Design of Teaching System of Track and Field Sports Training Course for College Students Majoring in Electronic Engineering Education

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In order to improve the unstable operation of teaching system caused by data security, this paper puts forward the design of teaching system of track and field sports training course for college students majoring in electronic engineering education. This paper analyzes the demand of track and field sports training course for teaching system, and on this basis, adopts B / S architecture designs the physical architecture of the system, and designs a two-tier network architecture. According to the application requirements of the system architecture, the hardware environment with high memory is designed. The privacy homomorphism technology is used to encrypt the system data, and the blockchain technology is used to transmit the system data, so as to improve the security of the system data. The experimental results show that the design of the system in the process of operation.

INTRODUCTION

In recent years, the rapid development of computer and network technology has greatly changed the mode of information dissemination, and human society is moving towards the information age. In the background of information society, the teaching mode of track and field training has not changed much compared with the past. In the long run, it is bound to affect the reform and development of track and field teaching. In the actual teaching work, many teachers also hope to improve the teaching efficiency and effect through the use of modern educational technology, but due to the lack of guidance of systematic theory, they often lose their direction, so the effect is very little [1,2]. Under the background of information age, it is necessary to design teaching methods to adapt to it.

The 21st century is a century when human beings enter the information society in an all-round way. The emergence of computers and networks has greatly changed the mode of information dissemination, affected the organization, transmission and acquisition of human knowledge, and improved the efficiency of people's acquisition of knowledge, reading and learning. It has become a strategic choice for the development of education to drive the modernization of education by informatization and realize the leap forward development of Education [3,4]. Although the education infrastructure has begun to take shape, the teaching mode and teaching methods have not changed much compared with the past. Many times, these facilities are only used as the objects for leaders to check and others to visit. So how can we make proper use of these tools as media, tap their potential, give full play to their value, and use them to promote learners' learning? This requires teachers to carefully design the rational use of tools in combination with teaching [5,6]. Today, with the development of science and technology, teaching technology continues to surpass. Instructional design has become one of the basic skills teachers

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must have. As a social activity to cultivate people, education bears the important role of transmitting production and life experience and promoting the growth of the new generation. Education is an indispensable means for all social continuity and development, and education is an eternal category of human society. With the development of society, the knowledge accumulated by human beings is more and more abundant, and the role of education in social development is more and more significant[7,8].

On this basis, it is necessary to study the teaching methods of track and field training course. This paper puts forward the teaching system design of track and field sports training course for college students majoring in electronic engineering education. Combined with modern Internet technology, the teaching system of track and field sports training course is designed. And through the experimental test, the operation effect of the designed system is verified. Through this research, we hope to provide valuable reference for the design of university teaching system.

DEMAND ANALYSIS OF TRACK AND FIELD SPORTS TRAINING COURSE TEACHING SYSTEM

Overview of System Requirements

The main goal of track and field sports training teaching curriculum is to improve students' mastery of track and field sports training knowledge and skills, and it is also a key course for electronic engineering education majors to exercise temperament and shape good physique. How to effectively use network resources is the key problem to be solved[9,10]. However, at present, the track and field sports training teaching methods commonly used in Colleges and universities mainly rely on Teachers' speech expression and body language to complete the teaching, so the teaching effect of track and field sports training course still has some deficiencies. From the basic memory decline curve of human brain, it is relatively difficult for college students to have a complete memory of track and

field sports training in a short time Therefore, such a teaching method will weaken the core significance of track and field sports training teaching[11,12]. However, if we use computer technology to make this appeal, it is entirely possible to achieve it. Teachers record every demonstration action into the website, and show track and field sports training through some three-dimensional action software or auxiliary teaching mode. Firstly, this teaching mode can greatly facilitate students, and they can watch teaching videos online anytime and anywhere. Secondly, it makes students' learning more efficient, happier and easier, and makes the course effective. Thirdly, the recorded video can be watched repeatedly, which can help students to review the old and learn the new to a certain extent[13]. The construction of teaching system can enable students to view the learning content at any time, make full use of Internet resources and fragmented time around the computer environment, improve learning efficiency and consolidate learning achievements.

