The Influence of Virtual Reality Technology on Modern Art

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Abstract. Since its inception, virtual reality (VR) technology has experienced rapid development. Following the outbreak of COVID-19 in 2020, the utilization of VR technology has increased significantly. In the arts sector, VR technology has brought about substantial changes. This paper aims to explore the current trends and future prospects of VR technology in the domain of art. The article undertakes an analysis of the impact of VR technology on art exhibitions, artistic creation, and art education. Virtual reality provides several advantages in these areas, such as minimizing the risk of damage to art pieces during display and storage, along with the creation of innovative painting techniques and mediums. Conclusively, this paper discusses the potential benefits of implementing VR technology in the art field. Moreover, it examines the challenges and inconveniences faced prior to the adoption of this technology. Overall, VR technology demonstrates promising opportunities for advancing the arts, and further research in this area is warranted.

Keywords: virtual reality; art; 3D art exhibition; preservation.

1. Introduction

VR (virtual reality) is a technology with a wide range of practical values that began to develop continuously in the early 20th century [1]. VR technology combines high-end technology applications, such as motion tracking technology, noise canceling headsets and various operating systems, to create a virtual environment that provides users with an immersive experience [2]. In the early days, VR was widely regarded as a product of science fiction, with a certain separation from real life. However, today, VR technology is becoming more and more mature. A large number of VR devices, games and videos have become part of People's Daily life, gradually changing the way people live [3]. VR technology is widely used in all fields of society, especially in the field of art plays an important role. In fact, most VR applications are inseparable from art, as visual art is closely related to VR. Unlike traditional art forms, VR art is more integrated in many ways and often leads to a richer experience. Although VR is widely used in art, there is insufficient literature on its analysis and discussion, so this paper analyzes three symbolic occupation area to illustrate.

When it comes to VR painting, unlike the flat media used for traditional painting. This paper mainly studies the impact of VR technology in the field of art from three aspects: VR and 3D art exhibition and preservation, fine arts education, and Art creation.

2. VR and 3D art exhibition and preservation

2.1. Online Exhibition

The application of VR technology in art exhibitions is gradually becoming the norm, and many artists and audiences have begun to accept and choose online exhibitions. Online exhibitions not only save money and energy for curators, but also provide the audience with an excellent sense of experience [4].



(a) (b)

Fig.1 (a)and (b) are both the figures of VR online exhibition made by WASSE 3DVR software

For artists, it is a good choice to display their works in the form of virtual exhibition. Muffakham Jah purposes that online exhibitions are good conviction for saving our culture and heritage collections. It is said that "In addition to preserving and disseminating knowledge, they also play an important role as a communication link between precious collections and the public." in the article,there is an Overview of web exhibitions [1]. In addition, although normally the ticket price of an online exhibition may not be as high as that of an offline exhibition, it does not mean that the profit will be reduced, as the actual investment of the curators will be correspondingly lower. By holding VR exhibitions, artists can save most of the costs required for traditional exhibitions, such as venue rental fees, art transportation fees, art insurance fees, art installation fees, art protection fees and a series of other expenses. In addition, the publicity of online exhibitions is also more convenient, saving labor and time costs, it is also easier to change. And at the same time, the online exhibition will not affect the effect of some flat and sculptural works, and in some cases, the effect will be increased. In addition, the layout of virtual exhibitions only needs to complete modeling and rendering to achieve good results. For example, in the fig.1 which shows how a VR exhibition creating software works, and the bottoms to create the whole exhibition. It is much more efficient than creating a realistic environment.

For visitors, virtual exhibition halls can not only provide a more immersive and exciting experience, but also have a lower ticket price. At the same time, digital exhibitions break the constraints of time and space. What 's more exhibits in virtual pavilions allow visitors to view them from multiple angles, while also displaying a wider variety of novel exhibits. Online exhibitions greatly reduce the impact of other visitors, such as queues and ticket checks, as well as the obstructed views that may be encountered in offline exhibitions. In contrast, VR exhibitions are conducted independently, which greatly improves the audience's experience and saves a lot of time for the audience by staying at home. In addition, with the help of VR technology, the audience can better understand and experience the details of the art works and the stories behind them. By zooming in, rotating and interacting, viewers can carefully observe the texture and delicacy of a painting, or gain insight into the form and structure of a sculptural work. Such intimate encounters not only enhance the emotional connection between the viewer and the work, but also provide an experience of the unique perspective of the artwork.

