

Research on Suzhou Prints Display Based on VR Technology

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Abstract

As an important part of the history of art development in the world, print art occupies a vital position in the development of human society. Chinese print reached its peak in the Ming Dynasty and continued to flourish in the Qing Dynasty, when Suzhou print was formed. Suzhou print is a unique form of folk culture in Suzhou area, with extremely important historical, artistic and cultural values. However, for a long time, most of the historical and cultural values of Suzhou prints have not been fully valued and understood. In recent years, with the development of network and multimedia technology and the continuous maturity and popularization of VR technology, it has been gradually applied to the multimedia display of information. In this paper, the exhibition of Suzhou prints under VR technology will be taken as the main research direction, and the collision and integration between traditional art forms and new technologies will be explored.

Keywords

Print Art, Suzhou Prints, VR Technology

1. The Historical Origin of Suzhou Printmaking Art

As for the origin of print, art historians can trace back to the Shang and Zhou Dynasties and even the primitive society, but no matter when its source is calculated, the print art supported by engraving techniques is bound to be associated with the generation of woodblock printing technique. Chinese woodblock prints have a history of more than 1100 years, which is longer than the history of woodblock prints of any nationality in the world (Yu, 2012). That is to say, China is the birthplace of woodblock prints. During the Five Dynasties period, Feng Dao began to carve the *Nine Classics*, which lasted for more than 20 years and had a great influence, and was known as the “woodcut printings of Five Dynas-

ties” in history. Two books, Tang Yun and Qiu Yun, which are now collected in the Paris Library, France, were both woodcut printings of the Five Dynasties discovered in Dunhuang. As can be seen from the quality of the printed edition, the standard of the engraving books at that time was the highest in the world. It can be seen from this that the original function of engraving was to be used as illustrations for printing books, which was first produced in the 9th century, and developed in the Song and Yuan Dynasties, and the Ming Dynasty was the golden age of illustration print (Zhang, 2012; Lin, 2011).

After the development in the Song, Jin and Yuan dynasties, the woodblock printing technique in the Ming Dynasty has made significant progress. At the end of the Ming Dynasty and the beginning of the Qing Dynasty, due to the development of industry and commerce and frequent maritime trade and cultural exchanges, the seeds of capitalist economy first appeared in Suzhou. With the development and expansion of the city and the demand of the emerging citizen class for spiritual and cultural life, popular culture thrives, and the creation of popular literature represented by novels and operas is active. At that time, the main achievements of Suzhou print were reflected in the illustration prints, which were mainly black and white in color, as well as red and black and color printing (Cheng, 2004). Suzhou prints of this period not only have a wide range of subjects and a surprising number, but also their artistic level and technical quality can be regarded as the model of illustration prints at that time.

After the early Qing Dynasty, illustration prints gradually decreased, and Suzhou prints began to develop in another direction. With the further development of printing technology, commodity consciousness and the public class, illustration prints were gradually separated from books to single decorative prints. Therefore, in a specific period of time, large and exquisite custom prints of Suzhou emerged at the historic moment in the middle of the Qing Dynasty (Liang, 2014).

Due to historical reasons, Suzhou printmaking has undergone two major transformations after its heyday. After the war of the Taiping Heavenly Kingdom, Suzhou prints declined irretrievably. After Taiping troops occupied Suzhou, they set fire to the area of Shantang Street, where Suzhou prints were concentrated. After the fire that lasted for dozens of days destroyed the ancient printing and painting workshops, Suzhou printmaking suffered a complete decline. The print shops that appeared later were mainly concentrated in the Taohuawu of the city. However, the new workshops and paint shops were no longer able to produce fine and grand engravings like those in the middle Qing Dynasty. In addition, Taohuawu was mostly in rural areas at that time, so its target customers gradually shifted from the original urban residents to rural ordinary people, and its artistic style also changed from the decorative prints framed and scrolled in the middle of the Qing Dynasty to the New Year pictures posted directly during the Spring Festival, i.e., Taohuawu New Year wood-block prints. Under the influence of the above complex political and economic background, Suzhou prints completed a transformation of artistic style in the late Qing Dy-

nasty.

