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Practical Exploration and Future Prospect of XR Technology to Expand the Expressive Power of Digital Media Art

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ABSTRACT

The development of digital media art has always been closely linked to technological innovation, this paper discusses the application of XR technology in the development of digital media art, which brings new possibilities for the innovation of artistic expression in the process of integrating a number of digital technologies such as AR, MR and VR. Traditional art forms have been transformed under the support of digital technology, and the expression forms and expressive power of digital media art have undergone obvious changes. XR technology has not only changed the cognitive and experiential forms of art aesthetics, but also redefined the interaction and experiential methods between art works and audiences, and enhanced the expressive power and influence of digital media art with the immersive and interactive nature of XR technology. In the future, the popularization of XR technology will lead the new development of digital media art.

Keywords: digital media art; XR technology; expressive; immersive

The development of digital technology provides artists with brand-new means of creation, enabling works of art to cross the traditional physical boundaries and display unprecedented visual effects and sensory experiences. From the point of view of the existing technical means, mainly including the following categories: digital image processing technology allows artists to easily adjust the color, brightness, contrast and other parameters of the image, to create a more vivid and realistic picture effect; three-dimensional modeling technology allows artists to build a more complex, detailed virtual scenes and character models; animation and interactive design technology makes the work of art has a richer dynamic effect and interactivity. animation and interactive design technology enables art works to have more rich dynamic effects and interactivity. In this combination of technology and art, artists are no longer limited to the traditional canvas and screen, but can use digital tools to create virtual, interactive works of art. These works are often highly personalized and customized, capable of dynamic changes based on audience response and interaction. For example, artists can utilize virtual reality to create immersive works of art that allow viewers to enter the virtual world through head-mounted devices to interact with and experience the work. The transformation of digital media art has not only changed the external performance of art works, but also profoundly affected the connotation of art and the way the audience experiences it. Digital media art is not only a new art form, but also a new cultural and social phenomenon. It not only expands the forms of artistic expression and creation methods, but also changes people's understanding and cognitive approach to art. In the era of digitalization, the combination of technology and art will become one of the important trends in the future development of art.

Among the many technological tools most relevant to the expressive needs of media art is Immersive Reality (XR) technology, which includes Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), and whose emergence can be considered, to a certain extent, as revolutionizing the development of digital media art.XR technology, through the creation of immersive and interactive experiences, not only changes the way people perceive works of art, but also expands the boundaries of artistic expression. XR technology, by creating immersive and interactive experiences, not only changes the way people perceive artworks, but also expands the boundaries of artistic expression. With the support of XR technology, art works are no longer limited to the traditional two-dimensional plane or even three-dimensional plane, as if breaking the traditional art category of virtual and real, and building a multi-sensory dynamic experience bridge between the audience and the works in the virtual space as if it were reality. In XR's virtual environment, the physical limitations of the real world are broken, creating an art world that is both surreal and lifelike. In this new art paradigm, viewers can immerse themselves in the virtual world of the artwork, interacting and communicating directly with it. The immersion and interactivity of this experience enables the audience to understand and feel more deeply the creative intent and emotional expression of the artist. It is also for this reason that scholars may have been arguing about the relationship between the "virtual" and the "real" in XR technology. Whether we actually exist in the objective

world or whether we create this world only by our consciousness is a deep philosophical question. According to our perception, the world we see seems to be real, but whether the perception itself is enough to prove its reality is a question to be explored. With the advent of XR technology, the judgment of the duality between real and false becomes blurred. In immersive live sutras, we also make the judgment from our senses that they belong to the real, but in reality they are surely fictitious. From a philosophical point of view, the ultimate way to realize immersive reality is through brain-computer interfaces, but who can guarantee that we are not "brains in a jar"[1] ?

The widespread use of augmented reality technology has had a profound impact on the concepts of physical, social and interpersonal space. However, no matter what kind of technology is integrated into artistic creation, the creator's pursuit of high quality for the work is always the core. In the process of creating digital media art works, not only should we follow the development trend of the times, but we should also go beyond the original intention of creation, carve and refine, and create the ultimate digital media art masterpieces. With the rapid development of augmented reality technology, dynamic experience, electronic sculpture, network performance installation, immersive art space and other art forms are like inexhaustible gold mines, which are constantly being discovered. Countless artists are like gold diggers, relentlessly exploring new fields and seeking unique and trendy artistic innovations. In the current digital age, XR technology is gradually becoming a new frontier for artistic expression. With the fusion of Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR), XR opens up unprecedented creative space and avenues of expression for artists. The application of such technologies not only expands artistic horizons, but also deepens the interaction between art and its audience. With the continuous development of XR technology, art works have transcended the traditional two-dimensional scope, bringing immersive visual experience and emotional resonance to the audience. This paper focuses on the role of XR technology in digital media art, especially how it broadens the boundaries of artistic expression through innovative visual and sensory experiences. We analyze a variety of different XR use cases, showing how they change the way art is created and appreciated. In addition, this paper explores the future potential of XR technology in the arts, including how it can promote diversity and interactivity in artistic expression. By delving into the combination of XR technology and digital media art, we aim to reveal how this emerging technology can provide new platforms for artists to express themselves, while at the same time bringing audiences a richer and more immersive art experience.

