

The Chinese Painting-style Animation Innovation in the AI Era

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Abstract. In the era of artificial intelligence, Chinese painting-style animation is undergoing an unprecedented transformation. The application of AI technology not only improves the efficiency of animation production but also brings new possibilities for innovation to creators. The impact of the AI era on the animation industry is multi-dimensional. AI technology can automate many repetitive tasks, such as the generation of in-between frames, the drawing of characters and scenes, and its application in various other aspects, thereby shortening the production cycle, reducing actual time costs, and improving timeliness. Its detailed functions, such as AI-assisted scriptwriting and directing to generate creative storylines, plots, and even scripts, provide new ideas for animation creation. One of the most admired and sought-after aspects is the operability and personalization of AI. By analyzing audience preferences and behaviors through various cases and traffic analysis, it can provide personalized content recommendations using animation production techniques, meeting the psychological needs of different audience groups. In terms of image and video processing, it can be used to enhance the visual effects of animation, such as automatic coloring, background rendering, image clarity and blurring processing, etc. For the design of characters and scenes, designers can quickly generate concept drawings of characters and scenes through subjective expression, including composition positioning, character body dynamics, and simulating different styles and schools of painting techniques. In terms of sound, it is also excellent, capable of simulating specific sound effects, generating and improving dubbing sound effects and sound quality, enhancing the auditory experience of animation, and through analysis techniques such as voice recognition and natural language processing, allowing animated characters to use lifelike body movements and facial expressions to interact with the audience, providing a better interactive experience.

Keywords: AI, Chinese Painting, Animation.

1. Introduction

The continuous updates of AI technology play a role in promoting society, including in the area of copyright protection where it can automatically detect and audit animation content to ensure compliance. In terms of market trends and consumer behavior, predictions assist production companies in making wiser investment decisions. In education and training, AI can be used for teaching and training in animation production, improving learning efficiency through simulation and virtual practice.

The era of artificial intelligence has brought revolutionary changes to the animation industry, not only improving production efficiency and quality but also providing new possibilities for the creation of innovative and personalized content.

Chinese painting-style animation has welcomed many new opportunities in the AI era. These opportunities not only drive innovation in artistic forms but also pave new paths for the inheritance and global dissemination of traditional culture. Digital reproduction technology of artistic styles can learn and imitate the unique styles of Chinese painting, such as ink wash and fine-brushwork paintings. To digitize these traditional art styles for reproduction and innovation in animation requires a significant amount of time and materials from human creators, while artificial intelligence can simplify the complex painting process, allowing animators to focus more on creativity and storytelling, thereby improving creative efficiency. By analyzing a vast array of Chinese art works and cultural materials, AI can extract key cultural elements and symbols to provide a rich material library for animation creation, and more accurately analyze to support the internationalization of Chinese painting-style animation with data and more possibilities. The AI era has brought

unprecedented development opportunities for Chinese painting-style animation, with technological innovation and intelligent applications further promoting the prosperity and development of this art form.

2. The Integration of Technology and Art

2.1. The combination of AI technology and Chinese painting art is a typical example of the fusion of art and technology, which interact on multiple levels to create new forms of art and modes of expression.

Human imitative abilities are extremely limited, influenced by a variety of factors such as culture and experience, while machines have an easier time learning. AI's ability to learn and imitate the unique styles of Chinese painting, such as ink wash and fine-brushwork, digitizes these traditional art styles, allowing them to be reproduced and innovated in animation, resulting in an effect that is definitely greater than the sum of its parts. What surprises us most about AI technology is its writing and drawing capabilities; writing can assist in the expressiveness of painting, and drawing tools can simplify complex painting processes, allowing animators to focus more on creativity and storytelling, thereby improving creative efficiency. Creators can use the remaining time to explore more Chinese art works and cultural materials, deeply mining the impact of culture on animation creation.

2.2. The effective use of artificial intelligence technology for cross-media integration forms an open multi-dimensional perspective.

Media technologies represented by materials, technology, intelligence, and digitalization challenge the boundaries of Chinese painting's expressive forms and play an important role in the continuous reconstruction of artistic creative language. The progress of AI updates people's cognition of new types of knowledge, but the powerful data support it provides is also something we should ponder deeply. Data mostly comes from human practice and situational deduction, so AI data will inevitably have unrealistic assumptions or errors. Therefore, while referencing it, we should also rationally analyze its rationality. For example, when simulating the brushwork and ink rhyme of Chinese painting, even the texture of the paper, these aspects should be verified with past experience. The digitization and preservation of traditional art works, along with technologies such as augmented reality (AR) and virtual reality (VR), allow audiences to experience and appreciate Chinese painting in new ways. It also provides new learning tools and methods in Chinese painting education, making the learning and understanding of Chinese painting easier and more intuitive. Art works are no longer limited to traditional display methods but can be integrated with digital art and creativity, making it possible for ancient paintings to dialogue with modern people. Technologies such as holographic projection and instant interaction make traditional paintings accessible.

