

Digital reconstruction of court ladies' apparel in Chinese heritage painting

Abstract

The Admonitions of the Instructress to the Court Ladies, a renowned masterpiece by Eastern Jin painter Gu Kaizhi, depicts the apparel styles of ancient court ladies. With the advancement of digital technology, the reconstruction of ancient artworks through digital means has become an essential direction in cultural heritage research. This study aims to digitally reconstruct the apparel depicted in The Admonitions of the Instructress to the Court Ladies and explore its applications and heritage value in the context of modern technological advancements. First, high-resolution image scanning and 3D modeling techniques are employed to accurately reconstruct the details of the apparel in the painting. By analyzing key elements such as fabric texture, color combinations, and structural features, and integrating historical apparel records, this study progressively reconstructs the historical apparel styles portrayed in the artwork. Additionally, virtual simulation and dynamic modeling techniques are applied to examine the appearance of the apparel in various postures and movements, aiming to capture their aesthetic characteristics in motion. The findings of this study not only provide a more intuitive and precise reconstruction of the apparel in The Admonitions of the Instructress to the Court Ladies, but also open new avenues for the digital preservation and research of ancient apparel, offering significant academic and cultural value.

Keywords: digital reconstruction, heritage painting, court ladies' apparel, the admonitions of the instructress to the court ladies

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Introduction

Cultural heritage serves as a cornerstone of national identity and a bridge for civilizational exchange, carrying profound historical and cultural significance. As an essential component of human civilization, apparel reflects not only the social and ideological context of an era but also its aesthetic and cultural values. The study, preservation, and reconstruction of historical apparel have always been of great importance. However, textiles, being highly susceptible to deterioration caused by oxidation, fluctuations in temperature and humidity, and exposure to light, often suffer from discoloration, fading, and fabric degradation. These challenges make the conservation and reconstruction of ancient apparel an intricate and demanding task.

Compared to the fragility of physical apparel, the depiction of apparel in ancient paintings provides an invaluable resource for historical apparel reconstruction due to its relatively stable preservation. Chinese classical paintings, characterized by meticulous brushwork and sophisticated composition, vividly portray the fashion and lifestyle of their respective periods. Among these, *The Admonitions of the Instructress to the Court Ladies*, created by the renowned Eastern Jin painter Gu Kaizhi, stands as a masterpiece. Based on *Nüshi Zhen*, a literary work by Western Jin scholar Zhang Hua, this painting illustrates moral lessons for women through historical exemplars. Although the original work has been lost, a Tang dynasty copy, currently housed in the British Museum, has survived. Originally composed of twelve scenes, only nine remain intact due to the ravages of time. This artwork not only showcases Gu Kaizhi's artistic excellence but also provides a detailed visual record of the apparel and social roles of court ladies, making it a crucial reference for historical apparel studies.

The Eastern Jin dynasty (317–420 CE) was a period of political turbulence yet significant cultural transformation. Despite initial

instability, the aristocracy gradually consolidated power, leading to a stable social order and economic recovery. During this time, the textile industry flourished, with advancements in silk and cotton production enhancing both quality and variety. Trade between the north and south intensified, facilitating cultural exchanges and influencing fashion trends. Philosophically, the rise of Neo-Daoism promoted ideals of spiritual transcendence, which permeated artistic and fashion expressions, favoring elegant, flowing apparel that embodied a sense of ethereal refinement. This period saw a fusion of traditional Han apparel elements with influences from Central Asia, creating a distinctive sartorial style.

With the rapid advancement of digital and information technologies, cultural heritage preservation has undergone a profound transformation—from two-dimensional to three-dimensional representation and from static imagery to dynamic simulation. Digital reconstruction techniques offer new possibilities for studying and reconstructing historical apparel, minimizing the complexities and uncertainties associated with physical reconstruction. By leveraging ancient paintings as references, digital reconstruction enables enhanced visualization and predictive accuracy, providing valuable insights for historical apparel studies.

