

Designing on the On-line Laboratory Management System of the Combination of Intelligent Card and Campus Network

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Abstract

The implementation of the construction of modern educational technology is inseparable from the laboratory. At present, the laboratory construction was established in turn, each unit was managed by independent situation, the traditional laboratory management is short of public platform, and don't implement the unified management of all laboratory, which causes the reset and waste of teaching resources. If using the intelligent card recognition system, We will realize the real-time data transmission through the existing campus network, build an on-line management system of laboratory basing on B/S structure which can well solve the above problems, and realize the rational allocation and using of teaching resources at last.

Keywords: *management of laboratory, intelligent card, campus network*

1. Introduction

Currently, with the rapid development of electronic information technology, the computer has become an irreplaceably important tool for university teaching, scientific research and handling official business, all major colleges and universities have set up their own computer rooms, which are responsible for the public curriculum, students on key, data downloads, scientific research and innovation and other important tasks [1]. With the growing pace of building the university, the constructions of computer room have also shown a trend of gradual implementation in batches, moreover, in addition to the university's uniform behavior, all colleges will build their own separate rooms based on their needs on teaching and research. If this happens then the whole university will start to emerge many rooms which belong to different units and with different sizes, although each room plays an important role in the implementation of all works of university, comprehensively, the room management are in different ways, management tools are uneven, management efficiency is unequal with high and low, most importantly, it is lack of whole-school co-ordination arrangements, so that the management stuffs are difficult to grasp the exact running state and service condition of each machine, and then the class arrangements and dynamic management to computer rooms are not equal to their ambition, which causes a generally low overall use efficiency to the machines. In addition, as the independence of the construction and management, there is no correlation between computer rooms, which also led to a common phenomenon of resetting whole-school resources, and the repeat purchases of the machines, the software and hardware devices have caused quite serious waste of money [2]. This study exactly aimed at the current status of colleges and universities, took the campus network as a platform and used the existing non-contact IC card system to develop and design a set of unified management system which serviced for the computer rooms of colleges and universities, and the whole-

school rooms can be carried out real-time co-ordinate control through the central control machine, so as to achieve the unified planning, unified procurement, unified construction, unified management, unified arrangement, unified use and unified maintenance, and can save time, save costs and reduce repeat investment for the construction and management of computer rooms, improve the room operating performance and utilization rate, and really play the important roles of computer in the implementation of all works of the universities.

2. System Overall Design

2.1. The system operation-based campus network infrastructure

The operational environment of the entire system is based on a TCP / IP-protocol distributed campus network [3], and the topology is shown in Figure 1.

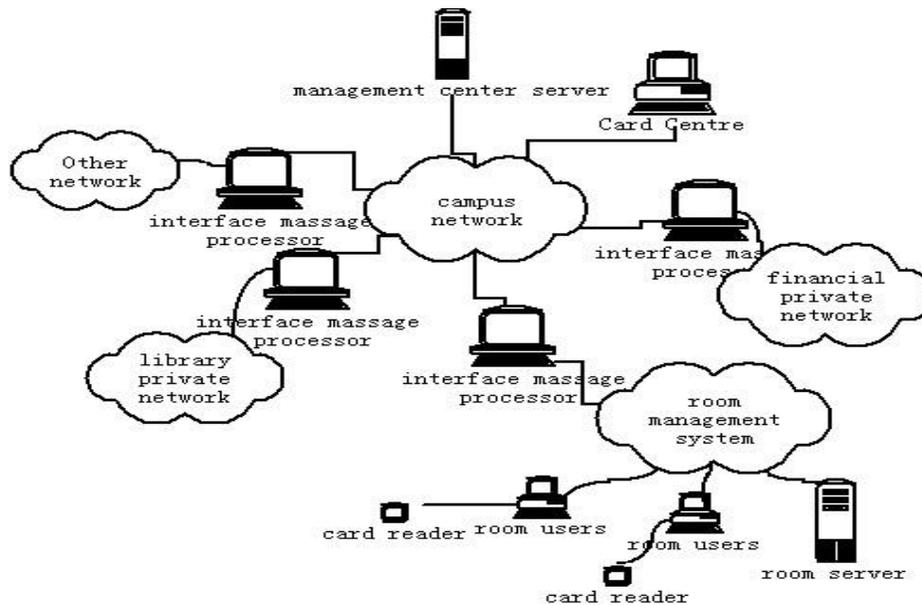


Figure 1. System network environment topological structure

In the premise of the original campus network cabling, the number of subsystems mounted on the servers can be improved just only need to increase three layers of devices on hardware, each subsystem is connected to the campus network through the interface message processor so as to achieve the real-time transmission and synchronization management of network data; as for the software, it just needs to increase the database table of the corresponding data subsystem [4], so the latter expansion of the system has the advantages of economy and simplicity. The system structure has the following advantages:

The “room management system” private network is isolated from the various subsystems in aspect of network; the communication between the various subsystems is achieved through their respective interface message processor and the “campus network” private virtual channels which has greatly improved the security of the entire system [5].

