Based on the Big Data Program Language Learning Website Generation System

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Abstract. In order to improve the learning efficiency of students, a website generation system based on big data is proposed. Under the background of big data, the hardware design of the system is completed by using the overall architecture design of the learning website generation system and the design of the learning website generation server. Through the collection of program language learning website data, the design of program language learning website generation database and the design of program language learning website generation process, the software design of the system is completed and the generation of program language learning website is realized. The test results show that compared with the website generation system based on cloud computing, the students’ learning efficiency is higher.

Keywords: Big data · Programming language · Learning website · Generation system

1 Preface

With the rapid development of electronic technology and network technology, today’s society has become an information society. The new talents required by the information society must have the ability to acquire, analyze and process information, as well as practical ability and innovative spirit. Traditional programming language teaching materials and classroom teaching have limited the improvement and comprehensive development of students’ information literacy to a certain extent [1]. Because of this, the Ministry of Education stated in the “Notice on Popularizing Information Technology Education” that from 2001, it took five to 10 years for China to popularize information technology education in primary and secondary schools, use information technology to drive education modernization, and work hard to achieve China. Leaping development of basic education [2]. At present, information technology courses in middle schools have become subjects for senior high school examinations. It can be seen that information technology courses have become more and more important in subject teaching, so higher requirements have been placed on the teaching of procedural language learning courses. Many schools have begun to pay attention to the teaching of information technology courses, but the author found in teaching practice that because the basic knowledge of
programming language and information technology provided in textbooks is relatively boring, operation exercises are not attractive to students, and it is difficult to cause this problem. The learning interest of students at the age stage results in low learning efficiency. At the same time, due to the rapid development of information technology, there is a lot of knowledge update in the textbooks that cannot keep up with the times and is outdated and cannot meet the needs of students. Therefore, the teaching methods and learning methods of traditional procedural language learning websites can no longer meet the needs of students’ comprehensive development, and new teaching models are urgently needed to promote middle school information technology courses to meet the requirements of the times [3].

The traditional meaning of the program language learning website generation system, is each program language independent design, separate coding, development workload, repeated coding more, with the increase in the demand of the program language learning website, professional developers are difficult to deal with the development of the website. In order to benefit more teachers and students, and considering the structural similarities of program language learning websites, it is imperative to develop high-quality program language learning websites quickly and efficiently. How in a short period of time to develop high quality programming language learning website, just rely on the development of professional and technical personnel can’t be meet a lot of demand, which makes programming language learning website generation system become the research topic, how to design a kind of easy to use this website generation system, to help don’t know the web site development and design technology of teachers can independently easily, quickly to learn architecture framework, design programming language learning website, with independent personality has important practical significance.

The research of this topic is based on solving the practical problems in education and teaching from the technical level, aiming to play the purpose of technology serving for teaching. In terms of research, the combination of investigation and analysis, theory and practice, and demand and application will help enrich teachers’ teaching methods and achieve good learning results. Design a big data-based program language learning website generation system, which not only saves the work of web page design and production that needs the participation of technical personnel, but also satisfies the designer’s demand for page personalization through a variety of templates. The research results will be helpful to promote the development of distance education and realize the goal of life-long education, which has considerable promotion value.

2 Programming Language Learning Website Generation System

2.1 Overall System Architecture Design

Establish a convenient and easy-to-use big data-based programming language learning website generation system, so that teachers can quickly build the framework page of the learning website without the help of technical staff, thereby focusing on designing teaching content pages. At any time, teachers can change the layout of the website by changing the website template or file [4]. As technicians in the educational technology
department, we will make full use of the web design experience accumulated in our work, and constantly design and add learning website templates for the system, making the system increasingly practical.

According to the goal of the system, this paper analyzes the functional requirements of the website generation system of program language learning, which is summarized as follows:

(1) Requirements for information collection
Provide information collection interface to fill or modify the program language learning website information: Information collection is carried out in a wizard-style filling form, which is simple and easy to use; the information collection page is also an information display page.

Limit the information submitted to ensure the validity of the data and provide secure data storage.