2.3. Although AI technology can imitate the style of artists, "concept" is something that cold technology cannot provide.

Concepts are related to the individual artist's perception of nature and life, as well as their subtle perception of art, which are the limitations of AI technology in generating Chinese paintings. The combination of AI technology and Chinese painting art provides new possibilities for the inheritance and development of traditional art, but also brings new challenges and opportunities. Through this combination, innovation in artistic creation can be achieved, the interactivity and personalized experience of art works can be enhanced, and the innovation of art education and art work protection can be promoted. With the application of these technologies, the dissemination and influence of Chinese traditional culture on a global scale can be further promoted. AI technology uses 3D scanning, virtual reality, and other means to digitize and preserve traditional art works with high precision, providing protection for traditional cultural forms that are on the verge of being lost. Through deep learning algorithms, it learns intangible cultural heritage traditional painting, sculpture, and other skills to create unique art works that combine traditional and modern elements. It provides new media

and pathways for traditional culture, such as virtual cultural exhibitions, interactive cultural theme games, etc., all of which attract young people to participate in cultural inheritance to varying degrees. For example, the "Wenlan" model, by combining image generation technology, can generate corresponding pictures based on inputted ancient Chinese poetry, showcasing a unique interpretation of Confucian, Buddhist, and Taoist thoughts. This display method can enhance the audience's sense of immersion and emotional connection. It also digitizes works with traditional cultural characteristics, using multi-dimensional information display, interactive collaboration, virtual learning, and other methods for education and dissemination, translating literary works into different languages to promote international communication and exchange. It also promotes the integration of intangible cultural heritage elements across various fields such as modern home furnishings, games, animation, film and music, and clothing, giving rise to new forms of products and services. Digital cultural content breaks through traditional spatial and temporal limitations, achieving rapid chain transmission.

3. Innovative Character Generation

3.1. Character generation and design creativity involve analyzing a vast amount of character image data to generate new character images, providing designers with creative resources and inspiration, and accelerating the character design process.

AI-generated characters may cover various styles and features, increasing the diversity and possibilities of character design. Advances in emotion and expression recognition allow characters to express emotions more realistically. AI analyzes human emotional expression patterns and applies them to virtual characters, enhancing their appeal and credibility. It can also simulate different types of character performances in various scene modes, presenting natural and smooth performances in virtual settings. This allows character design to transcend the performance capabilities of traditional actors, achieving a higher degree of expression and expansion through AI [2]. In terms of character AI interaction, virtual characters can engage in real-time interaction with the audience. Through natural language processing and emotion recognition, virtual characters can understand audience feedback and respond, increasing the sense of participation and entertainment in character design. The image design of characters provides more creativity and references for traditional actors. Designers can discover new creative elements through AI, promoting character creativity and development, and improving performance levels.

3.2. The application of AI in extracting Chinese art characteristics and generating creative characters is multi-dimensional and interdisciplinary, involving computer vision, machine learning, deep learning, etc.

The combination with Chinese art can be used not only for artistic creation but also in education, historical research, and other fields. AI can use image recognition technology to classify and identify Chinese art works, extracting key visual elements and stylistic features, which can be used in character design to make characters more characteristic of Chinese art. Through deep learning technology, AI learns the characteristics of Chinese art works, such as landscape paintings and fine-brushwork paintings, building specialized datasets that include a large number of landscape paintings from ancient to modern China, providing a foundation for AI to learn Chinese art styles. The high resolution and detailed annotation information of these datasets help AI to more accurately understand and imitate Chinese art characteristics, thereby creating new works in imitation of these styles. Combining the captured features of brushwork, composition, color, etc., with descriptions of characters from Chinese mythology or historical stories, creative characters with traditional Chinese art styles are designed and applied to character design, creating novel character images and achieving a combination of traditional art and modern aesthetics, preserving adherence to and emotion for traditional art culture for the future.

4. Enhancing Production Efficiency

4.1. AI technology is automating and innovating the animation production process in various ways, from scriptwriting and development, where AI technologies like ChatGPT can be used for script idea generation, analyzing and refining story threads to assist screenwriters in story disassembly and adjustment.

