Exploration of an Intelligent Computer-Aided Physical Education System Based on Web

Kaiya Xu[1] and Zhonghua Lin[2]

[1]Physical Education Department, Huaiyin Institute of Technology, Huai'an, Jiangsu 223003, China, xukaiya@hyit.edu.cn
[1]Physical Education Department, Huaiyin Institute of technology, Huai'an, Jiangsu 223003, China, huazhonglin@126.com

Corresponding author: Kaiya Xu, xukaiya@hyit.edu.cn

Abstract. The application to physical education is aimed at making up for some shortcomings in teaching, complementing each other, and complementing each other for students and even students. Sports workers in the whole society provide space for continuing education; it is the only way to explore a new physical education model that achieves two-way benefits in education quality and education costs and realize network technology-assisted physical education as soon as possible. This article analyzes the principles of the Web-based intelligent computer-assisted physical education system from the basic theory and educational methods, introduces the structure of the Web-based intelligent computer-assisted teaching system, and explains in detail the functions of the four main modules: the system implementation is discussed the key technologies include knowledge base, student model and teacher model. At the same time, the prospects for the development of Web-based intelligent computer-assisted teaching system are prospected.

1 INTRODUCTION

Physical education is a learning activity that teachers and students participate together. The development of physical education is inseparable from teachers, but the choice of educational methods and educational media is also very important. Hu [1] considers in our country's college physical education, the traditional physical education method emphasizes the learning of movement too much, and often ignores the students' interest, which leads to unsatisfactory results of physical education, and students can't obtain physical knowledge efficiently. Zhang [2] thinks the advent of the information age, the universal application of multimedia physical education has become one of

the indispensable ways of college education. Yin [3] considers although my country's computer-assisted physical education has been developed for a long time, the results are not ideal in terms of the understanding of computer-assisted physical education concepts and specific usage conditions. The application in teaching is even negligible. Teng and Cai [4] think it can effectively improve the quality of physical education and effectively accomplish the goals of physical education. Therefore, this article has important practical significance for the research of computer software in physical education. The physical education system running on the server can be accessed by multiple users, which greatly improves the resource utilization rate and learners You can talk to teachers and remote experts through various communication tools on the Internet, such as the Email language mailbox video conference system, or use (groupware) tools such as BBS bulletin board news bar and message book to cooperate with classmates to study and discuss difficult learning problems or ask experts for guidance, learning etc.

Yuan [5] consider Computer-assisted physical education mainly refers to a physical education method that uses computers as the basis for physical education to carry out certain interactive activities. Computer-assisted physical education is a relatively comprehensive subject, integrating computer science, psychology, pedagogy and other subjects, integrating sound, animation, influence and other media, and putting it into use in physical education. Computer-assisted physical education emerged in the 1950s. Its functions have become more abundant because of the development of computer software and hardware. More and more colleges and universities choose to use computer software for physical education. The development of computer-assisted physical education in physical education is relatively late, but the development speed is relatively fast. Many colleges and universities have successively established computer physical education teaching on physical education courses on the Internet using computer software. Such as Shanghai Jiaotong University Sports College. In physical education, the research on computer-assisted physical education is also increasing, such as the physical education of swimming technology through computers, and the research of physical education in basketball dribbling and smashing. However, the application of computer-assisted software is not comprehensive enough, and the understanding of its functions is not deep enough. There is a lot of room for development. Research on computer-assisted physical education should be strengthened to promote more physical education [6,7].

Artificial intelligence technology is applied to CAI, ICAI separates physical education teaching content and physical education teaching strategies. Judging students through intelligent diagnosis mechanism Analyze the reasons why students make mistakes and make suggestions to students for changes and the required learning content. Through the statistical intelligent diagnosis mechanism of the error distribution of all students, it will provide teachers with suggestions for key methods of physical education and provide teachers with friendliness. Through the intelligent analysis of the test results of the physical education content of the student's cognitive model, it provides the physical education supervisors with reference opinions on the evaluation of the teacher's physical education performance. The Web-based ICAI system uses the network as a carrier to carry out the software system of physical education work. He uses the network to realize distributed physical education. The physical education system running on the server can be accessed by multiple users, which greatly improves the resource utilization rate and learners You can talk to teachers and remote experts through various communication tools on the Internet, such as the Email language mailbox video conference system, or use (groupware) tools such as BBS bulletin board news bar and message book to cooperate with classmates to study and discuss difficult learning problems or ask experts for guidance, learning etc. [8,9].