The collected information includes configuration information of program language learning website, directory information of three levels, template selection information, etc.

(2) the framework generates requirements
This part is the most important functional requirement of this system. According to the collected information, each frame file of the learning website is generated on the server side, and a folder for placing the content page file is generated. The directory information should be presented in a tree structure in the frame page.

(3) Template requirements
The system provides template management functions, including importing templates, modifying templates, deleting templates, etc.

Develop flexible template design rules to enable template designers to design template pages with diverse structures.

(4) Interaction requirements
In the first-level directory to provide optional learning site commonly used interactive modules, including answering module, discussion module, homework module.

(5) User management requirements
Perform user authentication. For system security, this system does not allow two people to log in with one account at the same time. The password is irreversibly encrypted to effectively ensure the security of the system and user data.

According to the analysis of system requirements, the website generation system of program language learning is divided into presentation layer, business logic layer and database layer [5]. The presentation layer is responsible for providing a complete and unified interactive interface for users, the business logic layer is responsible for the processing of core functions, and the database layer is responsible for the access to database data. The overall architecture of the system is shown in Fig. 1.
B/S structure is adopted in the whole website generation system of programming language learning. Browser server architecture, system users (teachers, students, system administrators) log in to the system through the browser, put forward the business request of system management and program language learning website construction to the system through the user interface of the presentation layer, the system business logic layer processes the business, and operates the database when necessary. Under the B/S structure, the management, resource allocation, database operation, business logic management and dynamic loading of the whole system are centralized on the server, which is easy to deploy and manage.

As can be seen from the overall system architecture diagram, the design of the system ultimately rests on the user interface, system functions, and database.

### 2.2 Programming Language Learning Website Generation Server Design

The programming language learning website generation system is based on the B/S architecture and is divided into two parts, client and server. The server uses the RT5350 chip equipped with the Linux operating system as the development platform [6]. It mainly completes the functions of data acquisition, compression, and network transmission of the programming language learning website. The overall design structure of the server is shown in Fig. 2:
From the above figure, it can be seen that the server side of the website of program language learning USES the camera of USB interface as the data acquisition device of the website of program language learning, and completes the data collection function of the website of program language learning by calling the V4L2 function interface. Program language learning website data compression using the JPEG compression algorithm introduced above, through the transplantation of Libjpeg library to achieve. In the network transmission part, mjpg-streamer is transplanted to the streaming media server, and Socket communication is used to complete the wireless network transmission of the website data of program language learning.

Through the above operations, we have compressed the collected program language learning website data, and the server listens to the client’s access request after the collection. If an access request is received from the client, the server returns the program language learning website data to the client. This system is based on the TCP transmission protocol, and uses Socket communication to realize the program language learning website data transmission. The working structure of the programming language learning website generation server is shown in Fig. 3.
As can be seen from the above figure, the programming language learning website generation server first creates a Socket socket through the Socket () method and returns a descriptor of the Socket. The Bind () method is then used to bind the IP address and port number to the programming language learning website to generate a server-side binding. Call the Listen () function to listen to whether the client sends a request to the server. At this point, the client creates a Socket object and returns a descriptor of the Socket [7]. And call the Connect () function to send a connection request to the server through the IP address and port number, and the programming language learning website generates a server to receive the connection request from the client through the Accept () function and establish a connection. At this point, the Socket connection has been established, and the two communication parties can send data to each other. After communication is complete, close the Socket connection.

3 Program Language Learning Website Generation System Software Design

3.1 Collecting Program Language Learning Website Data

In order to improve the learning efficiency of students, it is necessary to compress the data before collecting the website data. Due to the large amount of original data
collected by the generation server of the program language learning website, it can not be smoothly transmitted in most networks. Therefore, we need to compress the collected website data [8]. Using JPEG as the data encoding method of the system, the advantages of JPEG encoding are its high compression ratio, simple algorithm, low requirements for hardware, which is very suitable for real-time transmission of program language through the network to learn website data. The compression structure of program language learning website data is shown in Fig. 4.

