

# The Digital Interactive Display Design of Intangible Cultural Heritage Lu Embroidery Technology

## --Taking the Yellow River culture in Shandong as an example

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### Abstract

Lu embroidery is one of the eight famous embroidery styles with rich technical value and cultural connotations. Yixian embroidery is the most traditional and historically significant form of embroidery in the history and development of Lu embroidery. In 2021, Lu embroidery was listed as a national intangible cultural heritage, and the rapid development of digital technology has provided new forms for the protection and inheritance of Lu embroidery. This article takes traditional Lu embroidery as the research object and uses digital technology to analyze and display it, in order to protect and inherit its skills and cultural connotations. By combining modern digital technology with traditional culture, we aim to enhance the dissemination and protection of Lu embroidery skills, while promoting the integration of cultural innovation. The article first introduces the historical background of Lu embroidery technique and its important position in the Yellow River culture of Shandong. Then, it analyzes the challenges of current intangible cultural heritage protection and dissemination. Finally, it proposes a display design scheme based on digital interactive technology and explores its potential social and cultural significance. The digital interactive display design of intangible cultural heritage Lu embroidery techniques is achieved through dynamic display, 3D modeling, and interactive design. It mainly uses digital software such as Adobe Photoshop, 3Ds Max, Maya, Adobe After Effects, Adobe Premiere Pro, Unity3D, etc. to refine and recreate the complex Lu embroidery techniques and cultural connotations. By using a digital interactive display method that combines audio and visual elements, we aim to break the one-way nature of dissemination, attract more users to learn about Lu embroidery, and promote the protection and inheritance of the intangible cultural heritage of Lu embroidery.

### Keywords

Shandong Yellow River Culture; Lu embroidery technique; Intangible Cultural Heritage; Digital interactive display; Cultural protection.

### 1. Introduction

Shandong, as one of the important birthplaces of Chinese civilization, has rich cultural heritage. The Yellow River culture, as a core component of Shandong culture, not only embodies the long history and profound cultural heritage of the Chinese nation, but also serves as an important carrier of intangible cultural heritage. Lu embroidery, as one of the national intangible cultural heritages, originated in the Spring and Autumn Period and Warring States Period. After thousands of years of development, it has formed a unique style and exquisite craftsmanship. In the field of combining traditional culture with modern technology, many scholars have conducted in-depth discussions. For example, Wang Xuan detailed several classic Lu

embroidery clothes unearthed from Li Yu'an's tomb in his book "On Several Embroidered Clothes in Li Yu'an's Tomb". In 2008, Xu Chongxiu explored the artistic and social value of Lu embroidery craftsmanship through his research on the origin of Lu embroidery in "The Development and Origin of Lu Embroidery". In "An Analysis of the Artistic Characteristics of Lu Embroidery", he delved into the artistic features of Lu embroidery, such as patterns, patterns, and colors.

In 2020, Li Qunying discussed in "Innovation and Design of Lu Embroidery Products under the Background of Cultural and Creative Industry" how to combine vocational education with Lu Embroidery to promote its innovative development; In the same year, Li Yongxin proposed to rely on the Lu Embroidery Studio to solve the problem of inheriting intangible cultural heritage skills, while cultivating talents in intangible cultural heritage skills to promote the development of Lu Embroidery; In 2021, Zhang Wenzheng and others proposed in "Research on Archival Protection of Lu Embroidery from the Perspective of Digital Empowerment" [14] to focus on establishing archives, summarizing storage, management and service, and to build a "Lu Embroidery" database and digital display platform, empowering the management of Lu Embroidery intangible cultural heritage archives with digital technology and spreading Lu Embroidery culture through new media. However, existing research is mostly focused on the macro level, and there is relatively little research on the digital interactive display design of specific intangible cultural heritage skills, especially the digital display design of intangible cultural heritage Lu embroidery skills in the context of the Yellow River culture in Shandong, which is even rarer. The protection and dissemination of Lu embroidery techniques still face many challenges. The inheritance of traditional crafts relies on manual operation, which is technically difficult and has a long learning cycle. The rapid development of modern society and changes in lifestyle have put traditional crafts at risk of marginalization. How to innovate the display of Lu embroidery skills through modern technological means and enhance their dissemination and protection effects has become an urgent problem to be solved. This article will explore the digital interactive display design of intangible cultural heritage Lu embroidery skills from the perspective of Shandong Yellow River culture, aiming to provide new solutions to this problem.

