

Research on the Digital Inheritance and Protection of Yue Embroidery Under the Meta-cosmic Technology

Yuying Wang, Huiyang Huang, Xiaochen Li, Wenkun Yang, Haoyuan Li, Min You*

Guangdong Institute of Technology, Zhaoqing, Guangdong

Abstract. With the rise of meta-cosmic technology and the increasing importance of intangible cultural heritage protection and inheritance, the integration of digitalization and intangible cultural heritage protection has become one of the hot spots in contemporary research. Taking Yue embroidery as the research object, this paper first introduces the characteristics of Yue embroidery and the current situation of its digital protection, then analyzes the application of meta-universe technology in intangible heritage protection, including the presentation of virtual exhibitions, real-time teaching of embroidery skills and the establishment of digital archives, and discusses the digital protection and inheritance methods of Yue embroidery under the meta-universe technology in detail. Integrate Cantonese embroidery culture with modern science and technology, put forward a new development direction, and promote the inheritance and innovation of Cantonese embroidery.

1. Introduction

Yue embroidery, also known as Guang embroidery and Chao embroidery, is one of the four famous embroideries in China with a long history. Yue embroidery often features full and intricate composition, neat and exaggerated patterns, vivid and contrasting colors, and diverse and variegated needlework. Due to its high requirements, it often requires skilled male workers and embroiderers and consumes a lot of time and effort, resulting in high prices and costs that deter prospective learners. Moreover, changes in the aesthetic preferences of contemporary youth and the acceleration of life pace have led to a decrease in demand for Yue embroidery, making its development and survival increasingly difficult in terms of limited space, disconnection from reality, and difficulties in inheritance. However, with the rapid development of technology, including the widespread use of 5G technology, human-machine interaction, virtual reality technology, big data, and cloud computing, non-material cultural heritage has found a new opportunity in the metaverse.

The "metaverse" is a virtual world where humans surpass reality and achieve virtual and real-world interactions based on the mapping of the real world using existing digital technologies. As a new form of digital communication, it is gradually changing people's lives. It features high immersion, open-source creation, closed-loop economic system, and sustainable development^[1]. It provides a new solution for non-material cultural heritage faced with problems such as space limitation and low attraction, allowing non-material cultural heritage to rejuvenate in the metaverse.

2. Characteristics of Yue embroidery and the significance of digital protection

2.1 Artistic value and cultural significance of Yue embroidery

As a representative embroidery craft in Guangdong, Guangdong embroidery is full of Lingnan characteristics from artistic style to creative thinking. In the image performance, the composition is full, golden and brilliant, focusing on the coordination of light and shadow, coupled with rich and exquisite stitching and bright and rich colors, highlighting the noble and elegant temperament, known as the magnificent "treasure of South Lingnan", with high technical value and cultural aesthetic value. Under the inheritance of Chen Shaofen and others, the needlework technique of Guangdong embroidery has undergone continuous development and innovation, and has become more modern value. Cantonese embroidery masters made good use of white painting techniques to produce, and applied color techniques on the basis of white painting, and extended the selection of materials to the categories of portraits, and used the expression techniques of traditional Chinese painting and oil painting to form a new style of "modern Canton embroidery", which ushered in the peak of Cantonese embroidery art.

After thousands of years of inheritance, exploration, absorption and innovation, Guangdong embroidery has formed a unique art form, showing deep and long historical and cultural accumulation. While inheriting the characteristics of traditional embroidery techniques, it has unique regional technological characteristics, and it has

*Corresponding author's mail: 10150129@qq.com

been developing continuously. At the same time, Guangdong embroidery adopts the paintings of Lingnan school painters, with lychee, cotton, flowers and birds and other Lingnan characteristics as the main theme, which not only carries the essence of Lingnan culture, but also integrates the Western painting style, absorbing Western painting lines, light and shade changes, making the works look very three-dimensional and ornamental. Therefore, Guangdong embroidery not only has a deep historical and cultural foundation in China, but also enjoys a high reputation in the world, showing the excellent artistic talent and exquisite craftsmanship of the Chinese nation.

2.2 The important role of digital protection in the inheritance of Guangdong Embroidery

Due to the emergence of mechanized production and computer embroidery machines, the traditional craft has been impacted by modern production methods, and few people are willing to learn the needle-line skills. Relying on the local environment, Guangdong embroidery is difficult to further open the market and is facing the danger of being lost and forgotten. With the development of modern science and technology, industrial digital transformation is being actively and steadily promoted.