System Function Requirement Analysis
Video teaching subsystem

In order to make an effective demand analysis of the track and field sports training and teaching system, it is necessary to determine the personnel involved in the system, including the administrator of the network track and field sports training and teaching system, teachers and students. The users listed above have different executive functions and different tasks in the teaching system of track and field sports training course. Among them, the administrator focuses on the information uploaded by teachers, the login accounts of teachers and students, the establishment of interactive forums, etc.; teachers focus on uploading teaching videos, uploading teaching courseware and other functions; students focus on downloading relevant teaching courseware or video and other functions, so as to provide real-time services for teachers and students and facilitate the normal teaching.

Teacher student interaction subsystem

Teachers and students have different executive functions in the track and field sports training system. In the process of system interaction, there are usually some mutual influence relations. Students' course quality scores and comments at the end of each semester will rethink and sort out the content taught by each teacher, which will play a positive role in stimulating and supervising, and in the next semester, according to the learning experience However, students or teachers will also play a certain role in the administrator's modification and management of the website in the process of using the system interface. In the process of downloading video courseware, students are not limited to only downloading videos. For students' personalized needs, they can add functions through the administrator's background operation. Similarly, for teachers, when the video upload efficiency is not high, the interaction of the system can be maximized by uploading the action image and then uploading the whole video. Basically, from the administrator down to every link, there is corresponding feedback adjustment, and every time it spreads down, the lower level goal will make negative feedback adjustment to the sub goal, so as to greatly promote the popularization and application of distance education.

SYSTEM ARCHITECTURE DESIGN

On the basis of the above, this paper first designs the physical structure and network structure of the track and field sports training course teaching system.

Physical Structure Design

At present, the two main architectures of software technology are C/S (client/server) architecture and B/S (Browser/server) architecture. C/S architecture is the client/server architecture, which is widely used at the software level, but it is difficult to meet the multi-party interconnection requirements of the existing Internet. Therefore, this paper uses B/S architecture to design the system. B/S is the browser / server architecture, which is a more modern software system architecture[15]. The emergence of this architecture system subverts people's understanding of the traditional software structure. It can meet the needs of multi-party interconnection and global network opening required by the existing Internet, and provides software developers with a new way of thinking and a more innovative structure. Figure 1 shows the architecture of track and field sports training and teaching system based on B/S architecture.

Figure 1.
Track and field sports training teaching system architecture diagram
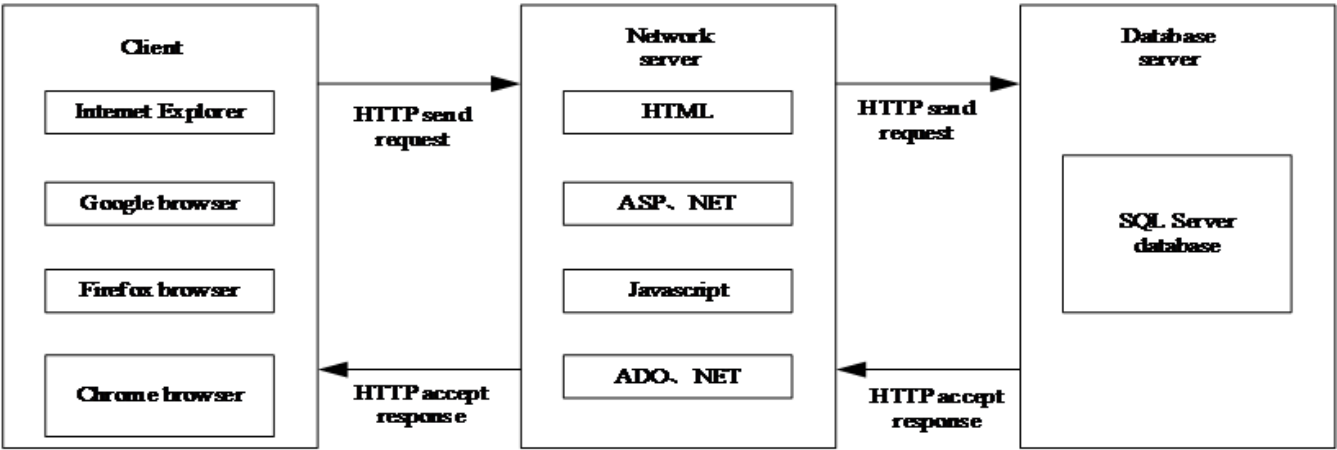
The architecture of track and field sports training and teaching system shown in figure 1 includes three parts: client, network server and database server, through which a typical three-tier B/S is formed Physical structure, in which the

