Design of mobile phone control for wifi module of intelligent trash bin based on STM32

Qi Wu

Suzhou Vocational Institute of Industrial Technology, Suzhou 215104, China.

30683458@qq.com

Abstract

The design takes stm32f103c6t6 as the core, sensor detection as the core principle, WIFI module ESP8266 for mobile phone control, accompanied by infrared detection circuit, 1.3-inch color screen display in Zhongjing Park and led alarm lamp, which are combined to achieve the desired functions. In the design, the rotation of the motor is used to simulate the flip effect of the intelligent trash can, and the WIFI can be connected to the mobile phone to control the opening and closing of the lid of the trash can. When the infrared sensor detects someone approaching within its own controllable range, the LED light will light up and display. At the same time, when the garbage in the trash can reaches a certain capacity, a sensor will detect and give a red light alarm, and there will be a corresponding display on the display screen. So as to remind people to clean up the garbage and realize the intelligence of the garbage can. As a result, it is convenient for people to deal with garbage and improve their awareness of environmental protection. at the same time, it also reduces relative contact during the epidemic, achieves the safety protection of hygiene and self-protection, and can make people safer and more at ease in the process of use. it is one of the devices with high performance and price.

Keywords

WIFI, stm32, infrared detection, color screen display.

1. Domestic research status

With the development of science and the progress of society, it is against this background that people pursue a higher quality of life. In addition to the sudden outbreak of the epidemic in the world in the past two years, the form of the epidemic has become increasingly severe. Reducing contact, isolating at home and doing well in self-protection have not only become the topic of daily discussion, but also the best way to reduce the spread of the virus, In this form, the government has also continuously promoted various zero-contact exchanges. For example, school education held cloud class meetings, enterprise development video conferences, etc. Exactly, how to block the spread of virus through objects, how to classify garbage and reduce contact have also become a crucial step. This is the significance of this design. Through the automatic switch of the intelligent trash can, the contactless dumping of garbage is realized, which not only caters to the living requirements of the majority of residents, but also conforms to the concept of unnecessary contactless advocated by the government, which is convenient for people and also protects their safety[1-12].

According to incomplete statistics, by 2021, the amount of garbage generated globally each year will be more than 10 billion tons, and based on the continuous growth of China's population, the amount of garbage generated is also increasing. It can be said that the amount of garbage and the population are growing in proportion. Therefore, the design topic of intelligent garbage can also made me more determined. Although the Chinese government has implemented many policies on how to treat and recycle garbage over the years, it still can not avoid polluting the

surrounding environment. In the face of a large amount of garbage, how to make people more convenient to put garbage on their own and improve environmental awareness, in view of this situation, After consulting materials and teachers and combining with the development of modern epidemic prevention, I began to study the topic of intelligent garbage cans[10-15].

This graduation design takes stm32f103c6t6 as the core, and adopts infrared sensor detection, WiFi module ESP8266, infrared detection circuit, 1.3 inch color screen display in Zhongjingyuan, and led lamp for design. The mobile phone can be connected to WIFI to control the opening and closing of the garbage can lid (simulating the intelligent flip of the intelligent garbage can) by using the analog switch of the motor. When the infrared sensor detects someone approaching within the range of its own acceptance, it will have an LED light on display. At the same time, when the garbage in the garbage can reaches a certain capacity, the sensor will detect and give a red light alarm to remind people to clean up the garbage, It realizes the intellectualization of garbage cans, makes it convenient for people to deal with garbage in their daily life, and at the same time reduces the contact during the epidemic, responds to the national policy, and achieves the health and safety protection, which can make people feel safer and more secure. It is a cost-effective equipment in the world today[16-18].