Another “transformation” of Suzhou Prints was that its business site began to migrate to Shanghai Small School Field after Xianfeng (1851-1862) and Tongzhi (1862-1875) of the Qing Dynasty. Located near the Town God Temple in the old city of Shanghai, the Shanghai Small School Field was the place for the Shanghai County’s garrison exercise in the 9th year of Ming Zhengde (1514). Since the Jiaqing years of the Qing Dynasty, the temple fair has risen here and gradually formed a commercial district (Li, 2002). The painting dealers also set up shops along the Town God’s Temple. Since the Jiaqing years of the Qing Dynasty, the temple fair has risen here and gradually formed a commercial district. The painting dealers also set up shops along the Town God’s Temple. At the end of the Qing Dynasty, Suzhou’s Shantang Street and Taohuawu New Year Pictures declined, but with the rapid development of Shanghai’s economy and the prosperity of the market, a number of painters and craftsmen from Suzhou were successively employed here (Du, 2005).

At this time, the rise of the calendar pictures also accelerated the decline of Suzhou prints. The word “calendar” originated in the 22nd year of Guangxu Emperor (1896), when Hongfulai Luzon Bank of Simu Road, Shanghai, gave away the “Shanghai scenery color map” to customers with lottery tickets: “Shanghai scenery color map, Chinese and Western calendar card”, from this “calendar” the word came into being. Western goods flooded the Chinese market in the late 19th century. In order to find a form of advertising suitable for the visual appreciation and reading habits of the Chinese people, merchants at that time combined the “foreign pictures” with the calendar in the Chinese New Year pictures (Liang, 2006). Thus, a new type of New Year pictures with the calendar came into being, which was used to sell goods, known as “calendar New Year pictures”. The combination of traditional New Year pictures and commercial art opened up a new art form, which inevitably influenced Suzhou print. Therefore, it was also an important reason for the decline of Suzhou print in the late Qing Dynasty.

After the founding of the People’s Republic of China, the government began to take the Taohuawu New Year pictures seriously, which gave new life to the Taohuawu New Year pictures. In the early 1950s, Suzhou Literary Federation excavated, collated and rescued the old version of Taohuawu New Year paintings through investigation, helping the art shops to resume production, and organized painters and folk artists to create a series of pictures titled “The Taiping Heaven Kingdom in Suzhou” for exhibition. In 1959, the Suzhou Taohuawu Woodcut New Year Picture Society was formally established. It specially recruited artists and trained a number of apprentices to engraving and printing, bringing the old New Year pictures back to life. After the “Cultural Revolution” began, New Year paintings were regarded as the “Four Old”, suffering a terrible fate. Most of the artists changed careers. In the meantime, more than one hundred kinds of woodblock prints of New Year paintings have been eroded and damaged due to piling up in the open air. In 1979, the earth returned to spring,

Taohuawu New Year Painting Society was restored, and Taohuawu Woodcut New Year Painting Research Society was established (Yu, 2013).

However, with the passage of time, New Year paintings have lost their original market and folk significance, and the New Year painting technicians are getting old, and the cause of New Year paintings was facing a predicament of lack of successors. In 2002, under the government's attention, the Taohuawu New Year Picture Association was classified into Suzhou Vocational and Technical College of Arts and Crafts, and transformed from the nature of production and operation to the nature of scientific research and teaching. Moreover, the Taohuawu New Year Wood-block New Year Picture Research and Training Class was established, which has trained three batches of new generation of talents. And beyond that, the cultural department of Suzhou has continued this art form through the establishment of the Suzhou Taohuawu New Year Woodcut Picture Museum and the Taohuawu New Year Picture Inherit Studio.

