The Impact of AIGC Technology on 3D Content Creation

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Abstract: Artificial Intelligence Generated Content technology (AIGC) is currently a popular technology, widely used in game and animation development. Although it has produced numerous outstanding works, there is still a lack of summary regarding its specific role in the creative process. Therefore, this study will analyze how AIGC technology functions in areas such as model production and scene design in game development, as well as in music scoring and scriptwriting in animation production. The research finds that some websites based on AIGC technology, such as Midjourney and Meshy, can assist developers in quickly generating 2D images, 3D models, and even textures for object surfaces that meet usage requirements, some text generation AI, such as ChatGpt, can also provide inspiration for the design of NPCs. OpenAI's MuseNet can rapidly generate high quality music for animations and films, which can help developers, especially individual developers, save costs while obtaining high-quality assets.

Keywords: AIGC, Game, Animation

1.   Introduction

The Artificial Intelligence Generated Content technology (AIGC) has rapidly emerged in various fields, becoming a new force for innovation in the industry. For example, in the fields of media, entertainment, education, and industrial design. Through core technologies such as the Transformer architecture, pre-trained language models, and diffusion models, AIGC has achieved the automated generation of large-scale, high-quality content. It can generate text, images, and even music and 3D models based on user-provided requirements, helping enterprises shorten production cycles and reduce labor costs while also providing convenience for individual workers.

However, traditional 3D content creation technologies face challenges such as long production cycles, high technical barriers, and High costs. For instance, in the processes of game development and animation production, creating a high-precision model often requires a team several weeks of time. The emergence of AIGC technology offers potential solutions to these difficulties. Nowadays, with the maturity of AIGC-based websites like Midjourney and Meshy, more and more developers are beginning to use AIGC technology to generate images and models needed for their projects. The author Xin Mi and others utilized MidJourney to generate concept art for the Black Bear Monster in "Journey to the West" to facilitate subsequent modeling work. This demonstrates that AIGC technology can significantly shorten production cycles and empower industries such as game development and animation production. Therefore, it is crucial to explore how AIGC technology can contribute to the game development and animation production sectors.

This article aims to explore the transformative impact of AIGC technology on 3D content creation, emphasizing its ability to address traditional limitations. First, we will introduce the background of AIGC technology, its core algorithms, and its extensive applications in fields such as art, music, and education. Next, we will analyze the limitations of traditional 3D content creation and discuss how AIGC technology can solve these issues through efficient and intelligent generation methods. Finally, we will delve into the specific applications of AIGC technology in industries such as game development and animation production, and look forward to its future development directions. We hope that readers will understand how to empower 3D content creation through AIGC technology and find it helpful for their own work.

2. The Current Status of AIGC Technology and Limitations of Traditional 3D Content Creation

In recent years, AIGC technology has emerged as a hot topic across various domains. Unlike content created directly by human authors, AIGC refers to content automatically generated using advanced generative AI technologies [1]. The reason why AIGC technology is gaining immense popularity is that it can assist various enterprises in shortening work cycles, improving work efficiency, and reducing time and labor costs. It can also address everyday questions, providing convenience for human life. From an algorithmic perspective, several key techniques underpin AIGC, including transformer architectures (the backbone of many advanced models), pre-trained language models (characterized by parallelism and self-learning capabilities), and diffusion models [1]. AIGC has found widespread application in art, music, education, and more, with countless products developed to leverage this technology. For instance, in terms of education and life, in the United States, OpenAI's ChatGPT and DALL-E-3 provide users with significant convenience in learning and daily life, Figure 1 shows a picture of "Kingdom of cheese" created by DALL-E-3, while in China, Baidu's Wenxin Yiyan and Huawei's enterprise-focused Pangu Cloud Model have gained prominence [2].

Meanwhile, 3D content creation has become a focal point in industries like gaming, filmmaking, and virtual reality. Traditional 3D content creation methods, however, remain time-consuming and labor-intensive. For example, developing game character models, constructing virtual scenes, or producing animated films typically involves using tools such as Maya and 3DS Max for initial modeling, followed by sculpting and texturing in ZBrush and Substance Painter. Creating high-precision models often demands significant time and resources, along with a deep understanding of technical and artistic principles [3]. Given current trends in 3D model production, AIGC is becoming essential for generating large-scale, high-quality 3D models efficiently [4].


```
response = openai.images.generate(
        model="dall-e-3",
        prompt="Kingdom of cheese",
        quality="standard",
)

img_bytes = get(response.data[0].url).content
img = Image.open(BytesIO(img_bytes))
display(img)
```

Figure 1: The code of suing DELL-E-3 to create a picture called "Kingdom of cheese"

3.   The Impact of AIGC Technology on 3D Content Creation

Traditional 3D content creation faces several limitations, such as low efficiency, a lack of automation and intelligence in large-scale content generation, and high technical barriers. The emergence of AIGC technology offers promising solutions to these challenges.