In addition, virtual exhibitions can also provide more personalized experiences for visitors. VR exhibitions can be customized according to the preferences and interests of the audience, enabling them to enjoy the works of art at their own pace and in their own way. Visitors can explore different exhibition themes, art genres or artists' works according to their own choices. What's more ,sometimes people can also enjoy the VR world in a genuine museum. This customized experience brings a unique and personalized artistic journey for each visitor.

The application of VR technology in art exhibitions brings many unique advantages. Through virtual exhibitions, artists can save money and display their works in a more flexible and innovative way; And the audience can enjoy a more diversified and convenient exhibition experience. As VR technology continues to advance, this trend is expected to continue to grow and have a profound impact on traditional art exhibition methods.

2.2. Preservation of artworks

Digital display brings many benefits to the preservation and protection of works of art. Firstly, quantity of the large-scale architecture can be efficiently preserved, in case of being destructed. Additionally, M.E. Portman, A. Natapov, D. Fisher-Gewirtzman purpose “The emergence of digital landscape visualization aligns with the early stages of landscape planning and design [2]. Since then, VR applications have played a significant role in advancing various aspects of landscape development.....”A famous example is the digital preservation of Notre Dame Cathedral in Paris after the fire. The historic building was badly damaged in the 2019 fire, however, Assassin's Creed: Revolution, a game released by Ubisoft Montreal and the buildings in Paris created by Andrew Webster [3], in 2014, recreates the streets and cityscape of France during the French Revolution in the 18th century, including the world-famous Notre Dame Cathedral. The rise of urban and architectural design in modern video games is exemplified by the Assassin's Creed series, which serves as a prominent illustration. As DiMasio stated, these games also offer fresh perspectives for comprehending and immersing oneself in historical information [4]. Through the game, people all over the world have the opportunity to explore the magnificent structure for themselves from the game during the restoration of Notre Dame. While Assassin's Creed: Revolution is not a VR game, the 3D modeling and digital preservation of the building in it share similarities to VR technology (Fig.2).



Fig. 2 Notre Dame Cathedral in Assassin's Creed: Revolution

Nevertheless, the use of online exhibition can effectively prevent many factors that can cause damage or aging of the art. For one thing, online exhibitions can reduce the time artworks are exposed to air and light, thus reducing the risk of contact with acidic and harmful gases in the air as well as moisture. Even when placed on a wall, the online exhibition does not cause moisture in the air on the back of the work, which can cause aging and damage to the work. For another, according some experiment of how the air influences the artworks in the reference [5], it is illustrated that “When exposed to a 50/50 mixture of acidic gases (acetic acid plus formic acid at a concentration of 100 µg per cubic meter) and oxidizing gases (nitrogen dioxide plus ozone at a concentration of 2 µg per cubic meter), the effects of two of the six mc frames on the painting were determined to be higher internally than externally. Concentrations of contaminants were selected to have a significant degrading effect on the painting. Another way to minimize the impact of potential pollutants on paintings in museum frames is to decrease air circulation and space, while implementing pollution-absorbing measures [6]. In addition, transportation during the offline exhibition is also a source of risk that cannot be ignored. It is easy to collide and cause some physically damages of the artwork during transportation. Online exhibitions, on the other hand, avoid the need for transportation, fundamentally reducing the potential danger to the works during transportation.

By adopting online exhibitions, artworks can be displayed in a more secure and controlled environment. While online exhibitions may not be able to completely replace offline immersive viewing experiences, they can provide a safe, convenient and fluid platform for artists and audiences, avoiding many potential risks of damage, while also bringing opportunities for more people to interact with art.