Real-time settle data.

To achieve the real-time data update at the middleware of interface message processor running so as to ensure the consistency of subsystem data and data in settlement center [6].

2.2. The overall framework of management system

2.2.1. Frame Structure

The overall frame of room management system is shown in Figure 2, including card distribution management systems, client systems and room monitoring systems etc. Card distribution management system also includes the card handling subsystem, recharge subsystem, loss register and retroactive subsystem, quit card subsystem and query system [7]. Client system includes user login system and the timing and charging system. The room monitoring system includes computer operation monitoring, room use monitoring, and arranging management subsystem.

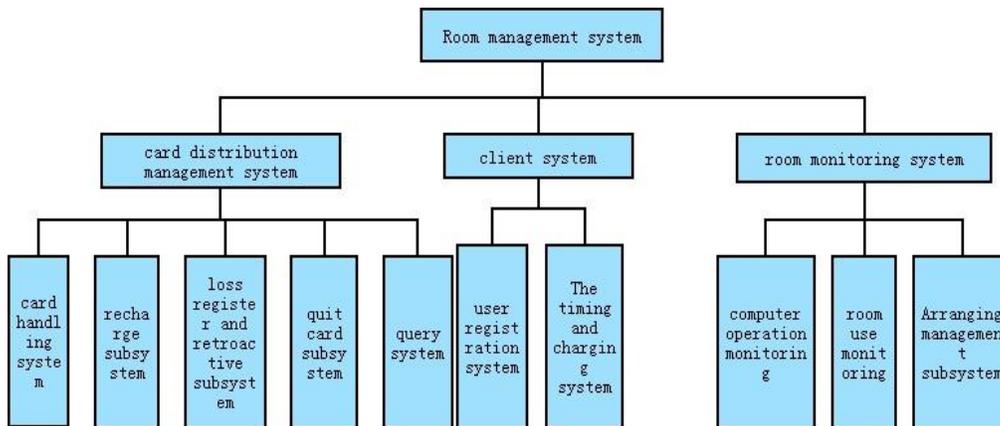


Figure 2. The Framework of Room Management System

2.2.2. The main system hardware structure

The hardware of the system is mainly composed of the following parts: IC card reader, server and campus network. Of which, IC card is an integrated circuit card with internal storage and processing capabilities [8], which can create or modify their own data in response to external excitation, moreover, the storage capacity of the card has been far beyond the card and with good security and is the key component of the management system. The server and campus network are all improved and created by use of the existing resources [9].

2.2.3. The system software platform

The system uses the Microsoft .NET technology, based on B / S structure, and the script is achieved using VB language, the database can be SQL SERVER or Oracle. The system has external software and hardware interfaces and is easy to expand functionality.

2.3. Several key technologies to achieve system function

2.3.1. Non-contact IC card reader

In order to avoid the disadvantages of easy to wear and damage of traditional IC card, the system uses non-contact IC card. Non-contact IC card is also known as radio frequency (RF) card, the power and signal transmission of IC chip are all achieved through the transmitting and receiving electromagnetic induction on the coil inside the card and the coil on reader, this system is adopted the mifarel and Phitips card, it has 1k bytes of memory and is divided 16

partitions, each partition can be set the password for both read and write operations [10], and each partition can be used separately. The read-write distance is up to 25mm, the time interval on read-write card is usually 150ms, the card can be written for thousands of times and the data can be stored for ten years. The main block diagram of non-contact IC card reader is shown in Figure 3.