Spatial Reinvention: The Generation of Immersive Digital Media Art Spaces

Among immersive reality technologies, VR (Virtual Reality), AR (Augmented Reality), and MR (Mixed Reality) constitute the three main technological pillars.VR technology creates virtual worlds through computer simulation, providing a three-dimensional dynamic environment that interacts with the user, making it seem as if the user is in another world. In contrast, AR technology combines virtual elements with reality, augmenting images and 3D models in real time to realize the interactive fusion of the virtual and the real.MR technology is a combination of VR and AR that enhances the realism of the user's experience.XR technology is not only a collection of AR, VR, and MR, but redefines the relationship between human beings and virtual space from a biological perspective. It pursues the full integration of interaction, experience and viewing, and is committed to creating an immersive sensory experience.The early application of XR technology can be traced back to 1994, when producer Julie Martin demonstrated the interaction between dancers and virtual images in the stage art work "Dancing in Cyberspace"[2] . Today, XR technology is used in a wide range of media industries, such as film, television and live events, to enhance the viewing experience for the audience and to enhance the immersion of the actors' performances.XR technology allows real-time interaction with virtual content, increasing the realism of the lighting of the scene and presenting the content in a natural visual way.

Immersive technology is becoming a key tool in the current interdisciplinary art field. This technology integrates visual design, interactive elements and digital creation, breaking through the traditional art limitations. Considered as a platform for artists to innovate, immersive technology not only brings art from the plane to the three-dimensional, but also realizes the deep interaction and experience between the work and the audience. The development of this technology has had a profound impact on traditional art forms. Compared to traditional art such as painting and sculpture, immersive technology makes the audience part of the experience, creating a new form of interactive art. This not only changes the way artists create art, but also shifts the way audiences engage with it. As technology advances, it is beginning to merge with other art fields, such as digital CG art[3] , 3D art and game design, demonstrating its diversity and adaptability. The use of immersive technologies drives artistic innovation and poses new challenges to the roles of artists and audiences. Artists are not only creators, but also explorers and applicators of technology, while audiences are transformed from passive receivers to participants and experiencers. In the context of globalization and digitization, immersive technology enables the dissemination and exposure of artworks beyond geographical and time constraints. The Internet, as a communication medium, allows art works to be presented in front of a global audience in real time, realizing the borderless expansion of artistic expression. Therefore, when designing and creating immersive artworks, artists need to take into account the characteristics of the technology, the audience's interactive experience and the emotional expression of the work. This is not only a technical innovation, but also a profound change in the field of art. Through this new form of art, creators are able to explore the possibilities of human emotions and social interactions, bringing a broader vision and

[1] "Brain in a Vat" is a hypothesis articulated by Hilary Putnam in his 1981 book Reason, Truth, and History. Hilary Putnam's discussion of the "Brain in a Vat" hypothesis appears in Chapter 1 of his book "Reason, Truth, and History". Hilary Putnam's discussion of the "Brain in a Vat" hypothesis appears in Chapter 1 of his book "Reason, Truth, and History." In this chapter, Putnam uses a metaphor involving an ant tracing a line in the sand In this chapter, Putnam uses a metaphor involving an ant tracing a line in the sand that unintentionally forms a shape resembling Winston Churchill. He uses this to explore the concept of representation and intentionality, questioning what makes something a representation of something else. This metaphor sets the stage for his broader philosophical inquiries. see Putnam, H. (1981). Reason, Truth, and History. Cambridge University Press.

[2] Writer and producer Julie Martin first brought augmented reality to the entertainment industry in 1994 with a theater production called Dancing in Cyberspace. The show featured acrobats dancing with projected virtual objects on a physical stage.

[3] CG is the abbreviation of Computer Graphics, which originally means "Computer Graphics", and "CG art" refers to digital visual technology works that CG art" refers to digital visual technology works that rely on computers, graphic design software, digital photography technology and computer-assisted drawing software to create.

infinite possibilities to the field of art.

Digital media art, with its unique means of communication and artistic characteristics, is gradually removing the gap with traditional art and the audience and transforming its forms of expression. Every technological innovation has greatly influenced the thinking and concepts of art creators. From the rise of computer graphics technology to today's rapid technological development, digital media art has gradually become the forefront of artistic innovation, demonstrating its richness and vitality in all walks of life. Compared with traditional painting or graphic design, digital media art is a perfect combination of art and technology, giving birth to a new industrial field. In this era, talents who master new technologies will stand at the forefront of the trend and lead the future development of digital media art. The progress and innovation of digital media art demonstrates the power of technology as well as the depth and breadth of culture. With continued technological breakthroughs, we expect to see digital media art play an important role in more fields, bringing the public a richer and deeper artistic experience. More and more art creators are adopting virtual reality painting software for their artistic creation, among which, artist Annazhilyaeva is a typical example, an early practitioner of virtual reality. "[4] and has performed all over the world, bringing technology into her creations and using mixed reality art to inspire people to explore art. Annazhilyaeva's "VR Oil Paintings" not only have the artistic aesthetics of traditional oil paintings, but also incorporate the unique charm of VR technology. VR oil paintings" by Annazhilyaeva are not only visually appealing Her works are not only visually stunning, but also emotionally resonant.

Fig. 1 Annazhilyaeva's creative process (photo credit: web report image)

There is a clear contrast between the use of XR technology and AR technology in the field of digital media art. Although AR technology enhances interactivity, transforms two-dimensional content into three-dimensional models, and gives static works a dynamic display format, it is still essentially limited to the traditional "observer" perspective. Users need to scan the QR code or use a dedicated application to experience the work within a limited screen, so although it has advantages in portability and ease of use, it is slightly insufficient in the depth and richness of the experience, and the experience of AR technology is limited by specific locations and equipment, which shows certain limitations in real-world applications. In order to adapt to wide dissemination and ease of use, AR technology needs to be simplified to a certain extent in terms of effect and content, which to a certain extent restricts its potential in the development of digital media art. Professional display devices provide a better experience, but at the expense of the portable nature of AR technology. In contrast, XR technology provides a fully immersive experience, and although it does not have the portability of AR equipment, it has a clear advantage in terms of content complexity and finesse. At the same time, XR technology and MR technology have their own focuses in the application field; MR technology is more often used in industrial design and production, and the core lies in the interactive interface of real-time sharing of images and changes in the real environment. For example, Microsoft's "Minecraft"[5] reality interactive game developed based on MR technology provides a new way of interaction, but the experience may not be as good as directly on the PC. Overall, XR technology represents a shift in thinking and application, breaking through the limitations of traditional technology to bring more in-depth experience and interaction possibilities for digital media art. The fully immersive experience is not only richer in terms of content expression, but also more capable of stimulating the audience's senses and emotions, opening up new paths for the development

[4] Annazhilyaeva has created a large number of "VR paintings", such as "Firre", "Water", "Gold", "Bird Gamayun".

