Application of Computer Visualization Technology in Intelligent Education Management

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Abstract. The rise of education informatization, big data and cloud computing has brought new opportunities for education management. Combined with the development of artificial intelligence and the needs of education in the new era, this paper introduces the concept of visual management to build a smart education management system of smart teaching, smart environment, smart management, smart evaluation, smart research and smart service. Taking Hunan Industrial and Commercial University as an example, this paper explores the practical contents and application scenarios of the construction of education management system through the application of visualization technology in intelligent education management, and promotes the school management behaviors such as educational resources, teaching environment, teaching evaluation, teacher-student activities, security and other school management behaviors to a new height, Finally, the adjustment and optimization direction of visual application of education management system is prospected.

Keywords: Smart education · Education management system · Big data · Visualization

1 Introduction

With the rapid development of Internet of things, cloud computing, big data, ubiquitous network, artificial intelligence and other new technologies, China's education management has entered the intelligent era rapidly. Artificial intelligence has rapidly promoted the change of educational ecology and has a wide application prospect in the field of education, which can effectively overcome the shortcomings of traditional education [1]. In the era of intelligence, it is an inevitable trend of history to carry out wisdom education in an all-round way. The integration of cloud computing and big data and other information technologies into the society provides a support platform for smart education. The horizon report (Higher Education Edition) released by the new media alliance has repeatedly mentioned that intelligent information technologies, such as artificial intelligence,

virtual technology, robot, Internet of things, blockchain and visualization technology, are helpful to education reform. Under this background, the ten-year development plan of education informatization (2011–2020) puts forward the requirements of "promoting the deep integration of information technology and education teaching"; while the action plan of education informatization 2.0 proposes to promote the construction of intelligent teaching system of colleges and universities facing the new generation network, and comprehensively build the public service system of education informatization, We should strive to achieve the three major goals of the "two high" strategy.

2 Construction of Intelligent Education Management System

The construction of intelligent education management system is the direction of the development of higher education informatization in China, which can promote the development of school education and teaching and meet the needs of selecting innovative talents in the new era. In the future, the development of education informatization in Colleges and universities in China will develop towards the trend of full integration of teaching resources, informatization of data, unification of management standards, and intellectualization of evaluation system. Based on the smart campus data center, this research has built a smart education management system by making full use of the digital campus environment, Internet of things, cloud computing, big data, ubiquitous network and other technologies. This system realizes six kinds of smart education businesses, including smart teaching, smart environment, smart evaluation, smart management, smart research and smart service, and provides new interactive application scenarios for teachers, students, parents, managers and other users, integrating teaching, evaluation, scientific research and management with the new big data application platform, It is used to realize the visibility of information perception, the clarity of application interaction, the flexibility of educational means and the timeliness of service response. At the same time, the availability of intelligent education management system is guaranteed by visual security platform, which reflects the fusion characteristics. It makes intelligent and advanced classroom teaching environment, ubiquitous network learning platform, transparent and efficient education management system, innovative network research environment, accurate and reliable teaching evaluation system and online and offline intimate teaching service platform become reality [2].

3 Interactive Technology of Surface Rendering and Visualization Based on MC Algorithm

3.1 Fundamentals of Surface Rendering Algorithm

Definition of voxel: eight adjacent points in the upper and lower layers of volume data field, as shown in Fig. 1. These eight points are called voxel corners, and their gray values are called voxel values. If medical imaging equipment samples uniformly in X, y and Z directions, the voxel values of any point in voxel can be represented by the combination of voxel values of eight vertices of voxel. In order to determine the way of
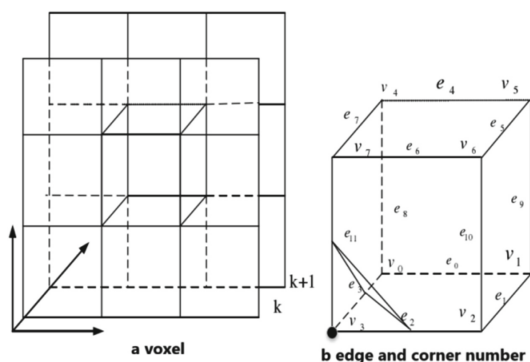
Fig. 1. Definition of voxels.

contour cutting voxels and find the configuration of voxels quickly and conveniently, 8 corners and 12 edges of voxels are labeled.

