

Design and implementation of intelligent voice classification trash cans

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Abstract: *With the continuous development of my country's economy, urbanization is getting higher and higher, making people's domestic garbage more and more, and the problem of garbage sorting is becoming more and more serious. In order to avoid the damage of daily garbage on the ecological environment, reduce the huge impact of daily garbage on the environment, and facilitate the use of the cycle of garbage and propaganda to the public to classify garbage. This article uses a STM32 single-chip machine. When the user says the password of the garbage or the name of the trash can, the voice recognition module of the trash can will be identified on the user password. The overall assembly welding is carried out to complete the debugging, which proves that it has high stability and reliability. To a certain extent, it has certain significance to reduce the workload of sanitation workers and their sanitation work management.*

Keywords: *STM32; trash can; voice recognition; steering gear*

1. Preface

At present, in the sustainable economic development of our country, the people's lives have been greatly improved. A large consumption of resources on resources has also led to the continuous increase in garbage in the lives of cities in my country. My country's recyclable and continuous development of garbage attach importance to the importance of garbage. The degree is getting higher and higher. The treatment of current garbage is the responsibility of everyone. To deal with the problem of garbage, it will not only benefit ourselves, but also benefit our descendants. As the world's largest country, China has a great impact on the results of garbage treatment, which has a great impact on my country and its world. Improper waste disposal not only causes damage to the environment, but also causes unnecessary waste of the unnecessary use of items. As the essential product of life for people's lives, the trash can is also a tool that is currently valued[1].

From the initial outdoor trash cans to pedal trash cans, to the current intelligent trash can, the improvement of the trash can symbolizes the continuous progress of our society and the progress of human civilization. The traditional trash can has a simple function. There are only a few logo names, which is difficult to achieve the effect of people's garbage classification. As a result, we have difficulty in recyclable material, causing unnecessary waste. In order to solve the above problems, this article designs an automatic voice recognition of garbage classification and low-cost smart trash can. It can realize the recycling of garbage, thereby improving the quality of people's living environment.

2. The main control module circuit

The design uses the STM32 single-chip microcomputer as the main control chip of the smart trash can controller. It is processed by the input signal of the keys, controlling the steering gear and indicators, and Bluetooth work to complete the functions required for this design. The main control module circuit is shown in Figure 1. The intelligent trash can controller in this designed uses the power-on reset and the button to reset to work together to prevent the program from running, the program garbled, or the user controls the control requirements during the use process. Power-powered reset: When electronic equipment is powered on, the system performs a complete startup process, initializes all components into the default state, and enters it into the controllable working state; The reset operation, by pressing the button to restart the device, improves the reliability and stability of the system to a certain extent[2].

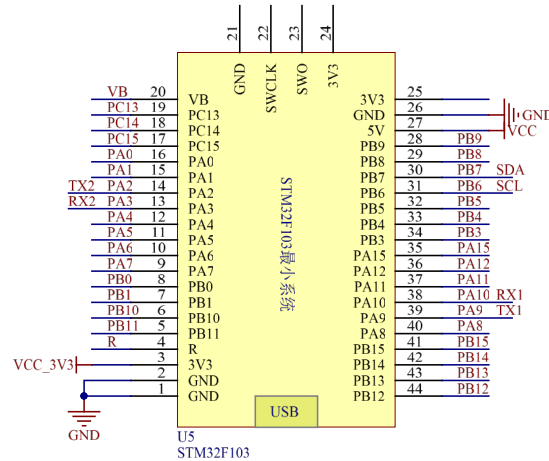


Figure 1: Principle diagram of the main control chip circuit

3. Voice recognition module circuit

This design adopts a voice recognition module. The current user needs to open the trash can, and then analyze the identified information through the central processor to control the turbine lid. Connect the microprocessor, send the instructions sent by the user to the single-chip microcomputer, and process it, and then control the device[3]. The used voltage is 5V to power the voice module. This module only needs to connect to the computer USB circuit to achieve program updates. This module can also achieve long-distance recognition other than 10m. The recognition rate is as high as 97%. The inhibitory effect of natural noise is better and supports more than 160 instructions[4]. The physical object of the voice recognition module is shown in Figure 2:



Figure 2: The physical diagram of the voice recognition module

The schematic diagram of the voice recognition module circuit is shown in Figure 3:

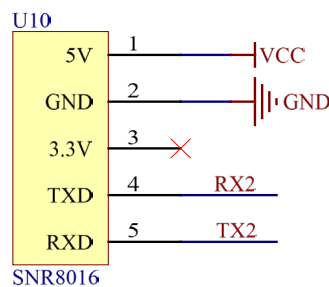


Figure 3: Voice recognition module circuit principle diagram

The pin function of the voice recognition detection module is shown in Table 1:

Table 1: Sound detection module pin function

Point label	symbol	function
1	VCC	5V power input
2	GND	power supply
3	3.3V	3.3V input, the load current does not exceed 50mA
4	TXD	communication serial port
5	RXD	communication serial port

The parameter indicator of this module is shown in Table 2:

Table 2: Voice recognition module technical indicator

Electrical parameter	voice recognition module
Operating Voltage	5V
stand-by current	50mA
Speaker	1 watt and 4 Euros
Module specification	28*40mm
Amplifier output	DAC(1W)
Voice instructions	number of voice instructions 160 (maximum)
communication method	UART/IO
Audio time	240 seconds (16K sampling)

4. River Module Circuit

This article uses the steering gear to control the opening and shutdown of the trash bin lid. The user voice module is monitored to control the opening of the trash can, and the rotation of the engine is facilitated to drive the barrel to flip the lid up. The circuit principle is shown in Figure 4:

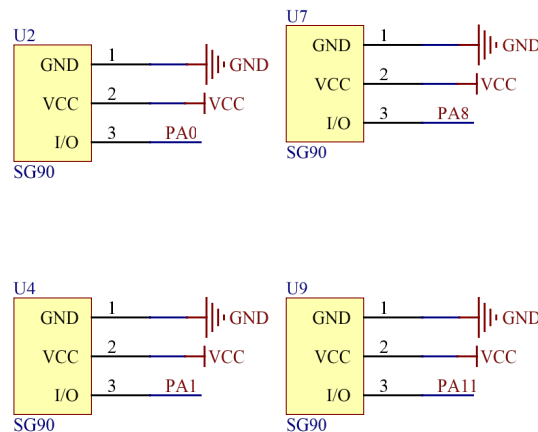


Figure 4: Circuit Circuit Circuit Circuit

5. Programming software introduction

The programming software used in this design is KEIL, and its development interface is shown in Figure 5:

This design mainly uses Keil to compile operations. Keil provides intuitive debugging tools, which can easily perform single -step debugging, tracking procedures, view variables and memory values in the development process, which helps to improve the code. Quality and reliability[5-6]. In addition, Keil also provides a variety of rich library functions and routine, which can greatly simplify the difficulty and workload of program development and improve development efficiency. In addition, as an integrated development environment (IDE), Keil can also easily carry out project management and version control[7]. When using Keil to develop projects, it can easily create, open, edit, and save engineering files, which can easily manage and control different versions to ensure the maintenance and scalability of the project. In short, Keil is a powerful, easy -to -use and convenient development tool, which provides a comprehensive support and solution for the development of embedded systems, which can help developers complete project development quickly and efficiently. At the same time, the quality and reliable code of code can be improved[8-10].

