Scientific and Social Research, 2025, Volume 7, Issue 4
https://ojs.bbwpublisher.com/index.php/SSR
Online ISSN: 2981-9946
Print ISSN: 2661-4332

Research on the Innovation and Challenge of AI and Stage Art Integration

Wei Han*

Inner Mongolia Digital Culture Audio and Video Publishing House, Hohhot 010000, Inner Mongolia, China

**Author to whom correspondence should be addressed.*

Abstract: Stage art is an important premise and guarantee of art performance, and an important part of creating performance atmosphere and improving audience viewing experience. At present, the wide application of AI technology in the field of art creation and production has brought new opportunities and challenges for stage art design. In this regard, this paper will analyze the application value of AI in stage art, explore the innovation and development of AI and stage art, and the challenges that need to be addressed to provide a certain reference for researchers and practitioners related to stage art.

Keywords: Artificial intelligence; Stage art; Fusion innovation

Online publication: May 2, 2025

1. Introduction

With the rapid development of information technology, AI has penetrated all aspects of people's lives, including the art field. Stage art, its innovation and change is always accompanied by the evolution of technology. In recent years, the introduction of AI technology has not only improved the efficiency and accuracy of stage art design but also brought more shocking and immersive viewing experiences to the audience. However, integrating AI and stage art is not smooth sailing, which not only contains great innovation potential but also faces many challenges. This paper discusses the way of the integration and innovation of AI and stage art, hoping to provide useful reference and inspiration for the future creation of stage art.

2. The application value of AI in stage art

2.1. Quickly generate the first draft of the stage art design

Traditional stage art design involves staff manually creating sketches and refining them into three-dimensional models, a process that is both labor-intensive and time-consuming. Today, stage art designers can leverage the advanced computational capabilities and deep learning algorithms of AI technology. By inputting key details

such as design concepts, color preferences, and stage dimensions into a generative AI system, designers can rapidly produce an initial draft for stage art. Following this, designers make adjustments to the draft considering factors like stage lighting, sound arrangement, and actors' movement paths to ensure the practicality and viability of the design. This approach significantly reduces the overall design timeline. Moreover, AI technology can autonomously create background videos based on entered keywords. For instance, in certain performances, supplementary videos are required during the show. AI can automatically craft more impactful visual elements, such as dynamic lighting, shadow effects, and smoke illusions, while also generating sample videos. This aids designers in enhancing the artistic quality and audio-visual experience of stage art [1].

2.2. Preview of simulated stage art effects

Currently, thanks to the robust simulation capabilities of AI technology, stage design professionals can effortlessly input design parameters, enabling the system to produce realistic previews of stage artistic effects rapidly. As technology continues to evolve and innovate, these previews now go beyond merely showcasing stage layouts, color coordination, and lighting effects. They also focus on prop placement, actor positioning, and the playback quality of screen background videos. Designers can view AI-generated previews of stage background video effects on their computer screens, creating an experience akin to watching a live performance. This allows them to conveniently review and refine the details of stage art designs from a holistic perspective. Such a preview approach not only enhances the efficiency of stage art design but also enables performance designers or chief directors to intuitively grasp the actual impact of stage art, facilitating more precise adjustments. Moreover, with the support of AI technology, designers can input feedback and revision suggestions into the system, which updates the preview in real time. This capability allows designers to observe the outcomes of choreography changes instantly without waiting for time-consuming reproductions [2].

2.3. Promote the innovation and development of stage beauty technology

Based on the analysis and learning of a large number of stage artworks by big data technology, AI can generate stage art design schemes with unique styles and creativity, providing fresh sources of inspiration for designers. This intelligent design aid greatly broadens the boundaries of modern stage art design, making it possible for many once-difficult creative ideas to become a reality. Moreover, the conventional process of stage art production tends to be time-intensive and demanding, making it challenging to guarantee that the final visual outcome aligns perfectly with the initial design plan. Conversely, AI technology enables designers to gain a thorough insight into the stage art effects prior to production by means of precise simulation and previews, thereby preventing unnecessary alterations and repetitive efforts. Additionally, AI technology facilitates the seamless integration of stage art with advanced technologies such as virtual reality and augmented reality, offering stage art a "forward-looking" mode of expression and interactive experience [3–4].