The compression steps of the program language learning website data are as follows:

Step 1: Discrete cosine transform

Discrete cosine transform is often used in signal processing and data processing for lossy data compression of signals and data. After the big data conversion, each data will generate a DC coefficient and 63 AC coefficients. The main purpose of using DCT to convert spatial domain data to frequency domain data is to focus the largest and most important information in a programming language learning website on a small amount of data. The formula for the DCT transformation is as follows:

$$F(u, v) = \frac{1}{4} C(u)C(v) \cos \left( \frac{(2i + 1)u\pi}{16} \right) \cos \left( \frac{(2j + 1)v\pi}{16} \right)$$  \hspace{1cm} (1)
Step 2: Quantitative

After DCT conversion, the data memory block is processed to make each coefficient value smaller, so as to obtain better compression effect in subsequent coding. For low frequency programming language learning website data quality most value and quantitative method, DC coefficients using the most exquisite processing after the reduction of almost no distortion, numerical data quality to affect language learning program site high frequency coefficient, the least important of JPEG is used the most rough quantitative way to quantify, so can get better compression ratio.

Step 3: Encoding

After quantization, DC code words and AC run code words are obtained. The DC codeword is coded using a differential coding (Differential Pulse Code Modulation: DPCM) method, while the AC codeword code is sequentially coded using a run-length coding method. In order to further improve the compression ratio, Huffman coding is also required for encoding.

The first thing the system needs to realize is the collection of data from the program language learning website, and the data collection interface is also the data display interface of the original system [9]. The system USES multiple groups of one and two dimensional arrays to temporarily store the data submitted by the user. The array name is saved in the form value, and the form name corresponds to the array name to realize the data transfer and data storage between pages. In a wizard-style way, each page provides “previous step” and “next step” buttons to guide users to enter information. Its functional flow is shown in Fig. 5 below.
Defining variables and arrays
Read basic information table and primary directory table information
Display and enter basic website information
Save site data
Display and input level 1 catalog information
Next step
Save site data
Display and enter secondary catalog information
Save site data
Display and enter three-level catalog information
Next step
Select template
Save site data
End

Fig. 5. Data collection flow chart of program language learning website

In the programming language learning website generation system, you need to complete the collection of programming language learning website data through the V4L2 interface. V4L2 (VideoFor Linux 2) is a new framework for developing acquisition device drivers under Linux. It can provide a standard API interface for application development. During the development process, developers can directly use the function interface provided by V4L2 to complete the development of the driver, which greatly reduces the workload of driver development.

3.2 Design of Database Generated for Website of Program Language Learning

To build a good data organization structure and database, so that the whole system can quickly, conveniently and accurately call and manage the required data, is an important indicator to measure the quality of system development.
In the design of database system, the following factors should be considered:
The database must be clearly structured and reasonably arranged.
The data structure of the database must follow the principle of normalization and standardization to ensure the data exchange of the previous program and the normal operation of the system.
When designing data tables, on the one hand, data redundancy should be minimized, storage space should be fully utilized, and the possibility of data consistency problems should be reduced. On the other hand, appropriate redundancy should be considered to improve operation speed and reduce development difficulty.
Must ensure the correctness and consistency of data during the exchange process.
Pay attention to database security.
According to the analysis of the data relationship, the data tables mainly designed and used by this system include the basic information table, catalog information table, template information table, and user information table of the programming language learning website [10]. The design of the data table is shown in Tables 1, 2, 3 and 4.

Table 1. Basic information table of programming language learning website

| Name          | Data type | Size | Is it empty? |
|---------------|-----------|------|--------------|
| SiteNameC     | Text      | 50   | Yes          |
| SiteNameE     | Text      | 50   | Yes          |
| SiteNameF     | Text      | 50   | Yes          |
| SiteTitle     | Text      | 50   | Yes          |
| InstallDir    | Text      | 30   | Yes          |
| WebmasterEmail| Text      | 100  | Yes          |
| Copyright     | Remarks   | –    | No           |
| GuestBook     | Yes/no    | –    | No           |
| Bbs           | Yes/no    | –    | No           |
| Exercise      | Yes/no    | –    | No           |

