

## Research Article

# Optimal Design of Intelligent Control System in the Communication Room Based on Artificial Intelligence

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With the current data-driven era, there is the potential to employ controllers that can store a large amount of data, which is not achievable with traditional controllers. Our goal is to propose an intelligent controller system for computer room management based on artificial intelligence that maintains data integrity, saves memory, minimizes computation, and simplifies program design. To upgrade the computer room management system's intelligence that is not high, the management mode that is not flexible, and the distributed large-scale management of the whole school that is difficult to realize, the original system is improved to the distributed computer room management system based on artificial intelligence. By starting from the actual situation of higher vocational college computer room, combined with the characteristics of the school computer room, we designed framework model based on distributed artificial intelligence machine room management system, the system by means of network communication technology and database access technology, put forward the B/S combined with C/S structure to realize the computer room management system model, and used radio frequency identification technology to develop radio frequency card. The results show that the optimization results of the traditional computer automatic control system in the computer room vary greatly and fluctuate between 0.6 and 0.8, while the control results of the automatic control system in this paper keep stable at 0.8, which can reach the ideal state in a short time. Through the outcome, it can be said that the proposed control method can be used of higher level of automation, flexibility, and robustness which will work effectively. Therefore, the improved system integrates software, hardware, communication, and distributed system technology into one, which greatly improves the control effect of computer automatic control process, and control result of computer automatic control process is more stable and has a certain practical application value.

## 1. Introduction

Using smart sensor technique to develop intelligent software apartments has also recognized as a dominant position in university renovation. In such an era of rapid advancement of machine learning and artificial intelligence, how to fully utilize technology, cloud platform, advanced analytics computing, and other resources to build a new intelligent control

and management platform, to achieve intelligent management of university network room teaching administration, has become the main production trend of university intelligent control and management system. At present, the construction of intelligent control and network technology-based computer room management system in colleges and universities is in the exploration stage. With the constant evolution, maturity, and perfection of Internet of Things,

information mechanism, schools will have different requirements for the application of the Internet of Things in various industries and fields. Strengthen the construction of intelligent control and management system of the college rooms, grant entire play to the function of science and technology in physical environment perception of the Internet of Things, and provide more personalized services for teachers and students in the teaching process and daily life. At present, there are many problems in management of computer rooms in many colleges and universities, such as heavy management workload, difficult arrangement of computer rooms, inconvenience of after-class computer and charge management, and many financial loopholes. Facing the high number and high investment of the school computer room, a set of functional integrity and practical, simple maintenance, high-security charge management system for improving the management efficiency of the computer room, reducing the intensity of work, and timely processing of the fault occurring in the computer room has important significance. How to use computer resources effectively and improve the utilization rate of computer room has put forward higher requirements on the management level of computer room. In this case, higher vocational colleges urgently need to develop a distributed IC card-based computer room management system for unified management, to achieve the modern management of computer room, and improve the management level of computer room [1].

Artificial intelligence, or AI for short, was first proposed in 1956 by John McCarthy and other scientists at the Dartmouth Institute in America. As a main division of computer science, artificial intelligence has become a broad interdisciplinary and frontier science after more than 60 years of rapid development. Artificial intelligence is considered as one of the three high-tech mechanisms in the 21st century. Artificial intelligence (AI) is a basic theory, methods and technology that combines computer software and hardware to refresh definite thinking processes and behaviors of human beings by studying the laws of human intelligence activities and building artificial systems with definite intelligent bearings. AI technology is a rapidly developing research field. The research on AI has not only become a hotspot of distributed artificial intelligence research but also a hotspot of computer technology research. At the same time, it has attracted wide attention from the scientific, educational, and industrial circles and has been applied increasingly widely in recent years. The reason for this is that AI-based systems have excellent advantages in problem-solving. AI technology provides a new distributed computing model and problem-solving approach, which can effectively relieve the constraints of sequential and centralized control on the system and seek the solution of problems in a concurrent and non-centralized way. It provides a new computational and problem-solving solution and will be a model for the next generation of complex distributed engineering systems. The traditional distributed computer room management system is usually a client/server structure. Compared with the client/server, AI does not need continuous network connection and can reduce the occurrence of network blocking. AI can move a piece of application code to the location of