If the layer spacing is much larger than the pixel spacing, the volume data field should be normalized, that is, the spacing of voxel x, y, Z is changed to 1:1:1. The normalization of volume data field is mainly divided into three steps: first, determine the standard value D of data field normalization, find out the minimum distance from X, y, Z, and regard it as the standard value, which is generally selected from the XY direction; second, two-dimensional image normalization, changing the spacing of X and y to D; third, normalizing the image sequence along the z-axis direction, so that the spacing of X, y, Z becomes D, so that x, y, Z are changed to d, The distance between Z becomes 1:1:1.

3.2   Isosurface

The purpose of surface rendering algorithm is to construct isosurface which can represent three-dimensional object from volume data. In the introduction of voxels, we learned that the voxel values of non sampling points can be represented by the combination of voxel values of eight corners of voxels, so any point in voxels has physical significance, because according to the principle of MRI image and CT image imaging, the same tissue should have the same pixel value [3]. The combination of points with the same voxel value will inevitably form one or more surfaces, such a surface is called isosurface. Different tissues of human body can be represented by selecting appropriate isosurface. According to the above expression, the isosurface can be expressed as:

$$\{x, y, z | f(x, y, z) = c\}, \text{c is a constant} \tag{1}$$

In the process of 3D reconstruction, the general 3D reconstruction algorithm uses geometric patches to simulate the isosurface in voxels to simplify the calculation. The moving cube algorithm introduced in this chapter is to generate triangular patches in voxels, which are used to simulate the isosurface, and finally draw the three-dimensional model.

3.3 Calculation of Vertex Position of Triangular Patch

The basic assumption of MC algorithm is that when the density of 3D discrete data is large, voxel values can be considered to vary linearly along the edges of voxels. Based on the above assumptions, the spatial positions of the vertices of the triangular patch can be calculated by linear interpolation.

When L is parallel to x direction, the threshold value of isosurface is c, and the calculation formula of x is as follows:

$$x = i + \frac{c - f(v_1)}{f(v_2) - f(v_1)} \tag{2}$$

4 Simulation for Teacher Portrait and Student Portrait System

Through the data fusion and mining of teaching administration system, personnel system, scientific research system, library system, network behavior management system and other data samples, we can record, track and master the students' learning characteristics, life rules and network usage in the whole process and all-round way, so as to design flexible learning and life paths for students, and dynamically adapt and adjust education policies, The implementation of intervention education management will eventually return to the "student-centered" nature of education. The student portrait system shows the trend of students' personal achievement, the optimal value of GPA, and the comparison of the optimal value of excellent courses. It can provide learning suggestions for teachers and students through the predictive analysis engine [4]. Simulation for Teacher portrait and student Portrait System are shown in Fig. 2 and Fig. 3.

In order to ensure the safe and stable operation of the education business system, the campus network has deployed the next generation firewall, network behavior management, database audit, intrusion detection, vulnerability scanning system and other security systems. Due to the massive security logs generated by various security systems
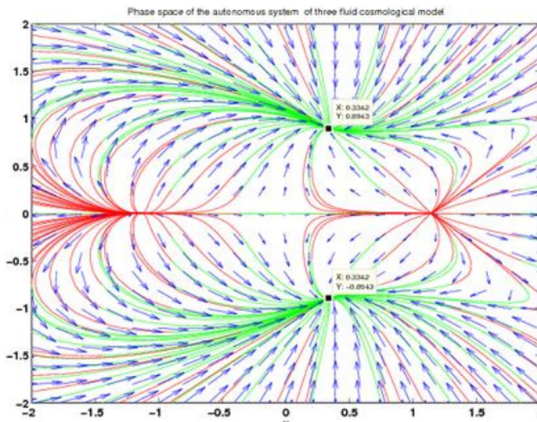
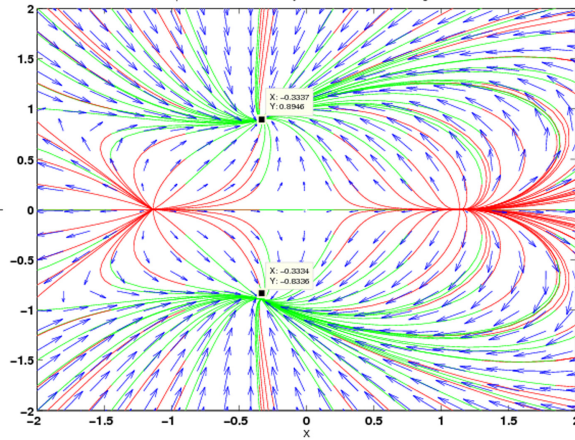

Fig. 2. Teacher portrait system

Fig. 3. Students portrait system

every day, and it is difficult for system administrators to analyze the security status, weak links and attacked objects of campus network from these text information, in order to make the systems more easily perceived and respond in time, the university has developed various visual security platforms, So as to ensure the stable and safe operation of various businesses.