The database design of the programming language learning website can provide query and storage processing of website data for the programming language learning website.
**Table 2.** Catalogue information table of programming language learning websites

| Name     | Data type   | Size | Is it empty? |
|----------|-------------|------|--------------|
| Id       | Auto number | –    | –            |
| MenuName | Text        | 50   | No           |
| Href     | Text        | 50   | Yes          |
| Down     | Yes/no      | –    | No           |
| Iframe   | Text        | 50   | Yes          |
| Directry | Text        | 50   | Yes          |
| sequence | Double precision type | – | No          |

**Table 3.** Programming language learning website template information table

| Name          | Data type   | Size | Is it empty? |
|---------------|-------------|------|--------------|
| templateID    | Auto number | –    | –            |
| Templatename  | Text        | 50   | No           |
| Showfilename  | Text        | 50   | Yes          |
| Css           | Remarks     | –    | Yes          |
| mainHtml      | Remarks     | –    | Yes          |
| Indehtml      | Remarks     | –    | Yes          |
| Menu2         | Remarks     | –    | Yes          |
| selected      | Yes/no      | –    | Yes          |

**Table 4.** User information table of programming language learning website

| Name       | Data type   | Size | Is it empty? |
|------------|-------------|------|--------------|
| ID         | Auto number | –    | –            |
| AdminName  | Text        | 50   | Yes          |
| Password   | Text        | 50   | No           |
| Purview    | Long integer | –   | No           |
| LastLoginTime | Yes/no | – | Yes          |
| LastLoginTime | Yes/no | – | Yes          |
| LoginTimes | Long integer | – | Yes          |
3.3 Programming Language Learning Website Generation Process Design

After the user enters the system, the system first provides a number of information entry windows for the user. The first is a basic information entry window for entering basic information such as the Chinese name, English name, title, copyright, and administrator mailbox of the website. The user clicks “Next”, the system will enter the second entry window for entering the first-level directory information, followed by the second-level directory information entry window and the third-level directory information entry window. The entered directory information includes the directory name, whether there is Sub-level, link file name, folder name where the content page is stored, etc. The last entry window is the template selection window. The name, introduction, and effect map of each template are placed in the window for the user to make a choice.

The program language learning site generation process is shown in Fig. 6.

Choose a programming language learning website

As mentioned earlier, since the information technology discipline is different from other disciplines, the information technology knowledge is constantly developing. Therefore, to use the programming language learning website to carry out teaching activities, when making a programming language learning website, you must first select topics and choose the questions should be derived from the needs of education and teaching, and at the same time they must be expandable and practical.
Teaching design

When choosing a programming language, teaching design, be sure about the basic level of operating environment, through the programming language study and research to complete the teaching goal, the knowledge content to a framework is presented to students, how to design what learning activities, use what kind of teaching strategy, need what kind of teaching resources, can be collected through what way, use what way to test the students can understand and grasp how much knowledge through learning. “Application” programming language teaching goal is to make students through the program language to understand and master the basic operation of office software, programming language knowledge is divided into introduction, skills, art appreciation and so on several parts to present knowledge in the program to students in the process of language learning website generated by computer operations training their own ability, to master the knowledge of programming languages. The resources used can be directly used in the library of programming language materials, can also be collected through the Internet, and the relevant part of the textbook can be directly used in the content of the textbook.

Preparation of program language resources

The preparation of programming language resources can be synchronized with the teaching design. After the programming language knowledge structure is basically determined, the corresponding materials and materials can be prepared. The materials in the resource library can be used directly, or the Internet, CD-ROM, newspaper digest or textbooks can be collected, and you can make your own materials if you can. In the preparation of programming language resources, attention should be paid to the normative nature of media formats and their relevance to the platform. When adding resources to the resource library, you should classify them according to the knowledge structure, in order to manage the resources and use them in the process of making a programming language learning website.

Building the knowledge structure of program language

Click “program language knowledge” to directly enter the program language knowledge module. After using “modify column” to edit the basic part of the program language learning website, the whole website generation process is what you see is what you get. After building the knowledge structure of programming language, you can start to edit a single page. You can edit the format of text paragraphs and insert multimedia materials into the page directly through the online editor of the system.