Nowadays, the development of computer networks is very fast, and the use of network platforms has been a long-term work carried out by the education department. Relevant distance education conferences are held every year around the world. In 2002, a well-known university in the United States began to carry out physical education video recordings online. MIT's first computer course "Introduction to Computer Science" was lectured by well-known professors of the school. It has been welcomed by people all over the world, and the click-through rate on the Internet has exceeded 10 million times, which has achieved very good results. The distance education forum is held all year

round in Boston, USA, with more than 10,000 participants, and more than 200 distance education papers are published every year. Distance education in Europe is also popular among students. According to statistics from the French Education Union, approximately 80% of students are or have received online distance education. Greatly improve the efficiency of learning. In recent years, the concept of smart education has also been proposed abroad. This is a one-step application of distance education, and it will be the focus of the next education. The MOOC, which is very popular on the Internet this year, has made great progress and has concentrated more learning resources around the world. The world's top universities, such as: Yale University, Harvard University, Oxford University, etc., these schools are actively promoting distance education. In China, distance education and physical education activities have been carried out relatively late, but they are now being promoted very strongly. In our country's universities, the selection of quality courses organized by the Ministry of Education has been carried out for nearly 10 years. In these ten years, 200 high-quality courses have been selected. All of these courses require the Internet to allow students to learn online. While launching high-quality courses, it also actively advocates the development of online high-quality courseware. For example, the Ministry of Education organizes a FLASH courseware competition every year, because the courseware produced by FLASH has a good effect on the Internet. These measures have greatly promoted the improvement of my country's distance education level in higher education. In primary and secondary schools, the Ministry of Education and local education organizations also actively carry out distance education activities. Based on the development of relatively comprehensive distance education across the country, the Central Party School and local party schools began to launch a series of distance learning systems for party members around 2008. Through the distance learning system, party members and comrades can learn according to their own time, that is, without delaying work or affecting learning. After many inspections of the sports network learning system, it is analyzed that they can also make good use of remote learning. The education system provides a learning platform [10].

The physical education system running on the server can be accessed by multiple users, which greatly improves the resource utilization rate and learners You can talk to teachers and remote experts through various communication tools on the Internet, such as the Email language mailbox video conference system, or use (groupware) tools such as BBS bulletin board news bar and message book to cooperate with classmates to study and discuss difficult learning problems or ask experts for guidance, learning etc. Therefore, the system proposed in this article breaks the time and space limitations of the model, and makes up for some shortcomings or deficiencies in traditional physical education teaching. It learns from each other and complements each other; it realizes online learning and answers questions from students. Data uploading and downloading and other functions.

2   WEB-BASED ICAI COMPONENTS AND ARCHITECTURE

2.1   Basic Components

In order to improve the working efficiency of ICAI on the network, it is necessary to decompose the ICAI system according to functional components. According to the functions and characteristics of the basic modules after decomposition, ICAI has the following basic components:

Knowledge point component group. They are all state components# respectively encapsulate the knowledge points of a certain course, unique knowledge presentation form, related exercises, grading standards, etc. The component provides the use method of the knowledge point and the necessary information of the knowledge point through the interface, such as subjects, courses, knowledge point keywords, practice keywords, etc., for use by the physical education management component. Textbook components. It is a stateful component that encapsulates the curriculum knowledge point system structure organized in the form of a semantic network, and provides a reference for the evaluation component and the physical education management component to organize the physical education content. Learning evaluation component. It is a stateless component that provides some methods to evaluate the learning status of students and sends the data to the student database.