client is mainly aimed at whether the communication protocol of the browser used by the user when browsing the system is consistent with the back-end server port, different browsers will have automatic firewall settings, and they also need to consider the mutual matching when setting IIS protocol with the network server, when using HTTP When sending information and receiving response information, the server has four different contents, including HTML、ASP.NET , JavaScript, and ADO.NET It connects with the back-end database server, and mainly completes the upload of teachers' courseware video resources, information query of students, course query of students, online learning and course selection of students, and

teachers' retrieval of uploaded resource list. Using three-tier B/S software design and construction, students can access the world wide web through the client, and do not need to install the corresponding software, which is convenient and efficient.

Network Structure Design

The network architecture of track and field sports training course teaching system designed in this paper is shown in Figure 2. The two-tier structure is clearly shown in the figure. The top tier contains database server, application server and client; the first tier contains firewall, many clients and network structure.

Figure 2.
Network structure of track and field sports training and teaching
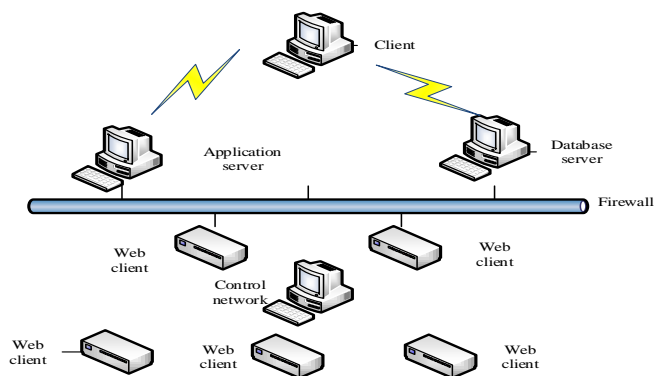
SYSTEM DESIGN
Hardware Environment Design

Hardware development environment is a core part of the track and field sports training teaching system designed in this paper. All kinds of operations, such as teacher side function, student side function, video upload compression and decompression, are completed by hardware system operation. The hardware system designed in this paper can store video, compress video, decompress video, capture video, record video, process video

online, display video in real time and so on. Because the amount of video data involved in the design of teaching system is too large, it needs higher configuration of software and hardware conditions, and it is a key to extract useful information from such a large number of redundant data, and it also needs higher memory hardware configuration. In the hardware environment of this design system, the client hardware configuration is shown in Table 1, and the server configuration is shown in Table 2.

