Design and implementation of Arduino control system based on social software

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Abstract: In this paper, based on the control of Arduino electronic components, the user can send control instructions to QQ, and after receiving information in QQ, the system determines whether it belongs to the control instruction. If it belongs to the control instruction, the command will be sent to the CQHTTP. After the DSL engine is parsed, the corresponding control instruction is sent to the Arduino control end, Arduino controls the action of the related devices. Whether the action is successful or not, it will pass through the callback system, the alarm notification system, the retry system and other fault-tolerant mechanisms, and give feedback to the user's final information.

1. Introduction
This paper uses Arduino as the control core, QQ as the control mode, the control instructions issued by the DSL engine into control instructions, Arduino control relay action, so as to achieve only a word, or just a few words can be made highly in line with their own needs of the control system.

The control system has the function of failure alarm notification, automatic retry mechanism and security identification. With the help of powerful DSL parsing engine, it can realize complex timing action, delay action, cyclic repetitive action and other functions with a simple sentence or a few words and understand the relevant situation at the first time.

The early Internet of things (IOT) refers to data transmission between two or more devices at close range. It solves the connection between objects and wires. The way of communication is mostly wired, such as RS323 and RS485, considering the convenience of mobile location, and more wireless use in the later stage. Common Internet of Things communication methods are divided into four categories: traditional Internet, mobile air network, wired transmission, short-range wireless transmission. In the consumer domain, the traditional Internet communication methods are HTTP, HTTPS and Websocket, GSM, 3G/4G and Internet of Things. The terminal communication methods are Bluetooth, RFID and IC. The system implemented in this paper mainly uses HTTP communication.

2. System design

2.1 Design ideas
The overall design of the system is mainly divided into two parts: software and hardware, hardware components are: Arduino UNO, W5100 expansion board, relay, LED light-emitting diode, buzzer, which relay, LED light-emitting diode. The software part mainly uses Arduino programming language, QQ, CQHTTP. Arduino UNO; W5100 Extension Board for network communication; Relays and LED
light-emitting diodes for extension function examples to verify the working state of the system; Writes a Web communication application that allows instructions to be passed to CQHTTP via QQ, and then to W5100, thus realizing the action of electronic components such as relays or LED light-emitting diodes. The overall system design block diagram is shown in 1.

![Overall design block diagram](Figure 1. Overall design block diagram)

2.2 Network communication mode

2.2.1 GSM protocol
This system controls the API interface provided by GSM operators through HTTP protocol, thus realizing the indirect control of GSM by HTTP.

2.2.2 CQHTTP
Cool Q Air is a lightweight, free, efficient robot core, CQHTTP through HTTP cool Q Air QQ event reporting and receiving HTTP requests to call cool Q DLL interface, so you can use other programming languages to control QQ. Simply put, QQ can be easily controlled by CQHTTP to build a powerful QQ robot.

2.2.3 W5100 brief introduction
In this paper, W5100 is designed as an integrated W5100 chip and can be compatible with Arduino network communication board, used to send and receive HTTP / HTTPS network data.

3. System hardware design
3.1 Communication line design
In order to improve the fault tolerance of the system, redundancy design is added, that is, assuming that W5100 communication is not affected by IPV4 address type. At present, there are usually two solutions to this problem: one is to add NAT penetration to devices without IPV4 addresses in the public network to make traffic transit; the other is to change the communication mode from forward connection to reverse connection. This system does not use the mainstream solution, but with the help of router equipment, to build a local area network. The communication network design diagram is shown in Figure 2.

![Figure 2. Communication network design drawing](image)

4. System hardware design

4.1 Software system flow chart
In this paper, the software is responsible for receiving information, parsing information, instruction conversion, instruction transmission, state detection and other work, is the core of the system.

4.2 CQHTTP and QQ robot docking

4.2.1 Program configuration
When the QQ robot receives the information sent by the user, CQHTTP needs to complete the task of receiving information, forwarding information, modifying the configuration file of CQHTTP, CQHTTP will automatically complete the message receiving and forwarding.

4.2.2 Information processing
After CQHTTP sends out the information through HTTP POST, other subroutines must complete the receiving of information, the judgment of instructions, the analysis of instructions, which is the core of the system software.

4.2.3 Information receiving program
Using the Bottle Web framework, you create a Web server that loops through the relevant ports and starts a thread to receive information if it receives a message.

4.2.4 Instruction judgement program
This part of the program judges the received information by instructions. If it is an instruction, it goes into the next process, otherwise it does not do any processing.

4.2.5 Instruction parser
This part of the program converts the determined instruction message into a request for an Arduino Web Server mapping so that Arduino can control the electronic component.

4.3 Instruction passing
This part of the program is responsible for transferring the translated instructions to W5100 over the network so that Arduino can control the execution of the original action. The main way of transferring
the instructions is to create an HTTP Client through requests library, and then HTTP Client sends HTTP GET requests to W5100.

4.4 Instruction execution
After receiving the HTTP request, Arduino finds a predefined action map that matches the content of the request, and then controls the corresponding action mechanism to perform the action.