the data, execute it at a high speed locally, and eventually remit the execution outcome to user, thus eliminating the transmission of a large amount of data on the network [2, 3]. AI refers to machine or software intelligence. When it comes to AI in control engineering, it is not necessarily about mimicking human intelligence. While seeing other people may teach you a lot about how to assist robots in solving difficulties, the vast bulk of intelligent control research focuses on real-world problems rather than people or animals. AI incorporates a variety of strategies, including search and mathematical optimization, reasoning, and probability-based procedures. Conventional control techniques and approaches are frequently less computationally demanding to implement than other AI applications and may be accomplished using low-capability microcontrollers. The successful deployment of emerging Industry 4.0 will contribute to the creation of more capable control systems and applications. AI advancements that will have an impact on control engineering include data mining techniques, multi-agent systems, and distributed self-organizing systems [4–6]. Radanliev et al. proposed a novel numerical technique for incorporating concepts from cognitive propulsion system, edge computing, artificial intelligence, and machine learning into automated intrusion detection. At the edge of the Internet of Things network, the engine uses machine learning technology to initiate process changes, providing actual intelligence with stability and operability for inferential network risk analysis. This will improve risk analysis capabilities and encourage the development of a systematic and comprehensive understanding of the challenges and threats that arise when deploying edge computing servers, as well as local IoT networks as machine learning and artificial intelligence technologies migrate to the Internet's periphery [7]. Artificial intelligence (AI) has found applications in society over the last decade. As AI applications become more challenging and use incidents expand, they highlight the significance of trying to address performance and power significant challenges in their implementation. Kurshan et al. [8] give a brief overview of what 3D integration offers in the design of machine learning chips, discuss emerging opportunities in the next generation of memristive architectures, and inspect challenges. Because of our limited knowledge of the activity and structures of the human mind, machine learning layout, which relies on the brain for inspiration and virtual world, faces serious challenges. However, a large sum is being invested in the development of memristive chips. We believe that three-dimensional integration not only provides tangible advantage for fee and versatile neuromorphic chip design, but it may also provide architecture flexibility when it comes of fusion, further enabling design in future works. For monitoring, the multivalent system can help in monitoring the condition of system and providing effective asset management by diagnostics and protection against faults. Both areas are built upon the multi-agent system properties, such as proactive, reactive, and social properties, as well as other fundamental properties. Moreover, they require highly developed communication protocols and specified architectures for the purpose of applications [9].

A major concern for the networked sensing and actuation of a large-scale system is the complexity, due to the number of components and their interaction patterns and communication delays. This complexity is raised when a control system is required to become intelligent by implementing a completely new variety of knowledge processing functions [10]. To sum up, this paper proposes a computer room management application process depending on artificial intelligence. Database design is the cornerstone of successful development of the system, so how to set up database tables, in which fields each table has to ensure data consistency, save memory, and reduce the amount of computation, which simplifies the program design is essential. According to the database design specification, to prevent abnormal data insertion, deletion, and update, the database design reaches three normal forms (3NF). The main data table of the system is user table, user on machine record table, user-type table, and rate table. The user table mainly includes the primary information of the user and the login information of the user. The user login record table mainly includes the login record registration; this table is convenient for the user to inquire their own login record. The user-type table includes user types such as super administrator, system administrator, general administrator, teacher, and student. The rate table mainly designs the system billing parameters. According to the rate, the way of billing, and the composition of measurement units, the database design also considers the needs of teaching, development, and conservation of the computer room. The intelligent managed process of communication computer room obtained by this study has a good system interface and easy to use, which is convenient for students to learn on the computer, reduces the management workload of computer room administrators, improves the utilization rate of equipment and work efficiency, realizes the modernization of computer room management, and has a certain practical application value.