Student component. It is a stateless component that provides some consistent methods to manage student data, provides services for related components, and is responsible for database access operations to establish a model for students to reflect their learning characteristics. The physical education management component is a stateless component. It is actually a reasoning machine, which formulates physical teaching strategies based on student characteristic data and physical education rules. For the last three stateless components, MTS can be used as a software package to handle the logic of sports teaching affairs together. MTS can make the components in the software package run in the same process, manage database links and distributed objects, and coordinate the security of transactions, so that distributed ICAI can run efficiently and safely.

2.2   Architecture

ICA1 uses a three-tier B/S distributed computing model based on Web technology, as shown in Figure 1.
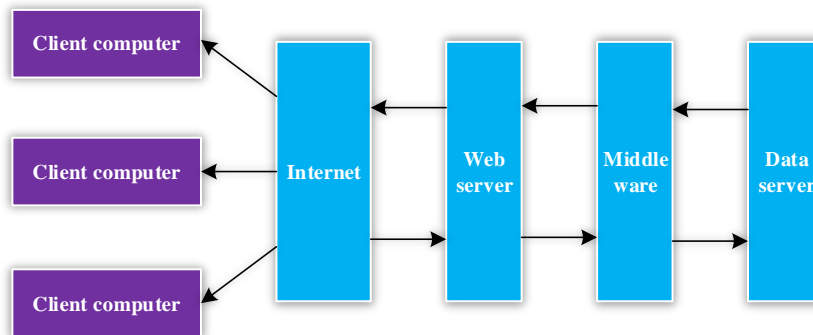
Figure 1: Three-tier B/S distributed computing model.

The browser/server (B/S) model is in fact a structural model similar to the terminal host system, and at the same time it has the distributed computing characteristics of the client/server model. Its main feature is centralized management. From a management perspective, the maintenance and update of the program code, as well as the backup and routine maintenance of the database, can all be performed on the server side.

The database server. Store student data and physical education rules. Such as: study progress, examination results, browsed knowledge points, number of passes, time and other student characteristic data and physical education teaching experience rules. The middleware resides here under the management of MTS, which consists of three components of physical education teaching management, learning evaluation, and student model. He uses ADO to access the database. Maintain and manage physical education data and student data. Responsible for producing PE teaching strategies. Interact with customer Web through IIS and ASP. Implement physical education and collect student learning characteristics information. Web server IIS and ASP use HTTP transfer protocol to transmit physical education information generated by learning logic components such as HTML files and Active controls to Web clients according to user requests, or obtain learning characteristic data from Web clients through ASP. Web server IIS and ASP use the HTTP transfer protocol to transmit the physical education information generated by the learning logic components such as HTML files, Active controls, etc. to the Web client, or obtain the learning characteristic data from the Web client through ASP. The web client only needs to be equipped with a web browser such as NetscapeNavigator or Mi-crosoft internet Explorer, forming a so-called "thin client". The physical education logic is mainly executed on the server side. Only when the client first accesses the relevant stateful component, the system transfers the component to the client, and then directly calls and executes the component when it accesses the component later. Therefore, the system does not have high requirements for the configuration of the client.

The establishment of the theoretical model of the network sports teaching system should not only be supported by advanced network technology, but also cannot leave the theoretical foundation research. The purpose of establishing the theoretical model of the network physical education system is to integrate and allocate physical education resources based on the actual situation of students, so that students can cross the recent development area with the assistance of the physical education system, and enhance their interest in learning and improve learning efficiency by exploring the potential of students. The development of the physical education system cannot be separated from the support of network technology. This article uses WEB technology and database technology as the basis for the software design of the network physical education system, and uses WEB technology to complete the communication and interaction between managers, teachers and students, and achieve adaptive resource integration and configuration to achieve a better effect of online physical education.

There is no difference in the essential content from the traditional physical education teaching auxiliary system to the WEB-based network physical education system. The purpose of the system design is to achieve better physical education teaching effects and assist students to better acquire knowledge. However, the traditional physical education auxiliary system is difficult to "teach students in accordance with their aptitudes" according to the characteristics of different students. Therefore, a web-based network physical education system has been developed. Through the adaptive management of physical education resources, students' needs can be explored to meet the needs of students at different stages of the construction of a knowledge system. Require. Under the above connotation, the following three aspects should be paid attention to when constructing a WEB-based network sports teaching system.

