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DESIGN OF SCHOOL BELL AUTOMATIC CONTROL SYSTEM BASED ON SINGLE-CHIP MICROCOMPUTER

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Abstract. This article introduces the basic components of the school's automatic control system, and makes a detailed introduction and comparison of the functions, application scenarios, and advantages of each part. The hardware design of the automatic control system is based on the STC89C52 single-chip control circuit as the core, supplemented by sensor circuits, clock circuits, bell circuits and human-computer interaction circuits to complete various functions. The human-computer interaction circuits include keyboard input circuits and liquid crystal display circuits. The software design of this system mainly includes sensor detection, button setting, and bell output part. The sensor detection part is composed of a temperature detection subprogram, the key setting part is composed of an independent key subprogram and a liquid crystal display subprogram, and the bell output part is composed of a voice recording and playback subprogram. The program and clock subroutine constitute.

Keywords: STC89C52 single chip microcomputer, sensor, electric bell automatic.

Introduction

Before the 21st century, the maintenance of school discipline was ensured by manual ringing by manpower or the teacher’s dismissal of the get out of class. However, it was inefficient and poor. Students’ learning effects are weakened and their enthusiasm for class is not high. In order to further guarantee and improve the teacher’s teaching effect, it can be used for more complex control applications [1].

In recent years, intelligence has become more and more popular, because manual represents unstable production capacity and difficulty in unified management of quality control. Behind the popularization of intelligent speed of light in daily life is the innovation and progress of single-chip microcomputers. It has the characteristics of high cost performance, small size, high reliability, and strong control power, which are widely used in various fields of automatic control [2]. Nowadays, the campus bell system has become the standard configuration of major colleges and universities, and it has very broad development prospects and room for improvement. At the same time, compared with the high labor costs, the advantages of low electricity cost and precise bell ringing efficiency also promote The reason why the ringing system is adopted efficiently.

This subject is an efficient bell system based on STC89C52 single-chip microcomputer, supplemented by temperature sensors, liquid crystal display, clock and other modules. It is suitable for various working environments and supports users' operations such as time adjustment, time adjustment, and bell time adjustment. It can be realized Real-time display of temperature and clock, operation of the bell system.

Overview of development at home and abroad

Through reviewing and summarizing the literature of relevant scholars at home and abroad in recent years, it is found that the ringing system is currently mainly optimized in three areas with a high degree of optimization and more optimization schemes: improving the accuracy of the system ringing, and optimizing the human nature of the ringing system Degree of integration and improve the flexibility of the system.

In the direction of improving the accuracy of the system's ringing, scholars advocate the use of external storage chips [3], broadcast [4], GPS [5] to improve the ability to self-calibrate the bell for a long time. Up to now, the bell system is extremely large. Part of the time calibration is still done by manpower. First, if the self-calibration ability of the electric bell system is increased, the cost of the electric bell system will increase. The second is that the mature electric bell system on the market has a certain self-calibration ability and temperature resistance. Humidity guarantees that in a short period of time, the accuracy of the electric bell system will not drop a lot, so the high-efficiency tends to manually adjust the time of the electric bell system. In the direction of optimizing the degree of humanization of the bell system, scholars advocate that the traditional electric bells that are widely used at present have large noise and harsh sound, which does not meet the requirements of people pursuing «green environmental protection» living environment. Soft, humanistic and pleasant music ringtones can be used [6], MP3 output [7], beating the bell [8] and other methods instead, aiming to create a better learning atmosphere and campus culture. In the direction of improving the flexibility of the system, scholars have proposed that the bell system is widely wired on each floor of the teaching building, and the wiring is messy, making it inconvenient to move and causing a lot of waste of raw materials. The control of the electric bell system can make the electric bell system no longer need to be an exception for special wiring, saving costs and improving the overall aesthetics of the campus. At the same time, there is still a lot of room for optimization of the system, using a high-precision clock chip or a special computer ringing system are both methods.

