

How Can Virtual Reality Technologies Transform the Art Field

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Abstract: In this paper, the researchers mainly focus on the fact that art will no longer be subordinate to reality. Instead, it will be blended into reality. Amongst others, Virtual Reality (VR) technology emerges as a good solution by allowing artists to create artwork in a digital virtual space. At the same time, the researchers also look into the future of VR. To bring a better creative environment for artists, VR tools are conceived in this paper that is suitable for them to create in the future. Finally, the researchers provide a platform for artists to show their work to more people.

Keywords: Virtual Reality, Virtual environment, Art

1. Introduction

In recent years, both Virtual Reality (VR) and Augmented Reality (AR) technologies have developed rapidly, and together, they are referred to as XR technologies in this paper. To follow the trend of XR technologies, XR devices have evolved from bulky head-mounted displays that connect with Personal Computers to light and small mobile devices such as Oculus Quest and Microsoft HoloLens. Computer vision algorithms together with high-performance mobile processors have enabled useful software features such as hand tracking and gesture recognition. Amongst others, VR controllers are now embedded with 6 degrees of freedom sensors. With these sensors, users can get more precise feedback on their hand movements. All the technologies mentioned above have made XR a powerful tool that transforms people's behavior in many fields, especially the art industry. Currently, XR technologies have mainly been utilized as an art creation tool or a medium that carries different art forms into reality. In the future, XR may further change the relationship between art and reality. Art will no longer be subordinate to reality and, instead, will be blended into the latter.

The researchers will discuss how XR can further transform the art field in this paper. Furthermore, the researchers will start by introducing the current art field and discussing existing problems that can be solved or improved by XR, then the researchers will dive deeper into the XR solutions and finally, the researchers will summarize and give out a conclusion.

2. Current Art Field

The current ecosystem of the art industry includes artwork creation, selling, collection and exhibition. Among them, the creators have found it frustrating as they are plagued with toxic materials and non-

erasable processes, and a lack of reference in the creation process. Firstly, the materials or mediums that are used to create the artwork can carry toxic chemicals and seriously affect artists' health [1]. Frequently, artists are unaware of the hazards of such materials as they are usually not well documented. Secondly, to paint an oil painting, the artist cannot undo a stroke if something goes wrong. Consequently, a tiny error may lead to the artist starting over. For this sake, the art creation process can be extremely time-consuming as the artist has to be very careful throughout the whole process. The same problem applies to sculptures as well. Thirdly, artists may find it hard to create and maintain a reference during the process of art creation. This especially applies to painters. For portrait painters, the model cannot be completely still. For landscape painting, artists usually finish the artwork in their studios for a better sense of color. Therefore, they will only perform a sketch with pen and paper on the scene and use it as a reference. Fortunately, the VR technology offers a good solution to these three problems by allowing artists to create artwork in a digital virtual space with a specially designed controller. This will free them from the limitation of physical art materials. This will be further discussed in the next section.

Once artists finish their artwork, they will need to look for collectors. Conventionally, they go to galleries, art fairs, or auctions. Now, in the digital world, websites, social platforms, and even NFTs provide new approaches for them to expand their influence and better sell their artworks. VR, being an essential part of the digital world, can potentially provide more effective ways for artists to sell their artworks. In fact, once an artist finishes an artwork with VR, he/she can immediately send it to digital galleries or post it on social networks. In this way, the artwork can be posted more quickly, and the artist can reach more viewers. More details of this approach will be provided in the next section.



Figure 1: Guia Besana, <https://www.nytimes.com/2014/10/12/travel/the-art-of-slowing-down-in-a-museum.html>.

The final step in the art ecosystem is the exhibition. Currently, most artworks are exhibited in galleries or museums. Usually, viewers will need to walk around to see the whole picture. Also, one may have to come really close and try hard to inspect every part of the artwork so that they can see every detail. Differently, for large artworks, viewers need to step away to see the whole image. In a crowded environment, viewers need to frequently walk around so that their views are not blocked. As illustrated in Figure 1, those famous museums are always crowded with viewers, so it is difficult for viewers to get close to artworks. Instead, they can only hold their mobile phones high in the back and take pictures one after another. Clearly, such a way of appreciation is a little poor. With VR and AR technologies, virtual museums and galleries can be built, or virtual artworks can be exhibited in a physical environment. In such cases, viewers would find it easier to view. In addition, narratives can also help a lot. Currently, museums and galleries provide some kind of hearing devices to help viewers better understand artworks. It will play a sound or narrate as a viewer comes close to certain checkpoints [2]. AR technology can improve this by not only playing sound but also showing visual information through the head-mounted display glass. The information can be on the side or even

overlay on the artwork, delivering a vivid experience. In the next section, a new art appreciation process with XR technologies will be introduced.