5 Demand Analysis and Development Strategy of Smart Education Platform

5.1 Demand Analysis of Smart Education Platform

Based on the analysis of the current situation and problems of the existing smart education platform, we can find that a perfect smart education platform needs to realize the following aspects: smart learning and teaching, provide students with diversified online learning methods and real-time interactive functions, and carry out knowledge construction with information technology, so as to realize personalized learning. We need to gather excellent teachers in the field of education, establish a huge network teaching team, realize teachers' timely online guidance and resource sharing, and let teachers become the designers, organizers and instructors of students' platform learning and platform activities. In terms of intelligent management, the teaching management of the platform needs more effective, faster and more convenient technical environment support. Visualization and automation of the platform operation, real-time monitoring of the education and teaching status of the platform, and the realization of comprehensive remote guidance. The real-time communication and cooperation of each system of the platform can realize seamless information exchange and business cooperation. The corresponding teaching information, teaching resources and platform services are pushed to users through the situational perception of learning and teaching [5].

In terms of intelligent scientific research and evaluation, the platform's scientific research and evaluation need to rely on big data technology, change from experience

based to data-based, and conduct more diversified and intelligent analysis and evaluation of various sources in the platform's teaching process. At the same time, cloud storage technology is applied to permanently store the classified data in the cloud, so as to regularly evaluate the development of users and put forward more targeted development suggestions [6].

5.2 Development Strategy of Smart Education Platform

From the demand analysis of smart education platform, we can find that the current smart education platform has many shortcomings in platform construction and development, smart teaching, smart learning, smart management, smart research, smart evaluation, smart service and so on. Therefore, for the future development needs of smart education platform, the following aspects should be realized:

(1) The construction and development of smart education platform should show the educational concept of smart education and realize the educational demand of smart education. The most important thing is that the national government must formulate specific theoretical guidance, overall planning, unified industry construction standards and operation specifications for the construction and development of the smart education platform, so that the smart education platform has a clear development direction and goals in the process of construction, development and operation, Unified construction planning industry standards and reasonable platform organization classification and system guarantee. So as to ensure the infrastructure construction and system application development of the intelligent education platform, promote the large-scale promotion and comprehensive application of the intelligent education platform, and improve the dynamic monitoring and supervision mechanism, fundamentally promote and ensure the construction and development of the intelligent education platform, and avoid all kinds of problems caused by the system confusion.

(2) In the initial stage of platform construction, it is necessary to formulate the corresponding internal comprehensive and standardized construction and operation scheme of the platform. From the classification and arrangement of teaching courses to the certification and examination of curriculum resources; from the certification of teachers' technical ability and qualification level to the empirical investigation of schools (educational institutions); from the integration of education and teaching forms (video broadcast, online live broadcast, real classroom assistance, etc.) to the intelligent teaching process (interactive classroom, virtual practice, etc.); From diversified teaching exchange and discussion methods to reasonable and humanized platform service settings, from standardized and concise platform management mechanism to scientific and empirical scientific research data analysis and evaluation, we must formulate platform construction and operation standards with comprehensive scope, continuous development and scientific theoretical basis [7].

(3) To establish a smart education platform serving users, smart education platform should be truly integrated into the current people's learning and life, and become a necessary tool and primary way for all kinds of users in the process of education and learning. First of all, it is necessary to improve the information technology

literacy of all kinds of users (including students, teachers, schools, etc.) in the intelligent education platform learning, so that all kinds of users in the platform can achieve barrier free learning and communication; at the same time, according to the education and teaching needs of all kinds of users, the platform should be able to develop a perfect online course learning system [8].

(4) Strengthen the management system of smart education platform. The construction and operation of smart education platform need a comprehensive, standardized and mandatory platform management system. The comprehensive management of smart education platform, first of all, is that the platform should aim at the different needs and behaviors of all kinds of users, and formulate a management system that can cover all aspects of platform operation. Then, the management system of smart education platform should be in line with the actual experience needs of users and relevant platform development specifications. Finally, the management system of the platform should be enforced to every aspect of the platform operation and development. Only by strengthening the management system of smart education platform, can we effectively regulate, control and improve the platform curriculum production and teaching practice of teachers (lecturers) and schools (educational institutions), and create a safer, more reasonable and more scientific learning environment for students.