(1) Construction of student models that meet the requirements of learners at different stages

The prerequisite for achieving self-adaptive management of online learning resources is to establish a student model, dig out their cognitive level from the types of students' personal information and daily access resources, and regularly track their course learning. The teaching effect is mainly affected by two factors, the student's personal style and cognitive level. In order to scientifically define the learning style of students, some research institutions have designed the AACS model and the CS383 model, and based on the analysis of the student model, they have given suggestions on the organization and management of physical education resources. There are also researchers who use genetic algorithms to predict the recent access to learning resources by testing students' abilities. This article records and excavates students' learning, recommends learning resources of suitable difficulty for students, and feeds statistics and planning structure back to relevant teachers in real time to maximize students' learning potential.

(2) Constructing a web-based knowledge base of the network sports teaching system

The knowledge base is the core content of the network sports teaching system. The traditional physical education auxiliary system only links physical education resources to the network, and does not effectively manage learning resources. The WEB-based network sports teaching system needs to classify and standardize the knowledge system. By designing courses and knowledge points to trigger rules, the network learning resources can be adaptively configured according to the actual situation of students. In the network physical education system, the domain model can be used to establish the mapping relationship between knowledge points to realize the description of systematic resources. In order to realize the adaptive management of learning resources, the division of knowledge system should be carried out according to the difficulty of the course, and the evaluation information of physical education teaching should be collected from the two aspects of students and teachers, so that the design of trigger rules can be adapted to the cognitive level of students.

(3) Learning guidance mechanism based on adaptive resource management

The adaptive management of physical education resources is suitable for the realization of expert systems. The expert system is a collection of trigger rules for all knowledge systems. The expert system can cooperate with the traditional physical education system model to realize the adaptive management of resources. The network physical education system studied in this article should be based on the full analysis of the level of students, based on the difficulty of the knowledge system, to achieve a reasonable match between students and resources, and improve the efficiency of

physical education. The learning guidance mechanism of adaptive resource management is the core of the WEB-based network physical education system, which consists of a feedback mechanism and a resource management mechanism. The feedback mechanism is divided into the difficulty of completing the difficulty system according to the students' cognitive level and teacher evaluation, and the resource management mechanism realizes the re-planning of students, teachers and resources according to the triggering rules.

3 KEY TECHNOLOGIES

3.1 Knowledge Base

There are three intelligent agents in the system: students, teachers and inference machines are indispensable. The students are the main bodies of learning, the teachers are the main bodies providing knowledge, and the inference machines control the physical education process. The main body inference machine obtains knowledge and physical education teaching methods in a certain field from the teacher, models the students to establish a student model, and then controls the physical education process according to these knowledge base structure as shown in Figure 2.
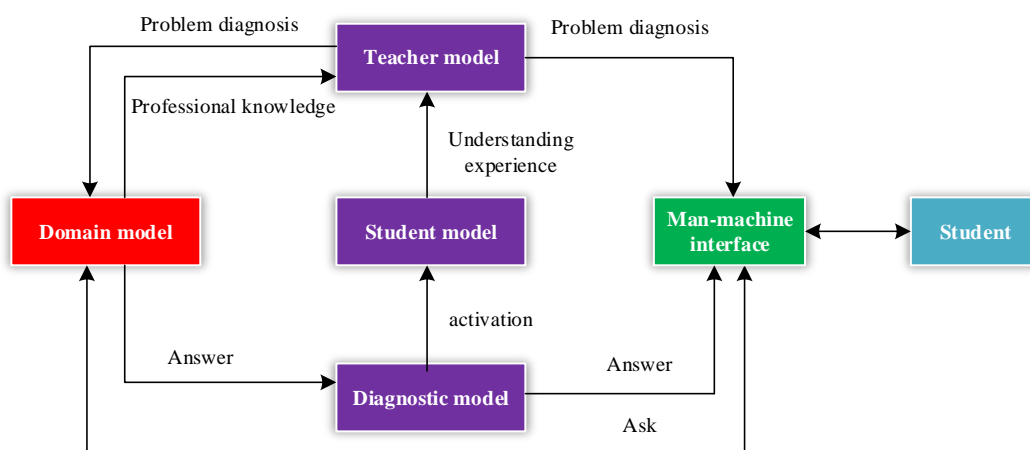

Figure 2: The base structure.