4.5 Design of GSM notification and control module

4.5.1 GSM notification module
After executing the action of electronic components, one of the subroutines in the module obtains the status information of relevant hardware, then W5100 sends HTTP GET request, sends the hardware status information to the notification module subroutine 2, which packages and filters the information, sends the information to the user through the GSM short message notification platform, and completes the GSM letter. Notification function of interest.

4.5.2 GSM control module
Message / xsend provides a complete and powerful SMS sending function, unlike the message / send API, message / xsend does not need to submit SMS content and SMS signature, just submits the tag of the SMS item you created in the SUBMAIL MESSAGE application, and can dynamically control the content of each SMS using text variables [6].

Using the message / xsend API, you will be able to create / manage your SMS templates efficiently and visually using the SUBMAIL editor. When a user requests that this item can be used for triggering, SUBMAIL immediately executes the send action without worrying about the send delay [7].

4.6 Fault tolerant unit program design
This part of the program is equivalent to a watchdog process. Once the GSM notification module subroutine obtains the hardware operation information, this part of the program converts the hardware information, the incoming control instructions into binary values, 0 is disconnected, 1 is closed, and then compares the two binary values, if an electronic component does not comply with Instruction action, then the program re-issued start instructions, the number of retries hard-coded in the Arduino program, default to retry once.

5. System deployment optimization
This paper implements an Arduino control system based on social software. Using QQ as the control command issuer, the system needs many complicated steps from zero to operation. Therefore, the whole system is optimized to make the system easy to control, deploy quickly, operate easily, fault-tolerant and timely notification.

5.1 Hardware optimization
The hardware part of the system consists of communication part, power supply part and action element.

5.2 Software optimization
The system software is also divided into many modules, including QQ robot, CQHTTP, information receiving module, instruction judgment program, DSL parsing program, instruction transfer program, instruction execution program, GSM notification module, GSM control module, fault-tolerant module and so on.

Similarly, information receiving module, instruction judgment program, DSL parser, instruction delivery program can also be packaged into a single file, because the IP address of Arduino is not fixed, so it is necessary to add a runtime program to get the IP address of Arduino in the network, which scans the devices in the LAN, and then Try to communicate with each device's port 81, if it can communicate with a device normally, then determine the IP as Arduino W5100 IP.

Instruction execution programs require manual modification by the user. The optimization of this part of the program is to give the user a usage document, which is maintained by the user in a collaborative manner. If the user uses the relevant electronic components, the user edits and improves the documents belonging to the relevant electronic components through collaboration. Ways to achieve relevant functions.

GSM notification module, GSM control module users can choose to use the default GSM SMS service providers, if there is a customized demand, users can also modify the code, use other GSM SMS notification service providers, or do not use GSM SMS notification function, the decision is entirely in the hands of users, so the system is more open. The common GSM SMS notification service providers have been mentioned in the third chapter and fifth quarter.

Fault-tolerant module is the system's default enabled module, the default number of retries is 1, the number of retries parameter can be changed to 0 or other positive integer values.

6. System simulation and operation experiment

6.1 Proteus simulation
The software design and debugging of the system need to be completed by Proteus simulation software. In this paper, LED light-emitting diode simulation.

After the QQ robot receives the "open led 0 now" control information, the LED will turn dark and bright after a short network delay.

6.2 Program running

6.2.1 QQ Robot operation
After downloading the optimized green file of the system, run the program, input the QQ robot account and password login server, you can see in the application options bar that the CQHTTP API plug-in has been enabled, if it is manually enabled, you need to manually download and configure the CQHTTP API publishing site, after running the program try to QQ machine When you send control messages.

6.2.2 GSM notification and control messages
In this paper, Proteus software is used to complete the simulation experiment of the system. After programming in Arduino IDE and compiling and exporting Hex file, the Hex file is imported into Proteus to complete the simulation.

7. conclusion
This paper is based on the Arduino control system of social software. This system takes Arduino as the control basis and social software QQ as the control information carrier. It realizes the notification and control function of GSM SMS operators.

After receiving the information of CQHTTP, the server determines whether the information belongs to the instruction, sends it to the DSL parser, converts it into an intermediate language, and finally transmits it to W5100 via the server. Then Arduino controls the action of the related electronic
components according to the converted instruction, and then the GSM notification module sends the action to the DSL parser. Post message sent to user mobile phone

The control system designed in this paper is based on the innovation of CQHTTP and QQ robots. Although the system has the characteristics of simple control mode, flexibility and low delay, I think there are still the following shortcomings:

1) Although the system control is timely and convenient, and the system deployment has been optimized, but there is still a certain distance from large-scale, commercial. Personally, the ideal scenario would be for users to control electronic components directly through Arduino on QQ or other social software without writing any code.

2) Although the transmission time of control instructions is less than 200 ms in the whole control process, the control information must pass through Tencent QQ server, CQHTTP, local receiving server and local sending server to reach W5100, and then Arduino reacts again. There are more transmission links if the current control information can be maintained.

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