6 Research on the Design of Smart Education Platform

6.1 Overall Design Architecture of Smart Education Platform

From the research on smart education platform, we can see that information technologies such as Internet, cloud computing, big data, mobile communication, Internet of things and artificial intelligence are the foundation of smart education construction, so the construction of smart education platform framework is destined to be a project set up at the top of information technology and education resources, It is a systematic education project with large scale, high technical difficulty, complex frame structure and extensive aspects. Therefore, we must make a unified overall planning for the construction of the platform, so that the construction and development of the platform can truly meet the needs of the concept of wisdom education, adapt to the needs of the development of education, integrate the educational resources of all parties, solve the current situation of the wisdom education platform, and design a scientific and reasonable wisdom education platform [9].

In the construction of smart education platform, infrastructure/equipment providers, software/application developers and banks/financial institutions should make full use of cloud computing, Internet of things, big data and other resources, and rely on cloud storage, parallel computing, data mining and virtualization technology (mware) to design cloud server and various virtualization software for smart education platform, In order to develop the necessary mobile learning system, intelligent teaching system, intelligent management system, data resource center system and other systems, as well as the application software to meet the development requirements. At the same time, all the daily maintenance and security protection of the platform (storage data security, network system security, terminal platform security, data backup) also need the technical

and financial support of various providers and financial institutions. Local governments and education departments play a leading and regulatory role in the construction and development of smart education platform. National education guidelines and policies are conveyed to all departments of platform construction and maintenance through local governments and education departments; similarly, for all kinds of situations in the operation of smart education platform, local governments and education departments also play a regulatory role, so as to make the construction of platform follow the development direction of national education.

6.2 Overall Hierarchical Structure of Smart Education Platform

In the intelligent education platform, the design and construction of the platform can be divided into user layer, terminal layer and application layer according to different organizational stages [10].

(1) User layer. The user layer of smart education platform includes two aspects: users and administrators. Specifically, it mainly includes students, teachers, parents, the public, administrators, schools and educational institutions. In the smart education platform, different users can log in to the corresponding platform service section according to different permissions, and use or manage all kinds of smart education services within their permissions [11].

(2) Terminal layer. The terminal layer of smart education platform refers to the necessary intelligent terminal devices for all kinds of users to use the platform system [12]. Specifically, it includes smart phones, iPads, computers, cameras, infrared sensors, heart rate sensing bracelets and other smart education wearable devices. The use of all kinds of intelligent terminal devices can not only optimize the user's experience in the learning service of the intelligent education platform, but also enable the platform to collect all kinds of relevant data through the use of users, providing data support for the mining and analysis of educational big data [13].

(3) Application layer refers to all kinds of application systems specifically set up for different levels and directions of learning needs and service needs in the smart education platform [14]. It mainly includes smart campus, smart classroom, digital library and distance teaching. Smart campus and smart classroom are oriented to all kinds of students and teachers. Through the construction of smart education platform, the data center, multimedia classroom, voice classroom, computer room, staff office, student dormitory and Library in real middle school can be connected with each other; at the same time, the schools can be connected with each other [15]. So as to realize the effective integration and sharing of various educational resources and optimize the distribution of educational resources. Shuyu library is an educational and learning sharing resource that is open to all users in the intelligent education platform through the Internet by using digital technology to process and store the existing library resources.

7   Conclusion

With the prevalence of big data and artificial intelligence, colleges and universities need to integrate all kinds of resources inside and outside the school, build a data sharing

platform, improve the digital literacy of teachers and students, accelerate the deep integration of modern information technology and teaching practice, and explore a new education management system and a new mechanism of education and teaching operation in line with the era background. At present, the visualization application of smart education management system is still in the primary stage, which needs to be continuously adjusted and optimized, and implemented and promoted step by step. Knowledge map, word cloud and 3D technology are the means and tools of knowledge visualization for harmonious integration of education and technology. Whether it is static or dynamic graphics and images, whether it is two-dimensional or three-dimensional space, technology can give it new functions to change the teaching mode and method of teachers, optimize the cognitive ability of learners and promote their learning ability. The goal of wisdom education is no longer to cultivate knowledge-based talents, but innovative talents. To achieve this goal, the innovation of teaching means is indispensable.

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