

Research on Character's Consistency in AI-Generated Paintings

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Abstract

This study aims to explore the issue of character consistency in AI-generated artwork. First, the concept of character consistency is explained, including the consistency of appearance, actions, and lighting, and its importance in continuous creation and storytelling is analyzed. Next, the study examines current mainstream AI drawing tools such as MidJourney and Stable Diffusion-based WebUI and ComfyUI, evaluating their strengths and limitations in maintaining character consistency. Finally, methods to improve AI drawing technology were proposed to enhance character consistency, aiming to achieve a higher level of consistency in AI art creation.

Keywords: *Artificial Intelligence, Stable Diffusion, AI Painting, Character Consistency*

1. Introduction

1.1 Research Background

In the contemporary field of art and design, the application of Artificial Intelligence (AI) technology is sparking a profound transformation. AI-generated painting techniques, particularly those rooted in deep learning and neural networks, can autonomously produce high-quality and stylistically diverse artworks, thereby opening up new possibilities for artistic creation. Through AI painting tools, designers not only expedite the creative process but also uncover unexpected ideas during periods of creative block. However, as AI painting technology becomes more prevalent, the issue of artistic consistency is becoming increasingly significant.

Currently, mainstream AI painting tools such as midjourney, Stable Diffusion-based WebUI, and ComfyUI can generate high-quality individual images. However, they still face significant limitations in maintaining character consistency. For instance, the same character may exhibit variations in appearance and details across different paintings, leading to visual and narrative inconsistencies in artworks. This issue is particularly

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pronounced in artistic design, where designers need to ensure consistency of characters throughout the entire design project to uphold artistic integrity and professional standards. Therefore, this study evaluates the performance of various AI generation tools in terms of character consistency and proposes production techniques to enhance the practicality of AI painting tools in artistic design.

1.2 Research Objectives

This study aims to analyze the consistency issues in AI painting tools when generating images based on textual prompts, covering consistency in character appearance, action, lighting, and alignment with textual descriptions. Through this research, effective creative strategies will be provided to enhance the quality of AI-generated images, improve the predictability and consistency of model-generated images, and promote the widespread application of artificial intelligence in image generation. Additionally, the study will explore how to maintain user creativity and diversity while ensuring consistency in generated images, achieving an optimal balance between technology and creativity.

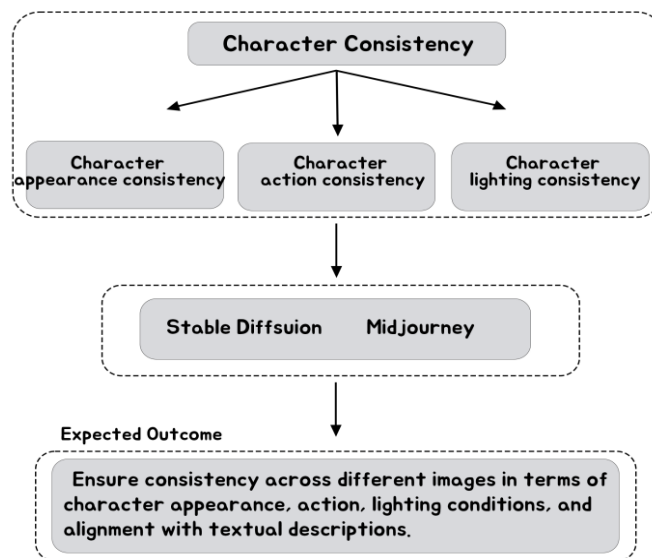


Figure 1. Research Process

2. Theoretical Background

2.1 Character Consistency

Character consistency refers to maintaining uniformity in the appearance, style, and behavior of characters across continuous or series works. This is particularly crucial in artistic design, especially in projects involving narrative coherence and visual consistency, such as animation, comic creation, and game character design. If characters exhibit noticeable inconsistencies across different scenes or time periods, it not only disrupts the overall coherence of the work but may also affect audience comprehension and experience. Character consistency is not only a fundamental element in artistic works but also a key factor in enhancing the quality of works and audience experience. Through designing characters with consistency in artistic works, artists can effectively convey the themes and emotions of their works, enhance their expressive power and impact, and thereby achieve deeper communication and emotional exchange between artistic creation and the audience.

2.2 Key Technologies Related to Character Consistency

MidJourney and Stable Diffusion lead in AI tools for digital art creation, each offering distinct advantages. MidJourney emphasizes artistic freedom and expression, allowing users to generate character images with unique styles through detailed input and reference images. Adjusting parameters ensures consistency across images. Stable Diffusion excels in high-resolution and quality, incorporating multiple character images in training to maintain consistency. Users can generate sharp images with specific seed values and refine consistency iteratively through text and initial image adjustments.