Knowledge representation: The entire domain knowledge base can be represented as a domain tree. Physical education strategy library: According to the physical education goals of the course and the characteristics of the physical education objects, reasonably select the physical education media information in the system Combine them organically. The content of the textbook is organized according to the level of chapter knowledge points and sub-knowledge points to form an optimized physical education system structure. According to the student's answering situation, the next time the student enters the system is determined After learning all the textbook content, students can extract exercises from the question bank for testing at any time. The system prompts which content to study according to the student's answer, and also provides hyperlinks to relevant knowledge points.

3.2 Student Model

The student model mainly includes the diagnosis module of the learning history database and the evaluation model. 1) The learning history database records the students' mastery of each knowledge point and the situation of answering questions; its organizational structure and content are different

depending on the type of student model Varies. 2) The diagnosis module analyzes the answers made by the students to find the students' errors and the root causes of the errors during the learning process, and then sends the information to the evaluation module. 3) According to the information provided by the diagnostic module, the evaluation module diagnoses the changes in the students' grasp of the knowledge points and then modifies the cognitive level of the students. The x y variation is shown in figure 3.
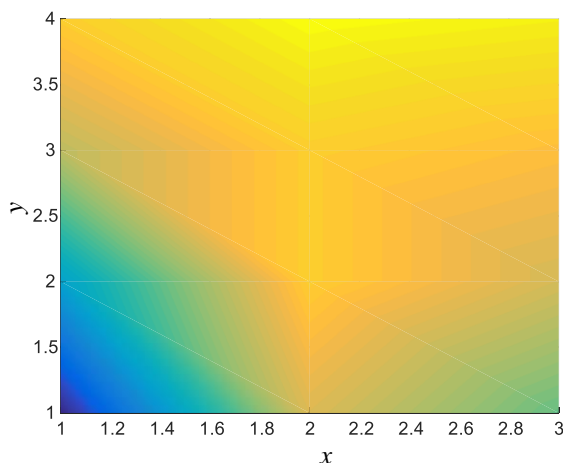

**Figure 3**: x, y variation.

3.3   Teacher Model

The sum of PE teaching strategies forms the teacher model. The strategy of the physical education teaching model determines the method of physical education. The physical education model is a sequence table of the physical education link according to the characteristics of the knowledge points, physical education requirements and the characteristics of the students to select a suitable physical education model.

The PE teaching sequence strategy determines the arrangement of the PE teaching sequence and the organization of the teaching plan. The PE teaching sequence is a designated sequence of knowledge units determined according to the type of physical education and the requirements of physical education. It is necessary to consider the systematic and completeness of knowledge and the students as well. Requirements and acceptance capabilities. The prediction is shown in figure 4
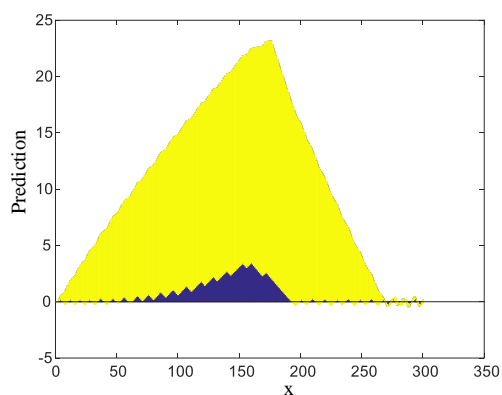
Figure 4: Prediction.

