

The impact of the development of holographic imaging technology on digital media art design

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Abstract: With the rapid advancement of technology, holographic imaging technology has also developed rapidly, bringing unprecedented creativity and expressive methods to digital media art design. This paper explores the impact of holographic imaging technology on digital media art design. The analysis is divided into four parts: the first part introduces the definitions and current trends of holographic imaging technology and digital media art design; the second part discusses the relevance of holographic imaging art to digital media art design, analyzing their technical and artistic complementarity; the third part focuses on the impact of holographic imaging technology on digital media art design, exploring innovations in visual effects, artistic creation processes, and audience interaction methods; the fourth part showcases the practical applications of holographic imaging technology in digital media art design through specific cases in photography, art exhibitions, virtual advertising, and 3D movies. This paper aims to reveal the importance and potential development directions of holographic imaging technology in future artistic creation and audience experience by analyzing its application and impact in digital media art design.

Key words: holographic imaging; digital media art; art design

1 Introduction

In the context of rapid technological development, digital media art design, as an emerging art form that integrates technology and art, has developed rapidly and is widely applied. Holographic imaging technology, as an important component, records and reproduces the light wave information of three-dimensional objects, allowing viewers to appreciate realistic three-dimensional images from different angles. This technology brings new possibilities for the creation and expression of digital media art. By deeply analyzing the background of holographic imaging technology and digital media art design, we can better understand their concepts, development history, and significance in modern society.

2 Concepts and development status of holographic imaging technology and digital media art design

2.1 The concept and development of holographic imaging technology

Holographic imaging technology uses the principles of interference and diffraction to record and reproduce the light field information of three-dimensional objects. It records the amplitude and phase information of light waves to generate realistic three-dimensional images, allowing viewers to observe stereoscopic images from different angles. This technology was first proposed by Hungarian physicist Dennis Gabor in 1947, for which he won the Nobel Prize in Physics in 1971.

The emergence of laser technology in the 1960s laid the foundation for the practical application of holographic imaging technology. Scientists such as Yuri Denisyuk and Emmett Leith independently invented practical holographic imaging methods, gradually transitioning the technology from theory to practice.

Entering the 1980s, the rise of digital holography marked a new development phase for holographic imaging. Digital holography uses computers for the recording, processing, and reproduction of holograms, improving production efficiency and significantly enhancing image resolution and display effects. In recent years, with the continuous advancement of computer and display technologies, the application of holographic imaging technology has become increasingly widespread in various fields such as medical imaging, security identification, 3D display, and artistic creation [1].

2.2 The concept and development of digital media art design

Digital media art design is an art form that utilizes digital technology and new media methods for creation and dissemination. It integrates computer graphics, interactive installations, virtual reality (VR), augmented reality (AR), internet art, and more, breaking the boundaries of traditional art and creating highly interactive and immersive artistic experiences. Digital media art design is not only a new form of artistic expression but also a new cultural phenomenon, offering diverse artistic experiences through the combination of technology and art.

The origin of digital media art design can be traced back to the mid-20th century when artists began experimenting with computer-generated art. The widespread adoption of the internet in the 1990s further propelled the development of digital media art, making it a crucial part of contemporary art. In recent years, the application of emerging technologies such as VR, AR, and artificial intelligence has greatly enriched and enhanced digital media art design in terms of expression and audience experience.

3 The relevance of holographic imaging technology to digital media art design

The relevance of holographic imaging technology to digital media art design is reflected in several aspects. First, artists engaged in digital media art can use holographic imaging technology to create immersive and interactive holographic art pieces. By combining holographic imaging technology with virtual reality technology, artists can create stunning virtual worlds where viewers can interact and explore. This fusion provides a new artistic experience that transcends the limitations of traditional flat and two-dimensional media.

Second, holographic imaging technology offers more creative possibilities for digital media art design. Artists can use holographic imaging to express their ideas and concepts, bringing artworks into a new dimension. The use of this technology makes artworks more vivid and immersive, while also providing artists with greater expressive space and artistic possibilities.

Lastly, holographic imaging technology changes the way audiences interact with artworks. Viewers are no longer passive recipients but can interact, intervene, and explore. This interactivity not only enhances viewer engagement but also makes the interaction part of the artwork itself, increasing their understanding and experience of the piece. The integration of holographic imaging technology greatly enhances digital media art design.

