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Exploration of AI and AR Technologies in the Character Design of "Dream of the Red Chamber"

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Abstract

This study explores the potential of artificial intelligence (AI) and augmented reality (AR) technologies in recreating the character of Wang Xifeng, a core figure in the Chinese classical literary masterpiece "Dream of the Red Mansions". By integrating two advanced tools, Midjourney and Kivicube, the study successfully created and displayed a digital virtual avatar of Wang Xifeng. The research employed qualitative research methods, including content analysis, experimental research, and a questionnaire survey. The feedback results showed that most participants were satisfied with the reshaped image of Wang Xifeng using AI and AR technologies. This study not only opens up new avenues for the modern interpretation of traditional literary characters but also provides valuable experience and theoretical support for the inheritance and innovative practice of traditional culture.

Keywords

Dream of the Red Chamber, Character design, AI image generation, AR technology, cultural heritage

Introduction

"A Dream of Red Mansions" is a classic of ancient Chinese literature. As an important character in it, Wang Xifeng shows a complex personality and rich emotions. Her image design is of great significance for understanding the cultural background of the entire work. However, traditional literary works face many challenges in modern communication. How to achieve the reproduction of classic literary characters through modern scientific and technological means has become a problem worth exploring (Liu, 2023).

In recent years, the application of artificial intelligence (AI) and augmented reality (AR) technology in cultural inheritance has gradually increased. AI technology can generate high-quality images, and AR technology can combine virtual images with real environments to enhance users' interactive experience and immersion (Jacob & Nóbrega, 2021; Ng & Ng, 2023; Leong,

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2024). This study aims to examine the application of artificial intelligence and augmented reality technology in the reshaping of Wang Xifeng's character image in the classic literary masterpiece "A Dream of Red Mansions". It aims to revitalize traditional literary characters with the power of contemporary science and technology and stimulate the public's resonance and desire to explore traditional culture.

Methodology

This study utilized content analysis, experimental research, and a questionnaire survey within a qualitative research framework to comprehensively explore the application of artificial intelligence (AI) and augmented reality (AR) technologies in recreating the character image of Wang Xifeng from "Dream of the Red Mansions" (as shown in Figure 1).

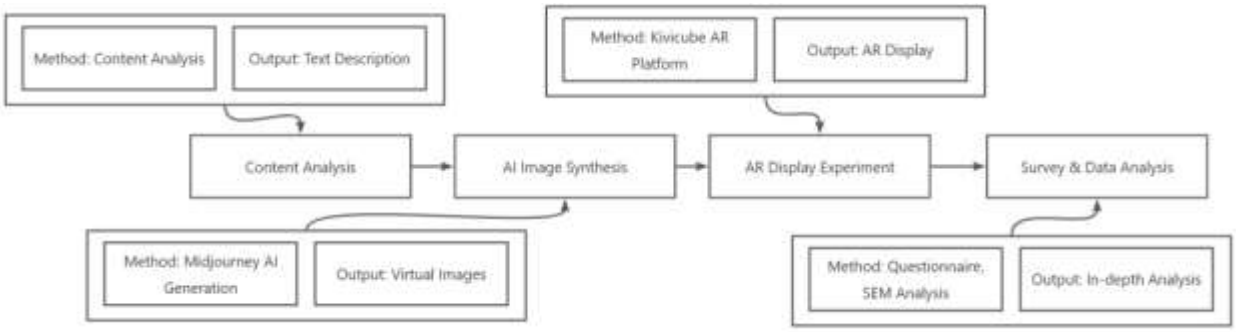


Figure 1. Research Methodology Framework

Initially, content analysis was employed to conduct an in-depth examination of Wang Xifeng's portrayals in classic film and television. The research team first carried out a design investigation, collecting classic screen materials of Wang Xifeng through publicly available online sources. From these materials, the key characteristics of Wang Xifeng—including facial contours, makeup details, clothing styles, and personality traits—were extracted, visually refined, and translated into textual descriptions. This textual foundation guided the subsequent AI-based image synthesis process.

The questionnaire was designed by the Wang Xifeng character design team and distributed via social media platforms, such as Xiaohongshu and WeChat, in order to reach a diverse audience. The data was collected over a period of time through these platforms, with 129 respondents participating in the survey. The respondents were primarily aged 18 and above, including teachers, literature enthusiasts, and IT/technology professionals, and were mostly from eastern China. The survey aimed to collect audience feedback on the digital image of Wang Xifeng reshaped using AI and AR technologies.