The overall hardware design of the school bell automatic control system

The hardware part of the school bell automatic control system is based on the smallest system of STC89C52, which is composed of expanded voice recording and playback, liquid crystal display, human-computer interaction, real-time clock, and temperature sensor modules to coordinate work. The hardware block diagram is shown in Fig. 1 below.

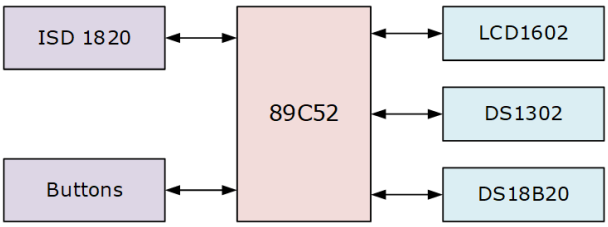

Fig. 1. Hardware block diagram of automatic control ringing system

The power supply of the system adopts 5V, which effectively guarantees the stable and normal operation of each module of the system. The main controller of the automatic control ringing system is the STC89C52 single-chip microcomputer. This single-chip microcomputer takes advantage of its own classic design and has a variety of ports. After proper programming, various modules can work together and achieve multiple functions. This design will pass The algorithm makes the control program concise; moreover, it seeks convenience and efficiency in defining the serial port, so that the legibility of the code drives the modification of the code accurately and concisely. The human-computer interaction module is convenient for users to complete computer-related operations and get the next operation instructions from the computer's feedback. The display module selects the lcd1602 liquid crystal demonstration screen, which completes the real-time display of temperature, the display of time, the instructions to the user's operation and the feedback of the current state of the computer. The electric bell circuit completes the realization of the upper and lower get out of class bells, and selects the voice recording and playback ISD1820 module, which supports high-quality and natural restoration of the voice, which is triggered by the rising edge. The temperature sensor completes the real-time monitoring of the temperature and transmits the data to the single-chip microcomputer. The EEPROM storage circuit enables the system to store clock information related to the accuracy of the bell in a timely manner even if the system is subjected to unexpected situations such as power outages. The switch module makes the system more environmentally friendly and economical. When not in use, it is turned off and enters the dormant state, and the battery can be updated and charged during this period; when it is turned on and enters the running state, it can work better due to the update of the dormant state.

This automatic ringing system has three working modes, detection mode, setting mode, and ringing mode, corresponding to three operation pages. In detection mode, use DS1302 module and DS18B20 temperature sensor and display data. In setting mode, press independent button 1 or independent button 4 to enter the operation page, press independent button 1 to increase or decrease the clock data, press Independent button 4 can read the ringing time for setting and modification. Ringing mode When the set clock data is the same as the clock read data, it will trigger the ISD1820 to work and produce a slow and pleasant music sound to remind teachers and students to go to and from get out of class.

The overall design of the school electric bell automatic control system software

The program design adopts a modular design idea. Each chip driver function is written into different header files, and then these header files are referenced and called in the main function. This can reduce the complexity of the program and facilitate the modification of the program.

Program programming uses Keil5 development software and uses C language to write program statements. Compared with assembly language, C language is more readable and transplantable.

The program executes the main function in an endless loop during the running process, and the keyboard scan function is called once in each loop to detect whether a key is pressed and whether the pressed key is a set key. If a key is pressed and the key is a setting key, the corresponding program is executed in the corresponding sentence; if no key is pressed, LCD1602 displays clock and temperature information.

Conclusion

The school bell automatic control system is designed to work together by multiple modules, coordinated and commanded by the STC89C52 single-chip microcomputer, through the single-chip microcomputer programming to enable the system to run in the direction you want, achieve, complete and improve the design functions of the system, forming a good closed-loop system , Human-computer interaction is carried out only by pressing the keys to guide and complete the operations performed by the users on the system. This design integrates the most mature modules at the moment, and the finished product has high efficiency and stability, and has good anti-interference ability. The related technologies include control theory, liquid crystal display, temperature sensing, etc.

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