3. The innovative development of AI and stage art

3.1. Design and creation automation

In the past, the design of stage art was based on the personal experience and creativity of designers, and with the help of AI technology, the entire stage art design process can be scientific and automated. AI-assisted stage art design is capable of analyzing extensive stage design resources and audience preferences, thereby intelligently generating a diverse range of design options for designers to select and modify. This approach not

only enhances design efficiency but also aligns with the aesthetic expectations of the audience while considering performance venue conditions. Another critical aspect in stage art design involves color application. Leveraging AI technology, it can evaluate performance emotions, environmental ambiance, and audience sentiments across multiple dimensions, offering optimal stage color arrangement recommendations. For instance, cool tones might be suggested for somber narratives, whereas warm and gentle hues could be proposed for joyful scenes, ensuring effective alignment between stage color expression and audience emotional needs. Moreover, AI serves as a valuable intelligent assistant for designers by supplying creative inspiration and reference materials derived from an extensive database of artworks and related resources [5].

3.2. Dynamic interaction link

AI technology is capable of gathering data, including the movements, expressions, and voices of performers and spectators, via sensors, cameras, and additional tools to establish immediate connections with stage components. For instance, by tracking the performers' motions and locations, AI can smartly modify scene elements like lighting, acoustics, and props, ensuring they align precisely with the performers' actions and presentations. Simultaneously, AI can adjust the stage ambiance and impact in real time by analyzing audience feedback and emotional responses, thereby increasing their engagement and immersion. Moreover, AI technology can perform live evaluations and interventions during performances, fine-tuning the aesthetic dance effects based on performance requirements. In a musical act, AI can dynamically regulate the tone, luminosity, and movement trajectory of stage lights according to the music's rhythm and the evolving emotions of the performance, creating a harmonious and integrated stage setting that complements the music. In theatrical productions, AI will also adapt the positioning and design of stage props in accordance with the narrative and actor performances, thus amplifying the storytelling's expressive power [6].

3.3. Emotional expression is more intuitive

The core of AI emotion recognition is to use high-tech technologies such as deep learning and natural language processing technology (NLP), based on big data emotion learning, to complete the recognition of a variety of emotional expressions such as voice, expression, and body. In a performance, AI technology will directly obtain performance data of actors through on-site cameras, microphones, infrared cameras, etc., and then use algorithms to judge their emotional expression. Upon completing the recognition of actors' emotional expressions, AI can effectively adjust stage art elements based on the specific context, thereby making emotions more engaging and contagious. For instance, if an actor portrays sadness, the AI might automatically shift the stage lighting to a deep blue hue while lowering the volume to establish a somber and melancholic ambiance. Conversely, when the actor conveys happiness, the AI could enhance the brightness and color intensity of the lights, amplify the sound, and quicken the rhythm to foster a joyful atmosphere. Moreover, by continuously monitoring the audience's emotional reactions in real time, AI can further refine the stage art design. For example, if the audience shows heightened attention and resonance toward a particular scene, the AI will intensify the lighting and sound effects for that scene to deepen the audience's emotional connection [7–10].

4. Challenges in the integration and innovation of AI and stage art

4.1. It is difficult to balance technology and art

On one hand, the strengths of AI technology lie in its efficient and precise data processing capabilities, as well