2. The Development and Presentation of VR Display Technology

VR display design is a new subject of audio-visual design formed with the emergence and popularization of VR technology and related computer application technology, which is a new means of information multimedia display with 3I (Interactive Interactivity, Immersion, Imagination) characteristics created by using computer VR technology and integrating image, sound, animation, video and other multimedia means. Specifically, VR display design is a means of information multimedia design based on VR technology. Through its computer-specific software (VRML, Virtools, 15, Cult3D, VR Platform, Quick Time VR, etc.), it simulates the three-dimensional real environment and object information to generate digital virtual images, integrates multimedia information such as images, sounds and animations, then spreads information to people with digital media as the carrier. Through the sense of vision, hearing and even touch, it makes people feel immersive to things in the VR space simulated by computer, which is a real-time interactive three-dimensional graphical interface. According to the designer's idea, it can produce a kind of information display which is similar to the objective environment and beyond the objective time and space, can be immersed in it, can be driven, more harmonious, with human-computer interaction ability (Li, 2004).

As Brenda Riel put it, "Interactive media is not about information, but about the experience". Compared with other means of information display, the greatest uniqueness of VR display is its interactivity, which means giving up visual arrangements and allowing free participation in the senses. VR display design is not to expand the scope of space, but to abandon the space dimension, restore face-to-face interpersonal interaction. For example, among other means of information display, movies and TV are the best means of providing multi-dimensional sensory information in the past, but they can only provide one-way information of visual and auditory senses, while VR display design can not only truly realize

the crossing of the interface, so that people can break through the constraints of time and space with the feeling of being on the scene, but also interact with the display information in a natural way, even including sensory information such as touch, smell and taste. In this way, a highly realistic interactive sensory experience that is impossible to achieve in other forms of multimedia presentation becomes a reality. It is this feature that highlights the value of VR display design and realizes a revolution in human information display.

Apart from that, VR display design has more liberal and personalized display effect and display mode. In a virtual environment, you can choose the way or perspective you need to browse and participate in the show, and you can also give full play to your imagination and act according to your will without affecting others. The creation of virtual environment can also be processed according to the designer's perception, making the display effect more free and rich, so as to achieve the purpose of driving the audience's emotion (Negroponte, 1997). The virtual digital environment breaks through the bondage of the real material world. In the free bit world, it breaks through the shackles of the pure rational material world, which makes the connotation of the display more free and rich, and it is limited only by the imagination of the designer. Therefore, this point is very consistent with the personalized characteristics of the times, which will bring people a new perspective to observe our environment and life, and help us create colorful virtual environments and countless digital three-dimensional life bodies that will not only appear in front of our eyes, but with the emotions of life and everything we want (Fang et al., 2004).

The components of VR display design are complex and comprehensive. For example, it is influenced by many factors such as technology, art and culture, and is not as simple as audio-visual and graphic processing (Liu, 2004). However, no matter how complex the components of VR display design are and how many factors affect it, as a way of information display, it cannot be separated from the scientific basis of transmission between people and display information. According to the propagation law of display information and the characteristics of VR display design, some principles that should be followed in VR display design can be summarized: the principle of accurate communication of information, the principle of humanized design, the principle of suitable communication, and the principle of artistry.

3. Research on Suzhou Prints Display Based on VR Technology

The use of VR display design as a digital display means can make the display and protection of human cultural heritage more sustainable. To be specific, it can create a three-dimensional or model database of physical information by means of image data acquisition, and preserve important resources such as original modeling data of cultural relics, so as to realize scientific, high-precision and permanent preservation of cultural relics information. And it can integrate and expand the scope of cultural relics resources through computer networks. It

makes use of virtual technology on a large scale through the Internet to display cultural relics in a more comprehensive, vivid and realistic way, thus breaking away from the geographical restrictions of cultural relics, realizing the modernization of resource sharing, cultural relics display and protection, and making cultural relics truly become the cultural wealth that can be “owned” by all mankind.