[5] Minecraft is a sandbox video game pioneered by Marcus Alexei Poisson (Notch). The game is maintained by Mojang Studios, now part of Microsoft Xbox Game Studios. The game was originally released on May 17, 2009 as a Classic version and on November 18, 2011 as an official Java version. The game was originally released on May 17, 2009 as a Classic version and on November 18, 2011 as an official Java version. My World's gaming platforms encompass desktop devices, mobile devices, and game consoles. features players freely creating and destroying different kinds of cubes in a three-dimensional space filled with cubes. Players can complete the game' s achievements (progress) by destroying their own cubes. The game features players freely creating and destroying different kinds of cubes in a three-dimensional space filled with cubes. Players can complete the game's achievements (progress) by destroying or creating stunning buildings and art in the single-player or multiplayer modes, or by collecting items and exploring the map. Players can also experiment with gameplay such as redstone circuits and commands in creation mode (with cheats turned on).

of digital media art.

Therefore, after the penetration of XR technology into digital media art, it can be found that there is a brand new change in digital media art, which is mainly reflected in four levels. First of all, XR technology triggers a change in the creation tools of digital media art. Traditional painting art mainly relies on physical tools such as canvas and paint, while XR technology provides artists with brand-new creative tools. Virtual reality painting software allows artists to create in a virtual three-dimensional space, and this way of creation not only breaks through the limitations of traditional painting, but also is more convenient and efficient. Secondly, XR technology promotes the innovation of digital media art creation mode, which provides artists with a brand-new creation mode. Through virtual reality technology, artists can observe and adjust their works more intuitively, so as to better realize their creative intentions. In addition, XR technology also allows artists to carry out multi-person collaborative creation, which not only improves the efficiency of creation, but also promotes the communication and cooperation between artists. Once again, XR technology realizes the expansion of digital media art forms, which brings richer forms of expression for digital media art. Virtual reality technology allows the audience to feel the art works in an immersive environment, augmented reality technology can combine the art works with the real environment, and mixed reality technology can perfectly integrate the virtual and the reality together. These forms of expression not only enrich the connotation of art works, but also expand the extension of art works. Finally, XR technology has brought about the enhancement of the artistic expression of digital media.XR technology has brought about a more immersive experience for the audience. Through virtual reality technology, the audience can more deeply understand the theme, connotation and expression of the art work, so as to more deeply feel the charm of the art work. In addition, XR technology also allows the audience to interact with the art work, and this interactive experience not only enhances the audience's sense of participation, but also improves the audience's aesthetic level. These four dimensions are strongly correlated and show a progressive relationship, with the final point of arrival being the generation of an immersive digital media art space that is unique to this art form.

The core of digital media art is to present "new" elements, including new ideas, new philosophies and new technologies. Digital media art not only responds to current cultural trends, but also pays attention to the real society and explores the future. Like a mirror, digital media art reflects everyone's inner world, and the audience's understanding gives the work a deeper meaning. This subjective approach requires a separate space, and XR technology provides just such an environment. Through immersive experience and perspective shifting, XR technology realizes a deep interaction between art and audience. Before creating digital media art, creators need to have a proper understanding of the immersive digital media art space empowered by XR reality technology. Immersive digital media art space is a technologically generated product, and its own characteristics have a certain degree of interoperability with the attributes of XR technology, which, on the whole, can be summarized as "perspective shift inside the work", "sensory deception of total immersion", "perception of time control", "sensory deception of time control" and "sensory deception of time control". "the escapism of perceiving the control of time" and "the perceptual experience of meeting the needs of the times". First of all, "the perspective change of being inside the work": with the help of advanced XR technology, the immersive digital media art space realizes the perspective change of the audience from the traditional "external observer" to the "internal participant". "This means that the viewer is no longer confined to the gallery. This means that the audience is no longer limited to appreciating the works in the gallery or theater, but is able to go deep into the works and realize in-depth interaction with the works. This change in perspective brings an unprecedented sense of participation and immersion. Secondly, the "sensory deception of total immersion": the immersive digital media art space creates an immersive experience that goes beyond traditional art by simulating visual, auditory, tactile and other sensory experiences. The audience feels as if they are immersed in the sensory deception of reality. This experience is unattainable by traditional art, and is the core charm of immersive digital media art space. Again, "perceiving time-controlled escapism": works in immersive digital media art space often have a temporality beyond reality, and can lead the audience to travel through time and space, experiencing the world of the past or the future. The audience has the opportunity to escape reality and enter a new virtual world under the control and manipulation of time. This sense of escaping reality satisfies, to a certain extent, people's desire to explore the unknown and the supernatural. Finally, "a perceptual experience that fits the needs of the times": with the development of science and technology, people's expectations of art are also being upgraded. Immersive digital media art space has emerged, with the help of advanced technology, to bring the audience a new modern art experience. This experience not only satisfies the audience's visual and auditory pursuits, but also provides opportunities for in-depth participation and interaction, adapting to the development needs of the times.

Practical Exploration: Creating More Expressive Immersive Digital Media Artworks

In various high-tech exhibitions or top immersive reality art exhibitions, we can see wonderful attempts and demonstrations of XR technology. This technology brings unprecedented expressiveness and possibilities to digital media art, making the art works more vivid and real, and allowing the audience to immerse themselves in it and feel the charm of art. In the field of digital media art, XR technology is widely used in film and television production, game development, exhibition display, stage performance and many other aspects, providing artists with a broader creative space and richer means of expression, and about different areas, we can often see very expressive XR digital media art works.

