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A Study of Artificial Intelligence Generated 3D Engine Animation Workflow

Chenghao Wang, Jeanhun Chung*

Doctor's Course, Dept. of Multimedia, Graduate School of Digital Image and Contents
Dongguk University, Korea
**Professor, Dept. of Multimedia, Graduate School of Digital Image and Contents*
Dongguk University, Korea

*how9951@gmail.com, * evengates@gmail.com*

Abstract

This article is set against the backdrop of the rapid development of the metaverse and artificial intelligence technologies, and aims to explore the possibility and potential impact of integrating AI technology into the traditional 3D animation production process. Through an in-depth analysis of the differences when merging traditional production processes with AI technology, it aims to summarize a new innovative workflow for 3D animation production. This new process takes full advantage of the efficiency and intelligent features of AI technology, significantly improving the efficiency of animation production and enhancing the overall quality of the animations. Furthermore, the paper delves into the creative methods and developmental implications of artificial intelligence technology in real-time rendering engines for 3D animation. It highlights the importance of these technologies in driving innovation and optimizing workflows in the field of animation production, showcasing how they provide new perspectives and possibilities for the future development of the animation industry.

Keywords: *Artificial Intelligence Generated Content, AI Painting, Animation, Real-Time Rendering Engine, Animation workflow,*

1. Introduction

1.1 Research Background

3D animation is an imaginative and realistic form of artistic expression based on digital technology. It is loved by the public and widely used in education, entertainment and other fields.In the traditional 3D animation production stage, artists and creative staff need to go through a tedious process to design characters, scenes, story board, and produce 3D asset models, textures, animation rigging and rendering.This process requires considerable time, effort, and technical ability, and is easily limited by the artist's personal style and technique.

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Corresponding Author: evengates@gmail.com (Jeanhun Chung)
Tel: +82-2-2260-3767, Fax: +82-2-2260-3766
Professor, Dept. of Multimedia, Gradute School of Digital Image and Contents, Dongguk University, Seoul, Korea

However, with the rapid development of artificial intelligence technology, AIGC has gradually shown great potential in the three-dimensional animation production process.Using deep learning and image generation technology, the artist's painting style, creative techniques and visual effects can be simulated and reproduced. It can generate realistic and high-quality paintings by learning and analyzing a large amount of images and data, and can provide inspiration for creative ideas to the creative team.

This article uses AIGC as the basis to analyze the new creative process in the three-dimensional animation production process, and combines the current relevant AI and three-dimensional technologies. Therefore, it is very meaningful to study the application of AICG in the three-dimensional animation process in depth, which will help to further explore and develop the potential of artificial intelligence in animation production, improve the efficiency and quality of animation production, and enrich the form and expression of artistic creation.

1.2 Research Objectives

Nowadays, using AIGC to generate art has become a novel and effective production method. By using machine learning algorithms and neural networks, it shows uniqueness and originality that traditional creation cannot match, so it has broader application prospects in the field of 3D animation.

This article comprehensively explores the application potential and impact of AIGC technology in the 3D engine animation workflow. Through detailed application case studies, we evaluate how AIGC technology can improve the efficiency, quality and creativity of animation production, and also conduct an in-depth study of its changes to the traditional 3D animation production process, including its impact on workflow, creative teams and resource requirements. Furthermore, the limitations and challenges of AIGC technology are detailed to provide insights for further technology improvements and application strategies. Ultimately, the goal of this study is to provide guidance to practitioners and decision-makers in the field of 3D engine animation production to help them better integrate AIGC technology, overcome potential challenges, and develop best practices to achieve more efficient, innovative, and high-quality Animation workflow.

2. Theoretical Background

2.1 3D Engine Animation Workflow

Against the background of the explosion of metaverse and artificial intelligence technology, the 3D animation workflow has continuously developed, and the picture effects and creative efficiency have been continuously improved. In particular, the emergence of real-time rendering engines and the integration of 3D animation have become a major change in recent years. Nowadays, the addition of AIGC to the three-dimensional animation production process further continues innovation and breakthroughs, and may become a trend in animation production in the future.

Traditional 3D animation production is divided into three stages: the early design stage, the mid-term 3D asset production stage, and the post-synthesis editing stage.This offline rendering workflow under the traditional mode undoubtedly requires many kinds of software, and the production process is also intricate, requiring continuous back-and-forth docking tests between software. And because the offline rendering time is too long, it is impossible to preview in real time and get feedback and modifications in time. We can only rely on gradual and frequent communication and improvement in each process. With the current application of real-time rendering, the engine rendering time is almost non-existent, and it can be said that what you see is

what you get. Therefore, the entire engine animation production process is greatly simplified, saving time and shortening the production cycle.

