The Motor Virtual Experimental System Based on Matlab Web Technology

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Abstract—The article introduced the system’s construction thought, structure, configuration and web technology based on matlab. It focused on the virtual experiment of direct-current motor mechanical properties. The system’s architecture was browser/server (B/S) mode. It adopted the active control technology and the matlab web server to develop the virtual experiments. The experiment results show that the system had achieved remote visualization visit without the time and space constraints, and had been characteristics of experimental results visualization and parameter adjustment easy. The system makes full use of multimedia network resources, and breaks the traditional model of motor experiment teaching, and reduces experimental costs, so it has been a better application prospects.

Index Terms—motor, virtual experimental system, B/S mode, matlab web, servers

I. INTRODUCTION

Virtual experimental technique originated in the late 20th century, is relying on virtual reality technology generation and development of a movie mode. Web-based virtual experiment teaching system refers to the use of computer technology, network communication technology, multimedia technology and other related information processing technology, virtual reality experiment, and determined according to certain principles of experimental procedure, experimental rules in order to establish an authentic and experiments are consistent virtual experiment environment in which the experimental teaching in time and space to be extended. Currently the more common network technology to build virtual experiment platform FLASH, JAVA, VRML and matlab and so on, each technology has its own advantages, especially matlab in circuit analysis, electric machinery and electrical control of the field of simulation application to be promoted and the use of given motor type of programs to open up a new trend in experimental studies, therefore, development and construction matlab web Server support of the motor simulation system is imminent [1].

Build long-range virtual experiment teaching system is the complex system engineering, in order to guarantee the quality and the operation after the system efficiency, operating system must have an appropriate network structure. The most common network teaching system to basically have two kinds of application mode, one is the traditional client/server structure mode (referred to as C/S mode), another kind is the browser/server mode structure (referred to as a B/S-based mode), and this mode mainly applies to the wan, server running data heavy load, in information security control ability compared with C/S mode is weak, the stability of the system, but it can be predicted, along with the continuous development of broadband technology, the B/S model will be greatly improved the shortage. In practical application, it shall be determined according to their needs, and this paper designs which model by using the B/S mode, namely, the system model based on web. In the B/S mode, a virtual experiment system by the receptionist browsers and backend server two parts. In front of the main technique to realize the four: the Java, QTVR, VRML, and active control technology. The most common backend server dynamic web language has 3 kinds: JSP (Java Server Pages), ASP (Active Server Pages) and PHP (Personal home pages) [2].

II. SYSTEM WHOLE DESIGN

Matlab environment by the United States, Cleve Moler and colleagues at the U.S. National Science Foundation funding in 1980, successfully developed, as a general mathematical tool. Matlab with its simple to learn, easy to use, and other high-level language was a powerful unmatched matrix processing and computing capabilities, and rich graphics rendering capabilities were very popular. Matlab was the computation software recognized powerful and widely used in scientific. It can run on personal computers, all the input, output and operation were in the matlab command window and edit window, complete, and thus it was independent of the operating system computing environment. Matlab also provided engines, and other programming interfaces, so other applications can start and control the operation of matlab.

To Internet as a virtual processing environment of network computing model allowed a variety of scientific computing, simulation, information processing had been greatly improved, network resources were fully utilized. Then, the network can provide people with matlab computing services. The answer was yes, it can install matlab software component that came with the help of matlab web server and web design and browsing

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technology, and achieved the so-called browser / server (B / S) computing model[3].

Clearly, the virtual experiment system using MATLAB simulation, using MATLAB web server components and web browser built B / S network model to implement virtual reality, and constructs a shared, multi-user process, experimental platform, to solve the current science and engineering Yuan School of Electrical based in the plight of the experiment.

III. MATLAB VIRTUAL EXPERIMENT SYSTEM

A. MATLAB Web Technology

MATLAB web server included MATLAB server, matweb and matweb.m file. The web application by the MATLAB web server and the MATLAB web service agent composed of two parts. MATLAB server.exe was running MATLAB application server environment, responsible for managing web application and the communication between MATLAB. MATLAB web service agent was an executable program matweb.exe. It was the MATLAB web server’s TCP / IP client, but also web-CGI extensions. MATLAB’s request it will redirect to matlabsrv.exe processing. It was a multi-threaded TCP / IP server, and you can configure in the matweb.conf to any legitimate TCP / IP port. MATLAB server to handle web page by calling matweb.m implied by the specified field mlmfile M files, Web pages, MATLAB, M links among documents[4].