This study focuses on the digital reconstruction of court ladies' apparel in *The Admonitions of the Instructress to the Court Ladies*, utilizing advanced computer-aided design tools and digital reconstruction techniques. By analyzing the apparel structures, color schemes, and textile craftsmanship depicted in the painting, the study employs CLO 3D software to conduct virtual simulations. Through this approach, the research enhances the authenticity and interactivity of historical apparel reconstruction, contributing to technological advancements in textile heritage conservation while providing a valuable reference for both academic research and contemporary fashion design.

Related works

Currently, several relevant studies have explored the digital reconstruction of historical apparel, focusing on various methodologies and applications. Liu et al.¹ examined the transformation of Chinese apparel from an archaeological perspective, emphasizing the role of material culture in shaping historical apparel styles. Chen and An² analyzed women's apparel depicted in mural tombs from the Wei, Jin, and Northern and Southern Dynasties, demonstrating how funerary art serves as a valuable reference for reconstructing historical dress.

Some studies have concentrated on specific aspects of historical apparel research. Li³ and Zang⁴ investigated apparel structures, fabric choices, and symbolic meanings, shedding light on the cultural dynamics of ancient Chinese dress. Meanwhile, Zhao⁵ explored the relationship between female body proportions and aesthetics, providing insights into how apparel construction aligned with historical beauty standards. Yang⁶ and Zhang⁷ further examined ancient textile techniques, particularly color schemes and dyeing methods, revealing the intricate connections between fashion and social hierarchy.

Regarding digital applications, several studies have addressed the use of computational tools in historical apparel research. Zhao⁸ and the Book of Jin⁹ documented archaeological discoveries, such as terracotta figurines and preserved textiles, which offer physical evidence supporting digital apparel reconstruction. Liu,¹⁰ Shen,¹¹ and Zhou¹² discussed digital visualization techniques in textile heritage studies, demonstrating the advantages of 3D modeling and virtual simulation in reconstructing historical apparel. However, most of these studies either focus on specific digital methods or provide general overviews of this field's development. A comprehensive analysis of the detailed procedures and challenges involved in the digital reconstruction of historical apparel remains relatively limited.

In this context, this study aims to bridge this gap by conducting an in-depth digital reconstruction of court ladies' apparel depicted in *The Admonitions of the Instructress to the Court Ladies*, integrating historical analysis with computational design tools. By employing CLO 3D software for virtual apparel simulation, this research not only contributes to the preservation and reinterpretation of ancient apparel but also provides a methodological framework for integrating art, archaeology, and digital technology in textile heritage studies.

Methodology

Artificial Intelligence-Based reconstruction

To ensure accurate digital reconstruction of the apparel depicted in *The Admonitions of the Instructress to the Court Ladies*, it was first necessary to reconstruct the damaged areas of the painting. Traditional preservation techniques had resulted in visible cracks, pigment loss, and fading, requiring an advanced reconstruction approach to recover missing details before further analysis.

This study employed artificial intelligence (AI)-driven image reconstruction technology, utilizing deep learning algorithms to enhance the clarity of the painting while preserving its original artistic characteristics as much as possible. Given that bigjpg possesses the capability to automatically detect and repair damaged areas of an image, including cracks, pigment loss, and color distortion, this study selected the software for the initial reconstruction process.

In the specific operational procedure, the target image was first uploaded to the bigjpg platform, ensuring compatibility with supported formats (JPEG, PNG, etc.). Subsequently, key parameters were set according to the reconstruction requirements: the magnification level

was set to 4× in this study to improve image resolution, while the denoising level was adjusted to high to optimize texture details and reduce noise interference. Additionally, the color detail retention option was enabled to ensure smooth color transitions and overall visual coherence during the reconstruction process. Once the parameters were configured, the AI system automatically analyzed the image, extracting its texture, color features, and structural details, and applied a deep neural network model to intelligently repair damaged areas, enhancing the overall visual clarity.