Now with the rapid development of AI, it has great application prospects in 3D engine animation. In the early design, ChatGPT can quickly generate story scripts, and AI painting can generate story panels, character designs and other content. In the mid-term design, AI can quickly create three-dimensional low-precision models, and then carve more detailed high-precision models in the low-mold. In the animation stage, AI technology can be used to help correct the transition animation between keywords to make the character movement more realistic and vivid.

It can be seen that based on the application of real-time rendering, the addition of AIGC has greatly improved production productivity. Adding AI to the original simplified process can solve the kind of mechanized and repetitive work, and can provide more creative personnel. Creative inspiration and ideas

2.2 AIGC Technology Application Advantages

AI content generation tools represented by Midjourney and Stable Diffusion are playing an increasingly important role in the film, game, animation and other industries. The emergence of ChatGPT has triggered a new trend in global AIGC. This technology will definitely have an impact on 3D engine animation production with its low-cost and efficient content generation method.

One of the main advantages of AIGC technology is its ability to significantly increase the efficiency of the animation production process. Traditional animation production can be time-consuming and labor-intensive, but AIGC can automate certain mechanical, repetitive tasks. Assistance can assist with generating background scenes, character designs, and even animation, allowing the creative team to focus on the more creative and complex aspects of the project.

3. Analysis of the Application of AIGC in 3D Animation

3.1 Text to Image

Text to Image is not just about simply converting text into images; it involves considering the semantics of the text description, contextual connections, and the feasibility of generating the image. The text in question is typically natural language text, which may include words, phrases, sentences, or paragraphs. These textual descriptions can encompass information about objects, scenes, plots, characters, abstract concepts, and more.The generated images are usually concrete visual representations, they can be photos, paintings, scenes, or other forms of visual content.

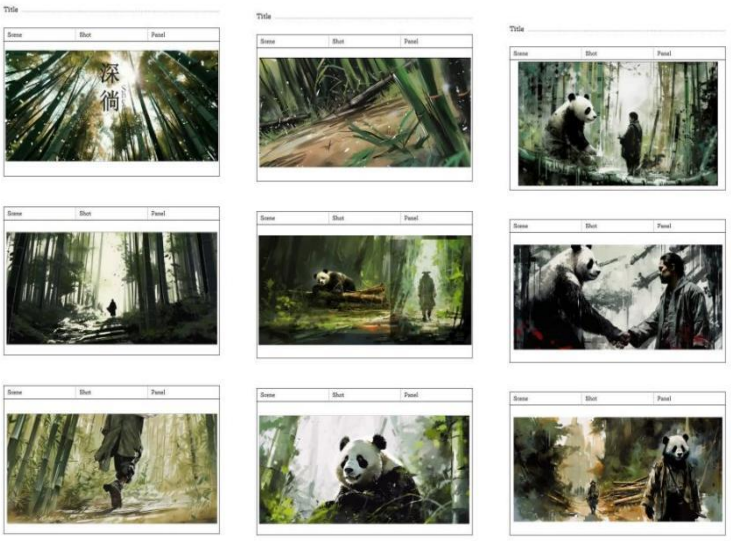

Figure 1. AI Generation Story Board

Text to Image is of great value in different application areas. As shown above, in the 3D animation production process, it can be used to generate story panels in pre-production, automatically generating visual images through text, and improving the participation of team communication. And the quality of the generated images on this basis is another key issue, which directly affects the authenticity and usability of the generated results.

Resolution: Determines the clarity and detail of the image. High-resolution images are generally more attractive, but also require more computing resources and time. There is a trade-off between speed and resolution of image generation to meet the needs of different applications.

Realism: This includes factors such as colour, texture, lighting and perspective, which all play a key role in the authenticity of an image.

Details: Details can include the texture of an object, its shape, and subtle features in textual descriptions. Higher quality generated images generally contain more detail, which is especially important during material map generation in 3D animation workflow.