According to the data, the EKO smart trash can developed by the United States is simple and generous in appearance, and the stainless steel material is good, and more importantly, it is noiseless, because its lid is buffered and has the function of keeping the lid open. A CCKO developed by Germany has the biggest feature that the garbage bag can be hidden and can prevent the emission of odor, but they all have a common shortcoming, The cost is relatively high, because the scope of research is very wide, and it needs to be specific to a certain application, so there are many R&D possibilities for this application. If a chip with high accuracy needs to be installed on a smart trash can, the production cost is far from incalculable. In addition, it can be considered as a high-tech product combining machinery, light and electricity. In order to respond to the concept of environmental protection, protect the environment, love the earth, and improve the quality of life, many places have begun to implement garbage classification management regulations. It would be too troublesome to understand the local rules every time you go to a place. Therefore, through reading the literature, you can roughly understand that an American company has launched a garbage can that can be classified intelligently, its name is Transhbot, It is understood that three garbage bins are installed inside its body, which can carry out intelligent garbage classification by itself. One of the biggest selling points of a smart trash can researched in Japan is "automatic packaging and bag changing". It is not only about how Xingdao deodorizes it, but also about recycling[3-16].

It can be seen that foreign trash cans are also closely followed by current affairs policies. Under such a background, research and design will be carried out to finally produce intelligent devices that meet the current background. Nowadays, for any emerging product, consumer reputation and customer satisfaction are an important aspect. However, at present, the smart trash can has not been recognized by consumers, and further in-depth research is needed before it can be widely used[16-20].

In addition, because garbage can is a very common thing in our daily life, how to achieve universal application and control production costs has also become a common issue for scientists at home and abroad[17-19].

At present, the current intelligence of smart trash cans is still far from the functions of voice assistants such as Xiaoai classmate and Siri on our mobile phones. This research is still at the initial stage, and there is no doubt that they are not intelligent. The self-classification function of domestic smart trash cans is not perfect. As far as the current technical level is concerned, according to the data, Its highest level is to achieve voice cleaning. According to the mobile phone voice assistant, we can associate with the future research direction of the smart trash can. It can be lidless or automatic flip type and can reduce costs on this basis. And more

importantly, it can ensure that it does not emit odor, can absorb odor, and can digest the garbage can. On the whole, it can be fully sealed. Another research focus is the cleaning function, which can not only realize automatic flip, but also self-cleaning on this basis[13-19].

In fact, the first thing people can think of is that the intelligent trash can has the infrared detection function to realize the independent intelligent function distribution, so as to control the working state of the intelligent trash can. Secondly, it has the sealed working mode to ensure that the trash can is completely closed, realize the function of no odor transmission and deodorization. In fact, whether the design of the intelligent trash can is in China or abroad, it is mainly the design of the appearance, and the practical function is still greatly discounted. At present, most of them are voice control modules.

In the future economic development of China, the popularity of intelligent garbage cans will be greatly improved, because this is not only the trend of economic development of the times, but also the inevitable trend of the background of the rapid development of artificial intelligence. The traditional garbage cans must be gradually eliminated in the process of economic development of the times, and finally realize the spread of intelligent applications, and drive the improvement of people's living standards. Secondly, the garbage cans in the future can also be used for intelligent garbage classification, which can remind people to classify by voice, increase environmental awareness, and build a pollution-free earth family together.In the future of more advanced technology, the research direction of trash can will be more and more, and the development of functions will be more and more in-depth. Perhaps the intelligent trash can can also be defined as an all-around intelligent housekeeper, truly realizing all-intelligent. The domestic market prospect and research of smart trash cans can still be expected by Chinese people.

2. Overall design

The combination of hardware and software. In the aspect of hardware, we mainly design the infrared detection sensor circuit, led display circuit, wifi module for network debugging control, and relay circuit, and use F103C6T6 for overall control. In the aspect of software, we integrate each functional module through program modules to achieve communication connection. The two complement each other, and one cannot be omitted to complete the overall design, Finally, we realize the functions we want. This design mainly uses the smallest system of F103C6T6 module in stm32 to realize the connection between control and external signals: the design schematic diagram of external pin diagram is shown in Figure 1.
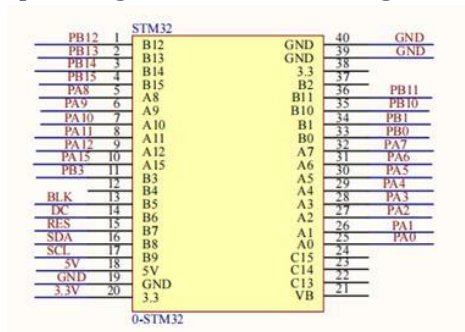