The predicted data is shown in figure 5.
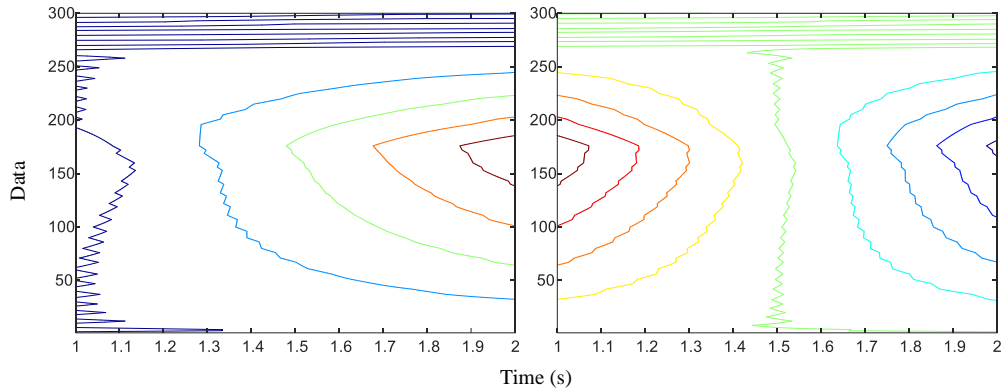
Figure 5: Predicted data.

3.4 Human-Computer Interaction

The interactive interface is the window through which the WEB-based network sports teaching system interacts with the user. The interactive interface of the student account needs to meet the online learning needs of users, the interactive interface of the teacher account needs to meet the teaching needs of teachers, and the interactive interface of the administrator account needs to meet the administrator's needs for user rights and system resource management. The following principles should be paid attention to when designing the human-computer interaction interface of the network sports teaching system:

(1) The principle of consistency. The consistency principle of interactive interface design requires that the style, style, and layout of different system interfaces should be consistent during design. For example, the font and menu positions of the teacher interface and the student interface should be consistent and standardized, the notification bar should be placed in a prominent position on the page, and the layout of the page elements should be beautiful.

(2) The principle of convenience and speed. In arranging and organizing page elements should be combined with user habits, and important information should be placed in a conspicuous position. For example, when designing a teacher's user interface, system functions related to teaching should be centrally placed, and related elements such as notifications, co-announcements, and information should be easy for teachers to directly access and use.
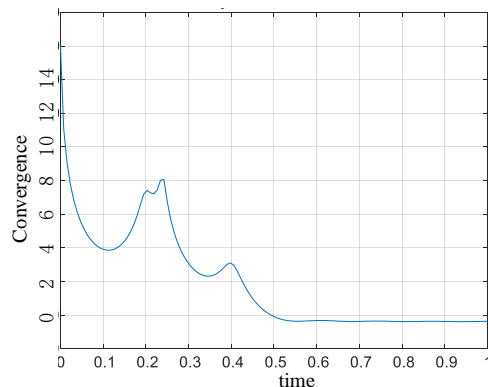
Figure 6: Convergence.

(3) Security principle. On the one hand, the security of the interactive interface means that the key function trigger link should be placed in a location that is not easy for users, such as the delete function of messages and resources; on the other hand, it means that the interactive interface should start from the interactive process to ensure data security, such as when the user logs in. Verification function, confirmation menu when deleting data, etc. In the WEB-based network physical education system interface design, according to the operating habits of students and teachers, learn from the traditional network physical education system interface design examples to design and layout the system function menu, so that the system interface meets the needs of most users as much as possible. The convergence is shown in figure 6.
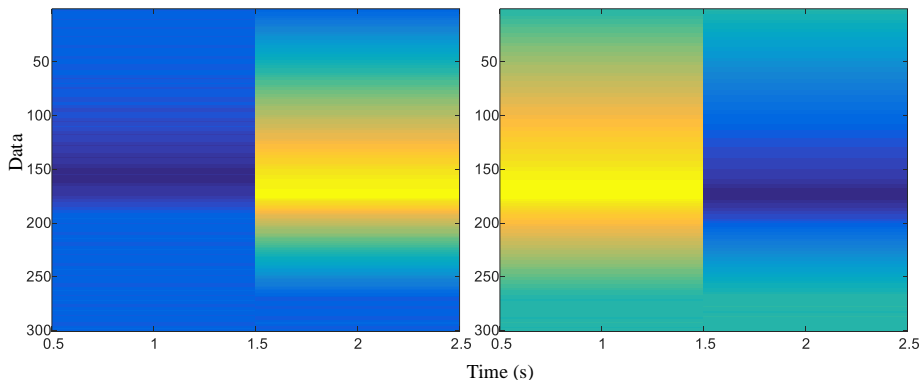
Figure 7: Data variation.