In the experimental phase, the Midjourney AI system was used to create and refine virtual images of Wang Xifeng, which were then integrated into real-world scenes using the Kivicube AR platform. This phase involved conducting AR display experiments to assess the specific effectiveness of AR technology in enhancing user interaction and immersion.

Structural Equation Modeling (SEM) analysis was conducted using the SmartPLS platform to examine the relationships between user experience, cultural belonging, technology acceptance, and satisfaction (Siswoyo, Suryana, & Dewi, 2020). This approach helped confirm the robustness of the research methodology and provided valuable insights into the broad application prospects of AI and AR technologies in recreating classic literary characters (Leong 2024c, Leong 2006).

Results and Discussion

Content Analysis Results

When exploring the image composition of Wang Xifeng in Dream of Red Mansions, the research team extracted the key visual elements of Wang Xifeng from five different versions of film and television works (Gong et al., 2024). Table 1 provides a detailed comparison of the common features of Wang Xifeng's facial features, makeup details, hair accessories, clothing style, and material from each version, allowing for a clearer analysis of the convergence and distinctions among the adaptations. They established detailed text descriptions and design-oriented principles for the next step of using artificial intelligence technology to generate Wang Xifeng's virtual image, aiming to ensure that the created digital image can accurately reproduce the unique style of this classic literary character (Li & Nan, 2023).

Table 1: Analysis of the common features of Wang Xifeng's image

Film/TV Representation	Year	Facial Features	Makeup Details	Hair Accessories	Clothing Style and Material	Similarities
	1944	High bun, willow-leaf eyebrows, traditional and simple makeup	Simple makeup, natural tones, dignified appearance	Simple traditional look, mostly hairpins	Ming and Qing style robe, layered attire combinat	
	1987	High bun, willow-leaf eyebrows, triangular phoenix eyes, refined to emphasize authority and cunning	Intricate makeup, highlighting facial features, bright colors, emphasizing wealth	Gold and silver hairpins, phoenix crown, hairpins, jade accessories, and silk ribbons	Ming and Qing style, luxurious silk, bright colors, wide sleeves, and high collar	
	1989	High bun, willow-leaf eyebrows, heavy makeup, emphasizing authority and cunning nature	Complex makeup, heavy tones, emphasizing her dominant position, vibrant colors	Precious stones and other gemstone accessories, emphasizing her noble status	Luxurious attire with intricate embroidery, layered dress combination	
	1996	High bun, willow-leaf eyebrows, unique and elegant, emphasizing a blend of strength and beauty	Refined makeup with metallic accessories, highlighting traditional cultural background	Metallic hair accessories adding visual weight, complex hairpins	Ming and Qing style clothing, high collar design, bright colors	
	2010	High bun, willow-leaf eyebrows, heavy makeup, layered and rich appearance, aristocratic demeanor	Bold makeup, vivid colors with traditional patterns, highlighting aristocratic presence	Hairpins made of metal, jade accessories, silk ribbons, and various floral elements	Satin, fur, silk fabrics, multiple materials, bright colors	

Experimental research results

During the experimental exploration, the team initially generated 50 fictional portraits of The team used Midjourney to generate 50 initial images of Wang Xifeng, and selected the most closely matching image for further refinement. The character’s color tones, clothing details, and hairstyle decorations were optimized to align with the original depiction in "Dream of the Red Mansions."

Chinese garden elements were also added to enhance the classical charm. Finally, name labels and descriptive text were incorporated to improve cultural accuracy (Leong, 2023).

To evaluate the AI-generated images, the research team conducted a survey with 129 participants, assessing visual similarity and cultural fidelity. Survey results (Q9) showed moderate similarity, with an average score of 3.3/5. Among participants, 21.7% gave high scores, while 35.7% gave average scores, indicating room for improvement. Cultural authenticity (Q22) had an average score of 3.5/5, with 26.4% giving high scores, though 14% noted that traditional elements could be better represented. Overall satisfaction (Q4) scored an average of 3.5/5, with 31.8% of participants providing high ratings, suggesting a generally positive response, though further improvements are still needed. (as shown in Figure 2)

