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A Study on Process of Creating 3D Models Using the Application of Artificial Intelligence Technology

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Abstract

With the rapid development of Artificial Intelligence (AI) technology, there is an increasing variety of methods for creating 3D models. These include innovations such as text-only generation, 2D images to 3D models, and combining images with cue words. Each of these methods has unique advantages, opening up new possibilities in the field of 3D modeling. The purpose of this study is to explore and summarize these methods in-depth, providing researchers and practitioners with a comprehensive perspective to understand the potential value of these methods in practical applications. Through a comprehensive analysis of pure text generation, 2D images to 3D models, and images with cue words, we will reveal the advantages and disadvantages of the various methods, as well as their applicability in different scenarios. Ultimately, this study aims to provide a useful reference for the future direction of AI modeling and to promote the innovation and progress of 3D model generation technology.

Keywords: *Artificial Intelligence Technology, 3D Modeling, AI Modeling, Sloyd AI, Artefacts.ai, Magic3D*

1. Introduction

In recent years, generative AI has become a research hotspot of wide interest in academia and industry. Against the backdrop of the continuous advancement of the digital economy, artificial intelligence has rapidly achieved remarkable development and has been deeply integrated with a variety of application scenarios. In the field of digital design, there is an increasing demand for 3D modeling techniques as virtual scenarios such as Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (XR), and Metaverse are widely promoted.In this context, there is a strong interest in methods to rapidly create 3D models using AI, especially for designers

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and 3D enthusiasts. Therefore, the focus of this study is to systematically summarize four approaches to AI modeling and provide a detailed analysis of some of these popular AI tools, aiming to reveal their advantages, disadvantages and scope of application.

2. Background of the Research

Traditional 3D modeling methods usually involve artists creating models by hand, requiring a significant investment of time and effort. This approach not only requires deep art skills and spatial imagination, but also a cumbersome and relatively inefficient production process. And 3D modeling AI generation greatly improves efficiency by training machine learning algorithms that enable computers to automatically learn and generate 3D models. The development of this technology has shown strong potential in a variety of fields such as gaming, film and television, architecture, product design, and virtual reality, providing customizable solutions for a wide range of industries.

3. Four Approaches to AI-Generated Models

3.1 2D Images Generate to 3D Models

The method of using images to directly generate 3D models in AI modeling converts 2D images into high-quality 3D models through deep learning and computer vision techniques. Currently, representative AI tools in creating 3D models using sub-methods include Common Sense Machines (hereinafter referred to as CSM), Kaedim 3D, and so on. CSM is building an AI platform that lets users generate game-engine ready 3D assets from single images and videos[6]. The main goal of the tool is to make it easier for users to create high-quality 3D models through intelligent algorithms and machine learning techniques.

As shown in Figure 1. is the main interface of CSM, click Get Started in the upper right to enter the model operation interface, we first import a favorite 2D image, CSM will automatically generate a multi-view 2D image, followed by clicking on the Generate button, you can quickly get both a 360-degree 3D model. This process has shown to be highly intuitive and user-friendly in practice, and the generated models have shown a satisfactory level of reproducibility. The initial 2D image and the AI-generated 3D model are shown in Figure 2.

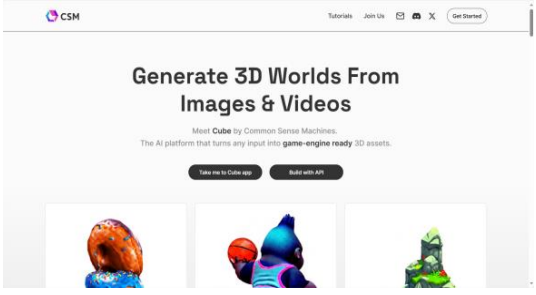

Figure 1. CSM Main Interface

Figure 2. 2D Images Generate Models

Meanwhile, as in Figure 3. users can also upload the generated models to the CSM repository for reference or use by others, or they can directly use the models uploaded by others in the repository.