To address the limitations of traditional 3D content creation, AIGC technology can rapidly generate 2D images or 3D models using technologies such as the Diffusion Model, significantly improving the production cycle for workers and empowering industries such as game development and animation production.

In the realm of 2D content, platforms like MidJourney can generate high-quality images based on text inputs [5]. In the 3D domain, tools like Meshy are now capable of generating high-quality 3D models tailored to user requirements [6]. The integration of AIGC with 3D content creation has breathed new life into the field, offering enhanced efficiency and creativity. AIGC technology has now permeated various aspects of 3D content production

3.1.   The Impact of AIGC Technology on Game Development

Game development involves numerous complex processes, such as scriptwriting, scene modeling, character creation, and conceptual design. These tasks traditionally require substantial time and effort. Midjourney, developed based on AIGC technology, can generate a large number of concept pictures in a short period of time according to the requirements of game makers, helping game developers quickly complete concept design and concept drawing, and software such as Meshy can quickly generate relevant models based on the text and images provided by game developers, Figure 2 shows the low-poly model of an ancient Chinese temple generated by Meshy, which greatly shortens the modeling process.

In terms of scriptwriting and concept design, AIGC can generate images and text drafts based on textual prompts, enabling game developers to quickly produce sketches or drafts. Developers can then refine and finalize these outputs to achieve their desired results in a fraction of the time. In the research conducted by the author Xin and others, the assistance of AIGC technology was utilized to provide ideas for the creation of monster images in "Journey to the West," indicating that AI image generation software such as Midjourney developed with AIGC technology at its core, offers significant support for character design [7].

In terms of NPC design, AIGC technology can also revolutionize the design of non-player characters (NPCs). By incorporating richer behavioral characteristics, NPCs can dynamically respond to players' actions, moving beyond static and repetitive behaviors. This level of customization enhances player engagement and immersion, making NPCs feel more lifelike.

In terms of scene construction, the latest 3D model generation technologies in AIGC allow developers to bypass the traditional low-poly modeling stage, jumping directly to high-precision model creation. The authors Huang and Sun mentioned that by adopting AIGC technology, they successfully reconstructed 3D characters and scenes from the ancient Ming Dynasty in their research, significantly enhancing the speed of modeling and enriching players' gaming experience with authentic historical settings, thereby increasing the realism of the game [8].
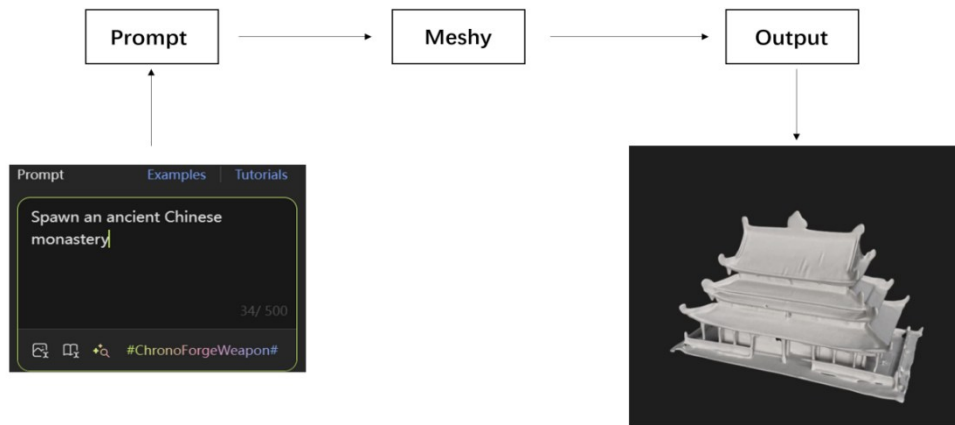
Figure 2: The process of using Meshy to generate models of ancient Chinese temples.