as its boundless potential for innovation. These advantages bring new vitality to stage art design. AI can assist designers in rapidly creating intricate and diverse visual effects, refining the arrangement of lighting and sound, and even forecasting audience emotional reactions through an in-depth analysis of historical data. This enables stage art design to resonate more deeply with human emotions and deliver a sensory impact. Nevertheless, it is this very power of AI that imposes significant pressure on some traditional stage art designers. On the other hand, the humanistic touch and warmth inherent in artistic creation constitute one of the central appeals of stage art. Each hand-drawn backdrop in a design sketch and every meticulously crafted prop on stage embody the creator's passion and dedication. As AI enters the realm of stage art with its cold algorithms and data-driven logic, the challenge arises: how to preserve this humanistic care while preventing stage art from becoming subordinate to technology. This delicate balance between technology and art manifests in the intricacies of implementation. The integration of AI necessitates compatible hardware, software support, and professionals who possess both AI application skills and an understanding of stage design aesthetics. Many small and medium-sized stage art teams lack access to such expertise. Moreover, while AI excels at swiftly processing and analyzing vast amounts of data, it falls short in terms of artistic creativity. Unlike stage art designers, AI lacks emotional depth and originality, which is why it remains a supplementary tool rather than a replacement in the field of stage art design [11].

4.2. Lack of emotion in design and production

Stage art is a field full of spirituality and creativity, but with the strong intervention of AI technology, it has gradually revealed a tendency of mechanization and cold desertification. In the process of stage art design and production, AI can quickly generate a variety of visual effects and scene layouts with its efficient data processing ability and algorithmic logic. However, this kind of creation based on data and algorithms often ignores the core emotional elements in stage art. Stage art serves as both a visual spectacle and a medium for conveying and evoking emotions. Every prop, lighting setup, and scenic element should embody the emotional depth and aesthetic vision of the stage art designer, fostering a spiritual connection with the audience. However, AI-generated stage art designs, along with their creation processes, appear overly rational and precise, lacking the warmth and human touch inherent in handcrafted art. Unlike human stage art designers, AI struggles to infuse its creations with emotion, fails to capture nuanced and complex emotional shifts, and cannot produce artworks that genuinely resonate with people on an emotional level. This practical challenge of emotional deficiency not only constrains the artistic expression of stage art but also diminishes the emotional bond between the audience and the work. Audiences typically seek to experience emotional resonance and profound soulful impact during performances. Yet, when stage art becomes excessively mechanical and impersonal, achieving such resonance becomes significantly more challenging. Consequently, in the integration and advancement of AI within stage art, it is crucial to acknowledge the issue of emotional absence in design and production, delve deeper into combining AI with artistic creativity, and uncover forms of artistic expression that can truly move people [12–14].

4.3. Weak construction of talent team

At present, the application of AI technology in stage art is increasingly extensive. From lighting design to scene layout, from costume design to prop production, AI has brought unprecedented innovation to stage art with its unique advantages. However, this kind of innovation is not achieved overnight but needs a team of talents with interdisciplinary knowledge, skilled AI technology, and a deep understanding of the essence of stage art to support it. But the reality is that such a talented team is not enough. On one side, practitioners in stage art, despite their

profound artistic comprehension and distinctive perspectives, frequently find themselves at a loss when confronted with AI technology. They are deficient in essential interdisciplinary expertise, such as computer science and data analysis, which makes it challenging for them to seamlessly incorporate AI into stage art creation. Conversely, individuals skilled in AI technology often lack a deep appreciation and passion for stage art, making it difficult for them to produce works of genuine artistic merit. This practical challenge of insufficient talent development not only hinders the effective application of AI in stage art but also restrains the advancement and innovation of stage art itself. Without a competent team of experts, achieving a harmonious fusion of AI technology and stage art becomes nearly impossible, as does crafting pieces that balance scientific sophistication with artistic allure. Consequently, enhancing talent pool development is pivotal for driving the synergy and innovation between AI and stage art. It is crucial to foster a cadre of hybrid talents who possess knowledge in both AI and stage art through systematic education, collaborative training, and cross-disciplinary partnerships [15].