On the one hand, the social informatization caused by science and technology threatens the living environment of intangible cultural heritage; On the other hand, the traditional protection of intangible cultural heritage has brought great changes due to the rapid development of digital technology represented by information technology, virtual reality and communication technology, which provides a broad space for the classification, preservation, display and dissemination of intangible cultural heritage resources^[2]. Moreover, information technology, as the representative, has played a great role in promoting the far-reaching spread of Chinese culture.

In recent years, China has paid more and more attention to the digital protection of intangible cultural heritage. Digital technology has significant advantages in storage, dissemination, application and display, etc. It provides a way to overcome the situational limitations of intangible cultural heritage, display and inherit intangible cultural heritage in the most authentic way, and also creates conditions for the construction of new protection and inheritance methods of intangible cultural heritage. For Yue embroidery, digital protection can effectively preserve its traditional skills and artistic style. Through digital technology, the production process, pattern design, stitch skills and other details of Yue embroidery can be recorded to form digital archives. In this way, even if the traditional production methods are gradually lost, future generations can still learn and study the skills of Cantonese embroidery through digital materials to ensure the continuation of its traditional skills.

3. The development status of Guangdong embroidery and the exploration of digital path

3.1 Difficulties and challenges of traditional Cantonese embroidery inheritance

With the continuous development of social economy and the improvement of people's living standard, people's demand for spiritual and cultural life is also growing. Under this background, traditional Cantonese embroidery has been unable to meet the needs of modern people's pursuit of both material and spiritual culture. At the same time, it has gradually lost its practical value in modern life and is facing a severe situation of declining day by day. The shortage of inheriting talents is an urgent problem to be solved. With the development of modern science and technology and the change of people's lifestyle, young people often choose other emerging professions, and the inheritance of traditional Cantonese embroidery is facing a serious talent gap. In addition, with the diversified development of contemporary people's needs, traditional Cantonese embroidery products have been unable to meet the market demand and lack of innovation, which is crucial to the innovation of traditional Cantonese embroidery. Improving market demand is also one of the important links to protect and promote Guangdong embroidery.

Due to the variety of similar products, similar products to meet the needs of the people and the increasingly fierce market competition, traditional Guangdong embroidery products continue to be squeezed by the market, the market share is also declining. In addition, traditional Cantonese embroidery has high requirements for artisans, and the high cost leads consumers to prefer cheaper alternative crafts

To solve this series of problems, we need to increase the intensity of technology research and development, improve the quality and design level of products. How to protect and carry forward the intangible cultural heritage in the rapid development and modernization of modern life, so as to continue the local spirit is a creative problem worth thinking about. On the way of protecting and developing Yue embroidery, we must face many difficulties and hardships. We should deal with the relationship between inheritance and innovation, and strive to protect and develop this traditional handicraft with a long history and rich cultural connotation - Yue embroidery.

3.2 Exploration and application of digital inheritance methods of Cantonese embroidery

Because of the traditional handicrafts often have more demanding requirements on their technology and materials, it is difficult for traditional handicrafts to achieve innovation and breakthrough to adapt to contemporary needs. The rise of digital technology can skillfully solve this problem.

Such as the use of three-dimensional scanning technology, 3D printing, virtual reality technology and

other ways to display and spread the digital Guangdong embroidery. In the inheritance of Yue embroidery skills, digital technology can be used to introduce new materials, techniques and design concepts, so as to further expand the creative space of Yue embroidery. Just as the product design through the computer, mobile phone, tablet and other tools, and then import it into the machine, so as to print 3D Guangdong embroidery model;

Another example is the three-dimensional scanning of Cantonese embroidery works, the use of virtual reality technology and specific equipment to show people its details and the full picture. Among these new ways of inheritance and development, the technical application achievements of virtual Reality technology (Virtual Reality, referred to as VR) are particularly remarkable. For example, the Guangfu Temple Fair in Guangzhou breaks through the limitations of time and space, and vividly displays Guangdong intangible cultural heritage through digital modeling and unreal engine technology, including embroidery workshops and Cantonese embroidery techniques, which are re-engraved in front of the audience in a new way, allowing the audience to instantly cross the ancient and modern times and have a "dialogue" with historical time and space, so as to revitalize this ancient art.

