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# A Comparative Analysis Between <Leonardo.Ai> and <Meshy> as AI Texture Generation Tools

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***Abstract***

*In three-dimensional(3D) modeling, texturing plays a crucial role as a visual element, imparting detail and realism to models. In contrast to traditional texturing methods, the current trend involves utilizing AI tools such as Leonardo.Ai and Meshy to create textures for 3D models in a more efficient and precise manner. This paper focuses on 3D texturing, conducting a comprehensive comparative study of AI tools, specifically Leonardo.Ai and Meshy. By delving into the performance, functional differences, and respective application scopes of these two tools in the generation of 3D textures, we highlight potential applications and development trends within the realm of 3D texturing. The efficient use of AI tools in texture creation also has the potential to drive innovation and enhancement in the field of 3D modeling. In conclusion, this research aims to provide a comprehensive perspective for researchers, practitioners, and enthusiasts in related fields, fostering further innovation and development in this domain.*

***Keywords:*** *AI Generator, Texture, Leonardo.Ai, Meshy, Modeling, Physically-Based Rendering(PBR)*

## 1. Introduction

Meshy and Leonardo.Ai are both deep learning-based generative models designed to autonomously create high-quality textures. As the current leading and most outstanding AI texture generation tools, many individuals face difficulties when choosing between the two. To understand their differences and advantages and disadvantages, this article will introduce their respective key features and analyze their disparities in terms of generation quality, artistic style, and other aspects through practical production. This will provide users with insights when deciding between the two tools.

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## 2. Theoretical Background

Meshy is a 3D generative AI tool that offers AI modeling and texture tools to expedite the creation of 3D game assets. With Meshy, artists and creators can utilize AI texture tools to produce textures for models using text prompts or 2D concept art.

Leonardo.Ai has introduced the Texture Generation feature, a novel capability aimed at streamlining the process of creating textures for 3D models. This functionality involves the rendering of the entire UV texture by uploading a 3D model (.obj), providing textual prompts, and subsequently witnessing the automatic creation and projection of textures onto the 3D mesh. This feature exhibits a remarkable degree of contextual awareness, respecting pre-existing UV mappings, making it particularly well-suited for applications such as gaming or any other scenario that demands textured 3D models.

## 3. Basic Comparison

Meshy offers a separate option to directly choose artistic styles, while Leonardo can only be controlled through prompts. Leonardo's preview rendering feature allows testing prompts for optimal results. Before fully texturing the model, a preview render is generated, texturing a perspective view to test prompts and ensure the style aligns with the user's vision. Once satisfied, the process can continue to generate complete textures, saving time and effort. Meshy, however, lacks a preview function.

**Table 1. Basic Comparison**

| Characteristics | Meshy | Leonardo |
|---|---|---|
| Platform | Web App/Discord | Web App |
| Generation Method | Text to Texture | Text to Texture |
| Output Result | PBR | PBR |
| Auto UV Function | Yes | No |
| Resolution | 1K/2K/4K | 2K |
| Texture Format | png | jpg |
| Previews | Yes | No |
| Import Format | .fbx/.obj/.stl/.gltf/.glb | .obj |
| Max Imported Size | 50MB | 20MB |
| Export Format | .glb | .obj |
| Basic Generation Time | 2 - 5 minutes | 5 - 10 minutes |
| Free Tokens | 200 | 150 |
| Style Control Method | Button/Prompt | Prompt |

Both tools can generate PBR textures after texture generation. PBR textures generated by Meshy include color, metallic, roughness, and normal maps, allowing control over roughness and metallic properties. Leonardo generates maps for Albedo, Normal, Roughness, Depth and Displacement maps, with control over roughness.

These resources can be downloaded and seamlessly integrated into tools like Blender, Unity 3D, or other applications, facilitating a smooth design workflow. Import and export formats and size limits vary; Leonardo supports OBJ files up to 20MB, while Meshy supports .fbx/.obj/.stl/.gltf/.glb formats with a maximum file size of 50MB. If the model’s original format doesn’t meet requirements, it can be converted using 3D software like 3ds Max or Blender.

Export formats also differ, with Leonardo exporting to OBJ files and Meshy exporting to GLB files. Therefore, after downloading, these files can be directly imported into 3D software like Blender or Unreal Engine that supports GLB format. If GLB is not supported, importing into Blender first and then exporting to formats like FBX is an alternative.

In terms of generation time, Leonardo is slower, taking 5-10 minutes for a complete texture, while Meshy generally only requires 2-3 minutes. However, Meshy may experience queueing during peak usage, leading to wait times of 20-30 minutes.

Regarding tokens, Leonardo provides 150 tokens daily, with 5 tokens for a preview and 30 tokens for a complete texture. Meshy offers 200 tokens daily, requiring 15 tokens for one generation. Thus, currently Meshy allows for more free trials.

## 4. Production Comparison

Generate textures using the same model and the same prompt in both tools, then compare the quality of the two software in different artistic styles and at different levels of complexity.

