

Xi'an Eurasia University Campus Metaverse—The Exploration of Digital Twin Applications for Library

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Abstract: The purpose of this paper is to explore the development of digital twin application in the campus of Xi'an Eurasia University. Firstly, the paper introduces the development of digital twin and the relationship between metaverse and digital twin, as well as the development and transformation planning of digital campus of Xi'an Eurasia University. Secondly, the development trend of the campus metaverse is discussed through the analysis of domestic and international research situation and the introduction of the Unreal Engine V. Then, the establishment of the digital twin model of the library is highlighted, and the solution of the digital twin problem by UE5 is expounded. Finally, the possibility of learning in virtual environments and the value of building campus metaverse are presented in the light of the possible crises faced. The research of this paper is of great significance to the development of library digital twin service, and provides new ideas for improving students' learning efficiency and experience and realizing teaching innovation.

1. Background

Campus metaverse and digital twin are both development trends of digital campus, but they have different concepts and application modes.

1.1. The Development of Digital Twin

The digital twin is first proposed by Professor Grieves M.W. [1], is the technology of real-time synchronization of physical entity and digital model. Through digital technology, all-directional, multi-angle and high-precision modeling of entity can be simulated, analyzed and predicted in the digital world.

The campus digital twin is the digitisation of the physical site at university, the creation of digital models and their synchronisation to the virtual environment for all-round monitoring and management. The development of campus digital twin plays an important role in the construction of digital campus. With the continuous development of technologies such as the Internet of Things, cloud computing, and artificial intelligence, campus digital twins are gradually transitioning from concept to practical application [2]. It can be seen from three aspects: data acquisition and modeling technology, application scene expansion, system integration and open platform construction. The development of campus digital twin can provide more accurate and comprehensive data support for

the university, improve the efficiency and quality of teaching and management, and promote the in-depth development of campus digital construction [3].

1.2. The Relationship between Metaverse and Digital Twin

The campus metaverse is a combination of physical and digital scenes from the campus to build a virtual 3D space that provides immersive interaction and cooperation for students, teachers and administrators to facilitate learning and teaching [4]. The campus metaverse can provide more individualized and interactive learning experience, and offer teachers with more flexible and innovative teaching methods. Campus digital twins not only digitize buildings, but also digitize teaching scenes such as classrooms, laboratories, and sports fields, providing more comprehensive and in-depth data support, and supporting more precise and efficient teaching and management activities [5].

The campus metaverse and digital twin technology are the development trend of digital campus. The campus metaverse creates a virtual world, providing personalized and interactive learning experiences that are suitable for teaching activities. Teachers can even set any image they like according to their preferences - the teaching teacher may also be Sima Qian or Einstein [6]. Digital twin technology focuses on the synchronization of entity and digital model, providing accurate and comprehensive data support, and is suitable for university management decision-making. Both have their advantages and can be applied in combination.

1.3. Development and Transformation Planning of Digital Campus of Xi'an Eurasia University

The digital transformation of Xi'an Eurasia University is a key plan, aiming at promoting the development of digital education, management and service, improving the digital level of the university and enhancing the competitiveness of the university. This strategy is closely related to campus digitalization and digital twin.

Digitalization is an important part of campus digitalization. The development of digital teaching, digital management and digital service all depend on the support of digital technology. Digital campus refers to the use of digital technology to upgrade and reform the campus in an all-round way to improve the level of campus management, service, teaching and so on. Therefore, digitalization is the premise and foundation of realizing digital campus and digital twin is an important means to achieve digital campus [7].

Xi'an Eurasia University's digital campus development strategy relies on the application of digital and digital twin technology. The strategy includes the construction of digital teaching resource center, digital campus management system and digital campus service center. The support of digital technology is the key to the implementation of digital campus management and services. Digital twin technology also plays an important role in digital campus strategy, such as campus construction planning and environment optimization. The application of digital and digital twin technology is an important part of digital campus strategy.

2. Campus Metaverse

2.1. Current Status of Domestic and International Research

The campus metaverse is an emerging field, which has received extensive attention and research in both academia and industry. The following is a review of the research in the campus metaverse:

Academic research: The research on the campus metaverse mainly focuses on the exploration of

application scenarios and the improvement of interactive technology. For example, virtual reality technology is used to establish a virtual classroom to realize more immersive learning experience [8]; augmented reality technology is used to construct a virtual laboratory so that students can carry out more realistic experiment exploration; artificial intelligence technology is used for learning analysis and intelligent evaluation to realize more personalized and educational teaching.

Industry research: In the industry, some companies have begun to explore the business model of the campus metaverse, and have carried out the research and development and practice of some related products. For example, Virtro, a VR education company, has teamed up with Edmodo, an academic social networking platform, to develop a virtual reality-based learning application; Classcraft, an education technology company, has developed a virtual game-based teaching platform to help teachers and students achieve a more fun and engaging learning experience.

Campus practice: Some universities also began to try to introduce the campus metaverse into educational teaching. For example, Michigan State University in US has built a virtual classroom based on virtual reality technology, in which students can learn and explore. Beijing Jiaotong University in China has developed a virtual navigation system based on augmented reality technology, allowing students to more easily understand various places and resources on the campus.

In conclusion, the research status of the campus metaverse is still in the preliminary stage, but with the continuous development and innovation of technology, it is believed that a growing number of academic institutions and enterprises will begin to pay attention to and explore this new field, providing richer and more diverse ideas and methods for the construction of digital campus.

