Research Article

Construction of Video Courses of Physical Education and Health Education in Colleges and Universities under the MOOC Platform

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In the traditional construction process of educational video courses for physical and health education in universities, numerous problems are encountered, such as small storage capacity, significant delay error, and decreased information throughput rate. Therefore, an educational video course for physical and health education in universities based on the Massive Open Online Course (MOOC) platform is constructed. The course is built by constructing a creative environment for video courses, establishing a video course model under the MOOC platform, and the caching code design for video courses. Upon numerous modifications and test runs, with the campus network’s help, the construction of a network teaching video for physical and health theory courses is realized. Our proposed approach’s experimental result shows that the designed course’s frame rate is 10% higher than that of the traditional course designing. The node's storage capacity is up to 130%, the delay error is significantly reduced, and the information throughput rate is not affected by the increase of network load.

1. Introduction

Video course is a new multimedia teaching mode that excels in developing modern computer network technology and video technology. The educational video courses of sports and health, based on the MOOC platform in universities, are an effective way to promote the reform of physical and health education in universities and promote the network and science of physical and health education in universities. Video courses break through the time and space limitations of traditional teaching activities and make the boring teaching content in the classroom more vivid through video. With the application of computer network technology, the all-around exchange and interaction between the two sides of teaching are realized [1]. Wireless network technology provides technical support for the construction of videos. Moreover, it remains an essential tool for the development and use of videos. In a nutshell, essential applications, including PPT presentation, are wireless network technology contributions [2].

With the popularity of the MOOC model for higher education, the development of video courses has gradually become one of the most important topics in the field of higher education. Only by keeping pace with the modern era and the technological trends, we can ensure the quality and effectiveness of education [3]. Therefore, this paper studies the related problems in the construction process of video courses for physical and health education under the platform of MOOC in universities. Initially, a method for constructing the MOOC platform is discussed, which helps to identify the issues related to designing an effective and robust course model for video courses [4]. It is anticipated that it can provide some references for the scientific construction of video courses for universities’ physical and health education.

The rest of this paper is organized as follows. Section 2 is about constructing the MOOC platform, and Section 3 proposes the video courses model. Section 4 describes the video course’s cache code design, and Section 5 gives the experimental results and performance analysis. Section 6 summarizes this paper and the future research direction.
2. Construction of MOOC Platform

To construct the MOOC platform, we have the following setup in place [5]. A PowerEdge R710 server is used to build a web server, and it also bears the function of a reverse proxy server. Two PowerEdge R720 servers are used as streaming media servers, and load balancing is achieved through a reverse proxy server. PowerEdge R710 is configured as a two eight-core Xeon E5620 processors with 32 GB DDR3 and two 500G SAS hard drives to install and 6 1T hard disks to store instructional video data. The development language is Java. The system is built based on the J2EE development system, and the multilayer architecture of the J2EE is shown in Figure 1 [6]. The architecture features of the business layer and the business logic processing layer make full use of the services provided by the J2EE business server [7].

The application server, represented by BEA WebLogic, provides perfect services for various programs, such as threads, transactions, database connection pools, and security. These services are very stable [8]. The server software environment installs the Windows Server 2008 Enterprise R2 version on the R710 server and installs NETFRAMEWORK3.5 and other running frameworks. IS7.5 is used as the main station’s server program, and the NGINX reverse proxy is installed on this server, and it is mapped to two other R720 servers to make the load balanced when accessing the videos [9]. Flash Media Server is installed on the two servers, and the video management program based on FMS is deployed to the server to achieve the control of video playback [10]. This system has no special requirements for client hardware. It only needs browser to be installed on the system, and FLASH plug-ins have to be installed. The bulletin information is shown in Table 1.

3. The Proposed Video Courses Model

First, the overall design of the model function, the course video script’s production, the collection of text material, and the entry and editing of the text information are discussed. The physical and health curriculum models in universities can be analyzed from various angles, namely, the concept of ideology, curriculum, teaching, the system of operation, and implementation. Image material is compressed in JPG format and image processing software such as Photoshop and Fore work are used for image production [11]. A camera is used to photograph the teaching staff’s technical movements. The editing of images, commentaries, and captions is carried out on the nonlinear editing system and stored in AVI or FLV format. Multimedia camera technology is used to convert the image material into WMV format and played on Internet [12]. The Microsoft SQL Server database, ASP technology, and page development software, i.e., Dreamweaver MX web, are used to integrate all kinds of obtained materials on the Windows XP server operating system. After many modifications and test runs, with the campus network’s help, the construction of a network teaching video for physical and health theory courses is realized. The construction’s flow chart is shown in Figure 2, which is similar to the one proposed by Mei [13].