In film and television production, XR technology is increasingly becoming a key technology in the field of film and television production, revolutionizing film and television production through the application of Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR). These technologies not only make scene design and preview more efficient and reduce the consumption of time and resources, but also make character design and animation more vivid and realistic. Especially in special effects production, XR technology creates more natural visual effects by combining virtual effects with real scenes. In addition, XR technology also shows great potential in interactive narratives, allowing viewers to interact with characters or scenes in movie and television productions through augmented reality technology, thus enhancing the viewing experience. In the field of film and television production, XR technology has enabled the creation of many high-quality immersive digital media artworks. The

Jungle Book"[6] directed by Jon Feijoo is a movie using AR technology. In the movie, the audience can experience the augmented reality effect integrated with the movie scenes through cell phones or other terminals. For example, when a river is shown in the screen, the audience can feel the vivid scene of water flowing on the screen through their cell phones; when the animals in the movie appear, the audience can also use their cell phones to witness their lively jumping or rushing scenes on the screen. George Lucas directed the "Star Wars" series of science fiction movies[7] is the use of VR technology to create the movie, the audience in the viewing process, through the VR equipment in a virtual universe, to experience the exciting moments of interstellar battles and adventures. Ltd. jointly produced by the Sanxingdui Museum and Lianyou (Chongqing) Technology Co., Ltd. MR guided movie "Ancient Shu Phantom Land Chapter 1 - Bronze God Tree" uses MR technology, the exhibition movie using MR technology, so that tourists in the visit to the reality of the museum's specific exhibits and the MR of the virtual movie seamlessly connected to achieve the perfect mixture of reality and virtual. The exhibition movie utilizes MR technology to allow visitors to seamlessly connect with the MR virtual movie while visiting specific exhibits in the museum in reality, achieving a perfect mix of reality and virtual.

The use of XR technology in game development is not only driving innovation and growth, but also fundamentally changing the way games are played and experienced. By blending virtual reality (VR), augmented reality (AR) and mixed reality (MR) technologies, XR infuses games with a higher level of immersion and interactivity, providing gamers with an unprecedented gaming experience. VR games such as "Beat Saber" and "Half-Life: Alyx" leverage immersive environments and spatial tracking technology to provide players with immersive experiences and new types of interaction, while Global phenomenon AR games such as "Pokémon GO" and "Harry Potter: Wizards Unite" create unique game mechanics by combining game elements with the real world, allowing players to interact with each other in the real world. interact with the game in the real world. These games not only connect deeply with players on a physical and emotional level, but also enhance social interactions in innovative ways. In addition, XR technology has pushed the boundaries of game design, introducing new game mechanics and the fusion of the physical and virtual worlds. For example, the time flow mechanics of the VR game "SUPERHOT VR" and the rhythmic challenges of "Beat Saber" demonstrate how XR technology can create unique game experiences that require players to react quickly both physically and strategically. Rapid Response. Overall, XR technology is not only a technological breakthrough, but also brings significant advances in game narrative, gameplay innovation, and social interaction. As the technology continues to evolve and optimize, the future of XR gaming will be even more colorful, delivering more realistic, interactive and innovative gaming experiences, heralding a more immersive and interactive gaming world on its way to us.

Figure 2 Harry Potter: Wizards Unite's gameplay screen (image credit: author's own)

XR technology has revolutionized the exhibition display field like never before. Its unique display method provides a more immersive experience for the audience. First of all, VR technology, as a brand new way of visiting and learning, puts the audience in a computer-generated three-dimensional environment through head-mounted devices to freely explore the content of the exhibition. In historical exhibitions, VR technology can reconstruct historical scenes, making the audience feel as if they are traveling through time and space, experiencing historical changes firsthand. In art exhibitions, VR technology models the artwork

[6] The Prince of the Forest, formerly known as Jungle Tales, is a collection of stories written by Rudyard Kipling. The stories told come from Kipling's sightings in India. One of the most widely known is a story about wolves raising a human child. The entire novel uses animals in an anthropomorphic manner to give moral admonitions with an enduring charm. The entire novel uses animals in an anthropomorphic manner to give moral admonitions with an enduring charm.

[7] Star Wars (English: Star Wars), which can be abbreviated as Star Wars, is a series of science fiction films produced and filmed by American director George Lucas. The characters and story of the first Star Wars trilogy of the 1970s-1980s were created with reference to the Vietnam War and the Japanese director Akira Kurosawa's Battle of the Battles. The characters and story of the first Star Wars trilogy of the 1970s-1980s were created with reference to the Vietnam War and the Japanese director Akira Kurosawa's Battle of the Battles. At the same time he changed the initial trilogy into a six-part series.

in three dimensions, allowing the audience to appreciate and feel the charm of art in all aspects. Secondly, AR technology combines virtual information with real scenes to enrich the content of the exhibition. Audiences can obtain virtual information related to physical exhibits, such as 3D models, background stories and related information, through devices such as cell phones or tablet PCs. In science and technology exhibitions, AR technology superimposes three-dimensional models of products onto the booths, enabling visitors to understand the structure and functions of the products more intuitively. In cultural exhibitions, AR technology superimposes the background stories and related information of exhibits onto the physical objects, helping the audience to deeply understand the history and cultural value of the exhibits. Finally, MR technology seamlessly integrates the virtual with the real, allowing visitors to explore the exhibition content more freely. Through MR technology, viewers can see virtual information and images in the real environment, blending with the real environment and presenting unique visual effects. In product exhibitions, MR technology demonstrates the product design and manufacturing process in real time, allowing visitors to gain a deeper understanding of the product connotation. In cultural exhibitions, MR technology presents the background stories and related information of the exhibits in real time, helping visitors to dig deeper into the history and cultural value of the exhibits.