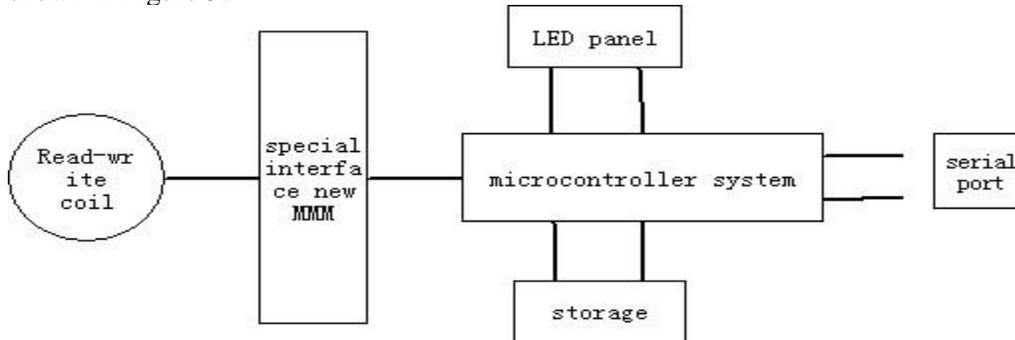


Figure 3. Non-contact IC Card Reader Block Diagram

2.3.2. Etherscope technology

The etherscope is also known as the low-cost ethergate, and it is mainly used for the communication of various measurement and control products, household appliances by the ether internet [11]. It can directly access the control equipment to the Ethernet and directly control the network. The composition of the “etherscope” is shown in Figure 4, which consists of single-chip microcomputer and the Ethernet interface chips. These chips complete the communication task with Ethernet on the physical layer, which uses RJ-45 socket and can direct connect to the Ethernet. The ordinary microcontrollers are used internally. The single-chip microprocessor is responsible for the protocol conversion on data link layer and network layer and the data exchange tasks. It unpacks the IP package which is received from the Ethernet, takes out the data, then forms a frame again in accordance with RS-232, RS-485 and other field bus or parallel bus communication protocol to send to the monitoring and control equipment, or pack the data frame sent by monitoring and control equipment to form IP packets again and send to the Ethernet [12].

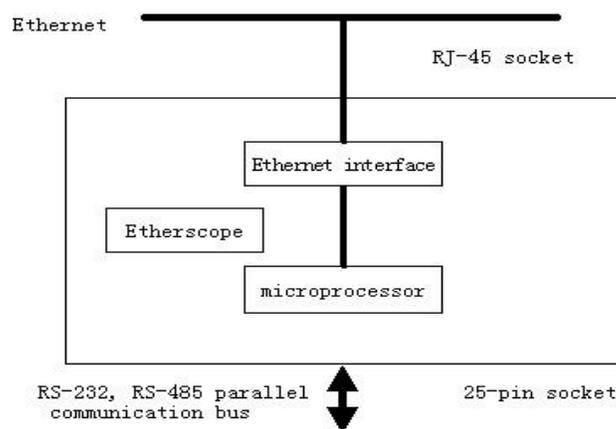


Figure 4. The Composition of Network Etherscope

3. Introduction to system function

3.1. The main function introduction of card distribution management system

The card distribution subsystem mainly records the basic information of card holder [13], such as: specialty, class, student ID, name, password, card number, card amount, date, *etc.* the system will store these information to the basic information table of the cardholder, in addition to the basic information, it should also have the field of whether the card has been reported the loss and the field can be used to indicate that the card is valid.

The role of the loss register and retroactive subsystem is to report timely to the management center when the cardholders lose their cards so as to reduce the corresponding loss of the cardholders. The card will be locked upon report of loss and cannot continue to use, the specific information will be written to the table of report of loss. The students who have lost cards can re-apply for a new card.

The recharge system allows users to supplement the amount of cards, which is divided into two kinds: the first kind is the collective recharge, and the other kind is single recharge. The collective recharge is the unified room recharge activities when conducts certain collective activities, for example the recharge taking whole class as one unit.

When the users no longer use the card, it can be settled through the quit card system, deduct depreciation cost, take back card, and the card can be used after treated again.

In the query subsystem, the users can query the remaining amount of the card as recharge in order to understand the situation. In addition, it can also inquire the recharge records, records of on and off computer etc. Each query can be classified or comprehensively queried in accordance with card number, student ID, name, date and other parameters [14]. The administrators can conduct a detailed inquiry to some users and can also query the user information subject to certain conditions, calculate the sold quantity and amount of IC card in a certain period of time.

3.2. Introduction to the client system

The client subsystem is mainly used to determine the identity of the users, including the control of user login and timing. All rooms are equipped with a validation sub-server, and through the validation process, this sub-server can be directly connected to the database of the management center. When the users use the computer with a card, the sub-server reads user card information and downloads user information from a central server database for comparison. If the users are legitimate and the information can be matched, then they can normally boot up and register, otherwise they cannot register successfully, meanwhile modify the state characters in the database user table. And at this time the user verification is only identity authentication, and then as the users turn on the computer and enter into the system, the system will prompt the user to enter student ID and password, the user must enter the correct student ID and password before using the computer. If the IC card used by the user is picked up or obtained through other means, when the user enters the password and student ID for three times and is still not correct, the system will lock the user account, and prompts the administrator of the account problems, if the users want to continue to use, they shall unlock to the server room. After successful login by the user, the room server will automatically read the user's amount, real-timely detect the amount of the user and estimate the time for using computer by the user, when the amount of the user is about to run out, the client subprogram will prompt the user.

