Research on Educational Content Service Platform Based on Virtual Reality Technology

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Abstract: The virtual reality content service platform is studied in this paper. The integrated system platform such as blockchain technology, face recognition technology, big data analysis system and deep learning technology being the VR content distribution center, the artificial intelligence recognition system based on virtual human beings, and the whole body precision motion capture technology and laser optical positioning being the terminal performance products are integrated. The platform can break the constraints of space and time, create new virtualized and immersive learning scenarios, enrich classroom-teaching contents, create open learning mode, and transform traditional learning methods.

1. Introduction

In the Decision of “Accelerating the Development of Modern Vocational Educationpromulgated by the State Council”, the effective mechanism of expanding the coverage of high-quality educational resources by means of information technology is clearly put forward to support the development and application of VR virtual simulation training system matched with professional courses. In January 2017, “the Notice of the Thirteenth Five-Year Plan for the Development of National Education” is issued by the State Council, which mentioned that everyone should actively develop "Internet + Education", and make every effort to promote the deep integration of information technology and education and teaching, and explore new models of education and teaching in the future by making comprehensive use of Internet, big data, artificial intelligence and VR technology. At the same time, it is emphasized again that we should promote the construction of network simulation training environment in Vocational schools. Therefore, the state gradually attaches importance to the construction of educational informationization, and the policy is good to promote the improvement of educational informationization.

From the perspective of teaching, the current educational content mainly comes from teachers' lectures and Internet video explanations. Therefore, the resources are taught in a single way, the content is monotonous, the resources are not rich enough, and the diversity is lacking[1]. Building a virtual reality education service platform can integrate scattered high-quality VR resources, so that schools and students can access the knowledge of substantive and effective use.

In the information age, the teaching methods and the efficiency of teaching are both affected by science and technology. It’s difficult to clarify some inaccessible knowledge, objects, concepts, traditional methods of education or experience. Safety education can only exist in the form of bulletin boards or become formalistic, so that students cannot have figurative understanding and real feelings[2]. The contents uploaded by the virtual reality education service platform are highly immersive VR products, which can bring students the most intuitive feeling.

When the school conducts classroom teaching, especially safety education and training, the virtual reality educational content service platform includes the functions of online content construction and offline equipment landing, which can make up for the shortcomings of the hardware and software application system in education because of the limited class sessions,

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incomplete hardware equipment or high-end cutting-edge teaching equipment, and slow update speed[3].

This study will promote the use of VR classrooms and content service platforms in the the primary and secondary schools in the whole province, use virtual reality technology to break the space and time constraints, and create a new virtualized & immersive learning scenarios. VR education practice will be promoted and construction and operation mode will be comprehensively innovated. Safety education content material support platform will be developed and educational resource pool will be built. The integration and development of information technology and education and teaching will be deepened and the process of education modernization will be accelerated.

2. Designation of the System Frame

The platform is implemented using the logical framework shown in Figure 1. Build a content service platform based on blockchain technology, face recognition technology, big data processing technology for smart terminals, cloud-linked online content service platform of decentralized VR copyright content payment system, link optical positioning and motion capture as the core of the technology, and present products' offline experience section with mobile classrooms as the terminal to create blockchain content service platform.

