Applications and Challenges of Virtual Reality Technology in the Storage and Editing of Photographic Works

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Abstract: With the rapid development of virtual reality (VR) technology, its application in the field of photography is gradually showing unique advantages and opportunities. This paper discusses the application of virtual reality technology in photographic recording, editing and display and the challenges it brings. In terms of recording, VR technology overcomes the spatial limitations and security problems of traditional recording methods through virtual space and cloud storage; in terms of editing, VR provides a three-dimensional virtual environment for photographers, which enhances the intuition and creative inspiration of editing; in terms of display, the virtual display platform enhances the interaction between the audience and the works through immersive experience. Although the application of VR technology in the field of photography is promising, it still needs to overcome challenges such as technical complexity, data management and privacy protection. By analyzing the current state of technological development, this paper discusses the future development direction of VR technology in the field of photography and proposes new ideas for the integration of photography and technology.

1 INTRODUCTION

In keeping pace with the development of the new era, everything around us has long been quietly changed. The development of the fast-paced era has also accelerated the pace of people's lives to a certain extent. Especially in terms of the impact of the image, people have to make people notice the change. As a student of photography, the way photographic images are displayed and stored has changed to some extent. How to quickly store and process photos taken in the moment has become a problem for most photographers. In the age of streaming media, where photos are displayed at a rate of nearly one second each, it is also worth discussing how to retain the interest of those who are interested.In the era of rapid development of science and technology, Virtual Reality (VR) technology has begun to penetrate towards a variety of fields, among which the impact in the photography profession is particularly thought-provoking the article, the author Wei puts forward some new ideas that can provide new thoughts and opportunities for the development of education. The proposed idea of photography simulation laboratory effectively provides multi-faceted solution ideas for photography technology in education, for example, it can diversify the scenes available to students and the use of photography equipment (Wei 2024). There is a great possibility that some weather problems can be solved on location shoots, and photographers don't have to worry about sudden bad weather anymore. For some people who don't have much pocket money but love photography, it is also a good choice if they can utilize virtual photography equipment for shooting.In addition to the aspect of shooting usage, how to exhibit photography is also an important issue. Virtual display is a worthy choice of display platform. The construction of virtual models is a tedious step in the VR scene, and this problem may affect the diversity of virtual display platforms. The emergence of Terrestrial Laser Scanning (TLS) and Unmanned Air Vehicle Digital Photogrammetry (UAVDP) proposes a more concise way for it (Xuan Peng, 2023). Therefore, virtual display platforms might have this enhancement in visualization options afterwards. In the article, the author, Li describes that in the 1920s and 1930s, photography was published as a supplement after layout. This change has led to the

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realization that readers' reading habits may have changed dramatically since then, and that virtual reality technology could be the “leader” in leading the way for new ways of exhibiting photography (Li, 2011). In this study, the paper will discuss the combination of exhibiting and storing photographic works with Virtual Reality (VR). The article is divided into five parts: difficulties encountered in the storage of photographic works, the current development of virtual research platforms, the role of virtual reality technology in simulation laboratories, changes in the editing of photographic works and the advantages of virtual reality technology in the storage of photographic works.

2 DIFFICULTIES ENCOUNTERED IN THE STORAGE OF PHOTOGRAPHIC WORKS

Usually, the process of shooting is accompanied by a kind of “storage” behavior. For example, most DSLR cameras, micro cameras, or other electronic devices use SD cards or various types of memory cards for storage. Traditional film cameras use film to develop and then turn it into a sheet of photo paper for storage. In addition, the new generation of young people, Polaroid is also very popular, this camera storage method is the use of special special photo paper direct imaging, has the characteristics of the original can not be copied.

There are still many technical and administrative challenges in the storage of photographic works. Based on the information in the text, common dilemmas include the following.

2.1 Insufficient storage space

When shooting photos and videos, most photographers choose to shoot high-resolution image files (e.g., RAW format). These formats are uncompressed, unprocessed image data captured by the sensors of a digital camera or scanner. Due to the intrinsic nature of the format, they are stored in conditions that require a high level of storage space. And with the upgrading of shooting equipment, a single image may reach hundreds of megabytes or even larger, placing high demands on the storage system.