4 The impact of holographic imaging technology on digital media art design

4.1 Enhanced visual impact of digital artworks

Holographic imaging technology brings unprecedented visual impact to digital media artworks through its unique three-dimensional imaging method. Traditional two-dimensional art forms, while capable of presenting detailed images, often lack depth and a sense of three-dimensionality. Holographic imaging technology can record and reproduce the light wave information of objects, including amplitude and phase, to generate realistic three-dimensional images, allowing viewers to view and perceive the three-dimensional effects of the artwork from multiple angles. This visual innovation not

only makes the artwork more realistic and spatial but also significantly enhances its visual appeal. In some holographic imaging exhibitions, viewers can see lifelike three-dimensional images that appear to float in the air, providing a strong visual shock. The dynamic changes in light and shadow further enhance the visual effects, immersing viewers in the fantastical world created by the artwork.

4.2 Expanded artistic creation possibilities

Holographic imaging technology brings new possibilities for artistic creation, breaking the limitations of traditional art forms. Artists can use the characteristics of holographic imaging technology to create in virtual spaces, free from the constraints of physical materials and space. This freedom greatly stimulates artistic creativity, allowing bold exploration and experimentation with new art forms and expression methods. Artists can create virtual sculptures using holographic imaging technology, which not only have real three-dimensional shapes but can also incorporate dynamic changes and interactivity. Additionally, artists can combine holographic imaging with other media forms to create interdisciplinary comprehensive artworks, enriching the variety and forms of their creations. Currently, in many concerts, we can see the involvement of holographic imaging technology, enhancing the atmosphere of the performance by combining music with holographic images, allowing audiences to enjoy a dual feast of visual and auditory experiences simultaneously [2]. In the 2021 China Central Television Spring Festival Gala, "Splendid Garments of Mountains and Rivers" is a classic example of combining holographic imagery with stage art. In this dance performance, the background used holographic projection technology to switch scenes such as deserts, lakes, jungles, and wheat fields, perfectly integrating real performers with virtual scenes, providing the audience with a surreal viewing experience.

4.3 Strengthened interactivity and participation

Holographic imaging technology provides new possibilities for immersive and interactive experiences in digital media art. In traditional art displays, viewers are often passive observers, but the application of holographic imaging technology changes this situation. Viewers can interact with holographic images through gestures, voice, and other methods, participating in the creation of the artwork, changing the shapes and contents of the images. This interactivity not only enhances viewer engagement but also gives the artwork greater vitality. The combination of holographic imaging technology with virtual reality (VR) and augmented reality (AR) technologies allows viewers to enter a fully holographically constructed virtual world for immersive interaction and exploration.

4.4 Cross-disciplinary integration and innovation

The application of holographic imaging technology promotes cross-disciplinary integration and innovation between art and other fields. Holographic imaging technology plays an important role not only in pure artistic creation but also in film production, commercial displays, education, and training, promoting the cross-disciplinary development of digital media art. In film production, holographic imaging technology can be used to create virtual scenes and characters, seamlessly integrating virtual and real elements, enhancing the visual effects and narrative capabilities of films. In commercial displays, holographic imaging technology can be used for product presentations and brand promotions, attracting viewers' attention through vivid three-dimensional images, enhancing brand influence and recognition. In education and training, holographic imaging technology can be used for three-dimensional displays of teaching content, helping students better understand and master complex concepts and knowledge [3].

4.5 Transformation of art dissemination methods

Holographic imaging technology changes the dissemination methods of artworks, enabling broader dissemination through digital platforms. Traditional art exhibitions are often limited by specific spaces and times, but the introduction of holographic imaging technology allows artworks to be displayed and disseminated digitally, breaking the limitations of

geography and time. Artists can upload holographic artworks to the internet, allowing viewers to watch and interact through various terminal devices. This digital dissemination method not only expands the audience range of artworks but also provides artists with new creation and display platforms. In holographic imaging digital museums, viewers can watch artworks from all over the world through online platforms, experiencing realistic three-dimensional effects [4]. At the 2010 Shanghai World Expo, holographic imaging technology was used to display "Along the River During the Qingming Festival", allowing viewers to see dynamic scenes of ancient life in three-dimensional presentation, providing unprecedented artistic shock.