After the reconstruction process was completed, the high-resolution image was exported and subjected to an initial evaluation through visual comparison, assessing edge sharpness, color consistency, and detail reconstruction to ensure that the AI reconstruction results met expectations, as shown in Figure 1 and Figure 2.



Figure 1 Original image.



Figure 2 AI-reconstructed image.

Photoshop-Based reconstruction

Following the initial AI reconstruction, the painting successfully regained a significant portion of its lost details. However, challenges remained in terms of accuracy and color fidelity, necessitating further refinements through manual intervention. To address these issues, Photoshop was utilized as a digital reconstruction tool, replacing traditional paper and brush techniques with a graphics tablet and stylus. By adjusting software parameters such as brush size, color depth, and overall image properties, the reconstruction process significantly enhanced image precision and optimized the final reconstruction quality.

After importing the image into Photoshop, various tools and plugins were employed to improve clarity and detail, including the

ACR (Adobe Camera Raw) plugin, InFocus plugin, USM (Unsharp Mask) sharpening technique, tonal curve adjustments, contrast optimization, and multiple filters. The process involved duplicating the original image and converting it into a smart object for flexible adjustments, followed by the application of a high-pass filter to refine color variations and determine a suitable sharpening radius. USM sharpening was then applied, with careful tuning of intensity, radius, and threshold values, and blended with the original image in overlay mode to achieve optimal clarity. Subsequent tonal curve adjustments enhanced brightness and vibrancy, and finally, all layers were merged to produce a high-resolution, detail-rich reconstructed image. The final reconstruction results are shown in Figure 3.



Figure 3 PS repaired image.

Apparel element analysis

Style analysis

During the Wei and Jin dynasties, social instability and cultural integration among ethnic groups led to significant transformations in apparel styles. Despite these changes, apparel such as Shan (Chinese:衫), Ru (Chinese:襦), and Qun (Chinese:裙) remained the predominant fashion. Long-sleeved robes were also in vogue at certain periods. The fusion of Han apparel with styles from various ethnic groups influenced the evolution of apparel during this era.¹

The Ruqun (Chinese:襦裙) ensemble from the Wei and Jin periods was characterized by a short ru jacket with wide sleeves and a long, floor-length skirt. The ru, a short apparel reaching only the waist, was often referred to as “Yaoru” (Chinese:腰襦). During the Han and Wei periods, women typically wore a ru on the upper body paired with a long skirt, leading to the phrase “shangru xiaqun” (Chinese:上襦下裙).² The selected reconstruction subject aligns with these characteristics, suggesting that the court lady depicted in the painting wore a cross-collared ru with wide sleeves.

The Qun (Chinese:裙) is the focal point of the ruqun ensemble, covering a significant portion of the depicted figures. During the Wei and Jin periods, skirts were worn with a natural waistline, positioned between the bust and the waist.¹¹ The skirts were designed to be loose and flowing, often featuring straight or slightly tapered cuts to create a smooth, draping silhouette. The hem was long and slightly gathered, contributing to an elegant, cascading effect.¹³ Wei and Jin skirts generally emphasized a relaxed and natural aesthetic, commonly appearing in an A-line or trapezoidal shape. The fabric was typically lightweight, such as silk or fine-woven cloth, which allowed the apparel to sway gently with movement, enhancing its fluidity. A simple belt or a thin sash was usually used to secure the waist, subtly accentuating the natural contours of the body.^{11,13}

The bixi (Chinese:蔽膝) was an essential component of ancient Chinese apparel and had been in use since the pre-Qin period. During the Wei and Jin dynasties, it played multiple roles in women's apparel. Functionally, the bixi served as an additional layer of coverage, while also symbolizing the wearer's social status and elegance. In *The Admonitions of the Instructress to the Court Ladies*, the bixi stands out as a distinctive feature, complementing the apparel of the depicted figures. Typically, the bixi was suspended from the waistband, extending down to the knees, reinforcing a dignified and graceful appearance. The edges were often adorned with embroidery or brocade, and silk was the primary material. The surface decorations featured geometric patterns or cloud motifs, creating a design that harmonized with the overall outfit.^{3,10,11,13–15}