Table 1 Detailed parameters of client hardware system

Detailed parameter description of client hardware system	
Computer model	Dell XPS 15 9650 laptop
operating system	Windows 10 64 bit (DirectX 12)
processor	Intel Core i7-7700 @ 2.8GHz quad core
a main board	Dell 05ffdn (Intel Xeon E3 - 1200 V6 / 7 Gen Intel Core)
Memory	12gb (Samsung DDR4 2400mhz / Hynix DDR4 2400mhz)
Main hard disk	Samsung mp69 1 vnems mausgn2 65bg (256g)
Graphics card	NVIDIA geforce GTX 1050 Ti (4GB / MSI)
monitor	Sharp SHP 1453 (15.7 in)
sound card	Ruiyu @ Intel hi fi audio controller
network card	Atheros Killer Wireless-n/alac 1535 Wireless Network Adapter/ Bigfoot Networks

Table 2 Detailed parameters of server hardware system

Detailed parameter description of client hardware system	
Computer model	Dell precision 7820 tower desktop
operating system	Windows 10 64 bit (DirectX 12)
processor	Intel Xeon bronze 3104 @ 1.7GHz six core
a main board	Dell 05wnj2 (Intel Xeon processor P family)
Memory	32GB (Hynix DDR4 2400mhz / Hynix DDR4 2666mhz)
Main hard disk	MgO 1100 SATA 256g
Graphics card	Nvidia GeForce GTX 730 (2GB/Nvidia)
monitor	Philips phlc11d Phl 226v6 (21.7 in)
sound card	Ruiyu @ Intel hi fi audio controller
network card	Atheros Killer Wireless-n/alac 1535 Wireless Network Adapter / BigfootNetworks
CD drive	Hitachi LG DVD + - RW gu90n DVD recorder

Software Design

Design of data stream encryption algorithm

In order to encrypt the video data obtained from the track and field sports training and teaching system, this paper focuses on the design of video stream encryption. In order to facilitate the teachers and students to upload and download courseware, this video stream encryption system adds a simple encryption mode. The default value of encryption key and decryption key is the same as AES in counter mode. In this paper, privacy homomorphism technology is used to encrypt the system data stream [16], and the process is as follows.

First of all, G stands for ciphertext, C stands for plaintext, α stands for sigmoid function $[a, z]$ stands for concatenation between user a and teaching system resource z, then the relation propagation mode between access features and resources can be expressed as,

$$G = \alpha(\lambda_G[a_t, z_{t-1}]) \quad (1)$$

$$C = \alpha(\lambda_C[a_t, z_{t-1}]) \quad (2)$$

$$\tilde{a} = \tan a(\alpha(\lambda_a[a_t, z_{t-1}])) \quad (3)$$

$$a_t = (1-\alpha) \cdot (\tilde{a}, z_{t-1}]) \quad (4)$$

Where, λ_G, λ_C, λ_a, denote matrix parameters.

If the output set is S, at time t, the output layer and the input layer can be expressed as,

$$a_t = (1 - \lambda_G \lambda_C \lambda_a) \ z_{t-1} \quad (5)$$

$$S_t = \lambda_G \lambda_C \lambda_a a_t \quad (6)$$

This paper analyzes the correlation between the feature u of access terminal a and the resource z of teaching system

$$R(u, z) = cosine(x_u, x_z) \quad (7)$$

Among them, x_u, x_z represent the vectors of users and teaching system resources after feature extraction.

Finally, we get the correlation degree between

resources and user characteristics, and take the TOP-N as the access object to allow downloading and uploading, so as to improve the security of data.

Design of secure real-time data stream transmission

In order to achieve secure real-time data transmission, this paper uses blockchain technology for data transmission within the system. In the process of secure real-time transmission, due to the risk of courseware data being stolen, this section adopts three-level protection secure real-time transmission protocol when designing the system, so as to avoid the theft and video infection of the system by foreign invaders to the maximum extent And the upload of harmful courseware materials [17,18]. The data transmission mode is as follows.

On the basis of the above data encryption processing, let S_k denote the generated private key and G_k denote the generated public key

$$S_k = SHA256(Y_i)$$

$$G_k = Secp256k1(S_k) \tag{8}$$

Among them, *SHA256* represents hash algorithm; *Secp256k1* represents ECC elliptic curve algorithm.