The use of XR technology in the field of stage performance is revolutionizing artistic expression. With the help of VR technology, the audience can get an immersive viewing experience. In stage performances, through VR equipment, the audience seems to be in the scene, immersed in the performance atmosphere and stage lighting, sound effects and other elements, so as to more deeply understand the plot and the role of the AR technology will be the virtual elements of the fusion with the real scene, for the audience to bring a richer visual experience. In stage performances, AR technology can combine virtual characters, props, etc. with real scenes, so that the audience can get an intuitive visual experience when watching the performance. In dance performances, AR technology integrates virtual dancers with real scenes, making the audience feel as if they are witnessing real dancers dancing on the stage.MR technology, as an integration of VR and AR, realizes the seamless connection between virtual elements and real scenes, and provides the audience with a more realistic and natural interactive experience. In stage performances, MR technology combines virtual characters and props with real-life scenarios, giving the audience a more intuitive visual experience when watching the performance. By creating immersive and interactive performance environments, XR technology not only enhances the visual effect of the stage, but also brings a new immersive experience to the audience and provides choreographers and directors with new narrative tools. Berlin-based drummer and Sunhouse artist Philomène Tsoungui participated in the XR live performance at the "We Love XR" organization[8] , using Sunhouse's sensor acoustic kit to capture the drummer's subtle percussive movements, and then using the accompanying software to input the sound into the computer in the form of analog signals and analyze the sensor signals to realize the drummer's digital response. The software used to input the sound as an analog signal into the computer analyzes the sensor signals and allows the drummer to control the digital sound. During the performance, Philomène Tsoungui created four dreamlike virtual worlds, changing the scenes to the rhythm of the music, creating a powerful visual effect for the audience.

Fig. 3 PhilomèneTsoungui's live stage performance (Photo credit: web report image)

The creation of digital media art is a multidisciplinary process that integrates visual art, psychology, aesthetics and communication. In XR digital media art scene design, the theory of mental flow[9] plays a guiding role, and digital media art is a

[8] WE LOVE XR is an international collaborative project that explores the possibilities of extended reality by various artists and contributors from different fields. Initiated and curated by OBJ.Studio, the project is presented by AMBION GmbH at the SUPEROOM XR studio. For this project, more than 50 artists and contributors have crafted a surreal and immersive XR experience that demonstrates the many possibilities of XR. For this project, more than 50 artists and contributors have crafted a surreal and immersive XR experience that demonstrates the many possibilities of this revolutionary approach.

[9] The theory of mind flow is a psychological state that describes people's ability to be fully engaged and have an optimal experience in a particular state.

key tool to realize the immersive experience of the viewer. The process of constructing the immersive nature of XR digital media art works involves several links: digital media art as the basis of the artistic atmosphere, immersive design as the way to realize the concept, and scene design as the specific design means. In this process, theme, subject, time and space are the four core elements. The theme and subject of the work form the basis of the artwork, reflecting the creator's aesthetic concept. The "confusion" and "disarray" of time and space are unique to XR technology, which stimulates and confuses the viewer's senses to bring about a deep immersive experience. During the creation process, the artist can intuitively experience how the audience's subjective perspective changes the traditional way of creation. By establishing body motion capture devices and eye tracking technology[10] , the work is able to respond in real time to changes in the audience's behavior and vision. To take full advantage of the benefits of digital media art and XR technology, it is common in the industry to use head-mounted displays or omni-directional fusion projection venues. Each artwork has its own unique content and purpose, designed to provide a different experience for the viewer. The work itself is a unique scenario, and creators need to employ diverse display formats to avoid a single model. In short, any space that promotes interaction between the work and the audience can become a stage for artistic communication. Developing new digital media art forms and expanding real art works through a scenario-based mode of thinking is the best interpretation of the communicative nature of digital media art. On the basis of virtual space art atmosphere, building a communication platform is of key significance for the development of digital media art. Taking the digital media art exhibition "Mixed Reality Interactive Virtual Performance" held in the United States as an example, it is crucial to ensure interference-free communication among the audience. Individual experience installations enhance interaction between people while energizing the virtual world experience. The importance of network technology is self-evident here, as it allows users to remotely enter the virtual space and share interactive scenes. The popularity of interactive communication platforms reflects the reliance and demand for individual experiential installations that facilitate the dissemination of artworks. By giving specific themes, interactive scenes can create diverse applications such as launches, concerts and exhibitions. Individual experiential devices make it possible to enter a non-physical online immersive space, bringing a new dimension to the display and experience of art works.The application of XR technology in digital media art space forms a holistic art space with the characteristics of deceptive reality. This kind of space integrates light, sound, image and environmental elements to provide an immersive experience for the audience. The audience can not only experience the art atmosphere in these scenes, but also feel the intuitive charm of digital media art works. The design of the Cube Pavilion demonstrates how any structure can be integrated into the virtual world to enhance the audience's subconscious experience. The combination of the virtual and the real not only guides the audience to explore the beauty, but also provides an adventurous experience.The art space created by the XR technology has an important position in the development of digital public art space, and constructs a new concept of "multi-dimensional hybrid public space". The construction of a holistic art space focuses on the occasion and form, and its core lies in the audience's experience. Innovation can start from time, place, object, use, etc., while the change of scene details should maintain the consistency of the core concept. The trend in this kind of space is towards three-dimensional digital reality technology, aiming to break the boundaries of reality and enhance interactive interest. In this environment of information flow, the audience can understand the creator's concept more deeply. In the era of the mobile Internet, the holistic art space as an expression of XR digital media art demonstrates the integration of experiential, emotional, community and data.