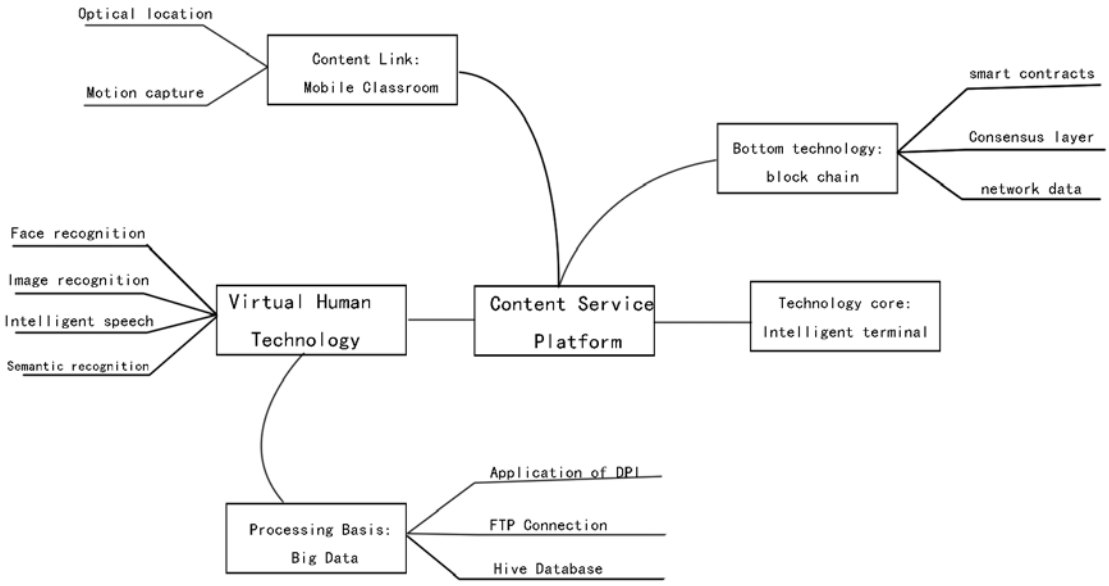

Figure 1 System overall logical framework

3. VR classroom construction plan

The optical positioning technology captures the moving objects according to the infrared camera and transmits them to the corresponding computer server terminal according to the heat feedback and image data feedback of the objects themselves. The video objects are inversely calculated by the visible light tracking system[4], and then the obtained image signals will be transformed into the digital signals and sent to the computer software terminal. The corresponding digital signals will be transmitted to the VR engine, and the engine will calculate the digital signals, and then synchronizes them into the VR animation model connected, thereby performing spatial positioning and motion simulation of infrared shooting on the objects. The objects to be photographed need to be connected with corresponding positioning signals, and the marking points can autonomously emit optical signals or reflect point signals transmitted by the positioning system, so that the marking points in the image captured by the camera can be clearly distinguished from the surrounding environment. After the camera captures the marking points on the targets, the images

captured by the multiple cameras from different angles are transmitted to the computer, and the useless information is filtered by the visual algorithm to obtain the position of the marked points. It should be added that the positioning method requires multiple positioning instruments to perform omnidirectional tracking and positioning of the targets, and at least two images with the same marking points perform sub-pixel extraction and matching operations to calculate the spatial position of the targets[5]. The optical positioner is installed as shown in Figure 2.

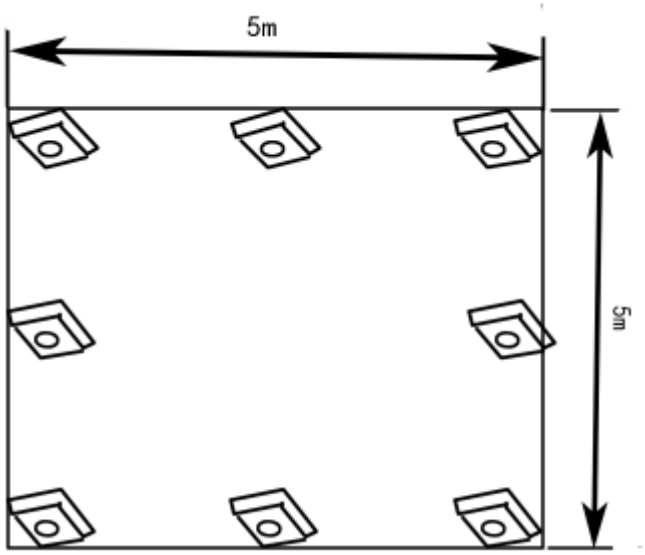

Figure 2 Basic area locator installation diagram

4. Online cloud platform construction plan

Build a cloud distribution platform with tasks such as task release, content distribution, resource management, community operation, and payment management as the core functions, and build a link between the virtual reality content creation company and the B-end (school-based) virtual reality content needs organization. Integrate the content requirements of virtual reality and standardize content resources[6-7], and distribute and manage content according to the actual needs of the B-end, thereby forming a VR platform industry chain with virtual reality content services as the core for the B-end (school-based) market and a new virtual reality ecosystem that serves the future of virtual reality education market.

Demand release: The platform supports the demand release of B-end (mainly school-based). After the demands are reviewed by the platform, they can be connected with corresponding content creators to meet the needs for VR educational content of the B-end (school-based) market, thus integrating the supply and demand resources in the VR market currently.

User management: Manage the B-end VR classrooms, VR offline experience halls, VR creation companies and other registered users, including basic information, historical cooperation information, experience feedback information, and membership level, etc.

Payment management: The B-end can select the corresponding content and make payments according to the actual demands. After the platform confirms the payments, make point-to-point distribution of the corresponding content, and the payments are paid to the content creators according to the prior agreement of the platform.

Content distribution: After the platform confirms the payments, it will make point-to-point distribution of the corresponding content to the B-end users. After the B-end user experience is completed, the platform generates the experience report to feedback the experience results, especially the fire safety education, traffic safety education, etc. Feedback can track the actual effect of each student in real time, and can also provide closed-loop feedback on supplier content updates.

Resource management: Resources are the core of the platform. There are two aspects of resources. One is the company's self-made resources. Currently, the main focus is the security education module, including VR fire safety education and VR traffic safety education. The other

aspect is the resources uploaded by creation teams. This part of the resources needs to be reviewed by the platform team and standardized according to the B-end hardware adaptation, so content standards need to be developed.