Character design and generation, using machine learning and deep learning algorithms, AI can learn from a vast amount of image data and generate new character images, increasing design diversity and shortening production cycles. Scene construction, AI technology uses machine learning and computer vision technology to automatically recognize and extract scene elements, quickly constructing realistic scenes. Motion capture and motion synthesis, AI technology simplifies the motion capture process, automatically extracting character motion characteristics from video data, generating realistic motion sequences. Motion synthesis technology combines AI algorithms to generate a wide range of movements from limited motion capture data, expanding the possibilities of animation production. Image generation and animation, AI models like Stable Diffusion can generate static images, used as materials in traditional workflows or further animated. Frame-by-frame image generation technology is used in the spirit of traditional animation, obtaining temporal consistency through some mechanism or application. Video generation, one-step tools like Runway's Gen-2 can directly generate video clips through text prompts and parameter tuning [3]. Image-to-video generation tools allow video generation conditioned on images, either starting from specified images or using images as references.

4.2. Democratization of animation production, AI tools like Animaker provide one-stop production and editing, including AI video generators, character builders, asset libraries, etc., lowering the barriers to animation production.

Intelligent animation characters, through rule engines, machine learning, and deep learning technologies, can exhibit autonomy, intelligence, and interactivity. Optimization of animation production processes, AI technology provides efficient creative tools and methods, improving the efficiency and quality of animation production. LLM-driven tools, large language models (LLM) can assist in programming and scriptwriting, theoretically assisting in the production of animations from start to finish, even completing all tasks.

4.3. AI can automate the execution of repetitive and labor-intensive tasks.

In animation production, AI technology can cover multiple key stages from character design to animation generation, thereby reducing manpower requirements and time costs. During AI-assisted design and creation, rapid iteration and modification are possible, reducing additional costs due to errors.

4.4. In animation production, AI technology helps reduce trial and error costs and accelerates the speed of creative realization.

AI technology can quickly analyze large amounts of data and generate in-depth insight reports and predictive models, helping decision-makers make more accurate judgments and decisions, reducing costs due to decision-making errors. By learning user preferences and behavior patterns, generative AI can provide highly personalized experiences, such as personalized recommendations and customized news, enhancing user experience and satisfaction while reducing marketing costs. AI's base models can generate content close to human levels in open domains and can be fine-tuned for specific industries, improving adaptability and flexibility, reducing costs due to environmental changes. Technological progress drives cost reduction, with the emergence of more efficient algorithms and specialized hardware, such as GPUs and TPUs, continuously reducing the cost of AI training and deployment, making advanced AI technology more widely available. As the adoption

rate of AI increases, development and deployment costs decrease because fixed costs are spread over larger units. Venture capital investment in AI startups also plays a key role in reducing costs.

5. Cultural Heritage and Innovation

5.1. AI technology plays an important role in promoting the combination of traditional art and modern animation technology.

Multi-dimensional information display, interactive collaboration, virtual learning, and other methods allow digital cultural content to break through traditional spatial and temporal limitations, achieving rapid chain transmission, providing the public with a new way of experiencing information.

5.2. AI technology can assist artists with repetitive work and, by learning human creative experience and patterns, generate inspiration and artistic concepts beyond human imagination.

The involvement of AI technology has changed human artistic creation, art production, and aesthetic methods. The combination with art and cultural relics breaks through time and space boundaries, quickly and efficiently completing the preservation of originals and vivid reproduction, allowing traditional art to be revitalized in the digital age [4]. Some animation companies have begun to try using AI technology to reduce personnel costs and cover the entire process of animation production, from script ideas to editing, lighting, scene effects, and a complete set of processes. AI intelligent painting systems use computers to transform natural images into art images through style transfer, achieving cross-disciplinary integration between technology and art [5]. The application of various AI technologies in the field of animation will become more in-depth, redefining the entire animation market structure and potentially raising practical issues in the training of art talents. AI technology provides new momentum and possibilities for the combination of traditional art and modern animation technology, while also bringing new challenges and issues, requiring joint efforts from the industry, academia, and policymakers to ensure the positive impact of AI technology and address potential risks and challenges.

6. Challenges Faced

6.1. The application of AI technology in animation production is not yet mature.

There are issues with incoherence, lighting treatment, basic dissection of character limbs, and details such as hair, which prevent AI from being fully integrated into animation, especially 3D animation. The cost and direction of AI technology investment are not clear. With technological innovation, the application of new models, new computational requirements, and considerations for computer hardware, there is a lack of relevant talent. Without a mature business model, it is difficult to recover costs within a certain period, and profitability is even more of an issue. Secondly, there are copyright and originality concerns. AI-generated content may involve imitation or adaptation of others' works, risking infringement of copyright. Different countries and regions have different stances on AI copyright, and the law is still exploring the use of AI in areas such as pornography and art. AI technology may replace some basic animation production jobs, affecting the employment of traditional animators.