The digital display method provides more security measures for the protection of artworks. Digital models can be protected with encryption and secure storage systems to prevent infringement, piracy and unauthorized copying. In addition, digital displays can also allow viewers to appreciate the details up close in a virtual environment through simulation and interaction functions, and reduce the need for direct contact with the actual artwork, thus reducing the potential damage caused by human manipulation or spectators.

3. Fine Arts Education

The immersive experience of VR technology has brought many changes to education, including art education, like what is said in Language Learning in Virtual Environments: Past, Present, and feature [7], It also solves some problems existing in traditional art classrooms, from which both teachers and students can benefit. Here are two common ways that VR technology can be applied in art education.

What's more, some experiments also show the positive influence of VR when it is used in education. "The sense of embodiment (SoE) brought about by VR promotes embodiment and active learning, shown by the research" [8].

VR painting learning: Teachers guide students to use VR for painting learning. At present, there are many art studios using virtual painting on the Internet. In these studios, students can first doodle on paper, then use an app to photograph and capture the paintings, and finally view the fantastic images through VR glasses. Drawing and painting with VR can not only enhance students' sense of experience, but also provide richer learning elements. For example, students can observe the structure of three-dimensional objects through VR, appreciate artists' sculptures and paintings, and learn about art in an intuitive way. At the same time, people who is using VR technology also has tactile and auditory experiences through special gloves and headphones, further improving the quality of teaching. Through VR painting learning, students' interest is stimulated, while also improving their creativity.

VR assisted traditional painting learning: Teachers use VR technology to assist traditional painting learning, while students do not need to enter VR. Especially during the epidemic period, online teaching has become popular, and many teachers have combined VR with their courses. One common way is to use prerecorded VR videos to show the process of interior design or product design. Another way is for teachers to go into a virtual environment and deliver a live lecture. Through the immersive experience brought by VR technology, students' learning efficiency is improved, sometimes using the eye gaza data is useful. The authors who wrote summarized that "In contrast to conventional educational resources like books and videos, VR has demonstrated its ability to enhance student involvement and knowledge retention in specific subjects [8]. Nevertheless, students may still experience distractions and lack of focus due to factors like stress, drifting thoughts, disruptions from surrounding noise, and external notifications. Analyzing students' eye gaze data could provide valuable insights in identifying such instances of distraction." Compared with traditional classrooms, teachers do not have to worry about problems such as having too many students and not being able to observe good painting angles and lighting, or not being able to observe still life. In VR online teaching, students enter the virtual environment separately, without interfering with each other, and can freely adjust the observation Angle. At the same time, teachers can better control the communication between students and maximize the use of teaching time.

Although the application of VR technology in fine arts education is still in its development stage, it is expected to become an important form of teaching as the technology continues to mature. Especially in some specific environments, such as distance education for students in mountainous areas and online teaching during the epidemic, VR technology can provide more possibilities for education. In the future, with the further development and popularization of the technology, the application of VR technology in art education will be more extensive.

4. Art creation

The continuous progress of VR technology has provided artists with a completely new way to create, like "Proficiency in science, technology, engineering, and mathematics (STEM) fields is becoming more and more sought after. Merely possessing theoretical knowledge and formulas is often insufficient to grasp intricate phenomena. Simulation serves as a valuable aid in facilitating conceptual comprehension by providing visual representations of otherwise unseen processes. The continuous engagement with learning materials is crucial in simulated and virtual realms. VR technology allows individuals to interact with digital environments in an incredibly immersive manner." in reference [9] and gradually formed a remarkable art form. By using VR painting software such as TiltBrush and Open Brush, artists can create compelling works that take the viewer into a world full of imagination. This way of creating art in a three-dimensional, ornamental nature is booming, leading to immersive experiences like never before.