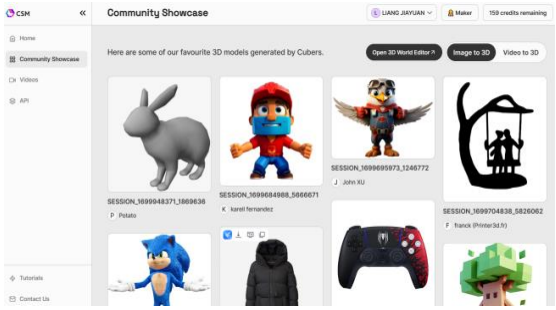

Figure 3. CSM Resource Library

In addition, the Kaedim 3D software has a similar method of generating models. However, unlike CSM, if the user is not satisfied with the generated model, Kaedim 3D can modify the model twice by entering commands, and even color the model in its interface. However, through research and testing, we also found that the models generated by Kaedim 3D are mainly based on Q-characters, simple items and architectural models, and its ordinary quality 3D model generation is limited by the number of facets, which is usually limited to 20,000 or less. For the generation of high-precision models there are still major challenges.

3.2 Keywords Generate 3D Models

Tools for generating 3D models using keywords in AI modeling include Masterpiece Studio, Magic3D, etc, which are capable of automatically generating corresponding high-quality 3D models based on keywords or prompts entered. These tools enable intelligent conversion from textual descriptions to entity models through deep learning and natural language processing techniques.

Masterpiece Studio is an AI-driven text-to-3D generator that generates not only 3D models but also animations based on a few step-by-step choices of generation type. This game-changing program boasts the simplest UI of any 3D authoring software currently available, and is suitable for users of all skill levels.

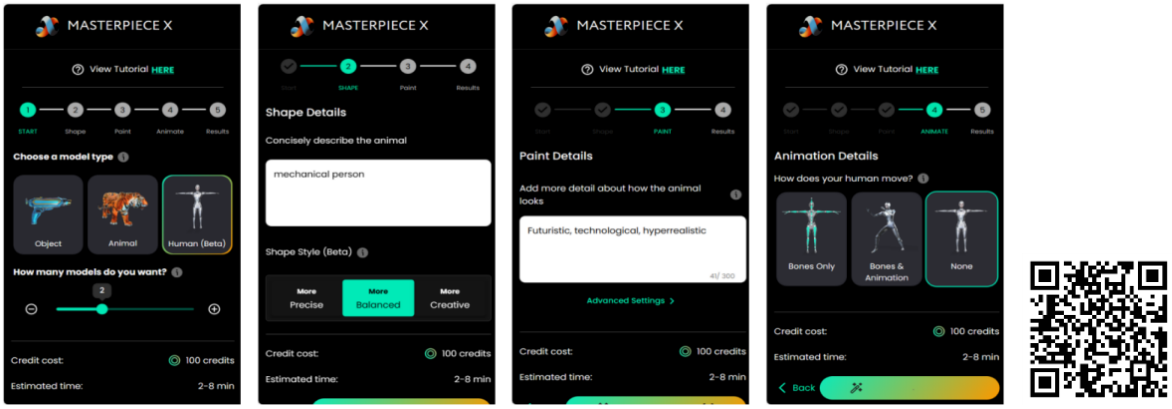

Figure 4. Masterpiece Studio Procedure

As shown in Figure 4. we demonstrate the interface of Masterpiece Studio. First of all, the user needs to select the corresponding model type, for example, when the user creates a robot model, the user can first select *"*Human*"* in the model category to express the demand for character creation.Secondly, keywords are used to refine the user's demand for the model's features, for example, in Shape Details, *"*mechanical person*"*, is used to narrow down the shape of the character to a character with mechanical features, and prompts such as *"*futuristic*"* and *"*technologicat*"* are inputted into Paint Details, in order to express the user's pursuit of the futuristic technological and surrealistic style of the model. Finally, the user can further select the details such

as character skeleton animation, and then click on the Generate button to quickly obtain the desired 3D model in only 2 to 8 minutes. Through this process, the generated model more accurately matches the keywords given by the user, as detailed in Figure 5.