Future Prospects: Technology Convergence is the Key to Enhancing the Expressive Power of Digital Media Arts

"XR Digital Media Artworks of the Times" is an in-depth exploration of the convergence of current technological trends and forms of artistic expression. The application of this technology in digital media art not only changes the way we view and experience art, but also poses new challenges and possibilities for the creation and expression of art itself.

XR technology provides a new experience for art interaction, especially in enhancing the immersiveness and interactivity of works, which is increasingly receiving widespread attention. This technology not only greatly enriches the presentation of artworks and provides a new perspective for us to appreciate artworks, but also expands the possibilities of artistic creation. XR technology plays a key role in enhancing the immersion of artworks. While the display of traditional art works is limited to specific places, such as galleries, museums or theaters, XR technology breaks this limitation and even creates a virtual space beyond the physical limitations. For example, with VR technology people can visit the Louvre gallery immersively without having to be physically present in France. With AR technology, works of art such as famous paintings or sculptures can be brought into one's personal space, enabling them to be enjoyed anytime, anywhere. This immersive experience is both convenient and realistic, helping to deepen the understanding and feeling of the artwork.XR technology also excels in enhancing the interactivity of artworks. Compared with traditional static, one-way display methods, XR technology makes artworks interactive with the audience, making the audience part of the creation. For example, some artists utilize AR technology to combine artworks with audience actions to create dynamic artworks. Viewers interact with the artwork through their mobile devices, changing elements such as color, shape or size to present unique visual effects. This interactive experience not only increases audience engagement, but also provides more possibilities for artists to explore artistic boundaries and possibilities. Artists can utilize VR or AR

The theory was first proposed by American psychologist Mihaly Csikszentmihalyi in his 1975 doctoral dissertation. The development of the theory of mind flow focuses on the individual's experience of the activity, including factors such as The development of the theory of mental flow focuses on the individual's experience of the activity, including factors such as the challenge of the activity, the degree to which the skill level matches the activity, clear goals and objectives. The development of the theory of mental flow focuses on the individual's experience of the activity, including factors such as the challenge of the activity, the degree to which the skill level matches the activity, clear goals, and immediate feedback. These factors work together to bring the individual to a state of obliviousness and full attention during the activity, known as the state of mind flow.

[10] When a person's eyes look in different directions, there will be subtle changes in the eyes, and these changes will produce features that can be extracted, and computers can extract these features through image capture or scanning, so that they can track the changes in the eyes in real time, predict the user's and computers can extract these features through image capture or scanning, so that they can track the changes in the eyes in real time, predict the user's state and needs, and respond to them, for the purpose of controlling the device with the eyes.

technology for creation and design, such as virtual reality sculpture creation, architectural design and clothing design. This type of creation not only gives artists greater freedom and flexibility, but also allows creativity and ideas to be presented more directly.

XR technology provides new methods for artistic creation. XR technology greatly expands the boundaries of artistic creation, providing artists with new creative tools and ways of expression. By combining elements from the real world and the virtual world, XR technology injects new creativity into artistic creation and promotes diversified development and innovation in art. Traditional painting, sculpture and photography have been extended with the help of XR technology, and many new creative tools and platforms have been created. Artists can create unique immersive artworks with the help of virtual reality technology, and viewers can immerse themselves in the virtual space constructed by the artists through VR devices and interact with the artworks, thus injecting richer potential into art creation. With the help of augmented reality technology, artists are able to integrate digital images with real-life scenes to create more vivid and three-dimensional works. Viewers can enjoy these artworks through cell phones or head-mounted AR devices, realizing the interaction between viewers and artworks. As a result, the art works go beyond the traditional two-dimensional and static forms of expression, and the ornamental and interesting nature can be enhanced, and the art works are also more vivid and three-dimensional. In the deep integration of art creation and technology, artists are able to use mixed reality technology to integrate digital technology with traditional art forms, thus giving birth to new art forms. They can use mixed reality technology to create interactive installations[11] , where the audience is involved in the artworks through human-computer interaction, making the artworks more active and dynamic. In addition, XR technology provides more opportunities for cross-border cooperation in art. This emerging art form involves knowledge and skills in a variety of fields such as digital technology, art creation, engineering design, and human-computer interaction, which makes it easier for artists to cooperate with scientists, engineers, and designers across borders, and thus promotes the fusion and innovation of art and technology.

XR technology has given new functional elements to art works, and from the perspective of social function, XR technology has given art works wider social influence and dissemination channels. While traditional art forms are limited by time, space and audience groups, XR technology realizes the global dissemination and sharing of art works with the help of digital platforms. With the help of VR equipment, viewers can experience artworks in an immersive way without being physically present, which greatly broadens the scope of the audience and enables more people to come into contact with and learn about the artworks, thus enhancing the social impact of the works.XR technology helps artworks realize closer social interaction and participation. With the help of virtual reality technology, artists are able to create more interactive works, and the audience can also participate in the artworks during the appreciation process, and contribute to the evolution and development of the artworks with their behaviors and feedback. This kind of interactivity gives works of art a two-way or even multi-directional expression, enabling them to realize more direct and three-dimensional communication with the audience, thus promoting the interaction and integration of art and society to a certain extent. From the perspective of cultural function, XR technology gives art works richer cultural connotation and diversified cultural expression. Through virtual reality technology, artists can create more immersive experiences, and viewers can experience different cultures, histories and situations in the virtual space, thus enhancing the cultural connotation and diversity of the works. In addition, XR technology also provides new means and ways to record and pass on culture. Artists can utilize augmented reality technology to combine digital artworks with real-life scenarios to create virtual narratives about cultural traditions and historical events, thus enabling culture to be preserved and passed on in new forms for a long time.