6.2. With the application of AI technology, animation designers may need to master new skills to adjust and use AI.

They need to be more involved in the combination of creativity and technology, not just traditional painting and design skills. Human artists incorporate personal emotions, experiences, and cultural backgrounds into the creative process, which AI finds difficult to fully replicate. AI may excel at imitating specific styles but may not match human artists in originality and depth because machines

are based on models, algorithms, and computational power, which are based on the underlying preset data in the models, thus there is still room for development in terms of human emotions and experiences. The problems encountered by AI in animation creation are complex and diverse, involving technological innovation, legal regulations, and ethical morals. It requires the joint efforts of the industry, law, and all sectors of society to ensure the healthy development and reasonable application of AI technology.

7. Future Trends

7.1. According to search results and the current development trend of AI technology, improving efficiency and reducing costs.

Technology will cover the entire process of animation production, from script conception to storyboarding, image/video generation, including music, achieving full automation of animation production. Many links in the animation production process, such as character design, pre-design of motion capture, preliminary design of scenes and backgrounds, and preview of rendering effects, will be increasingly AI-ized. Reducing the technical threshold of animation production will allow companies and individuals from non-professional fields to participate in animation production. This will significantly improve production efficiency and reduce costs, and in terms of the creation of personalized content, it will make animation production easier to achieve personalized customization, meeting the needs of different audience groups. Making animation production more flexible and efficient, allowing animation projects to be launched on the market more quickly and promoting animation creation to new heights.

7.2. AI technology is driving the transformation of animation production methods, from idea incubation to the final product.

With the continuous advancement of technology, the application of AI in animation production will become more extensive and in-depth. AI technology is not only an auxiliary tool but also has the potential to disrupt the entire animation production process, from story creation to art design, asset production, shot production, audio processing, and other links, AI technology has the potential to improve efficiency and quality. Some animation companies have reduced the number of employees to about half of the original through AI technology, and it is expected to save 40%-60% of cost investment within the next five years. Traditional animation production requires a large amount of hand-drawn work, while AI animation can use algorithms to quickly generate animations with rich details and realistic effects, greatly shortening the production cycle. It plays a role in the scriptwriting stage, assisting in the main line changes and the refinement of the story context through software like ChatGPT, helping creators enrich the story content. It plays an auxiliary role in character design and scene design, quickly generating multiple design schemes for selection, improving the efficiency and diversity of design. It already provides alternative solutions in motion capture and dubbing. The application of AI technology has reduced the technical threshold of animation production, allowing more non-professionals to participate in animation creation, promoting the development of animation UGC (user-generated content).

8. Conclusion

The development prospects of Chinese painting-style animation in the AI era are multi-dimensional and cross-disciplinary. The rational use of AI technology is important for promoting the development of China's animation industry, enhancing the international competitiveness of China's animation industry, and promoting Chinese animation to "go global." The application of AI technology is driving the transformation of animation production methods, especially in Chinese painting-style animation, where AI can help artists quickly generate characters and scenes with Chinese painting styles, improving creative efficiency. Through AI technology, traditional Chinese

painting styles can be automatically rendered and colored, preserving the essence of Chinese painting while reducing manual operations. Chinese painting-style animation has existed and been excellent before AI technology, but with the development of science and technology today, it can better carry and disseminate Chinese traditional culture, helping a new generation of creators understand and use traditional artistic techniques. While preserving traditional aesthetics, it explores new forms of artistic expression and promotes the innovative development of Chinese animation art. With the development of China's economy and the growth of cultural consumption, the demand for high-quality, culturally rich animation products is increasing, and Chinese painting-style animation caters to this market demand.

I believe that in the future, Chinese painting-style animation has a unique artistic charm and cultural identity. With the help of AI technology, it can be created and promoted more efficiently, enhancing international communication power. It can better integrate Chinese stories and cultural concepts into animation works, enhancing the international competitiveness of the works. I believe that in the process of cultural dissemination, more animation artists with innovative abilities will also be cultivated.

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References

- [1] From "Artificial Intelligence" to "Humanistic Intelligence"—On the Issues and Prospects of the Integration of Technology and Humanity [J]. Wu You. Journal of Shanghai Jiao Tong University (Philosophy and Social Science Edition), 2023(12)
- [2] The Emotional Machine [M]. Minsky. Zhejiang People's Publishing House. 2015
- [3] The Turn from Generative to Multi-Agent in Artificial Intelligence Art Creation [J]. Chen Baoyang. Art Research, 2023(05)
- [4] "AI+Art" Identity and Boundaries [J]. Fei Jun; Wu Bilin. Art Observation, 2023(08)
- [5] Feeling and Form [M]. [US] Langer (Langer, S-K.) Author; Liu Dajie, etc. Translated. China Social Sciences Publishing House. 1986