## 2. Research Methods

### 2.1. System Pattern of Computer Room Supervised System Based on AI

*2.1.1. Workflow of the System.* The working flow of college students' computer room is as follows: for the students who have class arrangements, the computer room supervised process will allocate the computer room according to the class arrangement and assign a machine to the students who swipe the card; for free students on the machine at their own expense, the machine room management system must first check the situation of the machine room, to see if there is no idle machine that can be used; if not, then give a "no idle machine" prompt information; if there is idle machine, then arrange students on the machine, the following process and the normal students on the machine the same. Its working flow diagram is shown in Figure 1.

Figure 1 is the client-server paradigm, also known as client-server architecture, which is a distributed application framework that splits tasks between servers and clients that

are either in the same system or communicate over a computer network or the Internet. It can be seen from Figure 1 that in the client/server mode, the client and the server must always maintain the connection during the calculation process. A high number of median results need to be transmitted during the calculation system, which wastes bandwidth, etc., making it difficult to adapt to the high delay and unstable network environment. The main research is to introduce AI technology into the computer room management system and rebuild our existing computer room management system model. In this new model, AI is not only the basic component unit of the process but also the independent function entity of the process. This new design can constructively decrease the network link time, reduce the occupancy of network bandwidth, greatly improve the robustness and reliability of the system, give full play to the role of the network for distributed computer room management, realize nonconnection interaction, support weak clients, and enhance the performance of remote interaction. The flowchart of the system is shown in Figures 2 and 3. In Figure 2, a flowchart depicts the individual phases of a process in a logical sequence. It is a general tool that may be used for a wide range of applications and can be used to describe a number of processes like service processes and project plans. Similarly, for Figure 3, the flowchart of credit card exchange has been shown. The dotted line indicates whether the subserver requests the server according to the IC card information. If it is a self-charging server (no request can be made to the server when there is IC card information), if there is no free machine, the subserver can first complete the prompt to the user that the machine is unavailable [11, 12].

As can be seen from the figures, the processing between the card reader and the subserver does not have to wait, and the communication between the subserver and the master server can be completed.

### 2.2. System Platform Mode

*2.2.1. Common System Platform Patterns.* In recent years, with the rapid development of computer technology and network technology, the management of the computer room in colleges and universities has been transferred from manual management to intelligent automatic management. A client/server program works on the client side and connects with a remote server for information, whereas a web application runs entirely within a web browser. On a regular basis, the client server sends queries to the remote server to gain information. User interaction with the server is always accomplished via a client-side user interface or application. To connect with a web service, a web browser is used. A client server application might be platform-specific or cross-platform, depending on the programming language used. A web application is platform neutral since all it needs is a web browser. The cross-platform language makes an application look native to the platform or operating system of the client [13, 14]. In this process, the choice of the platform mode of the computer room management system is the main problem that the system designers meet. The platform