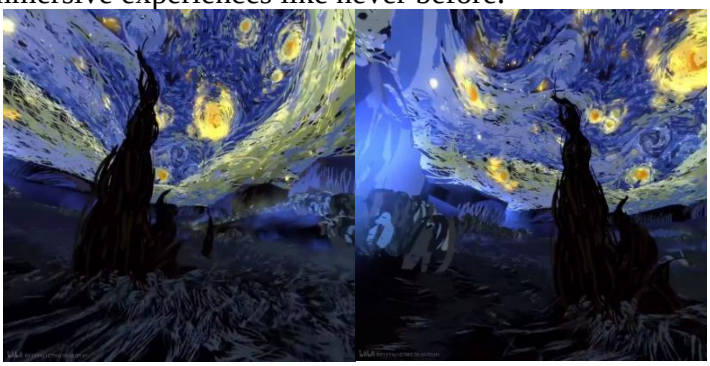


Fig. 3. The Internet artist created Van Gogh 's Starry sky twice on VR painting software

In the VR creation process, artists wear VR glasses and hold a controller, as if they are in a virtual space that transcends the boundaries of reality. They are free to draw lines and create objects in the air, which breaks the flat limits of traditional painting and allows their imagination to be completely released. VR painting software offers a variety of amazing brushes and effects that artists can use to create stunning works of art (Fig.3). Viewers can appreciate the artwork from different angles, interact with the artist's creation, and experience the wonderful world within the artwork.

In addition to painting, VR technology has also brought great innovations to the fields of film and games. Movies made through VR technology can make audiences feel the scenes and plots in the movies as if they were there, bringing a more immersive movie-watching experience. Viewers can see around the film 360 degrees, explore the movie world from different angles, interact with the characters, and further deepen their understanding of the story and emotional resonance. VR games take the immersive experience to the extreme, allowing players to personally participate in the game's characters and story, and interact with the game world through body movements and gesture control.

VR artistic creation not only brings an unprecedented artistic experience to the audience, but also provides a broader creative space for artists. Tilt brush has gained a positive comment in reference [10]*: An innovative* perspective which says that *"*Increased capabilities through the use of lean startup methods. The method was shown to provide initial positive results and received positive reviews. By promoting the active participation of each participant, the Lean Startup approach is able to break down hesitation and allow art therapists to put their heads down and develop interventions." VR breaks through the limitations of traditional art forms and opens the door to unlimited imagination. With the continuous innovation and development of VR technology, we can expect further expansion of VR art creation in the future. With the improvement of hardware equipment and higher quality content creation, VR art works will be able to reproduce the creativity and imagination of artists in a more detailed and true way. At the same time, by combining with other art forms and technologies, such as music, dance, light and shadow, VR art creation will present a more diverse and diversified experience.

5. Conclusion

VR has brought about numerous impacts on the art field, revolutionizing the way we experience and engage with art. One significant contribution of VR is its ability to transcend the constraints of time and space, providing unlimited resources for art exhibitions and fine art. This technology enables the creation of virtual exhibitions where art can be accessed and enjoyed by individuals from anywhere in the world at any time.

The applications of VR in the art field extend beyond exhibition formats. It has also revolutionized the preservation and conservation of artworks. Through VR, digital replicas of physical artworks can be created and stored indefinitely, ensuring their longevity and accessibility for future generations. This technology has become an invaluable tool for preserving and safeguarding culturally significant artworks and artifacts that may otherwise deteriorate over time. In addition to exhibition and preservation, VR has also had a profound impact on the media and methods of painting. Artists now have the opportunity to explore new digital tools and techniques within virtual environments, fostering innovation and experimentation. This not only expands the possibilities of artistic expression but also fosters collaboration and interdisciplinary interactions among artists from diverse backgrounds.

Furthermore, the integration of VR technology in art education has revolutionized the way students learn about and engage with art. Virtual art galleries, interactive tutorials, and immersive experiences provide students with unique opportunities to interact with artworks in a more engaging and hands-on manner. This enhances their understanding, appreciation, and critical analysis of art.

As VR technology continues to advance, we can expect further developments in terms of immersion and the overall user experience. The future holds even more transformative changes for the art field, as VR technology opens up new avenues for artistic expression, cultural exchange, and audience engagement. With its potential to create immersive and captivating experiences, VR will undoubtedly continue to shape and redefine the modern art landscape.

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