The resource information table is used to store all kinds of teaching resources in schools, which is shown in Table 2 [14].

![Figure 1: Multilayer architecture of MOOC platform using J2EE.](image1)

![Table 1: Bulletin information.](image2)

| Serial number | Attribute    | Field type | Field length | Primary key |
|---------------|--------------|------------|--------------|-------------|
| 1             | Bulletin number | Int        | 10           | Yes         |
| 2             | Content      | Varchar    | 100          | No          |
| 3             | Release time | Date       | 8            | No          |
| 4             | Release people | Varchar    | 10           | No          |
| 5             | Type         | Varchar    | 15           | No          |

The permission information table is used to store the contents of each user’s permission scope in the system, which is shown in Tables 3 and 4 [15].

The performance of virtual data migrating from one level to another is an important indicator of a system [16]. The following equations are used to calculate the migration performance:

\[
MT_T = \frac{M_{VM}}{N_{BW}}
\]

\[
P_V = \int_{T}^{T+MT_T} U_{CPU}
\]

where \(MT_T\) is the total time of migration, \(M_{VM}\) is the memory utilization of the virtual machine, \(N_{BW}\) is the available network broadband, \(P_{VM}\) indicates the degradation rate of the virtual machine, and \(U_{CPU}\) represents the occupancy of virtual machine [17]. Through these two equations, the degradation rate of virtual machine and the performance of application can be obtained.

The system uses the ZIP-LIKE distribution to simulate the video popularity test. The video is sorted according to the probability of clicking from high to low, and the probability of video being clicked is as follows:

\[
f_t = \frac{P_V}{c \times t^a}
\]

where \(c\) is the memory space and \(a\) indicates the ZIP-LIKE distribution parameters. The user behavior generator is used to simulate the released data, and the byte hit rate is used as the criterion of the algorithm. For this purpose, the equation is as follows:

\[
BHR = \frac{B_{cache}}{B_{req}}
\]

where \(B_{cache}\) is the amount of data provided by the cache server and \(B_{req}\) is the total amount of data that is requested for the user [18].
The type of knowledge point is an important analysis dimension. In order to ensure the validity of the data, the knowledge content of the teaching video course is classified and the reliability is analyzed. The reliability formula of the content analysis is as follows:

\[ R = \frac{n \times K}{1 + (n - 1) \times BHRK} \]  

\[ K = R \frac{2M}{N_1 + N_2} \]

where \( R \) is the reliability, \( n \) is the number of judges, and \( k \) is the average mutual agreement degree.

In this equation, \( M \) is the number of analytic categories agreed on by two adjudicators, \( N_1 \) is the number of cases analyzed by the first adjudicator, and \( N_2 \) is the number of cases analyzed by the adjudicator. If the coefficient Cronbach \( \alpha \) is used to examine the overall and internal consistency reliability, then the reliability coefficient \( \alpha \) is

\[ \alpha = \frac{k}{K-1} \left(1 - \frac{\sum_{i=1}^{K} S_i}{S_{xy}}\right) \]  

where \( K \) is the number of questions on the test, \( S_i \) is the variance of the score for the questions, and \( S_{xy} \) is the variance of the total score of the test. According to the different parameters, physical video courses can be divided into three modes. The following are the specific formulas used for each mode:

(i) Single-parameter mode:

\[ p(\theta) = K \frac{\alpha}{1 + D^{\theta-b}} \]

(ii) Dual-parameter mode:

\[ p(2\theta) = K \frac{\alpha}{1 + D_{2(\theta-b)}} \]

(iii) Three-parameter mode:

\[ p(3\theta) = c + (1-c) \frac{K}{1 + D_{3(\theta-b)}} \]

where \( D = 1.702 \), \( \theta \) is the value of the students’ ability, \( a \) is the division of the topic, \( b \) is the difficulty of the topic, and \( c \) is the guessing coefficient of the topic. \( p(\theta) \) is the probability of answering the question to the students with the ability of \( \theta \).
The construction of video courses can be divided into six levels: hardware level, basic platform level, data level, business support level, application level, and user level. The hardware layer improves the hardware support of the application platform so as to ensure that the program can run stably and efficiently and realize remote access to the system under the guarantee of network conditions. The basic platform layer is the operation system, database management system, NGINX reverse proxy service, host storage and backup system, and information security. The data layer is designed according to the needs of the system, the video files, and related configuration files designed according to the system requirements. The business support layer provides some general operation interfaces, including database access support, form service support, and message queuing. The application layer implements the specific functional modules of the system, and the user layer is the ultimate user.

