26. AI GENERATED GAME ART

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This paper aims to explore the use of AI-generated game art and its potential impact on game development, artistic creativity, and ethical considerations. Examples of integration of such technology in development process are described.

In recent years, game development has demonstrated a growing interest in the use of artificial intelligence (AI) for generating game art. Game art encompasses a wide range of visual assets designed specifically for games, including concept art, character models, environments and other illustrations. With the emergence of AI-generated game art, developers can now leverage machine learning algorithms to create unique and diverse visual content for their games.

Image generative AIs have existed for a long time, however, it is in 2022 when a revolution in this technology took place. A lot of research was done in the field of diffusion AIs, which led to the development of such models as Midjourney, Google's Imagen [1] and OpenAI's DALL-E 2 [2]. They helped showcase the possibilities of such technologies to the public. With the release of Stable Diffusion, AIs finally were used in production.

Stable Diffusion is an open-source latent text-to-image diffusion model [3]. It allows a user to input a text, a prompt that conveys what is supposed to be on the image, that will be later used as a basis for generated pictures. Technology consists of generating random Gaussian noise and denoising it in accordance to user input. The model understands what visual information corresponds to the given text by interacting with its pre-trained parameters. At the end of the process, the user gets the required image.

Despite skepticism that AI-generated art will follow the limited use of NFTs, this technology offers unique advantages for creating art at a scale that was previously unattainable. While someone may view the technology as a mere toy, the reality is that it has the potential to significantly speed up and automate various aspects of project development. AI-generated assets can serve as an effective tool for prototyping and developing projects. While the art generated by AI may not be created directly by the artist, it

nevertheless offers a means of self-expression [4]. The developer controls the final product, choosing the style, content, and which image will ultimately be used. Additional self-expression can be achieved through model tuning or training of the model on specific assets.

The usability of image generation AIs in games can be broadly classified into two categories: those that serve the needs of developers and those that cater to the preferences of players.

Capability to generate a visual asset in a matter of seconds is very valuable for a game developer. Previously, it was achieved using procedural generation, however, it would require developing a new system for each new game. The advantage of Stable Diffusion is that it can generate variety of different pictures on the array of different topics. Instead of making something yourself, you can just download a pre-trained model and use it in your creative process.

An example of the implementation of such technology into a creative process is a web game “RealZoo”. This game allows to combine 2 simple animals, like Elk or Turtle, into a new one – Turlk (Figure 1). Instead of spending a lot of money on an artist to draw more than a hundred of assets, the developer generated all of them in a couple of hours [5]. All he needed to do, was just to write prompts that would correspond to animal combination. Such powerful tools allow independent developers to make something they could not do.

Figure 1 – Examples of AI generated illustrations (Elk, Turtle, Turlk in that order)

Image generation Ais in video games offer a second type of use that targets players in particular. The main thing that differentiate games from other forms of art is interactivity. In the past, game developers tried different ways of allowing a player to create their own stuff in games. A problem can arise, when a player is given a lot of freedom – it means that a developer has to create a lot of assets and write how they can interact or be interacted with. Asset generation through Stable Diffusion denotes that the possibilities given to the player are endless, within the constraint of illustrations. A developer can additionally guide a player towards certain things, by allowing unique methods of creating text prompts for the AI.

The concept for such a game would be a single-player card game, that allows a player to make their own cards. Of course, giving a player set of pre-made card illustrations would not only limit their creativity, but also make cards look similar. If instead developer implements image generation, by creating a server to parse player requests, we can allow player to make any illustration they want. One of the features of Stable Diffusion is the usage pre-trained model. allows us to have a special model, trained on other in-game artwork. Such approach allows for both style consistency and makes experience unique from game to game.

Despite some of the benefits of AI-generated game art, there are still limitations to the technology that must be considered. For instance, AI-generated assets may lack the emotional depth and personal touch that a human artist can provide. They can be crucial for creating a truly immersive game experience. Moreover, AI-generated art may not be as flexible and adaptable as human-made art, which can hinder a developer’s ability to respond to changing design needs or user feedback. Therefore, it is important for developers to weigh the benefits and limitations of AI-generated game art when considering its use in their projects.

Although image generative AIs are among the most advanced forms of generative AIs, current technologies offer capabilities that extend beyond the generation of images alone. Google’s MusicLM is able to generate music, which could help beginner developers in case they do not have the composer [6]. GitHub’s Copilot is able to help developers write code, which can help increase the speed of the development process. OpenAI’s ChatGPT is able to generate text and reply to different kinds of user request. It is most efficient at brainstorming, but it can also be used as an assistance in writing process. Other kinds of generative AIs are in development, like ones for creating 3D models and videos, but those are currently not on the stage where their output can be used in games.

The use of AI-generated game art raises important ethical questions, particularly around the ownership and originality of the art produced. While AI-generated art can provide an efficient and cost-effective solution for game developers, it may also pose a threat to the livelihoods of human artists whose work is being replaced. Additionally, there is a risk that AI-generated art could be used without proper attribution or compensation for the original creators of the underlying algorithms. It is important that game

developers and AI researchers consider the ethical implications of AI-generated game art and work towards creating a fair and equitable system that respects the contributions of both humans and machines.

The legal side of image generative AIs is what also concerns people. Since a lot of models are trained on the set of publicly available images, there is a lot of debates on who owns the rights to pictures that stable diffusion produces. Recently there was a judicial precedent regarding one of the published comic books, which was made by using AI-made images for panels. Court decided that the author did hold the ownership of comic itself, including its text, however, not of its illustrations [7]. That is similar to the rights of using royalty free assets in your work, where you are given license to use it, but you do not hold copyright over it. Since royalty free assets were used in the past by independent developers to speed up the creative process, especially if they do not hold resource to hire a full-time artist or musician.

Ultimately, the ethical use of AI-generated game art will require a balance between the benefits it provides and the potential harm it could cause to the broader community.

In conclusion, AI-generated game art has a lot of potential for game developers and players alike. The advancements in technology have led to the development of models like Stable Diffusion that can generate various images on different topics by just inputting a text prompt. This technology offers unique advantages for creating art at a scale that was previously unattainable, and it has the potential to speed up and automate various aspects of project development. While someone may view AI-generated art as a gimmick, AI art has the potential to serve as an effective tool for prototyping and developing projects. Developers can also allow players to create their own stuff in games, making the experience unique and interactive. There are concerns about legal issues since models are trained on publicly available images. However, with the proper licenses, this technology can help independent developers to speed up their creative process and create something they could not have done before. The current technology offers capabilities beyond the generation of images alone, and developers can use it for generating music, helping write code, and much more.

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