Another notable feature in Wei and Jin court apparel was the floating ribbon extending from the back of the collar. This was a common and significant decorative element in women's fashion of the time. The floating ribbon was usually a long, narrow strip made from lightweight textiles such as silk or gauze, designed to enhance the apparel's sense of fluidity and elegance. Its length and width were typically moderate, ensuring a balanced drape without excessive extension. In the reconstructed image, the floating ribbon extends from the back of the collar, complementing the hairstyle and naturally cascading along the shoulders and back, creating a dynamic visual effect. In some cases, the ribbon gently wraps around the shoulders or elbows, adding layers and enhancing the overall fluidity of the apparel. This design not only contributes to the dynamic movement of the apparel but also enhances the graceful and refined presence of the court ladies.^{3,14} Based on the analysis above, the front and back reconstructed apparel is illustrated in Figures 4a–4b.

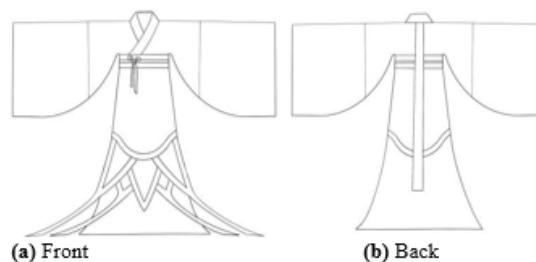


Figure 4 Reconstructed style diagram.

Fabric analysis

According to historical records, silk weaving techniques during the Wei and Jin dynasties had reached a high level of sophistication, with commonly used fabrics including Spun silk, yarn, and brocade.³ Among these, Spun silk, known for its lightness and smooth texture, was often used for underapparels or qun linings, while brocade, with its thick, luxurious, and vibrantly colored characteristics, was an ideal choice for outer qun. Based on the thickness and texture of the apparel depicted in the painting, the outer qun was likely made of ornate brocade fabric, which provided a sense of structure and layering. The intricate weaves and rich colors of such materials enhanced the visual appeal of the apparel, contributing to a more refined and elegant aesthetic.

The floating ribbon extending from the back of the collar, a common element in Wei and Jin Court Ladies' Apparel, also required carefully selected fabrics. In *The Admonitions of the Instructress to the Court Ladies*, the floating ribbon appears soft and draping, aligning with the era's preference for apparel that emphasized fluidity and grace. Historical texts indicate that such ribbons were often made from Spun silk, materials known for their lightweight nature

and excellent draping properties. These characteristics allowed the ribbons to exhibit a soft, flowing effect, enhancing the elegance and movement of the wearer.

Both *The Study of Apparel Culture in the Wei, Jin, and Northern and Southern Dynasties* and *Illustrated Compendium of Ancient Chinese Apparel* highlight the advanced silk-weaving techniques of the Wei and Jin periods, particularly noting that brocade fabrics, with their exquisite patterns and dense texture, were widely used in the daily and ceremonial attire of aristocratic women.^{4,16} The thickness, sheen, and pleat characteristics of the apparel depicted in *The Admonitions of the Instructress to the Court Ladies* closely correspond to these fabric properties, reinforcing the likelihood that similar materials were used in the apparel illustrated in the painting.

Pattern analysis

The apparel depicted in *The Admonitions of the Instructress to the Court Ladies* is characterized by simplicity and elegance, with no prominent decorative patterns. This aligns with the aesthetic preferences of the Wei and Jin dynasties. During this period, especially among the scholar-official class, apparel patterns were not the primary decorative elements; instead, greater emphasis was placed on fabric texture and color coordination.¹² Additionally, the painting's artistic style appears to deliberately simplify patterns to highlight the expressions of the figures and the overarching theme rather than focusing on intricate ornamentation. While elaborate brocade and embroidered patterns did exist in the Wei and Jin periods, they were more commonly used in ceremonial apparel or apparel for high-ranking nobility. Therefore, the simplified apparel designs in the painting align with the aesthetic trends of the time.