Figure 1 Schematic diagram of external pin design

Infrared sensor mainly uses infrared for data processing, and its two most important advantages are low cost and high sensitivity. Reflect by detecting the distance between obstacles, which mainly includes optical system, detection element and conversion circuit. When an object is detected to be close to and within its recognition range, the display status is displayed on. First, connect the mobile phone to the wifi signal named "Smart trash can", open the network debugging assistant, configure port 5050 to activate. When the manual input is 1,

the status is on, and when the input is 2, the status is off. The schematic diagram of the external pin design of the Wifi module is shown in Figure 2.
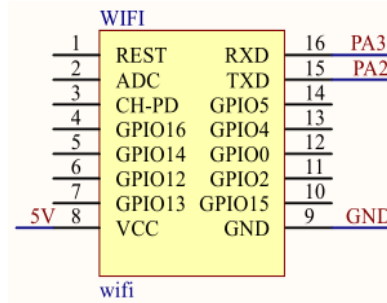

Figure 2 Schematic diagram of wifi module external pin design

In the design, the rotation of the motor is used to simulate the flip of the intelligent trash can. When the sensor detects the signal, the relay opens and the motor rotates to realize the flip of the intelligent trash can. The circuit principle of external pin diagram is shown in Figure 3.
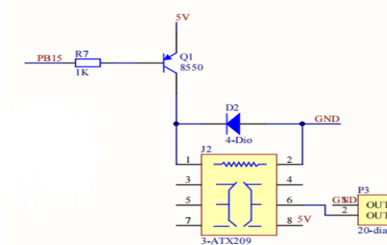

Figure 3 Schematic diagram of relay module design

First of all, turn on the power, and the words, status and capacity of the intelligent trash can will be displayed on the color screen. When the infrared sensor detects the signal, the sensor will send the data to the single-chip processor for processing data, and then the status will change. If the capacity is detected to be full, the led will light up to remind. The schematic diagram of external pin design is shown in Figure 4.
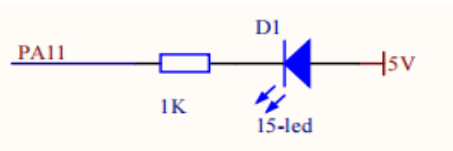

Figure 4 Schematic diagram of external pin design of alarm display module

3. Commissioning and analysis

First of all, check the circuit wiring for short circuit and open circuit. During this process, use a multimeter to check the lines of each branch circuit, check the pin welding of each module, and check whether there is faulty soldering, missing soldering and burr. Check two or three times to ensure that there is no error, and then power on the equipment. First, the device is powered on, and then the function is tested. Carry out key operation on the physical object to see whether its function can be realized. Secondly, connect the mobile phone for debugging to see whether the contactless function can be simulated through the mobile phone. As shown in Figure 5.
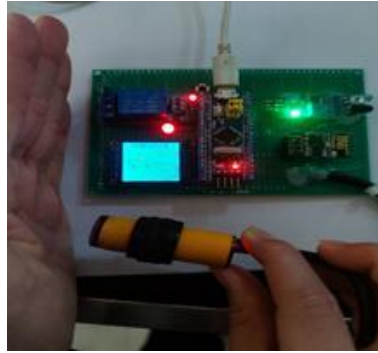
Figure 5 Software manual simulation circuit diagram

4. Conclusion

This design takes stm32 as the core, uses sensor detection as the core principle, and the WiFi module ESP8266 carries out mobile phone control, accompanied by infrared detection circuit, the 1.3-inch color screen display in Zhongjingyuan and the led alarm prompt light, which are combined to achieve the required functions. In the design, the rotation of the motor is used to simulate the flip effect of the intelligent trash can. The mobile phone can be connected with WIFI to control the opening and closing of the trash can lid. When the infrared sensor detects someone approaching within its controllable range, the LED light will light up and display. At the same time, when the garbage in the trash can reaches a certain capacity, the sensor will detect and give a red light alarm, and the corresponding display will be displayed on the display, Thus, people are reminded to clean up garbage and realize the intelligence of garbage cans.