The website uses ASP.NET MVC, LINQ to SQL, SQL SERVER 2005, FMS, AJAX, and other technologies to achieve the whole system construction. All kinds of technologies complement each other and ensure the overall integrity and efficiency of the system. The relationship diagram of each part of MVC is shown in Figure 3.

The implementation of ASP.NET MVC based on ASP.NET can be compatible with existing ASP.NET applications by multiple components in ASP.NET to realize data binding. In ASP.NET MVC, a controller is usually a class that inherits the system. When a request is sent to the server, the system looks up the corresponding action in the corresponding Controller through the URL address and the system routing setup. The relationship between the Controller, Model, and View in the ASP.NET MVC is shown in Figure 4.

The ASP.NET MVC framework is highly compatible and can use any.NET-based Database, ORM framework, or other tools. LINQ to SQL is an O/RM component included in the.NET F3.5 version. This component can implement RDB modeling and then use LINQ to implement the operation of the model. Through the relational mapping, the data in the database can be checked, updated, added, and deleted. Besides the above functions, LINQ to SQL can also support stored procedures, views, and transactions, creating a bridge between business logic and the model, in a simple way. Microsoft SQL Server 2005 data engine combines analysis, reporting, integration, and notification capabilities. Figure 5 shows the functions of uploading, downloading, selecting lessons, and inquiring modules for students.

The tight integration with Microsoft Visual Studio, the Microsoft Office System, and the new development kit makes Microsoft SQL Server 2005 unique. Microsoft SQL Server 2005 is suitable for all types of research and development (R&D) personnel, such as developers, database administrators, and decision makers, providing powerful technical support and solutions. Adobe Flash Media Server is a major component of the Adobe Flash Platform with compatibility.

The online course management module includes teaching resource management, job management, examination related management, interactive management and resource uploading, and download management modules.

The interactive management module is BBS, online questions and answers (Q&A), and video communication. The cloud storage system is shown in Figure 6.

The transcoding server management function module is constituted by the transcoding server manage class and the transcoding server manages User Interface (UI) class. The transcoding server manages the UI class by implementing the front interface of the function module, and the transcoding server manage class implements the business logic of the function module, in which the classes relying on three control classes are the transcoding server info manage class and the server transcoding class, as three subfunctions that implement transcoding server information management, server configuration, and server transcoding. Among them, the transcoding server info manage class has add, modify, and delete methods, depending on the transcoding server info entity class. The server configurust class has a parameter set method, which depends on the transcoding server info entity class. The server transcoding class has a transcoding method and depends on the transcoding server info entity class. The storage server management module is composed of the Storage_server manage class and the Storage_server_manage_UI class. The Storage_server_manage_UI class implements the front-end interface of the functional module, and the
Storage_server_manage class implements the business logic of the functional module.

4. The Design of Video Course Cache Code

Since the key of the cached data is unique when the key value is known, the value can be changed within the valid time of the cached data. In the Django framework, first set the key value and value through the Django’s own cache, and then introduce the Memcached module; the Memcached client is also set to the machine and then through the previously set key value to change the value and finally verified.

With the same key value test, we can get two values. But, in the same memory, the key value is unique, but there are two values. There is only one possibility. The test in the cache and the test in Memcached are not of a single value. In order to prove the conjecture, through the study of Django, we found that the Django framework encapsulates the key value. It added “:1:” before the key value to avoid the key worthy of repetitiveness.

The Django framework encapsulates the key value and ensures the uniqueness and security of the cached data by redefining the prefix. Memcached is a free, open-source, high-performance caching tool, which improves access rates in dynamic web and allows multiple users to access cached data at the same time. Figure 7 shows the working principle of Memcached.

From Figure 7, one can see that the single arrow indicates that the data is obtained from the RDBMS when the page is accessed for the first time and then stored in Memcached. The double arrow indicates that when the user accesses the page for the second time, he/she will obtain the data from Memcached. Because the Memcached server has no distributed functions, its distributed function can only be implemented by the client. Memcached servers store data independently. Multiple servers cannot share data and cannot communicate with each other.