3. How the Art Industry can be Transformed

First of all, it is an absolutely safe way for artists to make artworks with VR. According to the *Unknown Toxic Exposures: Arts and Crafts Materials*, the author Theresa N. Grabo claims that “Artists frequently work long hours, use art media intimately and intensely, contaminate living space with art supplies, and expose themselves and their families to toxic art materials [3].” Therefore, creating with VR is not only a good way for artists to create but also a way to protect their families. No toxic art materials are needed anymore, as they can create in a virtual environment. Artists can always keep themselves away from a cluttered environment full of paints, brushes, and other materials, and no longer need to spend huge amounts of money to buy art materials that will run out at any time. While artists can do what they want with 2D drawing tools, painting with VR provides a refreshingly simple canvas-and-paint method with finely tuned brushstrokes and realistic color mixing [4]. It is fair to say that staying in a safe and healthy environment for artists to create artwork is a good thing, and they only need a VR headset and handle to do the same.

Additionally, artists occasionally make mistakes in their creations, such as knocking over a sculpture, spilling paint on a canvas, or making an error that leads to irreversible mistakes. Differently, in the virtual environment, they do not need to worry about these, and they can create whatever they like. With our creation software, artists can click the withdrawal button for modification at any time if they are unsatisfied with their creations.

Finally, artists no longer need to worry about the change of references when they create artwork in the virtual world. Instead, they can upload their references to the software and move them to the creation interface when they are creating. Another problem that artists may encounter is that when they are creating an artwork in reality, the light changes, the look of the reference changes as lights change, and the feeling of seeing colors with the naked eyes also differs. Fortunately, with the VR headset, the colors and references they see will not change, as the environment and light are consistent in any case, so that they will not be disturbed by these factors when they are creating.

At this point, the VR headset is a good tool for artists to use VR to make artworks. Even so, they will inevitably feel uncomfortable when using existing VR handles to create artworks, because the existing ones are different from the props used by them in their routine work and are too heavy and rigid. So, in order to make them comfortable with these handles, researchers should make customized handles for different art creators.

In this case, the researchers need to know well the props that artists need to use when doing works. For example, works that need to be drawn with a brush fall into one category, and those that need to be shaped by hand into one category. Then, the researchers will develop customized handles and creative interfaces according to different categories. In this way, artists will be provided with a creative environment that they feel most comfortable with. In order to make artists' hand feel the closest to the real situation when using a VR handle, the researchers need a feedback system that can transfer the feeling in the virtual reality and the feeling in artists' hand to each other. Just like what Jamie Feltham states on the website: “Haptic feedback is essential in bringing player's hands into VR worlds. Without it, our virtual fingers are little more than ghosts floating through items and surfaces [5].”



Figure 2: BEBOP Design, <https://www.behance.net/gallery/58154731/Zerokey-VR-Glove>.

For example, Facebook's Oculus handle only has triggered in the index and middle finger area, so it can sense fewer hand movements and does not have a clear sense of the strength of grasping something, simply by pressing the button. Therefore, when artists create in the virtual world, they will not have too much practical sense of the original controller. In this case, force feedback gloves are a perfect fit for artists making sculptures in the virtual world because with these gloves, artists can feel the objects in the virtual world in spite of their size and shape, or the strength of artists in fabricating the model and the changes made to the objects. Sculptors usually use their bare hands to make clay sculptures, and they prefer to feel the work with their hands. So, to design suitable force feedback gloves, the researchers need to use the naked feeling technology, and the whole body of the gloves is made of light material. In this way, when artists put on the gloves, they would feel like rubbing hand cream on the hands and does not get too much feeling from the gloves. As shown in Figure 2, these VR gloves fit artists' hands very well, making them feel as if they were not wearing anything when creating. Although the gloves do not produce any touching feeling, the researchers will still keep the existing function of force feedback gloves and increase the density of sensors on the gloves so as to bring every part of the finger a sense of touch. At the same time, the researchers can also offer personal customization service, so that artists can design their own exclusive glove patterns.



