Design and Analysis of Intelligent Home System for Remote Control of Luminance by Mobile Terminal

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Abstract. Nowadays, the Internet provides a strong technical support for the construction and development of smart home. Smart home sets the user's living environment as the central platform, and uses many technologies such as Internet of things, radio frequency identification, etc., to practice the unification, intelligent management and regulation of all indoor household appliances, which has obviously improved people's living quality and created convenient conditions for users to manage household appliances. Under the pressure of high technology, the current smart home products on the market are of various types, diverse functions, each has its own advantages, most of the products are mainly used to regulate the switch quantity, analog quantity control involved in the degree of insufficient, unable to achieve the indoor lighting degree of fast and accurate regulation. This paper mainly develops a remote control system based on Android mobile terminal, and explores the specific method for the system to control the brightness of smart home lamps, so as to further improve the level of intelligence of smart home and the satisfaction of residents.

Keywords: Smart home, Android Remote control of mobile terminal, System design, Brightness of lamps and lanterns, Methods to explore

In the 1980s, smart home rise in Europe and the United States and other developed countries, the early 1990s into the mainland, in the process of domestic housing industrialization development, smart home in the mainstream position in the society. The purpose of building smart home is to improve people's quality of life, improve the smart home environment, convenient. Home appliance intelligentization is one of the important contents of smart home. It can realize the operation state of remote control facilities, collect and process the data information of three tables of home use, and present it visually. At the same time, it can also realize the unified control of other home use equipment¹¹. This paper mainly introduces an Android tablet computer remote control indoor lamps and lanterns is the brightness of the system, the system USES home WIFI and ZigBee network as the foundation, the brightness values of feedback controller to lamps and lanterns, and then the controller of the targeted control drive Angle of silicon controlled rectifier circuit, to take the way of voltage control in a limited range of lamps and lanterns, achieve the degree of adjust the brightness of lamps and lanterns.
1. System architecture
The function of this system is to remotely control the brightness of lamps and lanterns in the smart home room, which is mainly composed of control and communication systems. In the communication system construction stage, based on the WiFi module and the server to build the TCP link, and then based on the HTTP protocol to promote the MCU and server data information interaction process. Android client is also from the HTTP protocol to complete the task of information communication with the server, with the server as the carrier, the Android client request signal sent to the SCM, SCM in the capture of data information, in accordance with the standard procedures for its interpretation and analysis, on this basis to form relevant instructions and send actions.

The router builds a WiFi hotspot. Under the support of STATION mode, the single-chip terminal WiFi module is connected to the hotspot smoothly, and the Tomcat server and Android tablet will be connected to the hotspot. In order to ensure the security of the information flow in the system, the network has set up the form of WPA2 encryption. When the router connects with the Internet through the home broadband, it will integrate the server process into the cloud. The Android client can directly access the single slice sweep client by the local GPRS network, and it is not necessary to establish the connection relationship with the LAN WiFi hotspot in the above process.

2. Design practice of remote control system for luminance adjustment
2.1. Control procedures
The communication between the mobile terminal and the gateway host in the system adopts the C/S structure and realizes the preset communication target by using Socket programming and the gateway host. The mobile terminal sets up two channels to log in to the gateway host, one is connected to the home network connection, the other is connected to the home network wi-fi. If the selected login channel is different, then the corresponding login method will be different, connected to the home network can only access to the domain name to achieve login, and if connected to the home network, it can be suggested to use the domain name or LAN either way to set a constant IP gateway, and then achieve the login goal. Because most households regulate the brightness of lamps and lanterns in the indoor environment, most Android computers are connected to the gateway host with the support of the home Intranet. Upon successful login, the gateway host can be combined with subjective requirements and communication with the gateway host. In this paper, the luminance value of the living room lamp is taken as an example to illustrate, and users are required to plan the prescription of the adjustment slider on the operating interface of the Android mobile terminal, and then plan and set the luminance percentage index. Figure 1 is a partial diagram of the luminance percentage setting interface.

Figure 1. Luminance value setting interface diagram
After the user has planned the luminance percentage according to the subjective requirements, the application program will intelligently compose a control message and conduct it to the gateway host. At the macro level, the message structure can be divided into three parts: message header, regulation information and CRC inspection information. The message header contains the control type information. The first one is the basic information of the controlled room. Byte 0x01 represents the...
living room. The secondary bit represents the information held by the controlled type in the room, and 0x01 represents the time setting and brightness degree of the target lamps in the regulated room. For the regulation information, the first six bytes correspond to the information held by the living room lamp in a certain setting time. The brightness percentage planning information of the living room lamp is represented by the seventh byte. If the luminance value of the lamp is set to 60%, the corresponding value of the message is Ox3c. The last two digits of the message array represent the detection values of CRC.

In the control message is smoothly to gateway in the host, the CRC detecting proofreading is the initial step, determine its accurate rear can receive, according to the packet header information set, types of lamps and lanterns of capture control target information, then transfers the information to match the regulatory information within the site, to carry out the above process can well capture the brightness of lamps and lanterns percentage set specific data information.

After the gateway captures the luminance percentage value, the relevant algorithm is used to transform it into the luminaire voltage setting value, and then a normalized message is prepared around the living room home controller. With the aid of ZigBee module, this message will be smoothly transmitted to the home controller. Known a AT89S52 chip controller CPU stored in this system, the role of the chip, after receive the voltage value in the form of look-up table to support specific voltage from zero after the triggering time of the corresponding length, which in turn will time data information transmitted to PIC12F65 chip, PIC12F65 chip index to control thyristor, in accordance with the time after the operation to carry out the above, on both sides of sitting room lamps and lanterns of terminal voltage value is corrected, the scheduling of sitting room lamps and lanterns had reached the level of brightness.