## **2. Embroidery Techniques and Shandong Yellow River Culture**

The Lu embroidery technique originated in Shandong, which has a history of thousands of years. Lu embroidery can be traced back to the Spring and Autumn Period and the Warring States Period. According to the "Qilu Embroidery Manual", at that time, the craftsmen of Lu State had already mastered superb embroidery skills. During the Ming and Qing dynasties, Lu embroidery reached its peak and became a royal tribute, widely used in clothing, home decoration, and other fields. Lu embroidery is renowned for its diverse patterns, rich colors, and unique techniques, reflecting not only the aesthetic taste of the people of Shandong, but also the natural scenery and historical culture of the Yellow River Basin. It is known for its exquisite craftsmanship and unique style.

### **2.1. The Important Position of Lu Embroidery Techniques in the Yellow River Culture of Shandong Province**

The Lu embroidery technique is not only the crystallization of the wisdom of Shandong people, but also an inseparable part of the Yellow River culture. The Lu embroidery technique is the crystallization of the wisdom of the Shandong people. The Lu embroidery technique carries rich social, cultural, and historical information in the context of the Yellow River culture in Shandong. It is not only a handmade craft, but also a unique cultural symbol of the Jiaodong region. Representative works of Lu embroidery, such as "Ode to the Yellow River" and "Birds Paying Homage to the Phoenix", draw inspiration from the natural landscapes, animals, plants, and folk

stories of the Yellow River Basin. The patterns of Lu embroidery not only showcase the magnificent scenery of the Yellow River Basin, but also express people's love for nature and life.

### **3. Challenges in the protection and dissemination of intangible cultural heritage**

The Lu embroidery technique carries a long history and rich cultural connotations, and is an important component of the Yellow River culture in Shandong. Its unique techniques and exquisite patterns not only reflect the traditional style and historical culture of the Shandong people, but also embody the natural scenery of the Yellow River Basin and the aesthetic taste of the Shandong people. The inheritance of Lu embroidery skills relies on manual practice, which is technically difficult and has a long learning cycle. This is one of the reasons why Lu embroidery skills are difficult to achieve digital transformation today. To master the essence of traditional Lu embroidery techniques, it requires years of learning and practice. There are significant differences and similarities in the cultural dissemination methods of today's society. The interest of the younger generation in Lu embroidery skills has gradually decreased with the rapid development of modern society and changes in lifestyle; Many young people lack interest and motivation in inheriting traditional handicrafts, and are more inclined to choose modern professions and lifestyles.

#### **3.1. Difficulty in Inheriting Traditional Skills**

The inheritance of Lu embroidery skills relies on manual operation, which is difficult and has a long learning cycle. To master the essence of traditional Lu embroidery craftsmanship, it requires years of research and practice. However, the rapid development of modern society and changes in lifestyle have gradually sparked interest among the younger generation in the art of Lu embroidery. Many young people lack interest and motivation in inheriting traditional handicrafts, and are more inclined to choose modern professions and lifestyles. This has resulted in many older generations of Lu embroidery artists not having suitable successors, and the transmission chain of Lu embroidery skills has been broken.