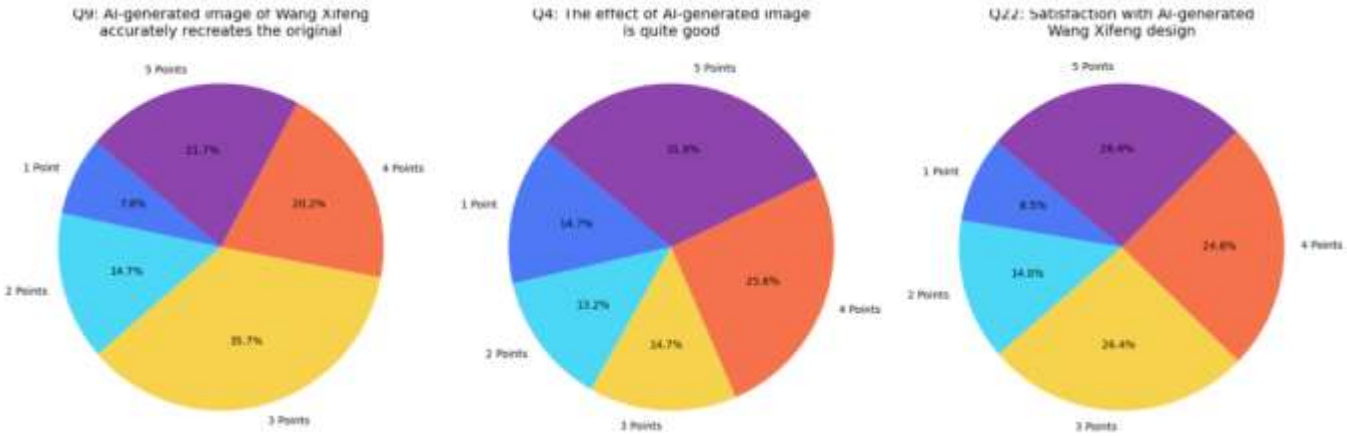


Figure 2. Audience Evaluation of AI-Generated Wang Xifeng Image: Visual Similarity, Cultural Authenticity, and Overall Satisfaction

The survey results from 129 participants indicate that the AI-generated images achieved a generally satisfactory level of cultural fidelity and visual similarity. However, moderate scores in certain categories suggest that further improvements are needed to enhance cultural authenticity.

After completing the AI images, the augmented reality (AR) platform Kivicube was used to generate links and QR codes, allowing users to interact with the images via mobile devices (as shown in Figure 3). The integration of AR and AI technologies has enhanced user experience, thereby improving the effectiveness of cultural heritage transmission (Leong, 2024b; Zhang, 2024).



Figure 3. QR code for viewing AR effects.