The principle structure of MATLAB web server was shown in Fig. 1. MATLAB web server was the core of matweb.exe, responsible for interpreting HTML pages sent by the client’s request, and converted to run MATLAB applications required parameters, and then started a MATLAB process, and the specified MATLAB applications and their parameters to the calculation process. After calculation, matlab program also responsible for the results to HTML pages of the way through matweb output to the client browser[5].

The working principle was shown in Fig. 2.

MATLAB web server was developed under MATLAB toolbox. It can be used by the client browser running on the server side of the MATLAB simulation program. The simulation results pre-set by the output HTML file outputted through the web browser to the client. Obviously, based on MATLAB web server developed a complete test consists of three parts: client; web server; MATLAB simulation server, which users enter data in the browser, MATLAB submitted to the server to calculate the results show in the browser[6].

B. Virtual Experiment Systems Architecture

MATLAB provided the core functionality with web tool MATLAB web server. It can be HTTP protocol; web server installed on the host, and provided remote computing service MATLAB. Using MATLAB web server will extend the application of MATLAB to the network, remote visual modeling and simulation. It was for the development of virtual electric and electronic experiment system had created better conditions. MATLAB-based virtual experiment platform features powerful as MATLAB itself, in data processing and analysis showed strong advantage.

Virtual experiment system used active control technology and the MATLAB web server. Through ASP (Active Server Pages) web page programming, it implemented a virtual experiment system[7]. Its overall structure was shown in Fig. 3.

C. Server

Microsoft’s Windows NT was for the system development platform. It installed MATLAB 6.5 and MATLAB server, configured MATLAB.conf and MATLAB server.conf file, created a web platform, in the web site to create a virtual directory cgi2bin and icon. Cgi2bin

![Figure 1: The principle chart of MATLAB web server](image1)

![Figure 2: MATLAB web server works](image2)
directory pointed to the matweb.exe and matlabserver.exe. The icon to run the virtual simulation results pointed to the directory path to graphics files. The other HTML documents, M files, and configuration files were placed in the appropriate directory[8].

IV. SYSTEM DATABASE STRUCTURE

The system used a relational database for data management and processing, according to Microsoft access relational database platform for data management experiment. The database management system was windows, the desktop data management system. It had a powerful, friendly interface and easy operation. Use relational database management system for data management is conducive to the organization of dynamic data. It had less redundancy, high data independence and ease of scalability. Dynamic update system data model, which meant that students accessed the system database data, needed to call and write at any time, this would require a database of hyperlinks to design reasonable. When multiple users simultaneously accessed the system, data redundancy error can not occur[9].

In developing data, the database would have classified management, and designed three different database data management, and it was shown in Fig. 4. It can prevent multiple users to access data redundancy error when the user impacted.

V. EXPERIMENTAL EXAMPLES OF DC MOTOR MECHANICAL CHARACTERISTICS

Experimental requirements: a direct-current (DC) motor armature voltage U=380V, power P=1 0kW, the armature winding turns N=50, the number of parallel winding on a=1, the main magnetic flux Φ = 0.130, armature resistance Ra=10Ω, the magnetic field coefficient CΦ = 0.103. Please analyze it mechanical properties. Using matlab software, a powerful data processing capabilities and provide matlab web server component of the server functionality through the web server functionality has been developed through the CGI interface function calls to achieve simulation results, the specific steps are as follows.