Color analysis

The color choices of Court Ladies' Apparel in the Wei and Jin dynasties often leaned toward subtle and soft tones, reflecting the era's appreciation for pure discourse culture and the ideal of detachment from material pursuits. The colors used in apparel were generally understated and refined, with commonly seen light-colored silks such as white, pale pink, and light blue. Particularly among the aristocratic class, restrained and elegant color palettes were closely associated with one's social status and cultural refinement.

Beyond aesthetic preference, the colors of Wei and Jin dynasty apparel carried symbolic meanings. Soft, muted tones often represented gentleness and dignity, resonating with the societal emphasis on rational thought and spiritual transcendence.⁵ Additionally, aristocratic women of this period often chose mild, harmonious colors as a way to express their reverence for Confucian etiquette and traditional culture. This is consistent with the portrayal of court ladies in *The Admonitions of the Instructress to the Court Ladies*, where their apparel colors reflect not only their cultural background but also their inner temperament. Based on the above analysis, the reconstructed color scheme for the selected figure is presented in Table 1.

Table 1 Reconstructed apparel color inference

Apparel item	Color	Pantone
Ru	Low-saturation, high-brightness yellow	607 C
Qun	Low-saturation, high-brightness yellow	607 C
Floating Ribbon, Corner Decorations, Ties	High-saturation, relatively high-brightness red	7628 C
Collar Edge, Qun Hem	Medium-saturation, high-brightness yellow	458 U

Digital reconstruction

The digital reconstruction process typically consists of several key steps: creating a 3D human model, estimating and generating apparel patterns, arranging and virtually sewing the fabric pieces, and simulating fabric properties. As a powerful 3D apparel simulation software, CLO 3D provides designers with advanced tools for developing, modifying, simulating, and rendering apparel in a virtual environment. In this study, CLO 3D technology was employed to digitally reconstruct ancient apparel, streamlining the traditional reconstruction workflow while significantly improving efficiency, reducing costs, and minimizing environmental impact.

Construction of the 3D avatar

Based on analyses of skeletal remains from ancient archaeological sites and historical records, the average height of women during the Wei and Jin dynasties was approximately 155–160 cm.¹⁷ This is slightly shorter than the average height of modern Chinese women but is comparable to the recorded heights of women in other ancient civilizations. Therefore, the median value of 157.5 cm was selected as the height parameter for the virtual model.

There are no precise historical records detailing the bust, waist, and hip measurements of Wei and Jin dynasty women. However, apparel styles of this period, such as the ruqun, were typically loose-fitting and emphasized a slender and soft silhouette rather than accentuating the bust or hips.¹⁷ These designs obscured specific body contours, reducing the direct influence of body measurements on apparel fit.

According to relevant studies, ancient women's bust measurements were generally moderate, influenced by binding techniques and apparel structure. It is estimated that the bust circumference of women during the Wei and Jin period ranged between 80–85 cm. The preferred aesthetic of the time emphasized a slim waist, particularly among noblewomen and literati, with waist circumferences typically around 55–60 cm. Unlike modern ideals, hip curvature was not a major focus in ancient aesthetics, but the estimated hip circumference ranged between 85–90 cm.^{5,6}

Thus, the median values for body measurements were selected as follows: bust 82.5 cm, waist 57.5 cm, and hips 87.5 cm. These body dimensions were then input into CLO 3D software, generating the virtual mannequin model shown in Figure 5. To ensure accurate body proportions, further adjustments were performed within the Avatar Editor, where the total body height was set according to anthropometric reference data. The software automatically redistributed segmental proportions based on this input, after which the Proportion Editing function was used to manually refine the torso length, leg length, and head-to-body ratio. Additionally, shoulder width, arm length, and inseam were adjusted to enhance anatomical accuracy, ensuring alignment with the predefined body measurements. The Measurement Tool was employed throughout the process to verify segmental dimensions and maintain proportional consistency. Once finalized, the optimized virtual mannequin served as the foundational model for subsequent apparel simulation and fit analysis (Table 2).