In the process of data transmission, the block generation rate of each round affects the security of the transmission network. And there are:

$$V_r \propto \frac{(S \cdot P)}{T_r} \tag{9}$$

Among them, P represents the generation rate of each round of blocks; V_r represents the propagation rate of information exchange in the transmission system; s represents the size of blocks in the transmission network; T_r represents the duration of each round.

Because the time interval T_d generated by the block in the transmission network is proportional to the duration of each round, it can be concluded

that:

$$V_r \propto \frac{(S \cdot P)}{T_d} \tag{10}$$

It can be seen that the transaction propagation speed, block generation interval and block size affect the security of transmission network in the transmission network, and restrict each other.
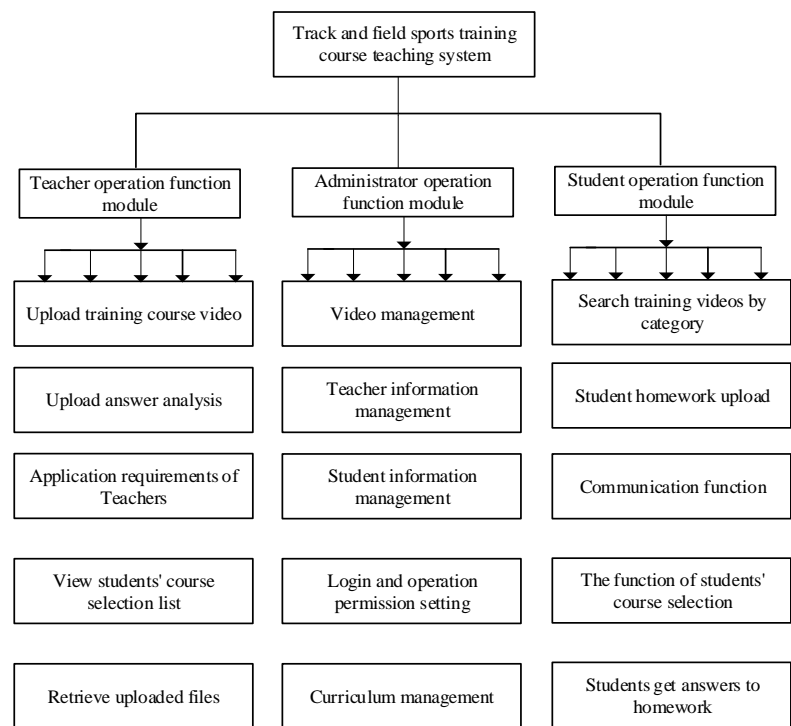
Then, the relationship between the time interval generated by the block in the transmission network and the block size can be expressed as follows:

$$S = \frac{s \cdot Q \cdot T_d \cdot a_t}{S_t \cdot SUM_Y} \tag{11}$$

Among them, s represents the average size of each teaching data in the transmission network; Q represents the number of data uploaded in the transmission network per second. Given the number of information exchanges and the size of exchanged information data, the block size and the time interval generated by the block in the transmission network restrict each other, so as to realize the safe transmission of data [19-21].

In the design of the system, in view of the unique needs of physical education learning, this paper has a new consideration on the operability and openness of the system. In terms of operating habits, this system tries to approach the existing learning and management software as far as possible. At the same time, it gives physical education teaching characteristics to ensure that the system is easy to operate, easy to use, and also takes into account the later maintenance needs of the system. The system design needs to be professional and intelligent. Combined with the needs of administrators, teachers and students, this paper arranges the functions of each part of the system. In the track and field sports training teaching system, the functions of each sub module are shown in Figure 3.