XR technology provides a free space for artistic creation, and by breaking the limitations of traditional art forms, it brings new expressions and possibilities to art creators. Traditional artworks are usually static, making it difficult to show the elements of time and change. Through virtual reality technology, artists can create more dynamic works, and viewers can experience the flow and change of time in the virtual environment, such as virtual landscapes, dynamic images and interactive elements, thus providing art creators with richer forms of expression. In the face of static works of art, the audience can only feel the artist's work through watching. XR technology can make art works more dynamic and interactive, the audience can interact with the works through virtual reality devices or augmented reality applications, changing the passive relationship between the traditional audience and the art, making the art creation more interactive and resonant with the audience, and increasing the ornamental and interesting nature of the works. In addition, XR technology breaks through the material and media constraints of traditional art forms. In traditional art creation, artists are often limited by specific materials and media, while XR technology provides artists with a broader creative space through digital media and virtual materials. In the virtual environment, artists can boldly experiment with all kinds of materials and effects to create unprecedented artistic masterpieces. In traditional art creation, artists often need to consider the physical properties of materials, such as paint, canvas, sculpture materials, etc. These physical properties limit the imagination of artists to a certain extent. XR technology, on the other hand, removes these constraints and allows the artist to focus on the essence of art creation - creativity. In the virtual environment, the artist is free to experiment with a variety of materials and effects without worrying about the difficulties involved in actual operation. This freedom gives artists more possibilities to give full play to their imagination and create unique works of art. How to grasp the rhythm of art creation in the virtual environment, how to inherit the flavor of traditional art in the digital media, are the issues in front of the artists, XR

[11] Installation art refers to objects (including the artist himself) placed in space, and has the connotation of a synthetic medium. From this point of view, "installation" is an extension of "object", an alienation of space itself, and a dialogue between human beings, objects, and the environment. "installation" is an extension of "object", an alienation of space itself, and a dialogue between human beings, objects, and the environment. Installation art began in the 1960s, and was also called "environmental art". As a kind of art, it is related to Pop Art, Minimalism and Conceptual Art in the 1960s and 1970s. In just a few decades, installation art has become a In just a few decades, installation art has become a fashionable part of contemporary art, and many painters and sculptors have added the title of "installation artist" to themselves. In the West, there are already specialized installation art museums, and art colleges have begun to offer courses on installation art. In the West, there are already specialized installation art museums, and art colleges have begun to offer courses on installation art. In the exhibitions of Western contemporary art museums, installation art also occupies a rather important position.

technology brings unprecedented opportunities for art creation, it breaks through the traditional art form of material and media constraints, providing artists with a broader creative space. In the virtual environment, artists can boldly try all kinds of materials and effects to create unprecedented artistic masterpieces. But at the same time, artists need to explore and challenge the possibilities of XR technology in order to bring more innovation and development to the field of modern art.

XR technology is changing the landscape of education, especially in the arts. This technology allows educational content to be personalized according to students' interests and learning speed, providing a learning experience that better meets each student's needs. In arts education, XR technology allows students to learn in a deeper, more self-directed way. For example, students can walk through a Renaissance gallery through virtual reality (VR) technology or experience ancient sculpting techniques through augmented reality (AR) technology, depending on their preferences. More importantly, XR technology can also provide powerful support for cultural heritage preservation. It enables us to create accurate digital copies of cultural heritage, which is important for those that have been damaged or are threatened with disappearance. Digital restoration can not only be used in educational scenarios, but also helps to preserve the historical and cultural value of these valuable assets. In the virtual space, users can even create works of art that would be difficult to realize in the real world. xR technology also supports remote collaboration, breaking down geographical constraints and enabling artists and students from all over the world to work together on the same project, contributing to the creation of a global artistic community. This technology provides the opportunity to experience different cultures, which is essential for promoting cross-cultural understanding and respect. Virtual tours allow students to explore the art and culture of different countries without leaving their homes, and to delve deeper into their history, thus developing a deep understanding and appreciation of global multiculturalism. In the traditional education model, students often learn about cultures and arts from around the world through books, pictures, and videos, which provide a certain level of information but do not allow students to truly feel the charm of the art and the uniqueness of the culture. Virtual travel, on the other hand, allows students to experience various art forms as if they were in a museum, art gallery or historical site, and this type of immersive learning greatly stimulates students' interest and enhances learning effectiveness. In terms of access to educational resources, virtual reality technology opens up unlimited possibilities. It ensures that everyone can access and enjoy art education, regardless of location. Whether it is a city or a remote village, as long as there are networks and devices, students can access high-quality art education resources anytime, anywhere. This equity is undoubtedly a major advantage that virtual reality technology brings to the field of education. In addition, virtual reality technology can also enhance the convenience of educational resources, making learning more efficient and interesting. Students can set their own learning paths and customize their learning programs with the help of virtual reality technology. At the same time, virtual reality technology can also provide real-time feedback and assessment to help students understand their own learning progress and adjust their learning strategies. This personalized and data-driven approach to teaching and learning enables educational resources to more accurately meet students' needs and improve the quality of education.