Table 2 Dataset of body parts

Height	Bust	Waist	Hip
157.5cm	82.5cm	57.5cm	87.5cm

Estimation and construction of apparel patterns

To accurately reconstruct the Wei and Jin dynasty court apparel depicted in *The Admonitions of the Instructress to the Court Ladies*, the image proportion analysis method was employed, integrating

historical literature and archaeological findings to estimate apparel dimensions. This method involves analyzing the proportional relationship between apparel and body measurements in the painting, allowing for the derivation of actual apparel dimensions. Since *The Admonitions of the Instructress to the Court Ladies* is a two-dimensional artwork, it lacks the depth present in physical apparel, leading to a certain degree of distortion in perspective. Therefore, it was necessary to apply image proportion analysis to convert and estimate the apparel dimensions more accurately.



Figure 5 Constructed avatar.

First, measurements of various parts of the apparel worn by the court ladies in the painting were taken and correlated with the figures' heights to determine proportional relationships. According to historical records and archaeological data, the basic proportions of Wei and Jin women's apparel were as follows: the ru typically accounted for one-fourth of body height 1:4, while the qun length was approximately 1.2 times body height 5:6. Sleeves were generally longer than in other dynasties, with a sleeve length of approximately half the body height 1:2 and sleeve width often equaling half the body height 1:2. Additionally, the floating ribbon extending from the back collar usually ranged from half to two-thirds of body height 1:2 to 2:3, and in some cases, it could extend nearly the full body height. Based on the proportions observed in the painting, the floating ribbon length was set at two-thirds of body height 2:3.

Using these proportional relationships, the apparel dimensions were estimated based on a reconstructed figure height of 157.5 cm. The calculated values were as follows: the ru length was approximately 39 cm, the qun length was about 145 cm, the sleeve length was estimated to be around 80 cm based on proportional calculations and historical references, the sleeve width was about 79 cm, and the floating ribbon length was approximately 79 cm. These estimations provided an accurate foundation for the subsequent digital reconstruction of the apparel. The final reconstructed measurements are summarized in Table 3.

Table 3 Size inference

Item	Section	Ratio of height and apparel	Size/cm
Ru	Apparel	1:04	39
	Sleeve	1:02	80
	Cuff	1:02	79
Qun	Qun	5:06	145
Floating ribbon	Ribbon	1:02	79

To create a 3D virtual apparel model, the first step is to develop 2D apparel patterns. Based on the analyzed apparel shapes and

styles, the pattern-making process is directly carried out in CLO 3D software. First, basic pattern pieces are drawn using the polygon tool or rectangle tool in CLO3D, according to the predetermined apparel measurements. Then, these pattern pieces are refined by adjusting curves, adding notches, and modifying seam allowances to accurately represent the intended apparel structure. The Edit Pattern tool allows precise manipulation of line segments, enabling modification of length, curvature, and angle to achieve the desired fit. Additionally, the Internal Line tool is used to combine the necessary darts, pleats, or style lines for apparel shaping. After these steps, the final 2D apparel pattern is presented, ready for the subsequent 3D apparel simulation process, as shown in Figures 6a–6c.

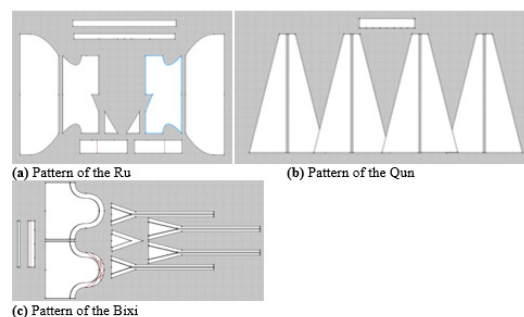


Figure 6 Construction of apparel patterns.