3.2 2D Image to 3D Model Generation

In the 3D model production stage, it can be roughly divided into three processes: low model, medium model and high model. In the traditional production process, it is common to create a basic 3D low-poly model, refine it to generate a mid-poly model, and then achieve a high-poly model through more detailed sculpting. Subsequently, the high-poly model is used for retopology, and in the game engine, a low-poly model is employed to bake relevant textures, aiming to optimize performance and conserve resources. Therefore, one of the key applications of AI in 3D generative models is to solve the repetitive operation problems of low models.

With the development of AI, it has played a crucial role in 3D model generation. Traditionally, sculpting and modeling have been skill-intensive and time-consuming tasks. However, AI-driven tools simplify this process by automating the generation of 3D models. Trained on diverse datasets, these tools not only enhance the production process and efficiency but also open up possibilities for creating complex and intricate models

that are challenging for humans to achieve manually.

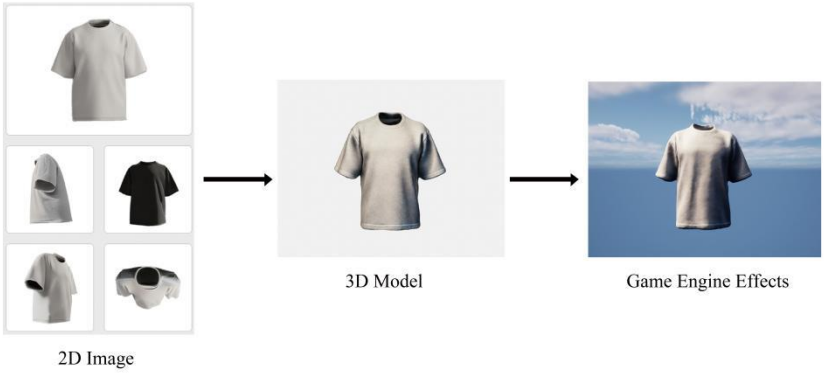

Figure 2. AI Generation 3D Model

In conclusion, the integration of AI-generated models signifies a transformative era in the field of computer graphics. AI-powered automated model creation is reshaping the industry, endowing it with broader capabilities. As technology continues to advance, the future holds exciting possibilities for driving AI-driven innovations in the realm of 3D graphics.

3.3 Animation

During the 3D animation phase, tasks such as character skeleton binding and bone weight painting are required, involving significant time and high technical expertise. The production of animation involves iterative polishing and adjustments of character keyframes and curves on one hand, and on the other hand, the use of motion capture and facial capture devices incurs higher costs. The introduction of artificial intelligence technology has to some extent reduced the difficulty of traditional 3D animation production, while also providing a more cost-effective solution for motion capture. This process of AI integration significantly enhances the efficiency of 3D animation production, while also offering creators more creative inspiration.

By leveraging AI systems, it becomes possible to analyze the complexity of human behavior and expressions, thereby presenting more realistic and natural character movements in animation. This technology not only enhances the fluidity of animation but also corrects transitions between keyframes, allowing for more nuanced emotional expressions in characters. This, in turn, strengthens emotional resonance with the audience. Furthermore, AI has played a positive role in scriptwriting and storyline deduction. Through the analysis of a vast amount of film and television productions, AI can predict audience preferences and trends, offering creative suggestions to content creators. The artificial intelligence animation software Cascadeur, introduced by Nekki, offers a plethora of intelligent tools to expedite the animation creation process. With the assistance of neural networks, it enables the rapid production of key poses in a short timeframe, while concurrently incorporating realistic and credible physics effects and detailed movements. Overall, the advent of AI animation has not only brought technological innovation to the animation industry but also provided creators with more convenient and efficient tools.