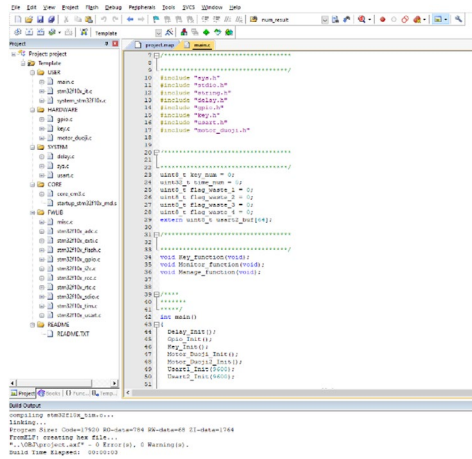


Figure 5: Keil development interface

5.1 The main program process design

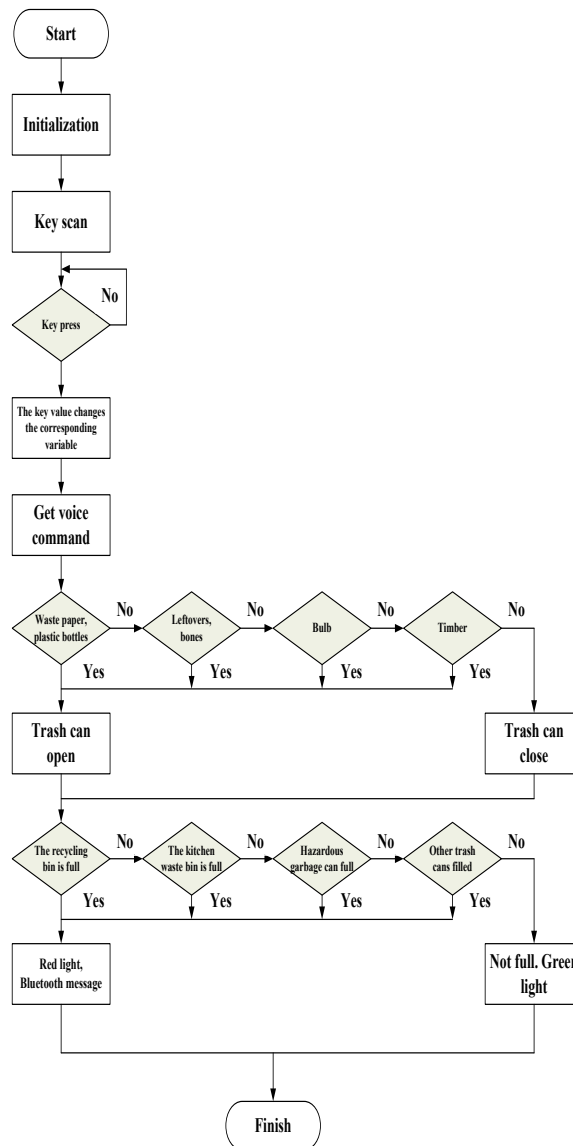


Figure 6: Programming Flowing

The password name is "waste paper | plastic bottle | recyclable garbage", then the recycling trash

can enlust the cover. If it is filled, the red light is on, and the "recyclable trash can is full" through Bluetooth, it is not filled, and the green light is on. If the kitchen waste bin is full, the red light is on, and the "kitchen waste bin is full" through Bluetooth, it is not filled and the green light is on. If the harmful trash can is full, the red light is on, and the "harmful trash can is full" through Bluetooth, it is not filled, and the green light is on. If the other trash cans are filled with red lights, and "other trash cans are full" through Bluetooth, it is not filled and the green light is on[11-13]. As shown in Figure 6:

5.2 Key function process design

When the key value obtained by identification is 2, the kitchen waste trash can open, delay 2s, and turn off. When the key value obtained by identification is 3, the harmful trash can is opened, the delay is 2s, and closed. As shown in Figure 7:

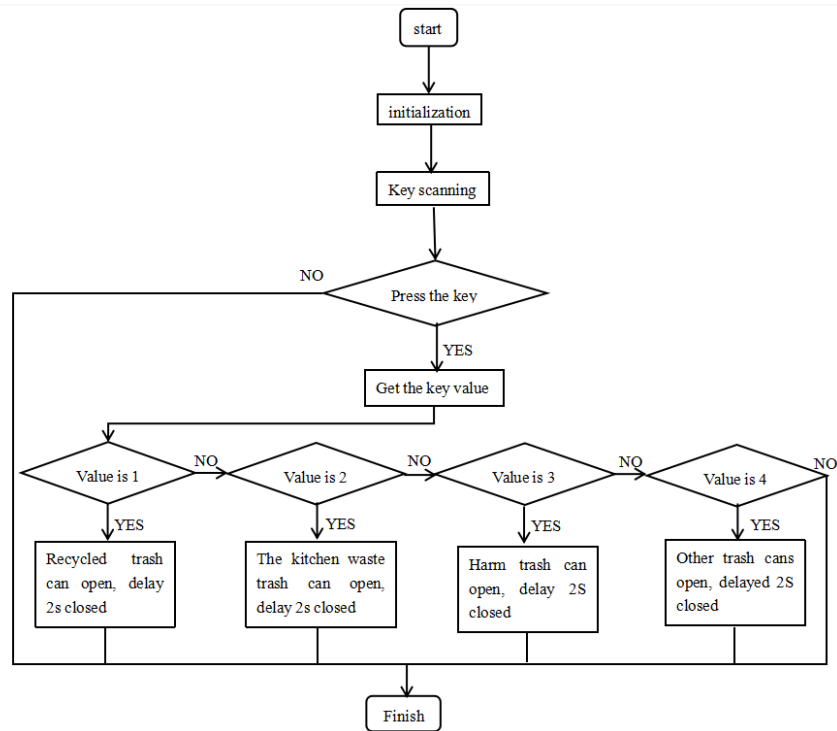


Figure 7: Key functional diagram

6. Overall physical debugging

The classified trash can designed in this article is shown in Figure 8 through the physical welding assembly. It can be seen through the physical map that the design of the design includes: STM32 single-chip microcomputer and its minimum system, infrared tube module, steering gear module, Bluetooth module, indicator light module, voice recognition module, power module, etc[14].

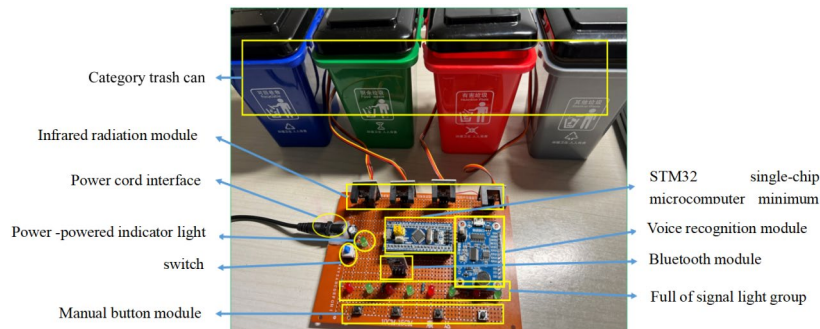


Figure 8: The overall physical test diagram

The welding assembly is completed by the circuit diagram, and the program burns, and the power

supply is connected to the physical test. Press the power switch, the off -power indicator is green, the lights on the signal of each module are on, and the lid of the trash can is closed. At this time, the signal light group is full of green, showing that the trash can not overflow.

When the user's voice control "bulb | harmful garbage collection" information is detected, the "harmful trash can" barrel lid is opened through the steering gear, and the voice broadcast "has opened the harmful trash can for you"; The physical button directly controls the harmful trash can. The physical test is shown in Figure 9, and users can also say that other related instructions open the corresponding trash can.



Figure 9: Voice recognition automatic control of physical test diagram

7. Conclusion

The structure of the trash can designed in this article is relatively simple. It can not only control the switch of the trash can manually, but also the user can also control the opening of different trash cans through voice. To a certain extent, it is of certain significance to reduce the workload of sanitation workers and the cycle of their items.

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