Research and Development of Computer Control Technology Experiment System Based on Network

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Abstract. The state has sufficient funds to invest in education. However, schools in some remote areas still do not have enough funds to set up offline teaching laboratories. In addition, the lack of experimental resources in the school also led to the failure of some teaching courses [1]. Many schools spend a lot of effort to build computer-based control laboratories. Even many schools have developed control technology test-bed in order to save cost. However, due to the large volume of the test bed, its handling is very inconvenient. In order to solve the above problems, experts propose to establish an electronic laboratory in the network. In order to help the experimental courses of mechanical and electrical majors in some schools go smoothly, the research and development of the experimental system of computer control technology based on network has been in progress. This paper briefly introduces the design scheme of network control experiment system and the operation platform of software. In the end, the problems that should be paid attention to in the operation of the system are also put forward.

Keywords: Network, Computing, Control, Experiment

1. Introduction
The study of theoretical knowledge can let students understand the core content of each subject. The study of experimental course can help students verify the correctness of the knowledge they have learned. It can help students get more inspiration in practice. Experimental teaching is an important means for students to learn to apply knowledge [2]. The framework of undergraduate knowledge of mechanical and electrical specialty and mechanical specialty is very complex. It's hard to learn this knowledge. In order to better understand the knowledge, students need to learn relevant knowledge with the help of control experiment courses. However, the number of control test-bed in many schools is insufficient. Insufficient preparation of experimental resources. Even many schools do not have enough funds to build an offline computer control laboratory.

In order to solve these problems, experts put forward that an experimental system of computer control technology can be established by using the information application of network (see Fig 1). This system can use the software and hardware facilities of electronic equipment to replace the physical controller to complete the complex work of various control systems. It mainly emphasizes the running of virtual experiment in network. In addition, control technology and modern electronic
technology will also strengthen the function of network control experimental system. The powerful computing power of the computer can turn the network into an electronic laboratory with unlimited resources. Students can learn the practical knowledge of related majors in the network laboratory anytime and anywhere. The emergence of electronic laboratory system simplifies the experimental courses of engineering majors.

2. The development status of network remote test system at home and abroad

2.1. Construction of electronic virtual laboratory
The carrier of virtual laboratory is network information. Virtual laboratory does not rely on real experimental equipment to complete the teaching content. It uses superb software technology to combine some words and pictures into a virtual experimental environment and experimental model. However, unfortunately, it can only show the virtual experiment process to students in the form of video. This will lead to students lack of practical ability to operate.

Figure 1. Traditional computer controlled experimental equipment.

2.2. Construction of electronic simulation laboratory
The simulation lab has an independent user login server. After logging into the server, students can use electronic software to write the experimental object and experimental environment program. Generally speaking, the process of programming should be completed by the teacher. Students participate in the simulation experiment course through software. In the running process of the network course, students can set up the experimental parameters and the types of experimental equipment independently.

2.3. Construction of electronic control laboratory
Different from the common network laboratory, the use of electronic control laboratory needs the assistance of physical experimental equipment. It needs the support of fixed network protocol. Students set the experiment parameters and the equipment object of parameter application in the electronic equipment. Through the network association between the electronic equipment and the experimental equipment, the information sent will be received by the experimental equipment. Through network communication technology and multimedia technology, the experimental equipment can show the overall experimental results to students.

2.4. Construction of electronic laboratory combined with virtual reality technology
In recent years, the emergence of three-dimensional technology will make the projection technology more excellent. Soon after, scholars put forward the virtual reality technology. It's also called VR technology. Experimental courses in foreign schools are built in VR environment. Students and teachers communicate with each other in the virtual world through VR glasses. Unfortunately, however, the use of this kind of laboratory is similar to that of ordinary electronic virtual laboratory. At present, it can't support the personalized operation of users.
3. Design framework of computer control technology experiment system based on network

3.1. Design and analysis of the overall architecture
Generally speaking, the computer control experiment system should be divided into three important parts. They are physical simulation system, acquisition control system and software operating system. The physical entity simulation system mainly simulates the field environment of modern industrial production. The acquisition and control system is mainly responsible for the detection of important parameters such as temperature and pressure of industrial site environment. The software operating system is mainly responsible for the correlation control of the above two systems.

3.2. Physical entity simulation system
According to the experimental course knowledge of mechanical and electrical specialty, the common physical object platform should be composed of four structures. They are electrical control box, water tank, platform surface and box structure [3]. The interior of the electrical box is mainly placed with power supply, switch and acquisition control circuit board. Different numbers of submersible pumps can be set in the water storage tank. To distinguish the difference between pump and circulating pump. Electric ball valve shall be installed under the platform surface to discharge water. In addition, solenoid valve and flow sensor are also indispensable.

3.3. Acquisition control system
The standards of acquisition and control of different control experimental systems are different. After receiving the user's software operation instructions, the acquisition and control system will control the executing device to complete the corresponding operation. According to the requirements of different experiments and the design of physical simulation system, the measurement module of various parameters of acquisition and control circuit should keep stable output. The number of measurement modules with different types of parameters should be installed according to the requirements of the designer of the experiment.