The application of virtual reality technology makes Yue embroidery break through the limitation of space. The audience can watch through VR, so as to achieve the immersive effect, and then make the audience feel the exquisite embroidery technology of the craftsman and the pursuit of beauty. This new digital display not only provides a more convenient and efficient learning platform for the audience, but also provides more possibilities for the inheritance and development of Guangdong embroidery.

4. Yue embroidery digital protection and inheritance under the meta universe technology method

4.1 Application of meta universe technology in digital protection of intangible heritage Basics

The meta-universe is a new virtual-real Internet application and social form based on the integration of new technologies such as extended reality, digital twin, cloud computing, and blockchain^[3]. The application of meta-cosmic technology in the protection of intangible cultural heritage can effectively cater to the characteristics of The Times, regionalism, culture and embodiment of intangible cultural heritage through the construction of pseudo-real space and surreal space. In addition, it can also promote the evolution of intangible cultural heritage projects from traditional ways such as mentoring and family inheritance to "spatial reconstruction", so as to solve the current problems such as space loss and shrinking inheritance groups in non-genetic inheritance. For example, in March this year, the Gansu Provincial Department of Culture and Tourism, together with Taobao Life, promoted Dunhuang culture with meta

Universe digital technology, and fully re-carved more than 10 classic Dunhuang murals of the Sui and Tang dynasties in 3D ancient style, creating and opening the first online tourist attraction - Meta Universe Dunhuang Museum.

At present, the rapid development of 5G technology has made the intangible cultural heritage more closely integrated with modern science and technology. The basic technologies of the meta-universe include blockchain and NFT, which can provide strong technical support for the digital preservation and dissemination of intangible cultural heritage. As a distributed ledger technology, blockchain technology has the characteristics of decentralization, immutability, transparency and so on^[4]. It can ensure the information security of intangible cultural heritage projects, thereby preventing unauthorized tampering and forgery. NFT is a digital asset based on blockchain technology, which has the characteristics of uniqueness, scarcity and tradability^[5]. Converting intangible cultural heritage projects into NFT can give them unique value and become an asset that can be traded in the market, thus improving the realization mechanism of intangible cultural heritage and opening up the economic closed loop. To this end, in the creation of digital assets of Yue embroidery, embedding NFT with unique, verifiable and traceable characteristics can improve the collection value of Yue embroidery artworks, provide new ideas for the digital innovation of Yue embroidery cultural creations, and further improve the current cash mechanism.

From this point of view, in the digital protection of intangible cultural heritage, the meta-universe technology has an important application basis and value, enabling the transformation of intangible cultural heritage data and intelligence, while realizing effective communication, it can also improve the intangible cultural heritage industry chain, help the innovation of intangible cultural heritage products "live", and make the intangible cultural heritage more in line with the development of the new era.

4.2 Digital protection and display of Yue embroidery art works based on virtual reality

Previous display methods were based on two-dimensional planes, and Cantonese embroidery works were limited to rigid display and exhibition, so they could not be effectively disseminated. Adding elements that appeal to the audience is the way to make the intangible cultural heritage spread effectively. The meta-universe, with its advantages of immersion and interaction, brings the audience a multi-angle perception experience. The core of the meta-universe construction is to expand the technology, using the technology to create a virtual space, such as establishing an art exhibition with the theme of Cantonese embroidery, by displaying three-dimensional models of Cantonese embroidery works in this virtual space, to provide users with an immersive viewing experience. At the same time, users can also feel the real atmosphere of the exhibition through virtual reality technology, and can freely roam, enlarge details, and

understand the historical and cultural background of the work, so as to improve the immersion of the exhibition.

The Meta Universe exhibition Hall is not only a display platform, but also has the function of social interaction. Users enter the virtual space through the brain-computer interface to participate in intangible cultural heritage ceremony activities remotely, achieve remote group gathering, and create an interactive ritual chain^[6]. Experiencers can share common emotions or emotional experiences in the process of exploring different exhibition areas in the virtual space. At the same time, users can also get to know more people who are interested in Yue embroidery through the social platform of virtual space and expand their social circle. Not only that, the use of meta-universe technology through 1:1 replica VR digital exhibits can avoid the loss of cultural relics due to improper protection of various factors, especially some special materials of cultural relics are easy to react with the external environment. In the case of Cantonese embroidery, due to the difficulties of hand embroidery and the restrictions of exhibition venues, it is impossible to display the same product in different exhibition halls at the same time.