A. Create HTML input file

Based on the experimental performance requirements and experimental input parameters design interface, write code to call the necessary related components, according to visualization add the form data entry, interface development framework adopted by the three parts of the page to achieve, and its concrete realization of the code is as follows:

Framework of the web page code:

```html
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; Charest=gb2312" />
</head>

DC motor mechanical characteristic experiment

<form rows="*" cols="273" frame border="yes" border="1" border color="#666666">

<frame src="zldjtxin.html" name="left Frame" frame border="yes" scrolling="No" no resize="no resize" border color="#999999" id="left Frame">

```
Experimental requirements page code:

```html
<p>&lt;font face="Arial"&gt; The mechanical characteristics of DC motor experimental reference data are as follows: &lt;/font&gt;</p>

A DC motor armature voltage 380V, Power P = 10, the armature winding turns N = 50, the number of parallel winding a = 1. &lt;br&gt;</n
Development of the framework of the code needed to interface with the input, but in this section of the code needed &lt;imp border=0 src="$Graph Filename$"> the code phrase and make statements in which "$ Graph Filename $" to achieve the image dynamic invocation, the simulation results is shown in Figure 5.

In the experiment by adjusting the input parameters can be different from the simulation results, which functions to achieve an innovative experiment, experimenters can be prepared according to their own prep, when the data to be their ideal simulation results.

VI. DESIGN OF MAIN MODULES

A. Virtual Laboratorie

System ASP programming interface with the server of the matlab web server service components, through the CGI interface links designed to achieve the project to...
B. User Registration

The interface primarily to achieve the registration of student information that is given to experimenters in the experiment as part of its legal status granted to conduct experiments login user name, registered experimenters must use their true numbers to register the school, because the design in the background using the experimenter ID verification measures in the back-end database, there should be the school number of experimenters in the experiment data as authentication information. When the registration is successful, experiments in the experiment as their teachers report the information to facilitate reporting of statistics and marking experiments.

System, there are experimental center elective system, experimental system planning, system help functions.

C. System Background

Web site needs a complete front and back office systems implementation, the system front system and database system, so that a better system security, system back with the full site model and a dynamic database links to achieve the required maintenance functions, its back system consists of two components, one is virtual electrical and electronic experiment background information network; one is virtual electrical and electronic experiment system background; it back using the same framework for both model development to facilitate implementation of the document editing and experimental project management, and give each administrator the only landing to implement a password.
to prevent unauthorized users access to background operation, affecting the normal operation of the system.

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The virtual laboratories established make up the motor deficiencies of the traditional laboratory, and it make teaching more lively and more flexible design of the experiment. The experiment in teaching innovation in the reform process, virtual labs to reduce the dependence on the hardware devices that can keep the current trend of technological development, but also it is the experimental development of national virtual developments. Continually improving the function of the system established web-based virtual experiment motor systems, the use of virtual experiment platform from time and geographical constraints, remote access, at any networked computer simulation experiments on the motor, and experiment. This system can save the results of the experiment in real time in the computer; also it submits the experimental report through the experimental system. Therefore, the computer virtual experiment system for the majority of motor teachers and experimenters a more advanced and more scientific experimental platform that can better meet the teaching requirements of modern electrical experiments. Its main features are as follows:

The experimental parameters can be easily input and regulation, to complete more of the principle experiments and innovative experiment.

The output is graphical, visual characteristics, and can facilitate the analysis of test results, test results can be directly submitted graphics experiment report.

Virtual experimental system is not consumption test equipment. Using campus network is easy to implement resource sharing and network access.

Experiment is a fast, efficient, and it is easy to carry out various designing experiments.

The client does not need to install the experimental support software, and realize the shared server functionality software.

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Shoucheng Ding. male, born in December 1973. Associate Professor. Gansu Province of China. He was graduated from Lanzhou University in 1995, and obtained Bachelor of Engineering. He mainly engaged in automated inspection technology, and committed to developing virtual experiment teaching system.

The presided subject of network-based electric and electronic virtual experiment system based on network is granted award for excellence of in 2010 by the national college of electronics association.LAN-based electrical engineering laboratory management system project is granted third prize in 2008 by university science and technology progress in Gansu Province.

As the main responsible member, the motor class teaching reform and exploration, and electrical and electronic experimental teaching methods, content and mode of reform and practice, and the circuit quality course of construction and research, respectively in 2005, 2007, 2009, is granted the results of teaching by Gansu Province II prize.