3.4. Program design of electronic software
The design of main program generally adopts the scheme of dead loop. Different kinds of sub functions should be called according to different experimental requirements of users. Time interval counter should be added to the program design of acquisition module. Ensure that the system can complete the measurement of a parameter at regular intervals. The program design of output control system should distinguish the function codes of different functional devices. We must avoid confusion of function codes.

4. The establishment of software operation platform of computer control technology experiment system based on network

4.1. Software interface design
The software interface of the experimental operation platform should display five different functions. The standard of general software platform is animation display function, curve display function, alarm function, data display function and personalized setting function of experimental parameters. These functions and tasks can be triggered at the same time. In addition, it is necessary to support the zooming and printing of pictures. Finally, the function of historical query and algorithm expansion of experimental data should be set up.

4.2. Design of server for data management
It is not only to manage data storage and display, but also to manage data. As the core content of the experiment, we must protect the safety of experimental data. Therefore, the design of data server is very important. As the central station of data storage, the server is not only closely related to the
database, but also connected with the experimental teaching software.

4.3. Web design of software client

Compared with the content design of software, the content of web design is secondary. The main purpose of client page design is to attract people's attention [4]. The design of the web page on the client side must be beautiful. It should be easy to understand. The designer establishes the software download link and the software comment forum in the webpage. After a period of time, the designer should update the technology of the current link of the web page.

4.4. Software control based on experimental types

There are two kinds of experiments that can be completed by the software of computer control experiment system based on network. The first is a local basic control experiment. The second is remote control experiment. The local control experiment can be completed in the operation interface of the software. Users only need to set the experimental data to start the experiment immediately. Remote experiment requires users to send the experiment mode and data to the remote server in the form of web page. The server will help the user's software connect to the remote experimental system.

5. The development environment and database operation of computer remote control experiment system

5.1. Network based environment for system operation

Since the monitoring system of experimental data is set up in an independent server, we can regard the running environment of the server as the running environment of the system. Platform installation vs development environment. It can ensure the stability of the connection between the server and the user center database. We need to choose Windows 7 as the running environment of the system. The reason for this choice is that Windows 7 is stable (see Table 1).

| Table 1. Analysis of the development environment and database operation of the remote control experimental system. |
|---------------------------------------------------------------|
| Data environment               | Requirement          | Solve                      |
|--------------------------------|----------------------|----------------------------|
| Operating environment          | Stable work          | Use of Windows 7           |
| Database structure             | Later maintenance    | Perfect function           |
| Data model                     | Measurement parameters| Information storage management |
| Communication module           | Connecting to the server | Realize remote control     |

5.2. Overall structure of database

The contents of the database include all the local experimental data and some remote experimental data. Therefore, the operation of the database will directly affect the quality of the control technology experiment system. The overall structure of the database should include experimental configuration, system login, network connection, data storage and data sharing. In addition, the design of the functional structure also takes into account the convenience of the later maintenance of the database.

5.3. Information management of data model

The database should store the user name and password information of the administrator. The types of experimental information stored include the name of experiment, the type of experimental technology and the specific time of experiment. The types of test parameters mainly include pressure, temperature, flow and ball valve opening. The types of remote experimental data stored mainly include experimental conclusions, experimental parameters and main experimental techniques.

5.4. Design of database communication module

The main function of the communication module of the database is to realize the operation of remote
control experiment. Its main connection target is the data server [5]. Users need to wait for the response time of remote server when using remote experiment technology. The communication module can save the time of sending data to the server. It can greatly enhance the transmission speed and stability of experimental data.

6. Advantages of research and development of computer control technology experimental system based on network

6.1. Using low cost to help students complete the control experiment
The construction cost of traditional computer control laboratory is very high. Moreover, some special experimental resources and equipment are difficult to buy. The research cost of network control experimental system is not very high. Using low cost to help students learn all kinds of experimental knowledge. Students can also observe the use of various experimental equipment in the network.

6.2. It integrates computer software technology and experimental technology
There is no doubt that the setting of the experimental system of computer control technology of network is a major breakthrough in computer software technology. According to the above description, some modern electronic virtual laboratories can only show the experimental process video to students. These multimedia virtual laboratory can not let students control the experiment independently. Therefore, the author thinks that the network control laboratory is the result of the combination of computer software and experimental technology.

6.3. It can reduce the waste of experimental materials
We know that there are very few resources for materials that control experiments. The imported experimental resources are very expensive. The use of electronic control laboratory does not need the support of physical experimental materials. After the failure of the traditional control experiment, the experimental materials are also wasted. Therefore, compared with the traditional control experiment, it can alleviate the waste of experimental materials. It is also a side support for the national economy.

7. Conclusion
According to the research on the establishment of Network Laboratory for remote control experiment, we can see the rapid development speed of network technology [6]. I believe that the future distance education will become an important pillar of the future education system. Although the shortcomings of computer control laboratory described in this paper are many, we still need to correct the network system with the correct mentality.

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