Arrangement of apparel pieces and virtual sewing

After creating the apparel pieces in CLO 3D software, it is necessary to adjust the pose of the virtual mannequin and arrange the apparel pieces in a 3D space. At this stage, the apparel pieces should be positioned as close to the mannequin's body as possible without colliding with it to facilitate the sewing process. Since the reconstructed apparel includes multiple overlapping parts and has a layered structure, a step-by-step modeling approach is adopted. The sewing process is carried out in sequence for the ru, ties, qun, and floating ribbon. After completing the sewing, the apparel undergoes a freezing process to prevent interpenetration between model layers and ensure the structural stability of the apparel, as shown in Figure 7.



Figure 7 The simulation proceeds.

Fabric simulation

CLO 3D enhances the realism of simulations by allowing the adjustment of fabric parameters. By creating a fabric model and defining its properties, color, pattern, and other elements related to both fabric and accessories, a highly realistic representation of the

actual fabric can be achieved. Based on the previous analysis of fabric and color, the fabric model is constructed by integrating fabric characteristics and color settings, as shown in Figure 8.



Figure 8 Fabric simulation.

Demonstration of digital reconstruction

The digital reconstruction of the court ladies' apparel depicted in *The Admonitions of the Instructress to the Court Ladies* was successfully completed using CLO 3D. The reconstructed apparel was based on historical records, archaeological findings, and proportion analysis derived from the painting. The final results demonstrate the feasibility and accuracy of digital reconstruction in reviving ancient apparel styles.

Through AI-based image reconstruction and manual refinements, the painting's damaged sections were repaired, ensuring a clearer and more precise reference for apparel reconstruction. The apparel patterns were then estimated using proportional analysis, aligning with historical records of Wei and Jin dynasty court ladies' apparel. The 3D human model was constructed based on inferred body measurements, providing a realistic digital mannequin for apparel simulation. The CLO 3D simulation successfully replicated the structural features, fabric drape, and movement of traditional ruqun, including the cross-collar ru, qun, wide sleeves, and the floating ribbon at the back collar.

The virtual simulation results confirm that the reconstructed apparels align with historical apparel characteristics, including fabric flow, fit, and aesthetic appeal. The apparel proportions and color schemes were consistent with historical descriptions, reflecting the understated elegance preferred during the Wei and Jin periods. The reconstructed apparel not only provides a visual representation of ancient apparel but also serves as a reference for further cultural heritage studies and digital preservation efforts. The final simulation results are shown in Figures 9a–9c.



Figure 9 Rendering results display.

Conclusion, discussion, and future perspectives

This study explores a new approach to historical apparel reconstruction through the digital reconstruction of the court ladies' apparel depicted in *The Admonitions of the Instructress to the Court Ladies*, highlighting the significant role of digital technology in apparel culture research. By digitally reconstructing the apparel portrayed in the painting, we have not only gained a deeper understanding of the design characteristics of Wei and Jin dynasty apparel but also provided a new perspective for studying the historical, cultural, and aesthetic values of ancient apparel.

The application of digital reconstruction technology in this research demonstrates its immense potential in historical apparel reconstruction and cultural heritage preservation. Compared to traditional methods that rely on physical artifacts or manual reconstruction, digital reconstruction enables a more precise recreation of ancient apparel details while incorporating virtual displays and interactive experiences to convey the cultural significance of historical apparel to the public. This approach offers more vivid and intuitive resources for historical studies while also providing practical reconstruction data for digital museums, film and television productions, game design, and other fields, greatly expanding the application scope of reconstructed historical apparel.

The digital reconstruction of the court ladies' apparel in *The Admonitions of the Instructress to the Court Ladies* demonstrates extensive application potential across multiple fields. In fashion design, the precise reconstruction of historical apparels provides modern designers with a wealth of historical elements and inspiration. By integrating traditional apparel structures with contemporary design concepts, designers can create apparel that blend deep cultural heritage with modern aesthetics. This not only promotes the inheritance and innovation of Wei and Jin-style apparel in modern fashion but also meets the growing market demand for personalized and culturally diverse designs.