Analysis of questionnaire survey results

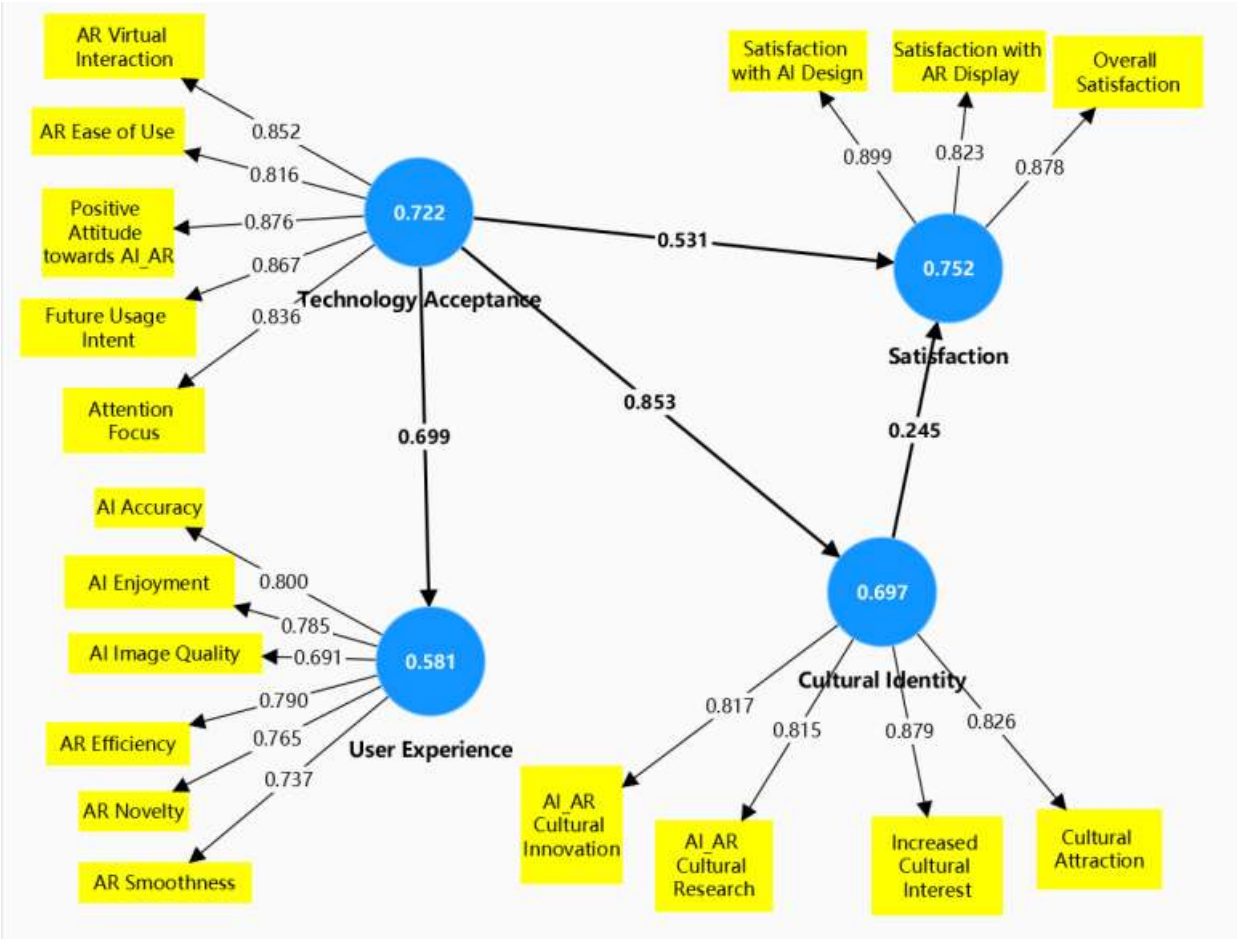


Figure 4. PLS-SEM Data Analysis Output

Technology Acceptance and User Experience： PLS-SEM results show that the path coefficient between technology acceptance and user experience is 0.699 ($\rho < 0.01$), indicating that the ease of use (path coefficient of 0.816) and virtual interactivity (path coefficient of 0.852) of the technology significantly enhance the user experience. A positive attitude towards AI/AR technology (path coefficient of 0.876) further boosts users' engagement and satisfaction, suggesting that the usability and intuitiveness of the technology are key factors influencing the user experience. (as shown in Figure 4)

Cultural Identity and Satisfaction： The path coefficient between cultural identity and satisfaction is 0.245. Although relatively low, the increase in cultural interest (loading value of 0.879) and cultural attractiveness (loading value of 0.826) significantly enhance users' emotional resonance. By fostering greater emotional engagement, cultural identity indirectly contributes to higher satisfaction. Therefore, future designs should emphasize the integration of cultural elements. (as shown in Figure 4)

User Experience and Technology Satisfaction： The path coefficient between user experience and satisfaction is 0.531 ($\rho < 0.01$), showing that the accuracy of AI technology (path coefficient of 0.800), enjoyment of use (path coefficient of 0.785), and image quality (path coefficient of 0.691) play a significant role in influencing user satisfaction. High-quality user experience not only increases technology acceptance but also enhances user satisfaction with AI design and AR display (Shrivastava, Jeyanthi, & Singh, 2020).(as shown in Figure 4)

Relationship Between Satisfaction and Overall Satisfaction： The path coefficient between satisfaction and overall satisfaction is 0.531 ($\rho < 0.01$). Data indicate that satisfaction with AI design (path coefficient of 0.899) and AR display (path coefficient of 0.823) significantly impacts overall satisfaction (path coefficient of 0.878). Optimizing the presentation of technology, especially the design of AI and AR in cultural heritage applications, will further enhance overall user satisfaction. (as shown in Figure 4)