As the number of user increases, the background will be gradually expanded. When a large number of users request the database at the same time and in case there is no caching technology, it can be imagined that the database will soon crash. In order to solve this problem along with the expandability, the two APP Server caches are merged under the Django framework.

It can be seen from the above code that the IP addresses of the two APP Servers are 101.200.0.130 and 101.200.0.162, respectively, and the service port number is 11211. When a user needs to expand the server due to business needs, he/she only needs to add the corresponding server address and port number to the code. The following code is the measured data, the relevant parameters are sent using JSON format, and it is explicitly specified that HTTP header information is not cached.

The serialization in Django is mainly used to return the retrieved data in the database to the client. In the video sharing system, the requested raw data is converted to JSON
format and then visualized and returned to the client or browser user. After formatting the video template list object through JSON, it is passed to the view module and then returned to browser.

5. Experimental Results and Analysis

In order to verify the effectiveness of the video system designed in this paper, the following comparative experiments are designed.

The traditional teaching video is the control group with two computers as the experimental object. The teaching video in this paper is the control group. Under the premise of controlling the single variable, the two groups of experiments are recorded and compared, respectively. Table 5 denotes the experimental parameter setting, and Table 6 denotes the network performance requirements.

Provided that the computers of the experimental group and the control group enter the working state at the same time and record the ring frame rate separately, in order to avoid the interference caused by unexpected events on experimental results, multiple experiments were conducted to compare the results. Figure 8 shows the comparison of frame rate for the two algorithms.

Analysis of Figure 8 shows that, with the increase of the time, the ring frame rate of the experimental group shows a trend of rising first and then decreasing. In the second experiment, the ring frame rate reaches a maximum value of 0.30. The ring frame rate of the control group also showed a trend of increasing first and then decreasing. When the second experiment was run, the ring frame rate reached a maximum value of 0.40. The initial ring frame rate of the experimental group was about 0.10, and the initial ring frame rate of the control group was about 0.70. During the third experiment, both groups of experiments reached the minimum ring frame rate. It was about 0.13 in the experimental group and it was 0.10 in the control group. Figure 9 shows the comparison of node storage capacity for the two algorithms.

It can be clearly seen from Figure 9 that the node storage capacity of the curriculum system designed in this paper increases with the increase of number of relay nodes, and the increase rate is much larger than the traditional curriculum system. Figure 10 shows the comparison of time delay for the two algorithms.

It is clearly evident from Figure 11 that the delay error of the experimental group increases slowly with time, and the upward trend is slow, while the delay error of the control group rises rapidly with the time, and the uptrend is steep compared to the experimental group. Figure 11 shows the relationship between the throughput and the network load.

As shown in Figure 11, it can be seen that the throughput of the control group of the traditional method gradually decreases as the network load increases, and the throughput rate of the experimental group shows an upward trend with the increase of the network load. In summary, the video course system designed in this article is real and effective.

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**Table 5: Experimental parameter setting.**

| Project components | Server configuration | Client configuration |
|-------------------|----------------------|---------------------|
| CPU               | Intel i7             | More than i3 of Intel |
| Memory            | 32 G                 | 2 GB                |
| Hard disk         | 2 TB                 | 500 G               |
| Operating system  | More than Windows 7  | Windows Server 2008 |
| Browser           | Above IE8.0          | Above IE8.0         |
| Database system   | MYSQL5.5             | MYSQL5.5            |

**Table 6: Network performance requirements.**

| Transport protocol type | Packet loss | Network delay | Delay jitter |
|-------------------------|-------------|---------------|-------------|
| TCP                     | <1/100      | <200          | <50         |
| UDP                     | <1/100      | <500          | <100        |

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**Figure 8: Comparison of frame rate for the two algorithms.**

**Figure 9: Comparison of node storage capacity for the two algorithms.**
6. Conclusion

In this paper, a video course construction method for college sports and health education under the MOOC platform is proposed. This platform verifies the advantages of the existing methods in practical real environment. Using hardware and software platforms, this paper realizes the construction of sports and health education courses and, at the same time, ensures that the system is reliable and effective. These courses are built by constructing a creative environment for video lectures, which is established using a MOOC platform. The experimental results of this approach show that the designed course’s frame rate is 10% higher than that of the traditional course designing. The node’s storage capacity is up to 130%, the delay error is significantly reduced, and the information throughput rate is not affected by the increase of network load.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declares that he has no conflicts of interest.

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