References

[1] Zhong B , Li J , Wang S , et al. The design of intelligent music system based on Internet of Things[C]// 2016 IEEE International Conference of Online Analysis and Computing Science (ICOACS). IEEE, 2016.

[2] Wu Y Y F . Design and development of monitoring device for corn grain cleaning loss based on piezoelectric effect[J]. Computers and Electronics in Agriculture, 2020, 179(1).

[3] Zhong H , Hong S , Gao C , et al. Testing Approach of HMI Designs for Vehicles with Automated Driving Systems: A Usability Test Case Based on the Driving Simulator[C]// International Conference on Human-Computer Interaction. Springer, Cham, 2022.

[4] Yao W , Kong X , Xu A , et al. New models for the influence of rainwater on the performance of photovoltaic modules under different rainfall conditions. 2023.

[5] Nadafzadeh M M S A . Design and fabrication of an intelligent control system for determination of watering time for turfgrass plant using computer vision system and artificial neural network[J]. Precision Agriculture, 2019, 20(5).

[6] Wang D Q , Song X , Tang B . Design and Implementation of a New Intelligent Compression Trash Tank*[C]// 2021 7th International Conference on Condition Monitoring of Machinery in Non-Stationary Operations (CMMNO). 2021.

[7] Jeyasenthil R C S B . A novel semi-active control strategy based on the quantitative feedback theory for a vehicle suspension system with magneto-rheological damper saturation[J]. Mechatronics: The Science of Intelligent Machines, 2018, 54.

[8] Li G L Z . Intelligent design method and system of trimming block for stamping dies of complex automotive panels[J]. The International Journal of Advanced Manufacturing Technology, 2020, 109(9a12).

[9] Andrade Gomes Barreto, Carlos EduardoSchiozer, Denis Jose. Optimal placement design of inflow control valve using a dynamic optimization process based on technical and economic indicators[J]. Journal of Petroleum Science & Engineering, 2015, 125(Null).

[10] Attar J D N . Analysis and Design of a Time-Varying Extended State Observer for a Class of Nonlinear Systems with Unknown Dynamics Using Spectral Lyapunov Function[J]. Journal of Intelligent & Robotic Systems: Theory & Application, 2019, 94(2).

[11] Zhang R , Feng Y , Sun H . Design of the Intelligent Bag for Preventing the Lost Based on STM32. 2019.

[12] Yuan Y , Huang Z . Design of Intelligent Monitoring System for Mobile WIFI[J]. Journal of Lanzhou University of Arts and Science(Natural Science Edition), 2015.

[13] Wang Y . Design of Communication Module of Control System for Intelligent Vibratory Roller Based on CAN-bus[J]. Road Machinery & Construction Mechanization, 2011.

[14] Zhan Y J , Guo-Bing L I , Zhu S L . Design of Internet of Things Control Module for Internet Gas Water Heater Based on Intelligent Cloud Platform[J]. Equipment Manufacturing Technology, 2018.

[15] Zhang J , Lu Z , Shang H , et al. Design of Intelligent Recyclable Waste Recycling Bin Based on Solar Energy[J]. Journal of Heilongjiang University of Technology(Comprehensive Edition), 2018.

[16] Chen Y Q . Design of Multifunctional Flow Control Instrument Based on STM32[J]. Instrument Technique and Sensor, 2015.

[17] Jianying W U , Ping X , Zhang Y , et al. Design of Omnidirectional Wheel Intelligent Garbage Bin[J]. Modern Manufacturing Technology and Equipment, 2019.

[18] Mei H Q . Design of Intelligent Control System for LED Lighting Based on WIFI Environment[J]. Technological Development of Enterprise, 2019.

[19] Meng G , Zhang Y , Kaisheng. The Design of the system of intelligent of copying list at home based on embedded module of S3C44B0X[J]. Control & Automation, 2005.

[20] Tan C W , Zong-Chun F U . Design and implementation of WIFI control system based on 8051 single chip[J]. Electronic Design Engineering, 2018.