2.2. Revolutions to Digital Twin and Metaverse with Unreal Engine 5

Unreal Engine is a game engine that provides powerful creative tools and modern technology for building applications such as virtual reality, augmented reality and metaverse. The release of UE 5 has brought about an important revolution in the campus metaverse. First of all, UE5 features advanced ray tracing and global lighting effects, enabling a more realistic visual experience and improving students' learning interest and participation. Secondly, UE5 adopts the open source authorization mode and provides a series of development tools and learning resources, which makes the development of the campus metavers easier and more open and promotes the rapid development. In addition, the application of Unreal 5 has good cross-platform compatibility, providing students with more flexible and diverse learning methods. Unreal 5 also adopts machine learning and artificial intelligence technology to realize personalized intelligent interaction and intelligent data analysis, enhance the user's immersion and interactivity, and help the university to better optimize the application effect of campus digital twin. To sum up, the release of Unreal Engine V will further promote the development and application of the campus metavers and digital twin, and provide better technical support and development opportunities for the digital transformation of the university.

3. Digital Twin Model of Library

Campus library is an important resource and knowledge center. How to use digital technology and metaverse model to improve the service quality and user experience is the current hot research direction.

The library's space and resources are modeled digitally to create a virtual 3D world in which users can freely browse, search and borrow the library's resources. The model can realize more real and intuitive spatial experience and interactive experience, and enhance the participation and satisfaction of users [9].

The model of campus library can be realized by virtual reality and augmented reality technology. Through virtual reality technology, users can freely browse and find books in the virtual library, and

even can borrow and read electronic books. With augmented reality technology, users can scan the labels of a book in a library through a mobile phone or other device to obtain detailed information about the book, such as borrowing status, recommended titles, etc [10].

Combining the digital twin technology, a digital model is established to monitor, predict and optimize the library operation efficiency and service quality in real time, so as to provide efficient and personalized services. Based on big data analysis and artificial intelligence technology, optimize resource allocation and service strategy, and realize intelligent Q&A and recommendation functions.

3.1. UE5 Solves the Problem of Digital Twin

The UE5 game engine can improve the rendering quality and realism of the 3D model of the campus library, and realize more realistic lighting, material effects and interactive experience through real-time ray tracing technology and physical simulation. In addition, the use of efficient development tools and programming languages allows for the rapid development of high quality models and cross-platform support allows more users to work on different devices. The use of the UE5 game engine can improve user experience and development efficiency while reducing production costs.

4. Digital Twin Service of Library

Campus library metaverse and digital twin models have many benefits, including increased interactivity, personalized services, visualization of statistics, reduction of physical space pressures, and facilitation of digital transformation. By using virtual reality and augmented reality, students and teachers can more intuitively understand the layout, books and resources of the library, and use gestures and voice commands to operate the virtual interface, increasing interactivity and entertainment. Digital twin technology can make visual statistics on the use of the campus library and all kinds of resources, and provide more direct and detailed data for the managers of the library. In addition, the virtual library and the digital twin model can provide unlimited access time and space for students and teachers, relieving the pressure on physical libraries and facilitating digital transformation.

4.1. Possibility of Learning in Virtual Environment

With the development of digital technology, the future university study will take place more often in the virtual environment. With the campus metaverse and digital twin technology, students can enjoy more vivid and realistic learning scenes, such as highly restored libraries, laboratories, classrooms and interact with virtual teachers and classmates. In addition, students can access personalized learning resources, such as learning content that matches their own interests and abilities, and engage in cross-cultural communication and learning. The future of university learning will be richer, vivid, personalized, global, helping students to better adapt to the future learning and working environment.

4.2. Construction of Campus Metaverse

In this paper, we discuss the concept, development status and application prospect of digital campus, campus digital twin and campus metaverse. Through the application of Unreal Engine V, we can transform the campus library into a 3D virtual reality format, enabling the possibility for student to learn, exploring and socializing in the campus metaverse. At the same time, the campus metaverse can be combined with the campus digital twin to provide richer campus experience and more accurate data support.

In the future, with the continuous development of virtual reality and augmented reality technology, the campus metaverse will be more sophisticated and diversified, providing richer learning resources, more authentic campus experience, wider social interaction and more diverse teaching models. At the same time, the application of the campus metaverse will also go deep into more fields, such as campus management, academic research, enrollment publicity, bringing more convenience and benefit to students, teachers and university administrators.

4.3. Possible Crisis

While the campus metaverse has benefits and opportunities, it also faces challenges in terms of funding, technology and human resources. At the same time, cyber security and privacy are risks that need to be taken seriously. In addition, the virtual environment is not a complete substitute for real-world learning and social experiences, so it is necessary to ensure that its use does not completely replace traditional approaches. Finally, the campus metaverse also needs to address social and political issues such as the digital divide and technological inequality to ensure equity and universal access, and to prevent discrimination and inequality.

5. Conclusion

In the digital era, the development of campus metaverse and digital twin has become an important strategic direction of digital transformation in many universities. As an advanced game engine, the Unreal Engine V brings unprecedented innovation opportunities to the campus metaverse and digital twin. It can improve the digital level of campus, create a more realistic, intelligent and efficient digital campus environment, and improve the quality and efficiency of educational teaching.

The future of university education will take place more in the virtual environment, where students can gain more flexible and intelligent learning experience through the campus metaverse, and realize the interconnection with the global education resources. However, the development of campus metaverse may face a number of challenges, such as technology, security, privacy and so on. Therefore, it is necessary to strengthen the technology research and development, and safety management at universities to ensure the sustainable development of the campus metaverse.

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