

THE WAY AI IS TRANSFORMING 3D GRAPHICS

Introduction. Artificial intelligence is revolutionizing practically every aspect of technology, including 3D graphics. Previously, making realistic 3D models and animations took a significant amount of time, expertise, and computational power [1]. Textures, lighting, and motion all have to be created manually by artists. Today, AI can perform many of these jobs not only quicker but with greater precision as well. It enables designers to construct realistic environments, automate laborious tasks, and experiment with new visual trends.

Main material. One of the biggest benefits of AI in 3D graphics is automation. Traditional 3D modelling usually required lengthy hours of manual effort to construct, texture, and render models. Many of these operations are now automated using AI-powered solutions. For example, algorithms can create 3D models from drawings or even individual 2D images. Simple sketches may be transformed into detailed 3D settings using programs like as NVIDIA GauGAN and RunwayML [2].

In animation, AI may fill in the gaps between critical poses, decreasing the animator's effort. It can also improve rendering by anticipating lighting, shadows, and materials more quickly than conventional approaches. This enables artists to concentrate on their creativity rather than on routine technical duties. Consequently, studios save time and money without sacrificing visual quality.

Artificial intelligence has introduced an unprecedented degree of realism to three-dimensional visuals. Neural networks process vast datasets of real-world images in order to identify complex relationships between light, colour, and texture. As a result, this analytical capacity enables the generation of visual effects that closely resemble natural phenomena. For instance, AI-based texture synthesis technologies are capable of automatically producing highly realistic materials, including wood, metal, and fabric.

Moreover, AI-driven lighting systems are able to reproduce global illumination and reflections with a high degree of accuracy. In the fields of gaming and virtual production, technologies such as NVIDIA DLSS (Deep Learning Super Sampling) enhance image resolution and frame rates while preserving visual detail. Consequently, the integration of realism and computational efficiency has transformed contemporary approaches to the production of 3D content in film, video games, and virtual reality environments.

Yet another significant advantage of artificial intelligence in 3D design is the substantial increase in processing speed. Previously, the rendering of highly realistic scenes often required several hours or even days to complete. In contrast, contemporary AI-driven rendering engines are capable of generating comparable results within minutes, enabling designers to visualize their concepts almost immediately [3].

In addition, AI-based tools provide intelligent feedback throughout the design process. Such systems can automatically correct geometric structures, enhance lighting conditions, and recommend appropriate colour palettes. As a result, the overall workflow becomes more efficient and interactive. Designers are able to experiment with a wider range of ideas without the concern of excessive time expenditure, thereby fostering greater creativity and innovation in the development of 3D content.

Artificial intelligence not only accelerates production processes but also significantly broadens artistic possibilities. Rather than replacing human creativity, it functions as a collaborative tool that enhances the creative process. Generative AI technologies are capable of producing novel forms, textures, and virtual environments that may not have been envisioned by human designers [4]. Platforms such as Midjourney, Stable Diffusion, and Adobe Firefly allow users to generate concept art or 3D textures from simple textual prompts, thereby creating entirely new opportunities for digital artistic expression.

Furthermore, AI technologies enable small teams and even individual creators to produce professional-quality 3D projects that previously required the resources of large studios. This increasing accessibility contributes to the democratization of digital design, fostering a more diverse, innovative, and inclusive creative community within the field of digital art.

Despite its numerous advantages, the integration of artificial intelligence also presents several challenges. Some artists express concern that AI-generated content may diminish the value of human creativity or potentially replace traditional forms of artistic expression. In addition, issues related to intellectual property remain a significant concern, as many AI models are trained on extensive datasets that may include copyrighted material. Furthermore, excessive reliance on automated processes can result in creative uniformity, whereby artistic works begin to exhibit similar visual characteristics.

There are also notable technical and economic constraints associated with the use of AI technologies. Advanced AI systems often require high-performance hardware and access to large volumes of data, which may involve considerable financial investment. Consequently, it is essential to maintain a balanced approach that combines the advantages of automation with human creative input while ensuring ethical responsibility in the application of AI-based tools.

Conclusion. Artificial intelligence is significantly transforming the field of 3D graphics by making the creative process more efficient, realistic, and widely accessible. It facilitates the automation of complex production tasks, enhances visual realism through deep learning techniques, and stimulates the emergence of new forms of artistic expression. At the same time, the growing use of AI raises important questions concerning ethics, originality, and the value of human creativity. The future development of 3D graphics will largely depend on effective collaboration between human creators and artificial intelligence systems, integrating advanced computational capabilities with human imagination and artistic vision. Achieving such a balance will enable the field of 3D graphics to continue evolving and reach new levels of technological and creative advancement.

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