5 Applications of holographic imaging technology in digital media art design

5.1 Applications in photography and film

The integration of holographic imaging technology into photography and film has brought revolutionary changes to visual arts. Traditional photography and films are often confined to two-dimensional spaces, whereas holographic imaging technology can record and reproduce the three-dimensional information of objects, making images more realistic and three-dimensional. For example, in film production, holographic imaging technology can be used to create scenes and characters, seamlessly blending the virtual with the real, thereby enhancing the audience's immersion and visual experience. A typical application is the use of holographic imaging technology in science fiction films. In the "Star Wars" series, holographic projection has become a classic visual effect. Through holographic imaging technology, filmmakers can create visual scenes that combine reality and illusion, making the audience feel as if they are in a future world. Additionally, holographic imaging technology can be used in documentary filming to showcase historical sites and precious cultural relics through three-dimensional holographic images, allowing viewers to intuitively feel the weight of history and the charm of culture [5].

5.2 Interactive art installations and exhibitions

The application of holographic imaging in interactive art installations greatly enhances viewer participation and interactivity. Artists can use holographic imaging technology to create immersive art installations where viewers can interact with holographic images through gestures, voice, and other methods, changing the shapes and contents of the images. This interactivity not only enhances the expressiveness of artworks but also makes viewers part of the artistic creation, providing an unprecedented artistic interaction experience. In modern art exhibitions, we often see interactive artworks where viewers can change the colors and shapes of images, even participating in the creation process of the artworks. This kind of holographic interactive installation art easily attracts a large number of participants, promoting deep integration between artistic creation and audience experience.

5.3 Education and museum displays

In education and museum displays, the application of holographic imaging provides new forms of knowledge dissemination and cultural heritage. In education, holographic imaging technology can be used for three-dimensional displays of teaching content, helping students better understand and master complex concepts and processes. Especially in medical education, students can use holographic imaging technology to view the three-dimensional structure of human organs, understand their functions and pathological changes, enhancing the intuitiveness and effectiveness of learning [6]. In museum displays, holographic imaging technology can be used for three-dimensional presentations of artifacts and artworks, allowing viewers to observe exhibits from multiple angles, understand their details and historical context. Currently, in many historical museums, holographic imaging technology is used to display ancient artifacts, allowing viewers to see the three-dimensional forms of the artifacts and even conduct virtual interactions and explorations, experiencing a more vivid and realistic historical culture.

5.4 Commercial advertising and brand displays

In commercial advertising and brand displays, holographic imaging technology creates new marketing methods and brand communication techniques. Using holographic imaging technology, companies can showcase products from multiple angles and functionalities in advertisements, making the content more vivid and attractive. A prominent example is the use of holographic imaging technology in car exhibitions, where viewers can see multi-angle models and internal structures of cars, even experiencing car functions and performance through interactive devices, enhancing brand influence and recognition. In high-end shopping malls and exhibitions, companies can use holographic imaging technology to display new products, attracting viewers' attention and enhancing the visual impact and market competitiveness of the brand. This application not only improves the effectiveness of advertisements but also provides new creativity and methods for brand communication.

6 Conclusion

Holographic imaging technology has brought revolutionary changes and development prospects to digital media art design. It not only provides new possibilities for artistic creation and display but also offers audiences a richer and more diverse art and technology experience. With continuous technological advancements, holographic imaging technology will play an increasingly important role in future artistic creation and cultural dissemination, bringing us more exciting visual and sensory enjoyment.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] Dong P. 2020. Exploration of the impact of holographic imaging technology on digital media art design. *China Artists*, 8: 125-126.
- [2] Wei Y. 2018. Analysis of holographic imaging technology and its impact on digital media art design. *Art Science and Technology*, 3: 60.
- [3] Qi YX, Zheng LY, Ma SN, et al. 2023. Design of virtual travel live cabin based on the concept of metaverse. *East China Technology*, 10: 90-92.
- [4] Zhu YQ, Yao M. 2021. Analysis of the impact of holographic imaging technology on digital media art design. *Monthly Culture*, 8: 164-165.
- [5] Song G. 2023. Interactive design of city ceramic exhibition hall based on holographic imaging technology. *Ceramic Science and Art*, 9: 58-59.
- [6] An BY. 2023. Exploration of the impact of holographic imaging on digital media art design. *Tomorrow Style*, 21: 109-111.