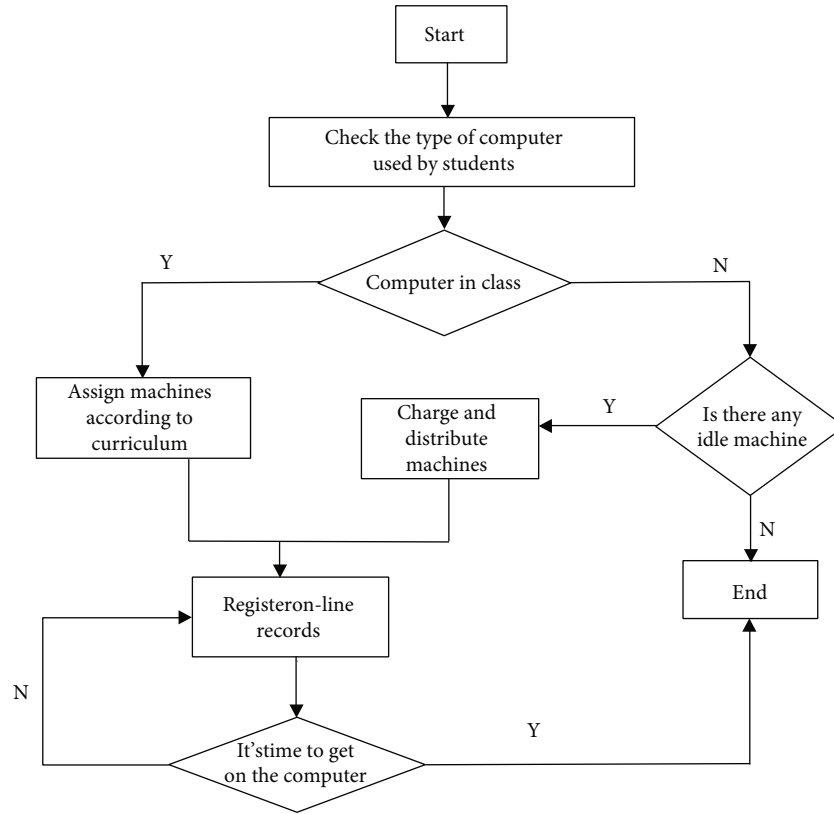


FIGURE 1: Flow diagram of the machine room.

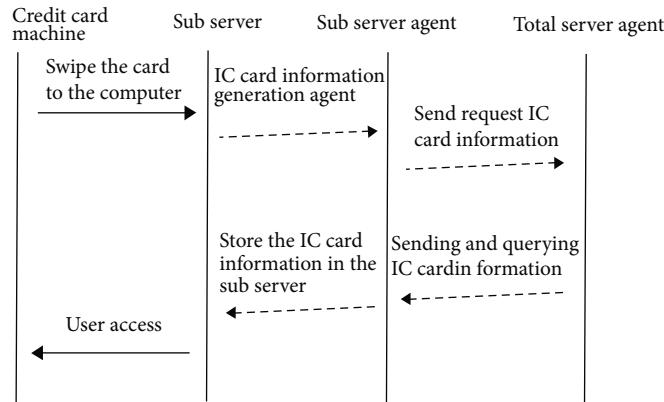


FIGURE 2: Flowchart of card swiping.

mode of computer room management system can be divided into four types: host terminal mode, file server mode, client/server mode (C/S for short), and web browser/server mode (B/S for short). The host terminal mode has been phased out due to limited hardware choices and unguaranteed hardware investment. The file server mode is only suitable for small-scale local area networks; for many users, a large amount of data will produce network bottlenecks, especially in the Internet which cannot meet the user requirements. Therefore, the platform mode of modern computer room management system should mainly consider C/S mode and B/S mode [15].

The broad classification of C/S- and B/S-type mode has been done in detail along with pros and cons. A client-server network's key advantage is the centralized control it gives. All of the required information is gathered in one spot. A client-server network's data is successfully secured due to its centralized architecture. It can be enforced using access controls, enabling only those who have been granted permission to do so. Client-server networks are extremely scalable. As needed, the user can increase the amount of resources such as clients and servers. As a consequence, the capacity of the server may be raised without creating substantial downtime [16, 17].

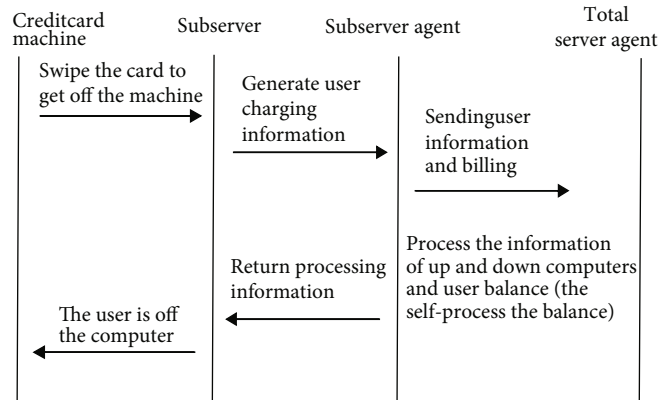


FIGURE 3: Flowchart of credit card discharge.