3.2. The impact of AIGC technology on the animation, film, and other industries

The characteristics of AIGC technology, being efficient and low-cost, have had a significant impact on industries such as painting, animation [9], and film. With software developed based on AIGC technology, such as MidJourney, Stable Diffusion, and DALL-E-3 creators can simply input their relevant requirements and quickly obtain a large number of related images, far surpassing the speed of hand-drawing by the creators themselves. Subsequently, creators only need to make improvements based on the generated images according to their needs, which greatly shortens the production cycle of animated films, significantly enhances production efficiency, and promotes the development of the animation industry. In July 2022, the animated short film "The Crow," produced by AIGC, won the Best Short Film Award at the Cannes Film Festival [10], reflecting the widespread application of AIGC technology in the field of animation production. In August 2022, the artwork "Space Opera," created with MidJourney, won an award in the digital art category at the art fair in Colorado [10], further indicating that the current AIGC technology is widely recognized across various fields. These two examples illustrate that the potential of AIGC technology in simplifying production processes and enhancing artistic expression has been widely recognized.

In terms of background and environmental animation, traditional animation's scene design and detail rendering typically require artists to draw frame by frame, as exemplified by the works of renowned Japanese animator Hayao Miyazaki. However, AIGC technology can automatically generate background elements and dynamic effects that meet specific requirements through the diffusion model. This technology is now widely utilized by various animation production companies. For instance, the background of the animated short film "Dog Bites Boy [10], released by Netflix on January 30, 2023, was generated using the diffusion model. Within the same timeframe, the images produced by AIGC technology far exceed the limits of human drawing and can generate personalized-style images suitable for animated film production based on subsequent requirements.

For script creation and design, AIGC technology, through NLP and reinforcement learning, has influenced the evolution of story conception and script writing. Reinforcement learning can optimize original scripts by analyzing the successes and shortcomings of previous scripts. Utilizing AIGC technology, the creators of "Rick and Morty" analyzed previous plots and dialogues, gaining insights that resonate with the audience [11]. Animation creators can further modify scripts based on AIGC's analysis reports, making the resulting animations more favored and sought after by viewers, thus providing new directions and possibilities for storytelling and scriptwriting.

In terms of animation scoring, AIGC technology, such as OpenAI's MuseNet, can significantly reduce the production time of scores for traditional animation works, saving human and time

resources in the traditional scoring process. In terms of sound effects, AIGC technology can analyze visual content and generate appropriate sound effects [11]. By applying these technologies, along with further adjustments by humans to the generated scores and sound effects, work efficiency can be improved while ensuring the quality of the output. With the aid of AIGC technology, the resulting scores and sound effects, which have a shorter production cycle and higher quality, can provide audiences with an immersive experience.

3.3. Restriction analysis

Currently, AIGC technology still has some limitations. For instance, compared to traditional two-dimensional hand-drawn images, the quality of images generated by AIGC is relatively rough. In terms of algorithm stability, the generated images can vary in quality, making them unpredictable [11]. Regarding usability, the training datasets used for AI training mostly contain biases, resulting in data that cannot be effectively represented in images. Given that the current AIGC technology cannot achieve a fully automated generation of directly usable images or models, human involvement becomes essential. Furthermore, it is necessary to consider the social impact of the samples generated by AIGC technology and to ensure that it does not bring significant negative effects to society. If AIGC technology is used to produce violent or explicit content, it could have a profoundly negative impact on the mental health of adolescents. Additionally, the capability of AIGC technology to generate three-dimensional content can create false and deceptive information, which is particularly pronounced in contexts such as virtual reality, advertising, and media[3]. Therefore, relevant laws should be formulated to regulate the development of AIGC technology in these undesirable areas, guiding it to progress along the right path. The flexible application of AIGC technology can enable creators to save considerable manpower and time resources during the creative process, thereby producing high-quality works in a shorter period, empowering industries such as game development and animated film production. However, at the same time, the regulation of AIGC technology must also keep pace with the times. Only in this way can AIGC technology create its greatest value in the future.

4. Conclusion

This article conducts an in-depth study on the application of AIGC technology in the creation of three-dimensional content, highlighting its significant positive impact on traditional three-dimensional content creation techniques. The research primarily emphasizes that AIGC technology can generate 2D images based on algorithms such as the Diffusion Model, empowering industries like game design, animation, and film production, significantly shortening production cycles and reducing costs. Websites developed based on AIGC technology, such as MidJourney and Meshy, can directly generate images and models suitable for product creation, which have been widely adopted by developers in product manufacturing. This article analyzes how AIGC technology can address various limitations in the gaming and animation industries, providing valuable references for developers looking to apply AIGC technology to their projects, and helping them create the best works at minimal cost. Finally, this article does not consider how to address the potential negative impacts of AIGC technology on society, such as the generation of violent and explicit images, as well as misleading false information. Future regulations on AIGC technology can be further refined to keep pace with the development of AIGC technology.

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