Figure 5. Masterpiece Studio Keywords Generate Models

In addition, the Magic 3D tool also provides the ability to generate 3D models by keywords. Users only need to enter the relevant text in a short time, for example, *"*a blue poison dart frog sitting on a water lily*"*, and the AI can efficiently synthesize the corresponding 3D model. NVIDIA has been actively planning the future direction of Magic 3D's applications, positioning it as a tool for producing massive 3D models for a wide range of gaming and meta-universe applications. This feature is designed to make Magic 3D easy to use for all users.

3.3 Images and Keywords Generate 3D Models

AI Tools in AI modeling that use images and keywords to generate 3D models include Artefacts.ai. This 3D creation method imports a 2D image and adds a few keyword descriptions to it, combining the two to generate a 3D model. Artefacts.ai main interface, as shown in Figure 6. Click on *"*3D Generator*"* on the left side of the interface and select *"*image to 3D*"* as shown in Figure 7. First of all, set *"*Border Ratio*"*, *"*Steps*"*, *"*Tilt angle*"* on the leftmost option of the page, *"*Horizontal Angle*"*, *"*Seed*"* Second, import your favorite 2D images, add keywords to describe them, and finally click Generate to wait for the generation.

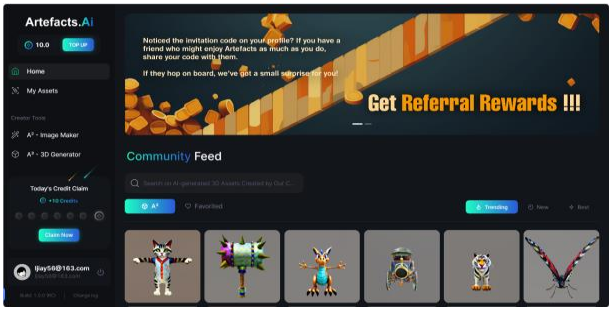

Figure 6. Artefacts.ai Main Interface

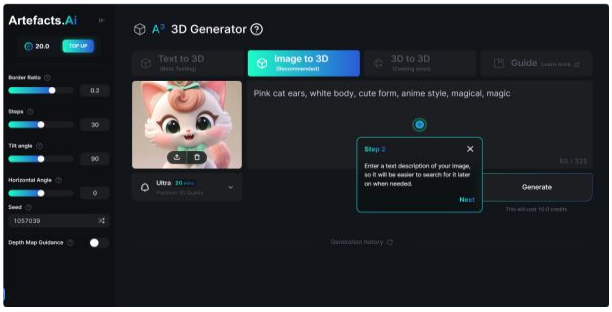

Figure 7. Artefacts.ai Procedure

The results of the operation are shown in Figure 8. The color morphology effect is still very satisfactory, compared to the simple picture generation 3D, the combination of pictures and keywords greatly improves the accuracy of the AI modeling, effective compliance with the details of the picture and the creation of the effect, but the shortcoming is that the model details are slightly rough, there is still a very high room for improvement.