- (1) *C/S* structure: the client/server architecture, known as the client/server (*C/S* for short) architecture, is well known as the architecture. *C/S* architecture application is accompanied by the network database (such as Oracle, Informix, and Sybase) and desktop graphics interactive window application and development technology development and gradually formed. It separates the user interaction interface and business application processing of a complex network application from database access and processing. The dialogue between the server and the client is carried out through a message passing mechanism. The client sends the request to the server, and the server sends the request back to the client after the corresponding processing through the passing mechanism. A large number of operations to the database through the way of remote database access to the backstage database server to complete this mode to a certain extent to improve the speed of user interaction and response, reduce the requirements of the client to the CPU processing capacity, application development is simple and has more powerful foreground development tool. *C/S* business logic: the architecture is a two-tier system: the first layer combines the presentation on the client system and the second layer combines the database server over the network as shown in Figure 4

Generally, application software with *C/S* architecture is left at the client side, which makes the client side application still fast when dealing with complex applications, which is not consistent with the development trend of thin clients. In the remote database access database mode (obbc.sql), the client and the backstage database server data exchange frequently, and the amount of data is large, when a large number of users access easy to cause network bottlenecks. The traditional *C/S* mode has many shortcomings: such as low efficiency: inconvenient installation and operation, difficult to upgrade, and low safety performance [18]. Moreover, if all clients request data from the server at the same time, the service may become overburdened. As a result, the network may get overcrowded. If the server fails for whatever reason, none of the clients' requests will be fulfilled. As a

result, the expenses of implementing and maintaining a client-server strategy are rather high [19, 20].

- (2) The *B/S* structure: browser/server structure, namely, browser/server (referred to as *B/S*) structure, is a change or improvement of *C/S* structure with the rise of Internet technology. Its client is a standard browser (such as Internet Explorer and Netscape Navigator); the server side of the standard WEB server collaborative application server responds to the browser's request. The *B/S* mode is a three-tier structure system. The first-tier client is the user's interface to the entire system. Customers' applications are streamlined with general purpose browser software such as Netscape Navigator and Microsoft's Internet Explorer. The browser converts HTML code into an illustrated web page. The web page also has a certain interactive function, allowing users to input information on the application form provided by the web page to submit to the background and put forward processing requests. This background is the second layer of the web server. The second layer web server starts the process in response to the request and dynamically generates a string of HTML code that embeds the result of the processing and returns it to the client's browser. If the request submitted by the client includes access to data, the web server also needs to work with the database server to complete the processing. Tier 3 database server is similar to *C/S* mode, responsible for coordinating SQL requests from different web servers and managing the database

2.3. *System Platform Mode Used by the System.* There are many differences between *C/S* and *B/S*. First of all, *C/S* is built on the basis of local area network; *B/S* is built on the basis of wide area network. Second, the hardware environment is different: *C/S* is generally built on a dedicated network environment in a small-range LAN between the special server to provide connection and data exchange services. *B/S* is built on the WAN, which does not have to be a special network hardware environment, such as telephone Internet, there is a stronger than *C/S* to adapt to the range,



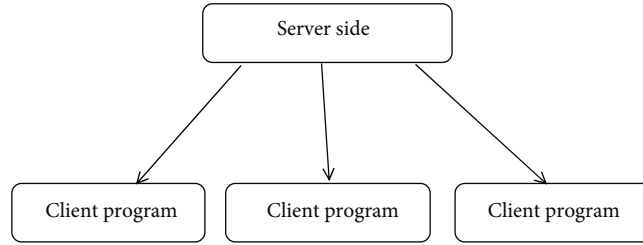


FIGURE 4: Architecture for C/S business logic.

generally as long as there is an operating system and browser on line. Although the two-layer C/S or B/S structure has many advantages, it has disadvantages in the following aspects:

- (1) Low efficiency in a distributed environment: in the general three-tier C/S or B/S structure access to the database process, because the client id direct with the application server and the application server and the database server hit, this will undoubtedly reduce the data access rate
- (2) For some special information form, through the database server makes the management very inconvenient. In the traditional three-tier C/S or B/S structure, data cannot be exchanged between the application servers. As for descriptive information, it must be exchanged through the database server. This not only causes the pressure of the database server but also is not easy to realize, thus affecting the application of the traditional two-tier C/S or B/S structure. We overcome this shortcoming by dividing the traditional application server layer into two parallel sublayers that can interact, thus making the three-tier C/S or B/S architecture more dynamic [21]. In the improved architecture, the two parallel sublayers not only have the functionality of their original application server layer, but they can interact with each other through some mechanism. The interaction principle between them is based on the principle of independence and mutual trust, that is, each sublayer is independent of the influence of another layer, and each sublayer has the integrity of the other side [22, 23]

AI technology is a good way to deal with in the past, the traditional C/S pattern cannot solve the problem, and its advantage lies in the following: 1 AI mode from the traditional C/S mode, the framework of the service request will be issued to the client code dynamically moved to execute on the server, the AI is not through the network transmission among the link and interact directly with the service source. This significantly reduces network bandwidth requirements and minimizes conflicts between multiple applications [24]. Of course, there are times when the code is moved to the client side for execution so that the interaction occurs locally on the client, which can achieve the same effect. Compared with the C/S mode, it is less dependent on

the network, does not need to keep the network always connected, allows discontinuous connection, and improves the utilization rate of the network [25].

### 3. Result Analyses

*3.1. Performance Test of Automatic Control System in the Computer Room.* To test in this paper, the performance of the automatic control system, computer rooms and the current classical room computer automatic control system optimization method on the same platform to carry on the simulation test, when the automatic control system by the outside factors under the condition of strong interference, the method and the traditional method of computer automatic control system of control results are shown in Figure 5. The dotted line in Figure 5 is the result line for the method proposed in the paper. It can be clearly seen that the output results have been stable which greatly improves the control effect of computer automatic control process. Through the outcome, it can be said that the proposed control method can be used of higher level of automation, flexibility, and robustness which will work effectively. This will address a major issue for the networked sensing and will solve the problems related to the communication delays. Under the condition of strong interference by outside factors, the traditional room change is very big, computer automatic control system optimization results in the output ups and downs unstable between 0.6 and 0.8, to achieve the ideal state of computer automatic control system control, long time-consuming, and results in this paper, the automatic control system control is steady in 0.8. It can reach the ideal state in a short time and improve the control effect of the computer automatic control system, and the control results of the computer automatic control system are more stable, with obvious advantages. The comparison results show that the optimization method of the automatic control system designed in this paper can solve the problems of large errors and low control efficiency in the optimization process of the automatic control system in the computer room.

*3.2. Implementation of AI-Based Computer Room Management System.* The client of this system includes the control client, the card swiping client, and the computer client, who are responsible for the server management, card swiping management, and the student computer control, and the client only carries on the data exchange with the subserver, without any contact with the central server. Take

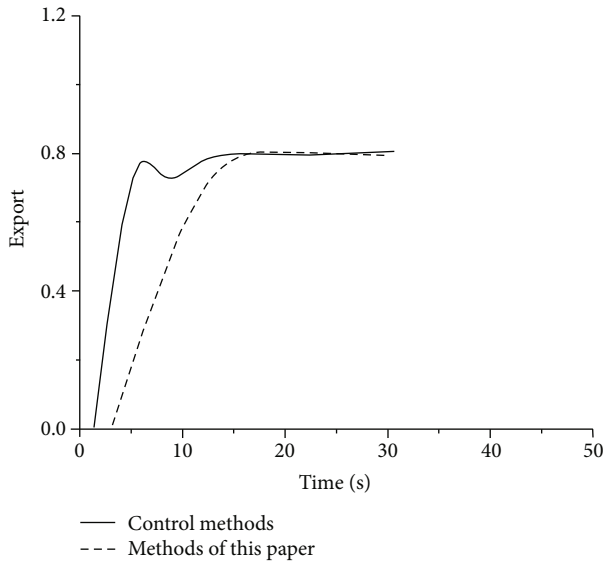


FIGURE 5: Output results of the automatic control system interference.