Moreover, if the art gallery is overcrowded, it will cause two problems: First, the size of the venue is limited, and the high passenger flow makes the daily maintenance of the art gallery a large workload, which is not convenient for closed maintenance. Secondly, during peak periods, tourists may not be able to fully appreciate the charm of Cantonese embroidery. Therefore, the role of Yue Embroidery virtual reality exhibition hall project has been highlighted. People can experience the charm of Yue embroidery exhibition at home by scanning codes, feel the heritage of China's intangible cultural heritage, broaden their personal vision, and improve aesthetic appreciation and participation.

4.3 Real-time inheritance and assisted learning of Cantonese embroidery skills based on augmented reality

Augmented reality technology (AugmentedReality) is A new technology that can simulate human vision, hearing, smell, touch and other senses and output them again, superimpose information generated by computers in real time into the real world^[7], so as to enhance the real world and provide people with experiences beyond the real world. Compared with VR technology, which only provides a completely virtual experience, AR technology can retain the user's perception and interaction ability of the real world, and solve the dilemma of VR technology's lack of realism by combining virtual-real scenes.

At present, there are many cases in which AR technology is applied to non-genetic inheritance. For example, Fengning Paper-cutting Culture uses AR technology to transform it into 3D animation, and projects intangible cultural paper-cutting techniques into real objects in the mobile APP for dynamic display; Pingjiang Shadow Play created an AR game with shadow play characters as game characters and combined with the real environment, and deepened the cognition of the cultural

connotation of Pingjiang shadow play through interesting interaction.

For the innovative inheritance of Yue embroidery, the use of augmented reality technology as a new media can break the limitations of the communication mode of Yue embroidery and improve user participation. If this technology can be used to design a real-time inheritance and guidance system for Cantonese embroidery skills. Compared with the traditional face-to-face teaching method, AR technology provides interactive animation for the stitching details of Guangdong embroidery technique, including patterns, colors and stitching, etc. By simulating the real production process of Guangdong embroidery, users can intuitively understand all aspects of Guangdong embroidery technique with rich visual effects. In addition, the brain waves in the AR system can also accept real-time neurofeedback, and the system will provide real-time guidance and suggestions according to the movements and progress of learners in the process of using the AR device to operate Guangdong embroidery. If the learner makes a mistake or is not proficient in a certain link, the system will immediately give corresponding tips and correction methods. Such an augmented reality inheritance and guidance system for Cantonese embroidery skills can undoubtedly improve learning efficiency and interaction, help learners to master Cantonese embroidery skills faster, thus reducing the threshold and learning cost of understanding Cantonese embroidery culture, and narrowing the distance between people and intangible cultural heritage.

5. Limitations of digital means in inheritance and protection of Cantonese embroidery

At present, the meta-universe has penetrated into many industries, fully activating the value of data elements in the management of various industries with the application orientation of multiple digital technologies, and has a wide range of application scenarios. As a new generation of Internet applications and social forms, it has set off a wave of innovation in the cultural industry. Although digital means provide a new way for the inheritance and development of Cantonese embroidery, and can increase the diversity of its content creation, preservation, dissemination and utilization, there are still many problems.

5.1 The conversion quality and precision of Cantonese embroidery figures need to be improved

The technical problems such as image distortion and color deviation are difficult to avoid in the digital conversion of Cantonese embroidery under the current situation of technology. If these problems are not solved, they will affect the audience's experience and sense of Cantonese embroidery. Therefore, we should increase research and development efforts, further improve digital conversion technology, overcome difficulties, in order to improve the

quality and accuracy of digital conversion of Guangdong embroidery.

5.2 The reality of virtual reality technology is still lacking

Although virtual reality technology can enable the audience to appreciate Cantonese embroidery more directly and comprehensively, due to the lack of technology, the audience will have a certain sense of dizziness, weightlessness and other adverse reactions. At the same time, virtual reality technology can not completely restore the true touch and details of Yue embroidery, making it difficult to further restore Yue embroidery. This is very important for traditional handicrafts. To this end, we still need to further explore and develop virtual reality technology or create more advanced ways to improve the reality of virtual display.