B/S architecture is used in this system, and J2EE is used as the development platform, MYSQL database and EJB is also used.

The platform is connected through the internet to create a "cloud distribution platform" for VR content, connecting online content providers with off-line VR mobile classroom terminals. By integrating existing resources and using cloud transmission technology, VR movies can be distributed to VR mobile classrooms in different locations over a long distance through network channels. Each VR mobile classroom terminal can download the project according to its own needs and pay a corresponding paid commission.

After the completion of system development, the large data processing analysis and terminal operation of artificial intelligence are added, and the corresponding virtual human system is added. When users use VR content, they will have virtual human to assist in collaboration and act as intelligent steward in traditional video platform. Unlike traditional video platform, this role has human body image and AI function.

Not only that, the experience data of each user will be transferred to the server database. With the large data algorithm, which can count and process the relevant data information. After the completion of large data processing, it will be fed back to the content platform to make it more rich and perfect.

5. Conclusion

Three aspects is discussed in this paper:(1) Combining with advanced panoramic video real-time mosaic, stereo display technology, eye tracking technology, head-controlled gyroscope technology, optical positioning technology and virtual scene sound positioning technology, building B-end (school-based) VR mobile classroom to carry out somatosensory interaction under the setting of the main body of education; (2) Building virtual-Reality Education Content Service Software Platform, it realizes task publishing, content distribution and B-terminal management, publishing educational service content of B-end according to individual needs, realizing the unified management and service of multi-B-end content; (3) Establishing virtual reality education mode of integrated online and offline management, forming virtual reality content for B-end (school-based) and virtual reality content as the core VR platform, which serves the education market of virtual reality in the future, and solves the difficult problem of safety teaching in the process of primary and secondary education, so as to enhance the self-rescue ability of primary and secondary school students before disasters.

There are some innovations in this paper. Firstly, Optical positioning and advanced inertial motion capture technology are used to achieve point-to-point capture without delay. Secondly, the block chain cloud distribution system which based on the block chain high-speed cloud transmission mechanism is constructed to realize the remote distribution of VR content to various landing VR mobile classrooms. It has the advantages of fast transmission speed, high transmission success rate, safe and stable operation, strong expansibility and easy deployment and maintenance. Thirdly, by adding the corresponding virtual human system, when users use VR content, there will be virtual human collaborative assistance, as the role of intelligent steward in the traditional video platform; Finally, through face recognition technology, each user's digital information is read and the experience data will be transmission to the server database, using the big data algorithm to produce each student's experience report, and the report is used for managers to monitor and evaluate the experience results.

This research applies virtual reality technology to student education and learning, breaks the space and time constraints, creates a new virtualized and immersive learning scenarios, enriches the classroom teaching content, creates open learning mode, and transforms the traditional learning style[8]. It has solved the problem of safety teaching that is difficult to operate in the process of primary and secondary education, so as to improve the self-rescue ability of primary and secondary

school students across the country when disasters occur. With the school as the service unit, the safety education content will gradually cover the history, humanities, tourism and other educational fields, so that students can master the knowledge difficulties in an all-immersive and entertaining environment.

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References

[1] Wang Cixiao, Li Heshan, Junjie. (2017) Application and development prospects of educational games based on virtual reality and enhanced reality. China's audio-visual education, 8, 99-107.

[2] Sou Jjintao. (2017) Design and Implementation of University Fire Safety Education System Based on Virtual Reality Technology. Master's Degree Thesis of Central China Normal University, 14-43.

[3] Zhao Qing, Li Xinliang. (2013) Research on Virtual Reality Modeling Technology Based on 3DSMAX. Electronic Testing, 5, 84-87.

[4] Meng Xiangxiang. (2015) Research on Optical System of HMD with Large Field of View Virtual Reality. Ph.D. Dissertation of Chinese Academy of Sciences University, 2, 43-101.

[5] D. Hayes, C. Turczynski, J. Rice, et al. (2014) Virtual-reality-based educational laboratories in fiber optic engineering. Proc. of SPIE, 11, 9289-9310.

[6] D.W. Cheng, Y.T. Wang, H. Hua, et al. (2011) Design of a wide-angle, lightweight head-mounted display using free-form optics tiling. OPTICS LETTERS, 36(11), 2098-2100.

[7] J.A. Piao, G. Li, M.L Piao,et al. (2013) Full color holographic optical element fabrication for waveguide-type head mounted display using photopolymer. Journal of the Optical Society of Korea, 17(3), 242-248.

[8] Zahira Merchant, Ernest T. Goetz, Lauren Cifuentes, Wendy Keeney-Kennicutt, Trina J. Davis. (2014) Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. Computers & Education, 11, 1102-1114.