4.4. Issues related to privacy and ethics

As AI technology becomes increasingly integrated into stage art design, its creative process has transformed into an unprecedentedly intelligent and efficient system. However, this advancement has also sparked significant debates regarding privacy protection and ethics. In the realm of stage art creation, AI can precisely monitor audience reactions and evaluate their preferences and emotional states, thereby offering a more tailored visual experience for performances. Nonetheless, the collection and analysis of such data inevitably raise concerns about invading audience privacy. Information such as facial expressions, eye movements, and even heart rate patterns may all be subject to AI scrutiny. While these datasets contribute valuable insights for innovation in stage art, they also carry the risk of misuse. Furthermore, the incorporation of AI into stage art raises ethical questions in the artistic creation process. Traditional stage art is a reflection of the designer's soul and emotions, with every detail embodying the creator's distinctive style and thought. Nevertheless, when AI becomes involved in the creative process, guided by algorithms and data, can the resulting works still be considered genuine art? Issues such as copyright ownership, artistic worth, and comparisons to traditional pieces created by AI present ethical challenges that require resolution. Moreover, the significant technical barriers associated with AI have deepened the divide between large production teams and smaller or medium-sized stage art design groups, concentrating resources in the hands of a few entities possessing core technologies. This technological dominance not only restricts the varied evolution of stage art but could also deny numerous stage art designers the chance to showcase their abilities. In this context, during the integrated innovation of AI and stage art, a robust privacy protection system should be implemented to safeguard the data security of audiences. Additionally, it is crucial to investigate and establish the ethical guidelines for AI-generated works, ensuring the preservation of artistic diversity and fairness.

5. Conclusion

To sum up, the integration and innovation of AI and stage art have broad prospects. With the continuous progress of technology and the deepening of applications, there is reason to believe that stage art will shine more brightly under the power of AI and bring more diversified artistic enjoyment to the audience.

Disclosure statement

The author declares no conflict of interest.

References

[1] Wu Z, 2024, Exploration and Practice of Stage Art Creation in the Era of Intelligent Design. Journal of Lighting Engineering, 35(6): 187–197.

[2] Liu XR, 2024, The Creative Practice of AI Technology in Stage Art Image Design — A Case study of the Musical "A Drop in the Ocean" and "Waste Music Group". Digital Communication, 2024(10): 63–65.

[3] Cen JH, 2024, Application of Digital Media Technology in Stage Design. Grand Review of Art, 2024(28): 54–56.

[4] Yuan YJ, 2024, Application of AI Technology in Stage Art Design. Audiovisual Industry, 2024(5): 105–107.

[5] Qu WX, 2024, Application of Information Technology in Stage Art Design. Footwear Craft and Design, 4(16): 117–119.

[6] Shi XR, 2024, Research on the Integration and Application of Artificial Intelligence and Stage Art. Art Market, 2024(7): 118–119.

[7] Pan CC, 2024, Stage Art meets AI, A New Opportunity for Professional Development. Shanghai Education, 2024(16): 41.

[8] Liu XR, 2024, Innovative Practice of Generative AI Enabling Stage Art Image Design. Grand View of Art, 2024(13): 52–54.

[9] Jiang ZL, 2024, Artificial Intelligence and Contemporary Stage Art Design. Theater Arts, 2024(1): 62–73 + 197–198.

[10] Liang N, 2023, Research on the Application of Digital Media Technology in Stage Art Design. Journal of Pu'er University, 39(6): 105–107.

[11] Cui J, 2023, The Development Trend of Stage Art Design from the Perspective of New Media. Artist, 2023(11): 126–128.

[12] Zhang Q, 2022, Research on the Application of Information Technology in Stage Art Design. Northwest Art, 2022(2): 132–137.

[13] Chen L, 2022, Analysis on the Application of Digital Media Technology in Stage Art Design. Masters and Masterpieces, 2022(6): 126–128.

[14] Zhang Q, 2022, Research on the Application of Information Technology in Stage Art Design. Xinjiang Art (Chinese), 2022(2): 85–92.

[15] Xie CC, Duan GJ, 2022, Research on the integration of Artificial Intelligence and Stage Art — A Case Study of the Technology Practice of the National Opera "Yanling Team". Grand Stage, 2022(2): 35–37.