Carry out a variety of learning evaluation activities

The online test can be realized through the program language test module. The test paper can be generated from the topic selection of the test bank or uploaded by the students themselves. The students can achieve self-evaluation after the test. Through the work submission module and the forum can realize the teacher to the student’s evaluation and the student’s mutual evaluation. Through this program language, we can see that using the generating system can greatly simplify the work of teachers, to avoid the network technology in the process of network teaching to carry out the obstacles, can effectively improve the efficiency of programming language learning website development, subject teachers can be free, so that they will focus on the organization of the teaching design and teaching content.
In conclusion, in the context of big data, the hardware design of the system is completed by using the overall architecture design of the system and the design of the learning website generation server; the software design of the system is completed by collecting the data of the learning website, designing the data base of the learning website and designing the generation process of the learning website, The program language learning website is generated.

4 System Test

4.1 Test Environment

Considering the need to test the compatibility of the system, the environment used in the test process is as follows:
- Processor: Intel core 1.83G dual-core
- Memory: 1 GB
- Operating system: Windows XP HOME
- Browser: IE7.0

Because the system is a platform for learners to study, discuss and test online, learners need to use a browser to use this platform. They must use the current mainstream browsers on the market to be able to browse to the page of the website and implement related Features.

4.2 Test Methods and Procedures

In order to verify the practicability of the application language learning website generation system, the application language learning website generation system based on cloud computing is adopted as the experimental comparison object. The specific operation steps of the experiment are as follows:
- Step 1: run the install.asp file of the system on Internet explorer.
- Step 2: after entering the following basic information of the website in the pop-up window, click “next”.
  - Chinese name: computer network
  - English name: computer network
  - Website subtitle: project 151
  - Website title: computer network learning website
  - Email address of administrator: abc@gdut.edu.cn
- Step 3: in addition to the two interactive modules of “message” and “forum”, there are three first-level directories on the website. Therefore, after selecting “message” and “forum”, enter the number “3” and click “next”.
- Step 4: after entering the level 1 directory information in Table 5, click next.
- Step 5: after entering the information of the following secondary directory, click “next”.
- Step 6: after entering the following three-level directory information, click “next”.
- Step 7: select a template and click next.
- Step 8: click “ok” and the system will start to generate relevant files and folders of the website.
### Table 5. Directory information

| Directory name | Program language knowledge | Network equipment | Related links |
|----------------|-----------------------------|-------------------|---------------|
| Link file      | 1.htm                       | 2.htm             | 1j.htm        |
| Whether there are subordinates | Yes | Yes | 否 |
| Number of subdirectories | 2 | 3 | 0 |
| Inner frame file | 1-00.htm | 2-00.htm |
| Folder         | aa                          | bb                |               |
| Catalog number | 1                           | 2                 | 3             |

#### 4.3 Analysis of Test Results

Using the above test methods and steps, the comparison curve of students’ learning efficiency is obtained, as shown in Fig. 7.

![Fig. 7. Comparison curve of student learning efficiency](image)

From the experimental results, it can be seen that when using the cloud computing-based programming language learning website generation system to provide users with learning, the learning efficiency of students is low, and only the learning efficiency of the last test reached nearly 50%; When the programming language learning website generation system provides users with learning, the student’s learning efficiency is very high, and the student’s maximum student efficiency has reached 95%. Therefore,
programming language learning website generation system based on big data can be obtained to improve the learning efficiency of students.

5 Conclusion

In view of the low efficiency of students’ learning in the traditional website generation system of program language learning, this paper proposes and designs a website generation system of program language learning based on big data. Under the background of big data, based on the hardware design and software design of the system, the system design of the system is completed, which realizes the generation of the website. The test results show that compared with the cloud based system, the learning efficiency of students is higher, and it has a wide range of application prospects. However, this study only considers the efficiency of students’ learning, and ignores the stability of the system. In the following research, it needs to be improved continuously to make the performance of the website generation system of program language learning reach a higher level.

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