2.2. home controller design
The hardware equipment is mainly composed of ZigBee hair receiving module, AT89S52 controller and SCR control module. According to the relevant specification requirements of intelligent home system design, ZigBee connection and transmission modules are respectively correlated with the construction of related AT89S52 controller. PIC12F65 and bta-40 SCR jointly form the SCR control module.

No matter from the broad or narrow perspective, the SCR control module occupies the core position in the family controller system. Figure 2 is the hardware schematic diagram. In figure 2, LA and NA ports are connected to fire wire and zero wire respectively. The main functions of GA and TA ports are to drive SCR module and load respectively. The function of GPO and GP1 pin is the voltage value AD; the function of GP2 and GP5 is to accurately detect the voltage crossing zero, drive the operation process of the SCR module; the function of GP3 and GP4 pin is to establish a series relationship between the T89S52 controller and the information flow and flow process.

![Figure 2. Schematic diagram of SCR control module](image-url)
2.3. software design

Theoretically, a PIC12F65 controller is responsible for regulating the operation state of a SCR. Combined with the subjective needs of the system in operation stage, it is necessary to plan and design the AT89S52 controller of a PIC12F65 controller to simultaneously regulate two PIC12F65 controllers, which also indicates that it needs to regulate the operation state of two SCR modules. The home controller master program needs to cycle the PIC12F65 controller in a certain order. FIG. 3 is a flow chart [6].

![Flow chart](example.png)

**Figure 3.** Schematic diagram of the main program operation process

Based on thyristor control situation as examples to analyze all the way, this paper AT89S52 controller is responsible for reading this channel set voltage design value, its complete conduction to PIC12F65 controller at the same time, the lamps and lanterns PIC12F65 can combine household environment brightness index to control processing, and complete the task been ADC sample, intelligent sampling data integration and AT89S52 devices inside the controller, AT89S52 will reference to the sampling data to detect the real value of thyristor module output, judging if the design value is higher than the feedback, will shorten the trigger action time length; If the design value is lower than the feedback value, the trigger action should be delayed as needed. By planning and correcting the trigger time after zero crossing, the output voltage value of the SCR module can be effectively and quickly controlled within a limited range. The following method is adopted to reduce the adverse impact on the operation stability of the household lighting system when the grid voltage changes significantly.

Figure. 4 is the flow diagram of AT89S52 to single channel PIC12F65 control program [7].
After the relevant control platform is built with this system as the support, the residential users can adjust the brightness of lamps and lanterns in the intelligent home environment remotely by using the tablet computer according to their subjective wishes. The results of several debugging and tests show that this system can adjust the luminance value of lamps and lanterns efficiently.

3. Constant light control design

Incisively and vividly to the smart home intelligent property of incisively and vividly, this study also planning and design of the constant light control scheme, concrete based on indoor environmental monitoring process, dynamic capture indoor light intensity, set the constant light button add within the lighting control interface, tenants can be designed constant light and threshold, the light and then comparative analysis of the collected information and the design value, if captured light is higher than the design value, the system can be intelligent lower light intensity of illumination, the process will drive the light intensity of illumination, conversely until its regulation and control in the household design of light range.

The intelligent controller device USES the RF communication mode to accurately regulate the illumination index of the adjustable lamp, and communicates with each other by means of wi-fi and router.

**Figure 4.** Flow diagram of light brightness control

System main program running stage, will also intelligent identifying constant light control function is enabled, if determine its in an open position, will step into lighting control subroutine to obtain application steps, subroutine first collected the room light indicators, use the code, according to A Web browser can dynamic presented by collecting the data, code design B said residents constant illuminance values, code X said change range, if there is A relation between B - X or less A B + X or less, it indicates the current room light light lamps and lanterns is controlled in the design of the user of the interval, then returned directly to the system of the main program; If there is A > B+N, it
indicates that the indoor light intensity has exceeded the range set by the household, and the system can intelligently weaken the illumination. If there is \( A > b \times x \), the control system will be prompted to implement improvement measures for the illumination value of the light, and will still return to the main program of the system.

Coordinate the process of illumination lamps and lanterns in the smart home often cannot step achieve expected goal, this is mainly due to the light to change value of the output voltage range of 0 ~ 10200, adjustable lamps and lanterns of 0 ~ 12 v voltage accurately control, the study of the proposed value planning to 10 different levels and at all levels category are 1020, adjust one level at a time, to light lamps and lanterns of comparative analysis of the present values and household design range, and then make further adjustment when making decisions.

4. Conclusion

This article explains the Android based remote control terminal, the use of PIC12F65 chip made of silicon controlled rectifier module build a wireless system, it can accurately control the indoor environment brightness degree of lamps and lanterns, and apply to adjust light lamp can make stepless change the properties of the planning of the constant light control measures, has the characteristics of convenient manipulation of the process, customer satisfaction as a whole is on the high side. In the follow-up research, on the basis of continuously improving the humanization level of the control system, the light dimming and curtains should be integrated to further optimize the dimming control effect, and integrate the voice intelligent control function, and strive to create a more comfortable and convenient intelligent home environment for people.

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