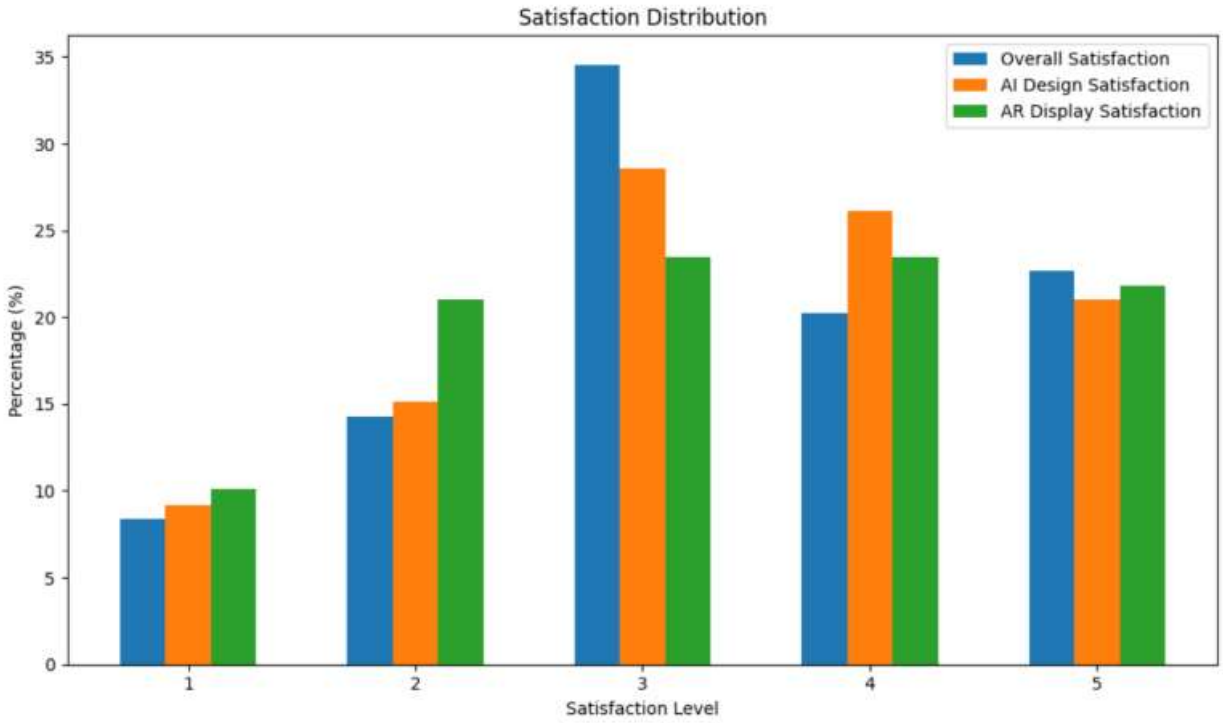


Figure 5. Satisfaction Distribution

Based on the user satisfaction survey data, 34.5% of users gave a score of 3, and 22.7% of users gave a full score of 5, indicating overall recognition of the reshaped image of Wang Xifeng from Dream of the Red Chamber. Specifically, 26.1% of users rated the AI design with 4 points, and 21.0% gave it a full score of 5, showing that the application of AI technology received a high level of appreciation. In contrast, satisfaction with the AR display was more varied, with 21.8% of users giving it a full score, and 23.5% giving scores between 4 and 3 points. These data suggest that the use of AI and AR technologies in character presentation has gained a certain degree of user recognition. However, the differences in satisfaction may be due to individual differences in users' acceptance of emerging technologies and their experience perceptions. Users with higher technology acceptance tend to give higher ratings, while those with a strong sense of cultural identity are more likely to experience emotional resonance during interactions with the technology, thus enhancing their satisfaction. Future research should further explore the different impacts of technology acceptance and cultural identity on user satisfaction in order to optimize the application of AI and AR technologies and improve the overall user experience.

Convergent Validity and Model Robustness： All latent variables have loading values above 0.7, and the AVE values exceed 0.5, indicating that the model has high convergent validity and robustness. Although the effects of AR smoothness (loading value of 0.737) and AR novelty (loading value of 0.765) are relatively minor, they still make a significant contribution to the overall user experience. The model effectively explains the relationships between technology acceptance, cultural identity, user experience, and satisfaction.

Conclusion

In summary, this study has demonstrated the broad application prospects of artificial intelligence and augmented reality technology in the field of classical literature re-creation. It emphasizes that the main role in the formation of user satisfaction is technology acceptance and cultural identity. By improving the degree of technology adoption, it can effectively enhance the user experience quality, deepen the sense of cultural belonging, and thus raise the overall satisfaction level, opening up new paths and practical strategies for the inheritance and innovation of cultural heritage. Future research directions should focus on improving the technical level, expanding the scope of experiments, and exploring the migration and application of this technology in other literary works, so as to verify its adaptability and effectiveness across different cultural environments.

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