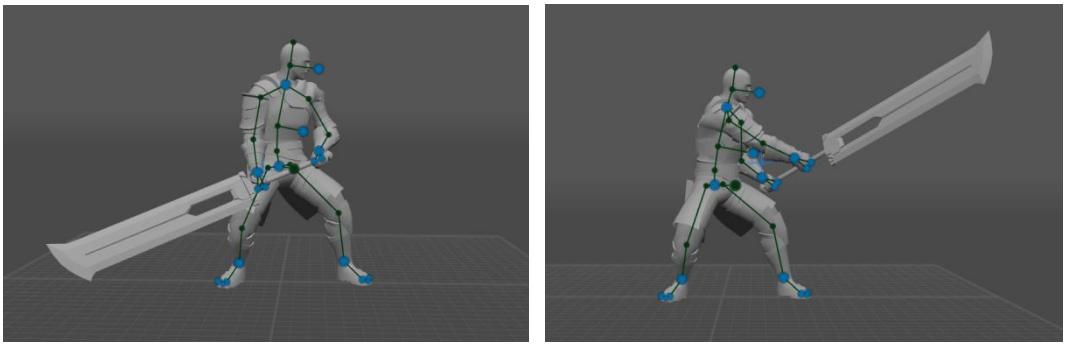

Figure 3. Cascadeur

4. Conclusion

AIGC (Artificial Intelligence Generated Content) technology represents a cutting-edge and revolutionary approach across various creative industries, including animation, design, gaming, and more. This technology relies on artificial intelligence algorithms, and its application in the field of 3D engine animation production offers distinct advantages. Therefore, this article explores the key benefits of using AIGC technology in the workflow of 3D animation. Through research, it has been discovered that in the early design phase of 3D animation, AI can provide inspiration and enhance production efficiency for animating the story and storyboards. In the mid-stage of 3D modeling, AI technology can address repetitive and low-value tasks by quickly generating low-fidelity models to save time. During the animation phase, AI can correct transitions between keyframes, enabling animations to portray more realistic and natural character movements.

In summary, AIGC technology holds the promise of transforming the field of 3D engine animation production by increasing efficiency, enhancing quality, expanding creative possibilities, optimizing resource utilization, providing real-time feedback, and reducing costs. Currently, artificial intelligence technology is still in the developmental stage, and due to the lack of accumulated life experiences and insights inherent in human existence, there are certain challenges in its direct involvement in creative processes. The primary advantage of current artificial intelligence lies in efficiency, particularly evident in mechanical and repetitive tasks. Therefore, the current application of artificial intelligence technology in the 3D animation production process revolves around placing the creator at the core, with artificial intelligence serving as an auxiliary tool. This approach aims to explore the integration of artificial intelligence technology with engines for real-time rendering of animations.

References

[1] Chenghao Wang, Jeanhun Chung "Research on AI Painting Generation Technology Based on the [Stable Diffusion]" The International Journal of Advanced Smart Convergence 12.2 pp.90-95 (2023) : 90. DOI:http://dx.doi.org/10.7236/IJASC.2023.12.2.90

[2] QianQian Jiang, Jeanhun Chung. "A Case Study of Creative Art Based on AI Generation Technology" The International Journal of Advanced Smart Convergence 12, no.2 (2023) : 84-89.

DOI:http://dx.doi.org/10.7236/IJASC.2023.12.2.84

[3] Tiemo Zhang, Mengze Zhang and, Bae Kihyung . 2019, "Research on the Way to Promote the Value Chain of Animation Digital Publishing in the Context of AI", International Journal of Contents, vol.15, no.4 pp.107-112. DOI: https://doi.org/10.5392/IJoC.2019.15.4.107

[4] Kim Yunkyoung. 2021, "Exploring Posthuman Identity in the AI Era -Focusing on <Zima Blue>", Studies in AI Humanities, vol.9, pp.9-34., vol.9, pp.9-34. DOI: https://doi.org/10.46397/JAIH.9.1

[5] Chenghao Wang, Jeanhun Chung "A Study on AI Softwear [Stable Diffusion] ControlNet plug-in Usabilities" The International Journal of Internet, Broadcasting and Communication 15.4 pp.166-171 (2023) : 166. DOI:https://doi.org/10.7236/IJIBC.2023.15.4.166

[6] Chen Xi, Jeanhun Chung "A Study on Character Design Using [Midjourney] Application" The International Journal of Advanced Culture Technology 11.2 pp.409-414 (2023) : 409. DOI: https://doi.org/10.17703/IJACT.2023.11.2.409

[7] Bo Yihang. Exploration of new methods for film split-shot screen creation—human-centered, human-machine collaborative artificial intelligence creation [J]. Modern Film Technology, 2022(09):10-18. DOI:CNKI:SUN:YSJZ.0.2022-09-002.

[8] Liu Mengya, Zhao Weiran. Research on the film visual effects creation process based on interactive engine technology [J]. Modern Film Technology, 2023(08):34-40+33. DOI:CNKI:SUN:YSJZ.0.2023-08-006.

[9] Ouyang Chunxue. Research on multi-modal AIGC animation based on deep learning [J]. Modern Film Technology, 2023(01):41-47. DOI:CNKI:SUN:YSJZ.0.2023-01-010.