With the constant development of social productivity and science and technology, the demand for virtual reality technology and its development software in all walks of life is increasing day by day. The three VR software commonly used are introduced as follows:

Virtools is a set of integrated software with strong interactivity, which is currently considered to be the most powerful and veteran virtual reality production software, and there are a lot of learning materials about this software, so it is the first choice for Web 3D game development. The huge volume of its 10 M browser plug-in is a bottleneck, but with the increase of domestic bandwidth, the impact in this regard has become increasingly insignificant; Web Max is a new generation of online 3D virtual reality software development platform with VGS technology as the core independently researched and developed by the company, with unique compression technology, real picture performance, rich interactive functions and other advantages. There is no need to download 3D web pages developed by Webmax. Users can browse 3D interactive content directly on the Internet only by entering the web address; Unity3D is a multi-platform game development tool that can be used for easy creation, also a fully integrated professional game engine. It is understood that it is the most professional, the most popular and the most promising virtual reality development tool at present, integrating the technical advantages of many previous software. From PC to Mac and even to mobile terminals, you can see Unity3D. The Suzhou printmaking VR display system designed in this paper is produced by Unity3D software.

Suzhou print VR display system is an attempt to apply VR technology to traditional culture display. VR technology is characterized by multisensory, immersive and interactive features, among which multisensory and immersive performance can enhance the sense of substitution of users, and interactive performance enables users to interact with the virtual environment naturally, rather than as an “outsider”. Applying the characteristics of VR technology to the display of Suzhou prints can enhance the sense of participation and immersive feeling of users, so as to attract users to take the initiative to understand the content of the display.

In the main drawing—Suzhou Chang Gate Picture, a series of Suzhou prints are selected to depict the life scenes of citizens on both sides of Suzhou River. In this engraving, the form of splicing is used to connect the engraving of relevant scenes in series (as shown in **Figure 1**). The interactive design of Suzhou Print VR exhibition was developed on the PC platform. The HTC VIVE motion-sensing helmet is used to control the roaming around, and the HTC VIVE handle is used to open the scrolls in the scene, so that the audience can watch more prints. Be-

sides, the viewing effect of prints can be adjusted by controlling the darkness and dawn with the handle.

It is worth mentioning that HTC VIVE is mainly used as the input device to replace the ordinary mouse and keyboard in the VR technology-based Suzhou prints content display system. In this study, a large amount of time was spent on the construction and dissemination of the immersive experience environment and the concrete implementation of the display system of Suzhou prints, presenting a relatively immersive three-dimensional design effect (as shown in **Figure 2**).

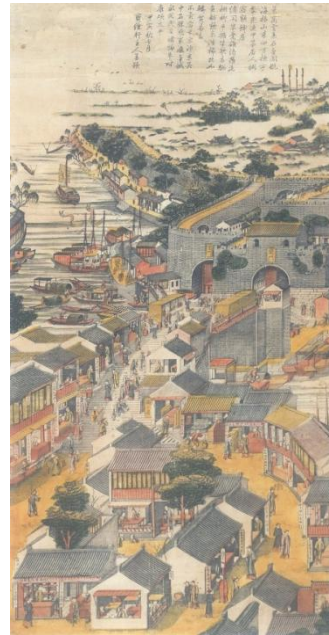


Figure 1. Diagram of suzhou chang gate.