the swipe client as an example to describe the implementation of the client. The card swiping client is responsible for the student swiping card on and off the machine and communicates with the subserver to decide whether the student swiping card can get on the machine, including swiping card management and message processing, which are, respectively, composed of IC card identification, message sending thread, message sending thread, message queue, and so on. The structure of the operation process is shown in Figure 6.

The computer room management application system is designed by combining the foreground database with the background database. Database design is the cornerstone of the successful development of the system, so how to set up database tables, in which fields each table has to ensure data consistency, save memory, and reduce the amount of computation, which simplifies the program design is essential. According to the database design specification, to prevent abnormal data insertion, deletion, and update, the database design reaches three normal forms (3NF). The main data table of the system is user table, user on machine record table, user-type table, and rate table. The user table mainly includes the basic information of the user and the login information of the user. The user login record table mainly includes the login record registration; this table is convenient for the user to inquire their own login record. The user-type table includes user types such as super administrator, system administrator, general administrator, teacher, and student.

#### 4. Discussions

The proposal is to create an artificial intelligence-based intelligent controller system for computer room management that protects data integrity, saves memory, reduces computation, and simplifies program design. As a result, the

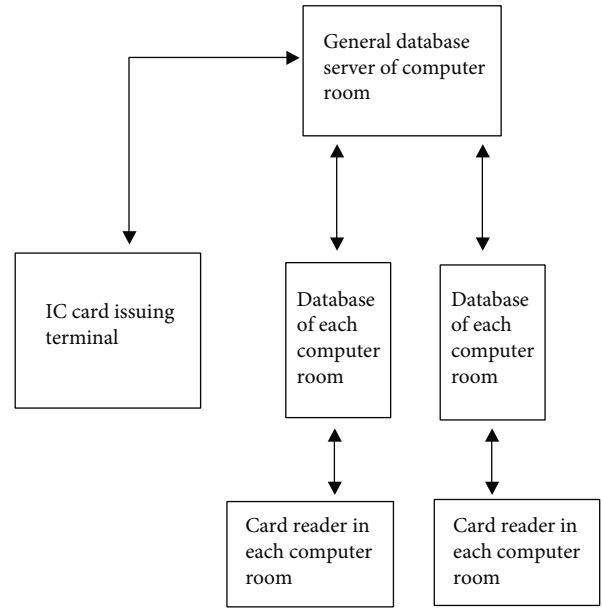


FIGURE 6: The overall design of database of the computer room management application system.

improved system combines software, hardware, communication, and distributed system technology into one, greatly improving the control effect of computer automatic control processes, as well as the control result of computer automatic control processes, which is more stable and has a practical application value. It is apparent that the output results have remained consistent, significantly improving the control impact of the computer automatic control process. As a result of the findings, it can be concluded that the suggested control approach may be utilized to achieve a better degree of automation, flexibility, and resilience, all of which will be beneficial.

#### 5. Conclusions

Based on the analysis of the defects of the existing computer room management system and the characteristics of AI technology, a framework model of distributed computer room management system based on artificial intelligence is designed in combination with the characteristics of interaction, autonomy, and initiative of AI technology. The existing management system of the computer room in our school has been improved. A management system model based on B/S and C/S is proposed, and a radio frequency card is developed by using radio frequency identification technology. Run on the system in the management of basic normal, in computer room management for the school to save a large amount of manpower and material resources, improve the control effect of computer automatic control system, equipment utilization, and efficiency, and solve the existing current computer automatic control system optimization process, the control problem of low efficiency, and great error in computer room management, modernization has certain actual application value.

## Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

## Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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