2.2 Data loss and corruption

After the shooting is completed, most of the image transfer will be in the memory card, hard disk, computer and other devices to migrate. During the process, it is very likely that the hard disk will be damaged, the format will be damaged, or the aging of the storage media will cause the file to be lost or unreadable. If only one copy of the image data is migrated or stored, the impact will be irreparable. However, after a long period of development, the emergence of cloud storage effectively solves part of the problem. It is a kind of modern storage field extended by cloud computing technology, it consists of three parts: a cloud storage platform centered on data storage, a cloud platform centered on data computation, and a cloud computing platform that takes both data and computation into account. (Li, 2015). This system can carry out information transfer and information analysis anytime and anywhere, even if the information users need to deal with is huge or complex, they can still rely on the cloud storage system to carry out the last step of electronic information processing. However, it still faces challenges of security and privacy protection.

2.3 Complexity of data management

As the number of photographic works increases, it becomes an increasing challenge to effectively manage and retrieve large numbers of digital images, especially in cross-platform, multi-device storage environments. According to the authors in the article, most of the database systems in common use nowadays are used to process textual and numerical data, i.e., they can only process formatted data. Images, however, are non-formatted data, and the difficulty of processing such data increases dramatically (Han, 2009). Most of the approaches that have emerged so far lack an effective categorization and tagging system. This loophole may lead to file storage disorganization, with a high risk of affecting the efficiency of later use and retrieval.

For now, it seems that there are viable solutions to most of these difficulties, which will be described in the second half of the article.

3 THE CURRENT DEVELOPMENT OF VIRTUAL RESEARCH PLATFORM

The current virtual research platform is one of the more extensive applications of VR technology in the field of scientific research, which allows users to conduct experiments, data analysis and academic communication in a virtual environment. From the

initial simple data visualization to today's research platforms that provide a complete virtual experimental environment, virtual reality technology has been widely used in scientific research. For example, virtual reality has been applied to research in the fields of medicine, physics, and education to help scientists simulate complex experimental conditions and research scenarios (Wei,2023). With the development of platforms, individual major technology platforms have emerged internationally. For example, the IBM Virtual Lab and Holodeck platforms allow researchers to manipulate data and validate results in a virtual world, further enhancing research efficiency. The IBM platforms are beginning to use cost-effective AI models to provide unique storage solutions for different people and to protect data and identity security. In the Holodeck platform, well-known companies such as Canon, Toyota, and Konicek have used this feature for office work, bringing people from all over the world together in the same virtual space without having to leave the office, breaking the distance barrier. Most academic institutions and research companies have developed virtual research platforms which allow researchers to conduct experiments without the constraints of physical space.

4 THE ROLE OF VIRTUAL REALITY TECHNOLOGY IN THE SIMULATION LABORATORY

Virtual Reality (VR) technology has significant application value in simulation laboratories. Simulation laboratories aim to simulate various experimental operations in the real world through virtual environments (Peng,2023), especially in some high-risk or expensive experiments, virtual laboratories provide a safe and low-cost experimental platform. In simulation labs, VR technology can create highly realistic experimental environments, allowing researchers to perform experimental operations, data analysis, and result derivation in a virtual environment. For example, VR simulation can be applied to medical surgery training, chemical experiment simulation, and engineering design. These are just a few of the more widely used uses for which simulation labs have evolved to date.

At the same time, regarding cost-effectiveness, compared with traditional laboratories, VR laboratories reduce the need for equipment, for example, students do not need to buy expensive photographic equipment in order to take a photography class, and at the same time, students can experience as they wish the rare photographic equipment that they may not be able to use in real life, which greatly reduces the cost.

And this way must also avoid the risks of the traditional way, especially in the use of high-power electrical appliances, reducing the possibility of fire, as well as casualties, providing a relatively safe experimental platform

5 CHANGES IN THE EDITING OF PHOTOGRAPHIC WORKS

With the progress of digital technology, the editing of photographic works has also experienced profound changes. From the traditional darkroom processing to digital post-processing, the means of editing photographic works has been greatly expanded.