3.3. Introduction to room monitoring system

The computer operation monitoring system can real-timely monitor the use condition of computer, including the service behavior of the computer hardware, software running condition, user application program content, *etc.* As for software and hardware failure, the system will automatically prompt center managers to treat in a timely manner; as for the use of application software by users, the administrators can achieve real-time monitoring to prevent illegal action from occurring. Such as: play games during class, Internet chat, or visit illegal websites, run illegal procedures, *etc.*

The room use monitoring subsystem and arranging management subsystem can display the arrangement and use condition of all computer rooms of the whole school in the way of images and texts, including school time, location and number of students to attend class, as well as the attendance and the number of idle computers of all rooms at non-school hours which can help administrators uniformly arrange courses. In addition, at non-school hours, the LED screens hanging outdoor can real-timely display the number of idle computers to facilitate the students to use.

4. The overall implementation process

When users use the computer with an IC card, they need to slot card for the first time, and the slot card is to determine the user's identity and check whether the card is valid. If it is not a valid card, the login will fail; if it is a valid card, the server in rooms will display user information, allow the users login and modify the card information, so even if the users forcibly enter the room, they cannot use the computer because there is no user records. When the users turn on the computer, the client subprogram requires the users to enter their account and password, general speaking, the account numbers are student ID, and the password is set by the applicant. After three times incorrectly consecutive input of user name and password, the system will automatically lock the user and prompt room administrator. If the input information is correct, the users can start the computer and then the system starts to time. After the users log out the system by way of cancellation, as cancellation, the client subsystem will notify the room server the time of exiting server by the user, the server will release the user's computer IP address, when the users leave the room they need to slot card again, marking the end of the first process of using computer. The entire process is shown in Figure 5.

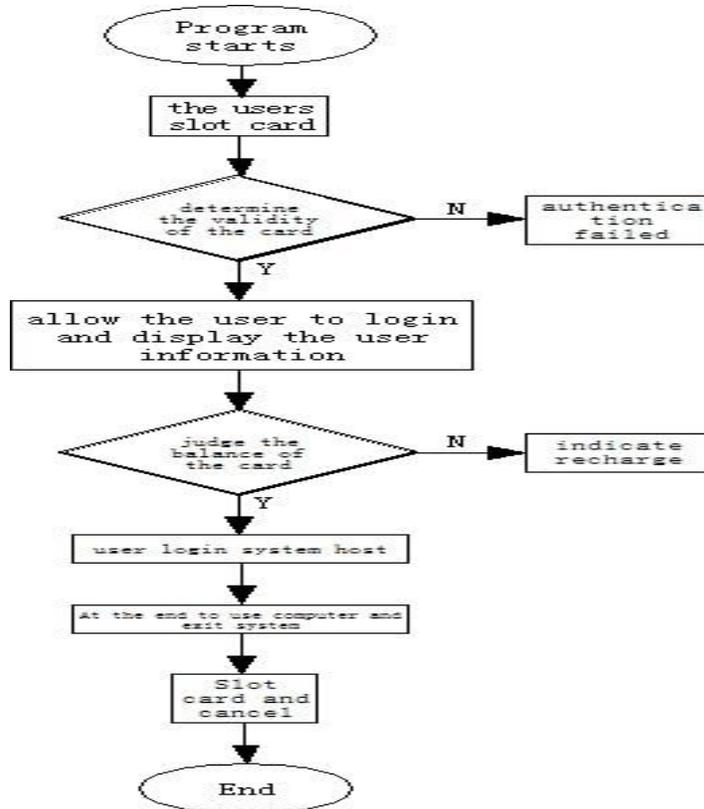


Figure 5. Flow Chart of the User on Key

5. Conclusion

The campus network-based non-contact IC card room management system can uniformly manage all networked computer rooms in the school, improve room utilization rate, which is a trial of digital campus construction, also the prototype of campus one card. After the successful application of the system, its scope of management can be further expanded, the combination and digital integration of student identity card authentication system, admission ticket identification system, library card processing system, cafeteria meal card management systems is the inevitable direction of future construction and development of colleges and universities.

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