4   CONCLUSION

The application to physical education is aimed at making up for some shortcomings in teaching, complementing each other, and complementing each other for students and even students. Sports workers in the whole society provide space for continuing education; it is the only way to explore a new physical education model that achieves two-way benefits in education quality and education costs and realize network technology-assisted physical education as soon as possible. This article analyzes the principles of the Web-based intelligent computer-assisted physical education system from the basic theory and educational methods, introduces the structure of the Web-based intelligent computer-assisted teaching system, and explains in detail the functions of the four main modules: the system implementation is discussed the key technologies include knowledge base, student model and teacher model. At the same time, the prospects for the development of Web-based intelligent computer-assisted teaching system are prospected.

Kaiya Xu, https://orcid.org/0000-0002-0067-4561
Zhonghua Lin, https://orcid.org/0000-0003-4903-5346

REFERENCES

[1]   Hu, Y.: Realization of Intelligent Computer Aided System in Physical Education and Training, Computer-Aided Design and Applications, 18(s2), 2021, 80-91. http://doi.org/10.14733/cadaps.2021.s2.80-91
[2]   Zhang, J.: Research on the Construction of a New System of Computer Based Whole Brain Physical Education Teaching and Training Method, Journal of Physics, Conference Series 1992(3), 2021, 1-9. http://doi.org/10.1088/1742-6596/1992/3/032022
[3]   Yin, J.: Thoughts on the Construction of Physical Education Teaching Innovation System in Colleges and Universities//Proceedings of 2019 7th International Education, Economics, Social

Science, Arts, Sports and Management Engineering Conference (IEESASM 2019). Clausius Scientific Press,2019, 949-952.http://doi.org/10.26914/c.cnkihy.2019.041506

[4]   Teng, Z.; Cai, S.: Application of Computer-Aided Instruction (CAI) in the Physical Education: Survey Analysis of Chinese Universities, Journal of Healthcare Engineering, 2021, 2021, 1328982-1328982. http://doi.org/ 10.1155/2021/1328982

[5]   Yuan, Y.: Design and Realization of Computer Aided Music Teaching System Based on Interactive Mode, Computer-Aided Design and Applications, 18(s2), 2021, 92-101. http://doi.org/10.14733/cadaps.2021.s2.92-101

[6]   Le, D.; Biswaranjan, A.; Ajaya, K.; Jyotir, M.; Raghvendra, K.: NoSQL Database Classification: New Era of Databases for Big Data, International Journal of Knowledge - Based Organizations, 9(1), 2019, 50-65. https://doi.org/10.4018/IJKBO.2019010105

[7]   Yael, R.; Ayelet, G.; Amit, R.: Identifying attributes of public transport services for urban tourists, A data-mining method, Journal of Transport Geography, 93, 2021, 134-144. https://doi.org/10.1016/J.JTRANGEO.2021.103069

[8]   Filip, E.; Andrea, H.: Big Data: a Source of Mobility Behaviour and a Strategic Tool for Destination Management, Czech Journal of Tourism, 8(2), 2019, 85-102. https://doi.org/10.2478/CJOT-2019-0006

[9]   Cheng, M.; Jin, X.: What do Airbnb users care about An analysis of online review comments. International Journal of Hospitality Management, 76, 2019, 58-70. https://doi.org/10.1016/j.ijhm.2018.04.004

[10] Baltasar, G.; Ortin, F.: A didactic object-oriented, prototype-based visual programming environment, Science of Computer Programming, 176, 2019, 1-13. https://doi.org/10.1016/j.scico.2019.02.004