5.3 The intellectual property system needs to be improved

With the popularization and application of digital technology, the reproduction and dissemination of Cantonese embroidery works has become easier. Therefore, it may induce and aggravate the phenomenon of original works being plagiarized and infringed, resulting in the threat to the creative rights and interests of original Cantonese embroidery craftsmen, and the difficulty of protecting data property rights, which will affect the development of Cantonese embroidery in the field of digital cultural creation. To this end, we should vigorously advocate the establishment and improvement of relevant legal systems and data property rights mechanisms to ensure that the legitimate rights and interests of Guangdong embroidery handicraft producers can be protected, starting from the construction and deepening of resource holding rights, processing rights, and product management rights, by protecting the legitimate rights and interests of digital asset owners to regulate digital copyright^[8]. Improve creative freedom and commercial flexibility to promote the creation and dissemination of high-quality digital content, so that data property rights in a more standardized way to profit, so as to stimulate the creative power of the digital cultural and creative field.

Although digitization brings new opportunities for the development of Yue embroidery, traditional skills are still the core and soul of Yue embroidery. To this end, the digital development of Guangdong embroidery should also be combined with traditional skills, not only to retain the unique charm of traditional skills, but also to give play to the advantages of digital Guangdong embroidery. Only through the organic combination of traditional handicraft technology and modern digital technology can we better promote the inheritance and development of Guangdong embroidery in this era.

6. Conclusion

The emergence of the meta-universe has brought new possibilities for the inheritance of the intangible cultural heritage of Guangdong embroidery. With the support of the meta-universe technology, the original ecological soil of Yue embroidery can be completely reproduced, which can intuitively reproduce the full picture of the traditional production scene of Yue embroidery, and its embroidery skills have been permanently retained, bringing more convenience and flexibility to the creation conditions, learning inheritance and realization mode of Yue embroidery, and helping to inherit and protect this intangible cultural heritage. However, the application of science and technology also needs to pay attention to the protection and inheritance of the traditional essence of Guangdong embroidery. It is not only necessary to consolidate the traditional foundation of the intangible cultural heritage, but also to make full use of the advantages of emerging science and technology, expand innovative thinking and inheritance paths, strengthen the connection between the intangible cultural heritage and people^[9], and avoid the impact of technology on traditional culture. Only on the basis of preserving the tradition can modern technology bring greater value to the inheritance and development of Guangdong embroidery.

Fund project

[1] 2023 Guangdong University Student Innovation and Entrepreneurship Project (project number: S202313720023)

[2] 2023 Guangdong University Student Innovation and Entrepreneurship Project (project number: S202313720009)

References

1. Zhang Haoran. Thinking on Promoting the Development of intangible cultural heritage in Shaanxi with meta-cosmic technology [J]. New West,2022(07):64-65.
2. Tan Guoxin, Zhang Lilong. Discussion on digital protection and inheritance of intangible cultural heritage [J]. Library,2019(04):79-84.
3. Zhan Qi. Intangible Element Universe: Empowerment, Integration and Immersion [J]. Today Media,2022,30(09):101-103.
4. Nguyen C D ,Pathirana N P ,Ding M , et al.Blockchain for 5G and beyond networks: A state of the art survey[J].Journal of Network and Computer Applications,2020,166(prepublish):
5. Sajjad A ,Amin S ,Arash M , et al.A network analysis of the non-fungible token (NFT) market: structural characteristics,evolution,and interactions[J].Applied Network Science,2023,8(1):
6. Han Xuan, Hu Hu Liu. Research on the application of blockchain in the network trust system [J]. Information Security and Communication Confidentiality, 2021 (09): 100-114.

7. Yadav N ,Sinha A .Augmented Reality and its Science[J].International Journal of Education and Management Engineering(IJEME),2022,12(6):33-44.
8. Hemley M .Playwrights bid to tackle Wild West' of digital rights[J].The Stage,2021,(38):1-1.
9. Wu Chengdu, Wang Ying. Let the intangible "live" : yuan universe and development of China's national intangible new thought [J]. Journal of jiang, reading 2022, 14 (3) : 148-157. The DOI: 10.13878 / j.carol carroll nki yjxk. 20220424.001.