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Figure 3.
Function of teaching system module of track and field sports training course

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                    ┌─────────────────────────────┐
                    │ Track and field sports training │
                    │   course teaching system        │
                    └─────────────────────────────┘
         ┌──────────────────┼──────────────────┐
┌──────────────────┐ ┌──────────────────┐ ┌──────────────────┐
│ Teacher operation │ │ Administrator     │ │ Student operation │
│ function module   │ │ operation         │ │ function module   │
│                   │ │ function module   │ │                   │
└──────────────────┘ └──────────────────┘ └──────────────────┘
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Upload training course video	Video management	Search training videos by category
Upload answer analysis	Teacher information management	Student homework upload
Application requirements of Teachers	Student information management	Communication function
View students' course selection list	Login and operation permission setting	The function of students' course selection
Retrieve uploaded files	Curriculum management	Students get answers to homework

The system function module mainly includes teacher subsystem module, administrator subsystem module and student subsystem module. Their specific functions are described as follows:

System login function: This module is used for permission and authentication of users who apply to enter the system. Different users log in to the system through account and password. System management function: system management is mainly by the super administrator to assign permissions to users, the specific permissions are module administrator, user. The module administrator carries out daily maintenance for each module, and the user refers to teachers and students, who get the right to use the system after registration. Teacher teaching resource management module: This module is the main place for the allocation of teaching resources. After the relevant personnel get the authority, they can allocate the teacher resources, teaching funds and teaching equipment. Teachers can upload teaching courseware and related files through this module. All courseware and teaching resources are saved and managed in the form of files. This module can also be used for students to browse, download and query teaching resources. It can give lectures, manage homework, discuss and answer questions online, and mark papers online. Teaching quality and evaluation management module: This module provides students' evaluation function to ensure the orderly and high-quality teaching. Students can evaluate teaching in this module, and query relevant data: the list of evaluated teachers, evaluation content, evaluation time; at the same time, the module provides the analysis report of students' performance to assist teachers in analyzing teaching quality and adjusting teaching plan. Track and field sports teaching operation management: students log in to get the permission to use the module. Module is to meet the students' daily course selection and course content query and other functions. The specific query details include student number, name, major, course selection teacher, course time and place, score query and make-up appointment. Administrators can manage the above information, modify and add student

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information, register results, and generate teaching management reports of track and field sports training courses.

SYSTEM PERFORMANCE TEST

In order to test the performance of the design system, this paper carries out a pressure test, that is, the operation of the system in the face of different application requirements. At the same time, in order to improve the reliability of the test results, the methods of reference [4] and reference [5] were used to test at the same time.

Test Environment

In this paper, mercury LoadRunner 6.0 is used as the simulation user of system testing. The number of simultaneous visits is set to six levels of 50, 100, 150, 200, 250, 300 respectively. According to the actual university class size, the proportion of teacher side visit and student side visit is 1:50. In this environment, its operation is compared.

Experimental Results

Firstly, the CPU usage of the system is compared, and the result is shown in Figure 4.

Figure 4.
### CPU occupancy test results of different teaching systems
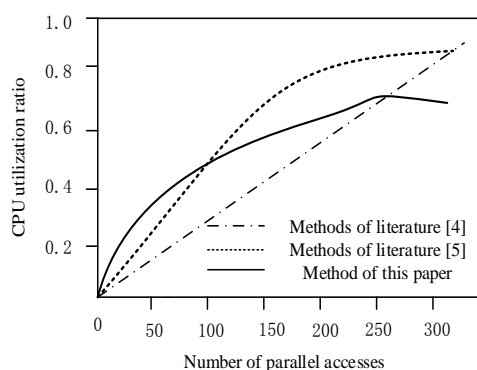
As can be seen from figure 4, in the test process, the CPU utilization of the three systems gradually increases with the increase of concurrency, and the degree of increase presents a certain linear relationship with concurrency. When the

concurrency reaches 300, the CPU utilization of literature [4] and literature [5] reaches the maximum of 91.3%. At this time, the system is basically in a congestion state, affecting the customer experience effect. In this process, the maximum CPU is 69.2%, which has little effect on users. This is mainly because the teaching system designed in this paper fully considers the needs of track and field sports training courses in the selection of hardware, and encrypts and controls the data transmission in the system, so as to reduce the abnormal operation of the system caused by security problems and reduce the consumption of CPU.