#### **3.2. The development pressure of modern society and the limitations of traditional display methods**

Traditional handicrafts are facing the risk of marginalization, while modern society is rapidly developing and the industrialization process is accelerating. As a handmade craft, Lu embroidery has low production efficiency and high cost, making it difficult to compare with modern industrial products. In addition, the changes in modern lifestyle have further exacerbated the survival dilemma of Lu embroidery skills, and the market demand for traditional handicrafts has decreased accordingly. The traditional way of showcasing Lu embroidery skills relies more on limited dissemination range and efficiency, and cannot meet the needs of modern audiences for physical display and on-site explanation. Traditional exhibition methods are often limited to specific times and locations, and visitors need to personally visit to appreciate Lu embroidery works. This display method not only limits the range of visitors, but also fails to meet the modern audience's demand for interaction and fun.

### **4. Theoretical basis of digital interactive display design**

Through interactive media, virtual reality (VR), augmented reality, AR and other technologies, digital interactive display design provides users with an immersive experience. It is a new type of display based on modern information technology. This display method not only enhances the audience's understanding of cultural content, but also improves the interactivity and fun of the display, effectively attracting the attention of the younger generation. Through this display

form, the audience's understanding of culture is enriched, and the interactivity and fun of the audience are also enhanced.

#### **4.1. Interactive Media Technology**

Interactive media technology presents cultural content to the audience in multimedia form through computer and network technology. Viewers can independently select and control the displayed content through interactive devices such as touch screens, keyboards, and mice. Interactive media technology not only enhances the fun of displays, but also provides personalized display experiences based on the needs and interests of the audience.

#### **4.2. Practical Application of Virtual Reality Technology and Augmented Reality Technology**

Through the three-dimensional virtual environment generated by computers, virtual reality technology provides users with an immersive experience. Users can enter a virtual Lu embroidery studio by wearing VR devices to experience the production process of Lu embroidery. The audience can feel every stitch and color change of Lu embroidery through VR technology, thus gaining a profound understanding of the exquisite craftsmanship of Lu embroidery.

By using computer image processing technology and augmented reality technology, virtual Lu embroidery patterns are combined with real scenes. Users can overlay the exquisite Lu embroidery patterns on surrounding objects through their mobile phones or tablets. This interactive way of viewing Lu embroidery not only allows viewers to experience the beauty of Lu embroidery, but also enhances their sense of closeness to traditional culture.

### **5. Design scheme for digital interactive display of Lu embroidery skills**

In order to better protect and promote the Lu embroidery technique, this article proposes a display design scheme based on digital interactive technology.

#### **5.1. Virtual Reality Experience Platform**

By using virtual reality technology to reconstruct the production process of Lu embroidery skills, the audience can experience every step of the embroidery process firsthand, thus achieving the goal of experiencing it firsthand. By wearing VR devices, the audience can feel every stitch and color change of Lu embroidery, thus gaining a profound understanding of the exquisite craftsmanship of Lu embroidery. Design a virtual Lu embroidery studio to reproduce the Lu embroidery production environment through realistic 3D modeling and animation technology. The audience can freely choose different Lu embroidery patterns and techniques through interactive operations to learn the basic techniques of Lu embroidery and complete their own works.

#### **5.2. Augmented Reality Interactive Display**

Lu embroidery patterns combine real-life scenarios through augmented reality technology, allowing users to see the exquisite Lu embroidery patterns covering surrounding objects through their mobile phones or tablets. Design AR for users, who can scan specific patterns or objects to trigger the display of Lu embroidery patterns. For example, users can scan a painting at home, and the painting will immediately display a matching Lu embroidery pattern. Users can adjust the color and style of the pattern through interactive operations, thereby enhancing their understanding and interest in Lu embroidery. Through interactive operations, Lu embroidery patterns can be matched with Lu embroidery patterns, thereby enhancing their understanding and interest.

### **5.3. Digital Museum**

Establish an online digital museum showcasing various Lu embroidery works and historical documents. Viewers can visit the exhibition anytime and anywhere through the internet, watch high-definition Lu embroidery works, and use 3D scanning technology to truly restore the details of each Lu embroidery work, understanding the stories and processes behind them. Designed a multimedia interactive display system that allows viewers to freely choose and browse exhibits, watch high-definition videos and animations through touch screens or interactive devices, and learn about the history and production process of Lu embroidery.