Figure 3: Image courtesy Massless, <https://www.roadtovr.com/massless-pen-pre-order-release-date-price/>.

This VR pen is just like the Apple pencil, with the same weight and size. What is the difference is that the pen will be installed on a rotation device and button? Just like the pen in Figure 3, it feels the same as the pen the researchers usually use. Artists can rotate the VR pen to the creation mode when painting and rotate it to the operation mode to change the brush and operate other content. The rotation will not cause artists to accidentally draw on the panel when operating. Although the creation software has a withdrawal function, it is more convenient for artists to operate. The button on the VR pen is to undo. When artists need to change the brush, they do not need to rotate the brush, making it quite

convenient to use. Also, the VR pen has a pressure sensor, so the thickness of the line can be changed depending on how hard the pen is pressed.



Figure 4: Robert Rodriguez, <https://www.cnet.com/science/features/the-first-frontier-for-mars-colonizati-on-video-games-and-vr/>.

For artists' virtual creation space, the researchers will provide them with different scenes, and artists can pick any scene to create. As shown in Figure 4, artists can choose to create in any scene, even on Mars. If there is no scene that the artist desires, he/she can also describe the keywords of the scene they desire, and then the AI will create a space for him/her based on these keywords. At the same time, artists can also upload their favorite space map, and the computer will create a 360-degree virtual space based on this image. Different creative scenes can also provide artists with specific scenes of background music.

Currently, many artists find no way to let others see their works. What is worse, the COVID-19 pandemic has forced many to stay at home. Under such a context, the advantages of virtual and augmented reality are obvious, and these technologies provide museums and galleries with a safe means to run themselves as usual as VR becomes more widely recognized. With these technologies, museums and galleries become accessible before the pandemic is brought under complete control. Even if the pandemic is totally contained, this accessibility will be critical for those with impairments who may not be able to see the exhibition personally today [6]. Art usually appears to be more pleasurable when it is a multi-sensory experience, such as visiting a gallery or a museum, seeing an artwork up close, and in some cases hearing or touching it, so the researchers have to create an art gallery to help these artists [7]. The design of this art gallery can be various, and the researchers will distribute them in different styles of galleries according to the style of artworks, which can be like space, desert, or the underwater world. At the same time, the virtual creation software and the art gallery are two linked software, with which artists can upload their works directly from the former to the latter. The gallery is accessible to all users, whether they are VR users, mobile users, or computer users. Because the researchers want to help artists promote and sell their works, the researchers target the gallery's viewers. Even though art lovers can only visit the gallery with their cell phones and computers, they can enjoy a 360-degree view.

Meanwhile, AR can be used to help viewers better understand artworks. The AR device can display text explanations on top or alongside the artwork while playing narratives. It can also highlight the details or even animate artworks with a virtual layer, which would not be possible within the physical world. Compared with the hearing narrative device, AR can be more vivid, illustrative, and immersive. Artworks can be sold through auction or priced items in digital or even NFT format, and art lovers can purchase them with different devices. The money will be automatically credited to the artist's account after the deal is made and the artwork can also be returned conveniently through the virtual gallery. After purchasing a digital artwork, art lovers will not only have ownership of it but also will get the right to 3D print and eventually acquire the physical artwork.

4. Conclusion

In conclusion, the researchers can transform the art field from three major perspectives. Specifically, they can help artists create and better sell their artwork and enable a better viewing experience with the aid of VR.

VR can improve the expression of art, expand its diversity, and free it from the confines of the old model, while also providing new opportunities for both viewers and artists. From the standpoint of art creation, technology, as an essential material means for modern art, allows people's imaginations to be presented in virtual reality with real and perceptible images, and constantly stimulates the imaginations of artists, ultimately leading to more new and interesting art images and more exciting and unfamiliar experience for viewers. Although there are still some technologies that may not be able to achieve what the researchers want, the researchers believe that in the future VR will definitely develop into one of the most comfortable and burden-free technologies to use.

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