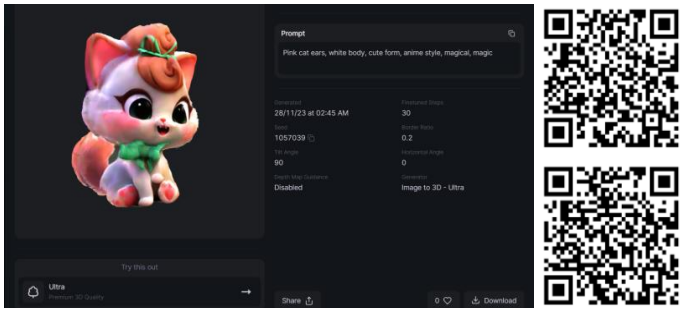

Figure 8. Artefacts.ai Images and Keywords Generate Models

3.4 Model Library and Keywords Generation of 3D Models

In addition to the three methods of model generation mentioned above, many AI tools also have model libraries, such as Sloyd AI and Imagine 3D. In this way, the user can use the 3D models in the model library without any pictures or text, or create a new model from an existing one. The Sloyd AI tool is a fast online tool for automated 3D asset creation, shown in Figure 9. as the open source model library. Users can search and directly download and use their favorite models.In addition, it is possible to customize the existing model, through the characteristics of the model shape, tilt angle, deletion and other operations to quickly obtain a "new" model. For example, as shown on the right side of Figure 10. the user can select a sofa model in the model library and add cushion elements to the model with the text "Sofa with cushions".

Figure 9. Sloyd AI Model Library

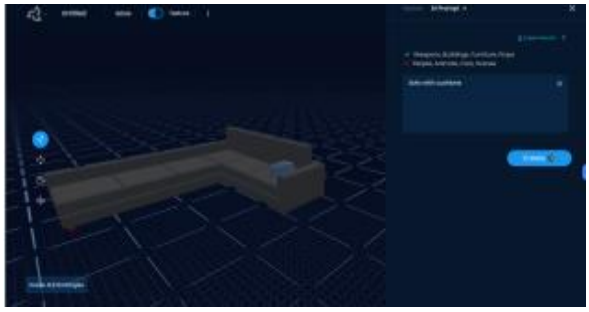

Figure 10. Keywords Generation Models

However, it is worth noting that Sloyd AI only applies to the generation of weapons, buildings, furniture, and props, and does not apply to the generation of keywords such as characters, animals, cars, and scenes, which is a limitation for the use and download of models.

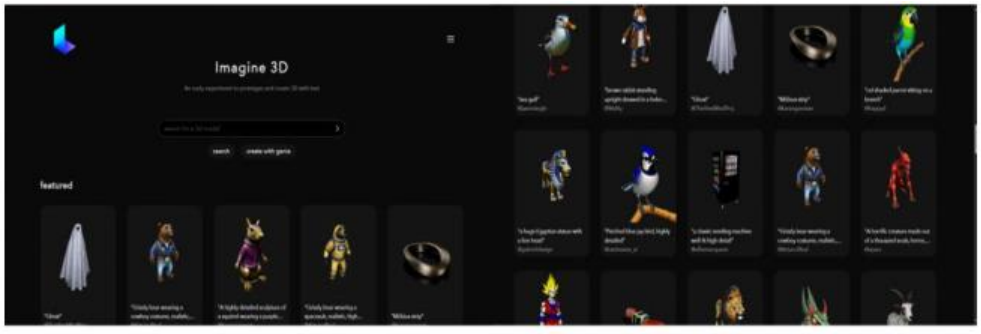

Figure 11. Imagine 3D Main Interface

4. Conclusion

In summary, this study summarizes and generalizes the four currently common methods of AI creation of models through specific sample examples. Not only does the use of these AI tools make the process of creating 3D models more efficient than traditional 3D modeling methods, but they are also highly pervasive, allowing users who do not have modeling skills to generate 3D models quickly and efficiently. Whether you're a game developer, designer, or just a 3D enthusiast, simple and efficient creation methods, a wide variety of creation tools, and AI technology provide the opportunity to turn ideas into reality. Although these tools still have some shortcomings in the perfection of high standard models, with the continuous emergence of several AI-generated 3D modeling software, as well as people's attention to AI, we have reason to believe that the fusion of AI and 3D modeling will open up a whole new field of creativity, so that people can release their creativity to the fullest extent in the virtual world and create more possibilities.

From an academic perspective, these methods are not just technical tools in practice, but also academic research involving deep learning, computer vision, and other fields.However, we also need to face up to some of the limitations of the current methodology, especially the challenge of creating high standard models.This provides important directions for future academic research, such as exploring more advanced algorithms and deep learning models to overcome the shortcomings of current models.This combination of academia and practice will have a more profound impact on the field of 3D modeling.

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