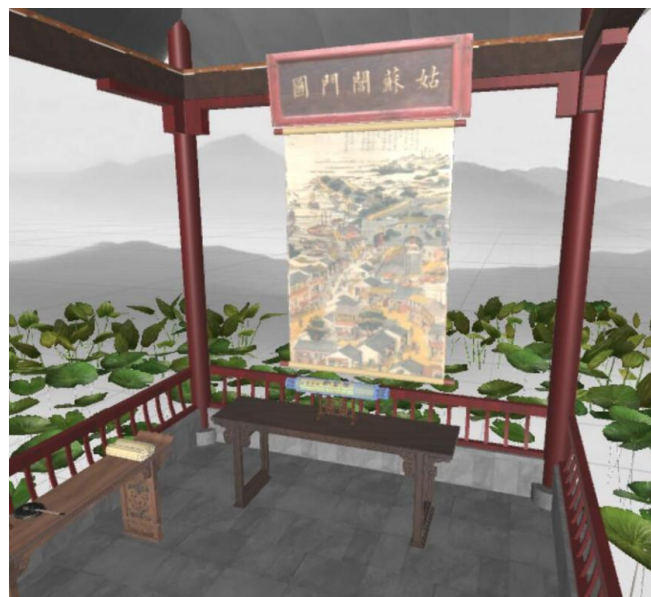


Figure 2. Design rendering.

On the whole, in this paper, by tracing the historical origin of Suzhou printmaking art, the development and presentation of VR display technology and Suzhou printmaking display based on VR technology, etc., the possibility of VR technology being used in the display of traditional culture is further explored, so that the creative transformation and innovative development of excellent traditional Chinese culture are continuously promoted. In the future, we should intensify efforts to the development of the integration of science and technology with culture, tourism and cultural relics, give full play to the supporting role of high and new technology in content creation, product development and model innovation, improve the quality of products and enrich the forms of expression, to enable China's traditional culture and art to radiate new vitality and luster.

4. Conclusion

The print has a long history in ancient painting. It is an important part of the world of art, and occupies extremely an important historical position in the history of human society in the process of development. This paper describes the development of VR technology and VR display design theory. Based on VR display design principle and Suzhou print theoretical knowledge, this paper puts forward a kind of display form and constructs a system which uses VR technology to integrate Chinese traditional culture into virtual cultural display and communication environment. The value of the study is put forward an effective way to spread the China traditional culture, the intangible culture Visible, contextualized and visual, so that it can be an effective interpretation, presentation and dissemination (Sun, 2013).

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- Cheng, Y. (2004). *Study on Suzhou Prints in Qing Dynasty*. Taipei: Soochow University.
- Du, D. L. (2005). *Research on the Fundamental Factors of Web Art Design*. Changchun: Jilin University.
- Fang, X. et al. (2004). *Digital Design Art*. Wuhan: Wuhan University of Technology Press.
- Li, Y. (2002). *Research on Application of Virtual Reality Technology in Industrial Design*. Changsha: Hunan University.
- Li, Z. (2004). *Virtual Design Studio-Research on Virtual Product Design Based on Network*. Beijing: Tsinghua University.

- Liang, H. Y. (2014). *Research on Chinese Folk Printing Graphic Form Language*. Shanghai: Shanghai University.
- Liang, L. (2006). *Research on Humanized Design of Modern Office Building Space*. Chongqing: Chongqing University.
- Lin, S. (2011). The Cultural Choice in Inheritance and Development of Tujia Tapestry from the Perspective of Digitalization. *Proceedings of 2011 IEEE 12th International Conference on Computer-Aided Industrial Design & Conceptual Design*, 2.
- Liu, X. (2004). *Virtual Reality Technology Aided Architectural Design*. Beijing: China Machine Press.
- Negroponte (1997). *Being Digital* (p. 140). Haikou: Hainan Publishing House.
<https://doi.org/10.1063/1.4822554>
- Sun, X. Y. (2013). *The Research of Designing of Cultural Heritage Digital Display*. School of Art and Design. Wuhan University of Technology: International New Media Era Digital Innovation Forum.
- Yu, L. (2013). *Integration and Innovation of Digital Print and Traditional Print*. Jilin: Jilin College of the Arts.
- Yu, Z. P. (2012). *The Role and Attribute of Chinese Prints in Social Development*. Tianjin: Tianjin Normal University.
- Zhang, Q. H. (2012). *Research on Jiangnan Poetics in the Late Ming Dynasty*. Wuhan: Wuhan University.