### **5.4. Interactive Learning Platform**

Develop an interactive learning platform for teaching basic techniques of Lu embroidery and online tutoring. Through simple operations, users can learn how to use tools and materials, try basic embroidery techniques, and even complete work sharing on social media platforms. Design a multifunctional interactive learning system to enable users to learn the basic techniques of Lu embroidery through video tutorials, interactive operations, and online guidance. The system can also provide users with personalized learning paths and assessment tools to help them master Lu embroidery skills.

## **6. Potential socio-cultural significance of digital interactive display design**

Through the application of digital interactive technology, Lu embroidery skills can not only be better protected and disseminated in modern society, but also stimulate the interest of the younger generation in traditional culture. This digital interactive display design is not only a display of technology, but also a continuation and innovation of culture.

### **6.1. Enhancing cultural identity while promoting cultural innovation**

Digital interactive display design can enhance the audience's cultural identity with Lu embroidery skills through immersive and interactive experiences. Through virtual reality and augmented reality technology, audiences can immerse themselves in the production process of Lu embroidery and feel its exquisite beauty. This experience not only allows audiences to have a better understanding of Lu embroidery skills, but also enhances their sense of pride and identification with traditional culture. Digital interactive display design can not only protect and spread traditional culture, but also be a new means and way of cultural innovation and development. By combining modern technology and traditional culture, a new art form and display method can be created to meet the needs of modern audiences. Through digital technology, the Lu embroidery technique is combined with modern art, design, and other elements to create new forms of art and display methods that promote the modernization transformation of traditional culture for modern audiences.

### **6.2. Expand the dissemination scope and audience of Lu embroidery culture**

The digital interactive display design, which provides new possibilities for the modernization transformation of traditional culture, breaks through the limitations of time and space and expands the scope of dissemination. Viewers can access the digital museum and interactive learning platform anytime and anywhere through the Internet and mobile devices to learn and reference the skills of Lu embroidery. This display method can not only expand the dissemination scope of Lu embroidery skills, but also attract more young audiences and stimulate their interest in traditional culture.

## 7. Conclusion

The digital interactive display design of intangible cultural heritage Lu embroidery skills, from the perspective of Shandong Yellow River culture, is not only a means of protection and dissemination of traditional skills, but also a design that actively explores modern cultural innovation. Through the organic combination of modern digital technology and traditional culture, a new display of modern digital technology aimed at promoting cultural innovation integration while promoting the dissemination and protection of Lu embroidery skills has been proposed, thus achieving the goal of promoting dissemination and protection. Digital interactive technology plays a significant role in showcasing the art of Lu embroidery. The application of virtual reality (VR) and augmented reality (AR) technology not only provides viewers with an immersive experience through interactive computing, but also enhances their understanding and interest in Lu embroidery techniques. This immersive and interactive display not only enhances audience participation but also strengthens their sense of identity and pride in traditional culture.

The design of digital interactive displays breaks through the constraints of time and geography, and the scope of dissemination also expands accordingly. Through digital museums and online interactive learning platforms, audiences can visit the site of Lu embroidery works at different times and places, to different regions, to different scenes, and to different fields. This borderless display method not only expands the dissemination of Lu embroidery skills, but also attracts more young audiences, thereby arousing their interest in traditional culture. This is also why this borderless display method is a good way to showcase and showcase. By combining modern technology with traditional culture, we aim to create a new art form and display method that meets the needs of modern audiences. For example, by using digital technology to modernize, modernize, and design traditional culture through the techniques of Lu embroidery and elements of modern art and design, it is a new form of art and design that promotes the transformation of traditional culture modernization.

In summary, the digital interactive display design of Lu embroidery skills can not only effectively protect and spread traditional culture, but also promote cultural innovation and development. Through the application of modern technology, we can inject new vitality into traditional culture and make it shine with new brilliance in modern society.

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