Technological integration has a key impact on enhancing the expressive power of digital media art, which integrates a series of cutting-edge information technologies to give digital media art a richer, more complex and vivid form of expression. With the integration of meta-universe, communication technology, artificial intelligence, digital twins and other technologies, digital media art presents greater innovative vitality and influence in creation, presentation and interaction. The integration of meta-universe technology can provide a more open and diversified space for digital media art. Meta-universe, a virtual world converged by many cutting-edge technologies, has no entity but is modeled on the real world, and through the superposition of a series of experimental technologies, it can bring a nearly real experience for users. The construction of such a meta-universe world cannot be separated from the transformation of the real world by digital media art. In the meta-universe, the quality of experience comes from the sense of immersion in "reality" and the sense of freedom to transcend reality, both of which come from the artistic atmosphere created by digital media art. Whether it is customizing one's personal image, social behavior, or purchasing and trading virtual goods, digital media art transforms, innovates, and brings them to life in the metaverse. It is digital media art that makes the experience of the virtual world realize the "fusion of reality and reality", thus realizing the experience of the real world into the meta-universe of replaceable experience. Decentraland is the most widely expanding platform in the current metaverse. As a blockchain-based virtual reality platform, Decentraland empowers users to create, experience, and participate in Monaco games in a decentralized environment[12] . The core concept of Decentraland is to build a decentralized virtual world where users can buy, sell, develop, and manage virtual lands. These virtual lands are used for a variety of purposes, including gaming, art, entertainment, social interaction, and commerce. In Decentraland, users are able to purchase digital assets, services, and experiences on virtual lands using their native token, MANA[13] , which is typically issued based on the ethereum blockchain, as well as create and develop on virtual lands. This decentralized virtual environment provides users with self-directed, creative, diverse and fun experiences. In addition, Decentraland provides an open platform for developers to create, develop and distribute their own content in the virtual space, thereby showcasing their creativity and work to a global audience. As a deep fusion of virtual reality and augmented reality, Metaverse opens up a vast virtual realm for art creators. In this context, art works are able to transcend the limitations of traditional physical space, presenting richer and more complex forms and presenting them to the audience in a more highly immersive way. With the help of meta-universe technology, digital media art can be vividly and three-dimensionally displayed, thus enhancing the immersion and viewing effect of art works. In the realm of the metaverse, our endless imagination and pursuit of art are the only limitations. Any element that can be created

[12] Decentraland's applications include, but are not limited to, a wide range of areas such as gaming, social interaction, virtual business and artistic expression. Users can participate in diverse activities in virtual reality, such as visiting art galleries, attending concerts or hosting social gatherings. Users can participate in diverse activities in virtual reality, such as visiting art galleries, attending concerts or hosting social gatherings.

[13] MANA Coin is a platform token issued on September 18, 2017 on the Decentraland platform with a total issuance of 2,194 million MANA. platform is a virtual world platform that develops on the basis of the blockchain. It was born for the decentralized open source project, in order to solve the problem of certain platform merchants earning profits. It was born for the decentralized open source project, in order to solve the problem of certain platform merchants earning profits from intermediate platforms.

in a tangible way can be given "entity" by the creators of digital media art, even if the element does not exist in the real world. In the metaverse, standardized tokens used for bartering are called non-homogenized tokens (NFTs)[14] . In the metaverse, the ownership of a given NFT belongs only to the person who owns its data, and thus the rules of copyright for digital media artworks are gradually being established.

The integration of communication technology provides a new way to enhance the interactivity and participation of digital media art. Through the integration of communication technology, digital media art works can realize real-time interaction with the audience, enabling the audience to communicate and collaborate in the virtual space, transforming the performance of art works into a more popular participatory journey, and broadening the social attributes and interactivity of art creation. This integration transforms digital media artworks from a static display into a dynamic and open social platform, enriching the audience's viewing experience. Artificial intelligence technology can provide art creators with many creative aids, such as generative art, image recognition, etc., making the creative process more efficient and diverse. At the same time, AI is also able to sense and process audience behavioral data, adjusting the presentation of artworks in real time according to audience feedback, bringing a more personalized and immersive art experience to the audience.

The development and integration of digital twin technology is profoundly changing the way digital media art is created and presented. This technology makes artworks closer to the real world, presenting more realistic and detailed visual effects and opening up new possibilities for the art field. Digital twin technology has a unique advantage in simulating the physical world. By accurately simulating various physical phenomena such as light, material, aerodynamics, etc., artists can create highly realistic scenes and objects in the virtual environment. This is especially important in the fields of movies, games, architectural design, etc. They can greatly enhance the sense of reality and immersion in the virtual world, making it difficult for the audience to distinguish between reality and virtual. In China, the application of digital twin technology in the cultural and creative industries has gradually been emphasized. The government and enterprises have increased their support for digital media arts to promote the upgrading of the industrial structure and the digital transformation of the cultural industry. With the continuous development and popularization of technology, digital twin technology will bring new opportunities and challenges for the creation of digital media art in China. With the help of this technology, artists can realize the accurate simulation of the real world and further expand the creative space of digital media. For example, in movie production, through digital twin technology, the director can more accurately control the lens effect, realize the restoration of the real scene, and improve the quality of the picture. In the field of game development, digital twin technology can help game designers present the game world more realistically and enhance the immersion and interactivity of the game. In addition, digital twin technology also plays an important role in emerging fields such as virtual reality and augmented reality, providing users with a more immersive experience. With the wide application of 5G, artificial intelligence and other technologies, digital media art will gradually become an important direction for the development of the cultural industry. The popularization of digital twin technology will help improve the international competitiveness of China's cultural products and promote the cultural industry to the world. At the same time, digital twin technology can also provide support for the inheritance and innovation of traditional culture, so that traditional culture can be revitalized in modern society. However, the development of digital twin technology also brings certain challenges. In terms of artistic creation, artists need to continuously improve their technical level and adapt to the changes in creation methods brought about by digital twin technology. In terms of industrial development, China needs to strengthen policy support for digital twin technology, cultivate relevant talents and promote industrial innovation. In addition, in the application of digital twin technology, privacy protection and data security issues should not be ignored.

[14] NFT is unique and unrepeatable, backed by blockchain technology, giving value to every digital media art product in the meta-universe. These tokens can be anything from a unique plant in a scene, to clothing worn by an avatar, to an entire extended reality scene, or even a planet. These tokens can be anything from a unique plant in a scene, to clothing worn by an avatar, to an entire extended reality scene, or even a planet. This "currency" can be traded for an unlimited number of times, and its value can change at any time, providing an opportunity to define the value of a digital media artwork, which is usually an added value. This "currency" can be traded an unlimited number of times, and its value can change at any time, providing an opportunity to define the value of a digital media artwork, which is usually