3. Consistent Image Generation

3.1 Character Appearance Consistency

AI art creation, maintaining the consistency of a character's appearance is of paramount importance. As artificial intelligence technology advances, AI-generated art has been widely applied in various fields such as artistic creation, game design, and film production. However, ensuring that a character's appearance remains consistent across different scenes or poses is crucial for enhancing the quality of the work and the user experience.

The consistency of a character's appearance is crucial for the coherence and integrity of a work, particularly in storytelling, comics, and animation. Inconsistent facial features, clothing, or body shapes can cause visual confusion and disrupt narrative flow, affecting audience immersion and realism. AI cannot enhance productivity if it fails to maintain this consistency. Achieving appearance consistency requires precise capture and reproduction of facial features, clothing details, and lighting effects, demanding high learning and memory capabilities from AI systems. MidJourney has demonstrated strong support in addressing this issue through experimentation.



Figure 2. Appearance Consistency

3.2 Character Action Consistency

Maintaining consistency and coherence in actions across generated images refers to the continuous and consistent depiction of movements of characters or objects throughout a series of images. This is particularly important for creating visually engaging and dynamically continuous visual narratives.

Action consistency in the field of image generation is a complex yet crucial aspect, especially when creating a series of images with continuity and narrative. By utilizing advanced model training and customizable user options, it is possible to maintain action consistency while promoting diversity and personalization in creative expression. With continuous technological advancements, we can expect to see more sophisticated image generation solutions that precisely capture and reproduce action continuity in the future.



Figure 3. Action Consistency

3.3 Character Lighting Consistency

Character lighting consistency refers to maintaining the same lighting conditions across different images, which is crucial for the coherence and visual impact of the character's appearance. Lighting not only affects the character's look but also directly influences the overall atmosphere and emotional expression of the artwork. It directly impacts the coherence and recognizability of the character's image. In AI-generated art, a character's facial features and body contours are influenced by lighting. By maintaining consistent lighting, we can ensure that the character's appearance remains uniform across different images, enhancing both the recognizability and unity of the character.

To achieve a highly consistent lighting effect, I utilized the advanced AI drawing tool ComfyUI, based on Stable Diffusion. First, a high-quality image of a person was imported as the main subject. Next, a background image with ideal lighting conditions was selected for reference. During this process, ComfyUI's powerful image processing algorithms were employed to gradually adjust and optimize the lighting effects on the person's image, ensuring that the direction, intensity, and color temperature of the light matched those of the background image. This method not only enhances the visual consistency of the image but also improves the overall aesthetic and realism, fully showcasing the immense potential and application value of AI drawing technology in image processing.

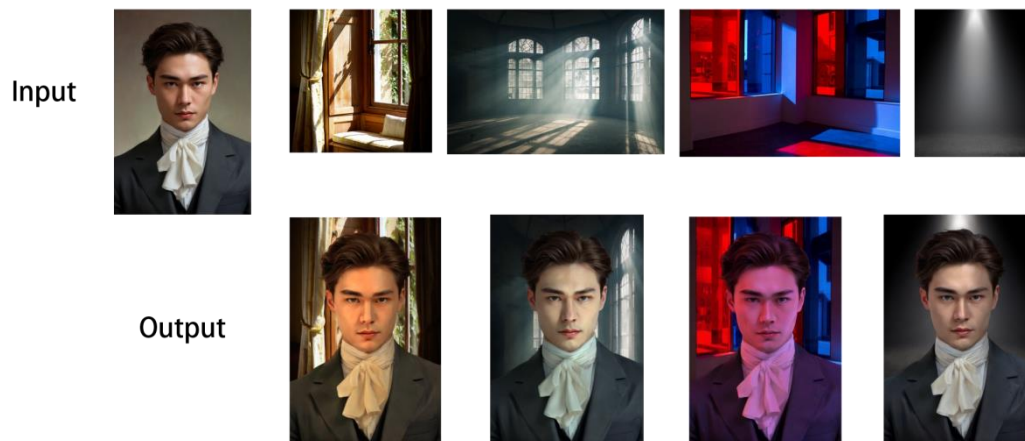


Figure 4. Lighting Consistency

4. Conclusion

With the rapid advancement of artificial intelligence technology, artworks generated by AI have increasingly become a focal point in both academic and artistic communities. This paper explores the issue of character consistency in AI-generated paintings, addressing how to ensure that characters created by AI exhibit stable and coherent features across different artistic works.

The paper begins by introducing the current development and application status of AI painting technology, highlighting potential inconsistencies in character portrayal during AI creation processes. Subsequently, it proposes several methods and technologies, such as midjourney, WebUI based on Stable Diffusion, and ComfyUI applications, aimed at enhancing character consistency in AI-generated paintings. These methods are tailored to different needs and application scenarios, enabling AI to more accurately capture and express visual feature consistency of characters. Through experimental testing, these methods have significantly improved the consistency of characters in AI-generated artworks.

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