On this basis, we compare the memory resource consumption of the system, and the results are shown in Figure 5.

Figure 5.
### Test results of memory resource consumption of different teaching systems
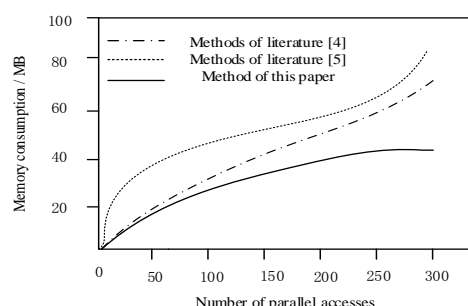
It can be seen from Figure 5 that the available memory of the three systems decreases with the increase of the number of login users, but in contrast, the memory consumption of literature [4] and literature [5] is significantly higher than that of the system designed in this paper. When the number of accesses is less than 100, there is no significant difference between literature [4] and the system designed in this paper, but when the number of parallel accesses is 300, the available memory of the system designed in this paper is about 57%. The available memory of reference [4] is only 23%. This phenomenon has a lot to do with the design and implementation of the system. In this paper, through the blockchain technology, the overhead of data upload and download on the

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access side is reduced, so there is no system bottleneck problem.

At the same time, the transmission rate, traffic and read-write rate of the three systems are compared, and the results are shown in Figure 6.

Figure 6.
Comparison of operation indexes of different systems
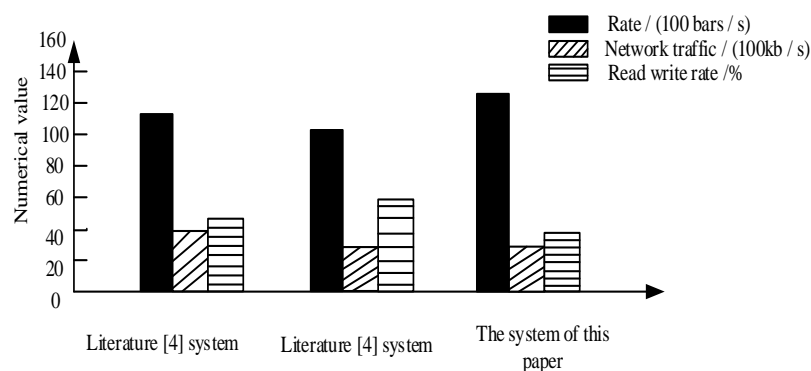
As can be seen from Figure 6, compared with the three systems, the system designed in this paper has good performance in rate, flow consumption and read-write rate, and is not limited by CPU and memory, which affects the results of other operation indicators. At the same time, compared with literature [4] and literature [5], it shows obvious advantages in transmission rate, which can meet various requirements of users in actual use, and has practical value. It is of great use value.

CONCLUSION

Educational technology is a historical category, its development comes from the application of technology in education, the educational technology system based on manual technology, the educational technology system based on Electromechanical Technology and the educational technology system based on information technology. According to the characteristics of each stage, it is called traditional educational technology, audio-visual educational technology and information educational technology. With the development of modern technology, the development and application of educational software is gradually strengthened, and the application of system method in educational technology is emphasized. The whole process of teaching and learning is designed and implemented.

The technology of concept form is increasingly valued, which leads to the emergence and development of the discipline of teaching system design, and gradually becomes the core of the whole educational technology. Information education technology is mainly characterized by the wide application of computer and network technology in education. It pays more attention to the application of teaching concepts, methods, theoretical system and related research results. The teaching system design of track and field sports training course for college students majoring in Electronic Engineering Education in this paper realizes the stable operation of the teaching system and improves its practical application value.

However, limited by conditions, there is still room for further research. In the future research, we can strengthen the function of the system. At present, it is only a unified teaching, and the next stage can establish the student evaluation function. According to the actual situation of students, we can analyze their shortcomings in track sports, and recommend personalized special training content, so as to improve the quality of students and the applicability of teaching system.

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