Prior to digitization, the editing of photography was at a stage where traditional editing methods were used. Relying on darkroom technology, corrections, exposure and color adjustments were made through chemicals and manual operations. With the popularization of digital cameras and the development of computer technology, the emergence of image processing software, such as Photoshop, has brought the editing of photographic works into the stage of using digital editing tools, making the work more efficient and refined (Li, 2011). Today, AI technology also makes automated retouching possible. Through special training, so that the computer can see the pictures like a person know can perceive them, so as to carry out the extraction of features, and finally instant beauty pictures and so on. (Wei, 2023).

In the future, image editing technology is developing towards intelligence, and intelligent retouching and automated processing based on machine learning will greatly improve editing efficiency. Through virtual reality technology, photographers are able to edit images in a three-dimensional virtual space to get more intuitive feedback and creative inspiration. Perhaps with the support of technological developments, it is possible to better help the photographer to accomplish secondary compositions in order to reach the goal and create new compositions. (Wei, 2023)

Figure 1: the Cathedral of St. Petka which was taken by VR camera. (Cubric,2018)

As illustrated in figure 1，this is a photo taken with a 360 degree panoramic vr camera. When one clicks in to view it, one can imagine actually entering the Cathedral of St. Petka. People can click on specific buttons on the picture to view every part of the church. It's even possible to zoom in on details, as if people were suddenly approaching a wall on a tour trying to see the details.

6 ADVANTAGES OF VIRTUAL REALITY TECHNOLOGY IN THE STORAGE OF PHOTOGRAPHIC WORKS

Table 1: virtual reality technology in the storage of photographic works

Storage Advantages	1.Avoid the limitation of physical storage space 2. Data visualization for efficient management
Exhibition format	1.3D form to view photography 2. Enhanced interactivity and immersion
Compared to traditional exhibitions	1.No need for additional support such as lighting, music, exhibit placement, etc. 2.Breaking through the physical space limitations, providing a more free display mode
Combined with cloud storage	1.Works are securely stored in the cloud 2.View and manage on any device via VR technology
Realization of space savings	1. No need to occupy real space 2. No need to consider exhibit preservation conditions (e.g., humidity, mounting materials, etc.)
application scenario	1.Efficient management and display of photographic works 2.Virtual exhibition, remote access, multi-device sharing

As shown in table 1，VR technology can provide an invisible and infinitely expandable virtual space for storing photographic works. Compared with physical storage devices, virtual storage not only avoids the limitation of storage space, but also enables efficient management of works through data visualization. Through VR technology, the audience can view the photographic works in virtual space in three-dimensional form, which enhances the interactivity and immersion of the works on display. This is a kind of feeling that is hard to achieve in ordinary exhibitions, which is usually realized only with the support of lighting, music, and exhibit placement. According to the author's account in the article, digital technology has been applied in different fields after continuous development. He gives an example of a photography exhibition in an art gallery, where people will prefer works that show the texture, grain, gloss and luster of the characters and scenes. Most people will prefer works that stimulate their senses and can better empathize with the author of the photograph (Li, 2022).

Meanwhile, combined with cloud storage and VR technology, photographic works can be safely stored in the cloud and viewed and managed on any device through virtual reality technology, breaking through the limitations of physical devices(Lian, 2022).And there is no need to occupy the real space, and no need to consider the preservation conditions of the exhibits, such as the requirement of humidity, whether the mounting materials will be broken (Paul David Kyle Sergeant,2006) etc.

7 CONCLUSIONS

This paper mainly carries out the work of information collection and analysis, summarizes several difficulties in the current storage of photographic images, and also lists the solutions to some of the

difficulties. With the continuous development of virtual reality technology, its application in the storage, editing and display of photographic works is promising. Although it still faces some technical and management challenges, with the continuous improvement of platform and hardware, virtual reality will play a greater role in artistic creation, academic research and data storage management in the future.

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