In cultural heritage preservation, the reconstruction of court ladies' apparel from *The Admonitions of the Instructress to the Court Ladies* contributes to a deeper understanding of the apparel styles and socio-cultural context of the Wei and Jin periods. By presenting traditional culture in a more vivid and intuitive manner through digital reconstruction, this research enhances public interest and awareness of historical heritage. In the context of globalization, these reconstructions serve as an important medium for promoting Chinese culture worldwide, strengthening cultural identity and confidence.

In art education, the digital reconstruction of historical apparel provides students with a visual and interactive learning resource, allowing them to gain a deeper understanding of ancient apparel design, craftsmanship, and cultural significance. Instead of relying solely on traditional flat sketches or textual descriptions, students can explore historical apparel details on digital platforms, significantly enriching their learning experience. Furthermore, the reconstructed apparel serves as an essential reference for artistic creation, enabling students to develop innovative designs inspired by historical aesthetics.

Additionally, the reconstruction of court ladies' apparel based on *The Admonitions of the Instructress to the Court Ladies* provides valuable support for archaeology and historical studies. By reviving ancient apparel, researchers can further explore the social structure, aesthetic preferences, and cultural exchanges of the Wei and Jin periods, advancing interdisciplinary studies in related fields. Apparel reconstruction offers new perspectives for archaeologists, helping to

uncover the functions and cultural significance of historical artifacts, ultimately contributing to a more comprehensive understanding of ancient societies.

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Conflicts of interest

No potential conflict of interest was reported by the authors.

References

1. Liu K, Zhou S, Zhu C. Historical changes of Chinese costumes from the perspective of archaeology. *Heritage Science*. 2022;10(205).
2. Chen S, An W. A brief discussion on women's apparel in mural tombs of the Wei, Jin, and Northern and Southern Dynasties. *Textile Herald*. 2019;(04):76–80.
3. Li S. Apparel art of the Wei, Jin, and Northern and Southern dynasties. Hunan Fine Arts Publishing House. 2010.
4. Zhang L. Apparels and culture of the Wei, Jin, and Northern and Southern dynasties. *Chinese Culture Forum*. 2014;3:12–19.
5. Zhao Y. Ancient female body proportions and aesthetics. People's Publishing House. 2015.
6. Yang B. The apparel styles and aesthetics of the Wei, Jin, and Northern and Southern dynasties. China Social Sciences Press; 2011.
7. Zhang Y. Research on apparel colors in the Wei, Jin, and Northern and Southern dynasties. Zhonghua Book Company; 2015.
8. Zhao X. Terracotta figurines and apparel culture in the Wei and Jin periods. Chinese Archaeological Society. 2015.
9. Book of Jin: Records of Apparel and Adornments. 2011.
10. Liu P. The evolution of women's apparels in ancient China. China Social Sciences Press; 2015.
11. Shen C. Research on ancient Chinese apparels. China Literature and History Publishing House. 1981.
12. Zhou X. Research on ancient Chinese apparels. China Textile Publishing House. 1984.
13. Shanghai Bookstore Publishing House. Women's makeup and accessories in Chinese history. Shanghai Bookstore Publishing House. 2003.
14. Wang M. A cultural history of apparels: from the Wei and Jin dynasties to the tang dynasty. Peking University Press; 2005.
15. Li H. Research on the apparel culture of the Wei, Jin, and Northern and Southern dynasties. Henan People's Publishing House. 2008.
16. Yang Y. Research on ancient Chinese silk fabrics. Zhonghua Book Company; 2010.
17. Dong G. Research on ancient Chinese apparel culture. Peking University Press; 2007.
18. Wang H. Research on apparel culture in the Wei, Jin, and Northern and Southern dynasties. Peking University Press; 2010.