the user memorizes the garbage classification knowledge,cultivate the user's "subconscious" behavior, and effectively help people classify garbage.

Using this smart garbage bucket can solve the difficult problem of classification at the source and cultivate the public's awareness of garbage classification. It can reduce the cost of garbage disposal, return a forest to nature and improve the ability of

science and technology innovation. At the same time,the product is in line with the national waste classification promotion policy. It reinforces users' brain behavior through voice, cultivates environmental thinking, and allows users to develop an awareness of garbage classification. With intelligent garbage cans,users only need to say the type of garbage to open the corresponding type of garbage can. The voice prompts and repetition can stimulate and strengthen the user's memory, thus reducing the load on the user's mind when remembering the knowledge of garbage sorting. At the same time, it can cultivate the user's "subconscious" behavior, thus effectively helping people sort garbage.

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