*"prompt: an old wooden stool, HDR, high quality, Realistic/Animation style –no low quality, bad color "*

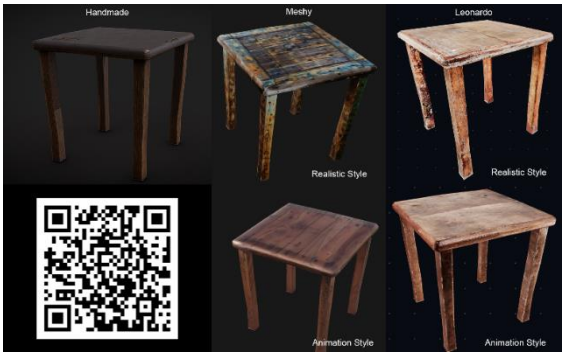


**Figure 1. An Old Wooden Stool**

In a realistic style, the textures generated by Meshy exhibit a lower tactile quality, consistently displaying unnecessary shades of blue-green in multiple attempts. Leonardo, on the other hand, offers a stronger sense of realism, with more consistent wood grain patterns and colors. In an animated style, both tools produce satisfactory quality textures, but Meshy aligns more closely with the stylistic requirements of animation.

*"Prompt: char Peugeot 1918 Tank, HDR, high quality, Realistic/Animation style –no low quality, bad color"*


**Figure 2. Tank**

When generating textures in a realistic style, Meshy produces textures with richer colors and details, albeit with a somewhat mottled appearance. In contrast, Leonardo's textures have a more uniform color and a stronger metallic feel. When it comes to generating textures in an animated style, Meshy excels in color coordination, details, and overall aesthetic, showcasing a distinctive animation style. Meanwhile, Leonardo's animated style is less pronounced, remaining closer to a realistic style.

*"Prompt: Jue wine vessel, Bronze, HDR, high quality, Realistic/Animation style –no low quality, bad color"*

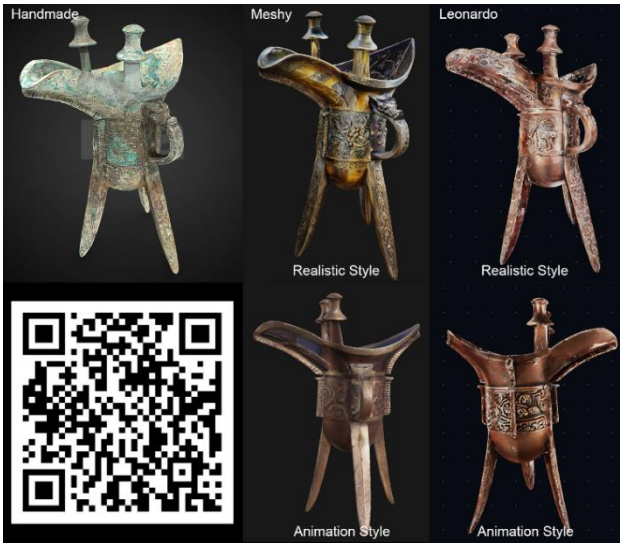


**Figure 3. Jue Wine Vessel**

Both tools are capable of generating textures effectively, with Meshy producing more intricate patterns, while Leonardo maintains a more uniform color palette and achieves a slightly higher level of realism. Additionally, when it comes to generating textures in an animated style, Meshy demonstrates a superior performance in terms of visual effects.

*"Prompt: Chinese dragon, HDR, high quality, Realistic/Animation style –no low quality, bad color"*


**Figure 4. Dragon**

When generating textures for a detailed dragon pattern in both styles, Meshy clearly outperforms Leonardo in terms of quality. Leonardo's generated textures exhibit color mottling issues and lack corresponding details. While Meshy produces higher-quality textures compared to Leonardo, there is still significant room for improvement, particularly in the handling of the dragon's head.

*"Prompt: Old Wooden House, HDR, high quality, Realistic/Animation style –no low quality, bad color"*


**Figure 5. Old Wooden House**

When generating textures in a realistic style, Meshy continues to experience color mottling issues, while Leonardo maintains a uniform color palette. Additionally, Leonardo handles details such as doors and windows more effectively, resulting in a stronger sense of realism. In terms of generating textures in an animated style, both tools perform well, but Meshy excels in animation style, offering richer colors and details.

*"Prompt: a girl, HDR, high quality, Animation style –no low quality, bad color"*

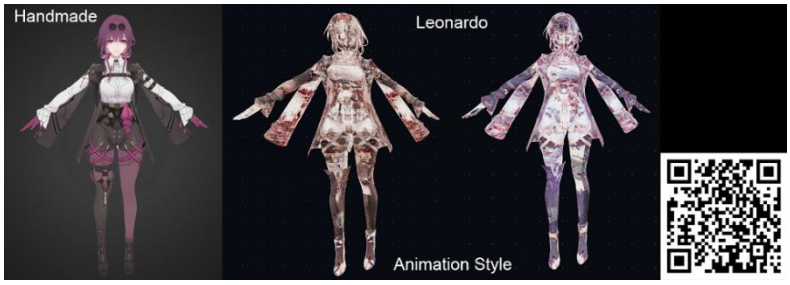


**Figure 6. A Girl**

Multiple attempts on Meshy consistently result in a prolonged wait after reaching 99% progress, ultimately displaying a task failure. Although Leonardo manages to complete the generation, the quality is exceptionally low. Despite the attempt to depict an animated-style girl, the texture appears fragmented and is entirely unusable.

*"Prompt: a mammoth, HDR, high quality, Realistic/Animation style –no low quality, bad color"*

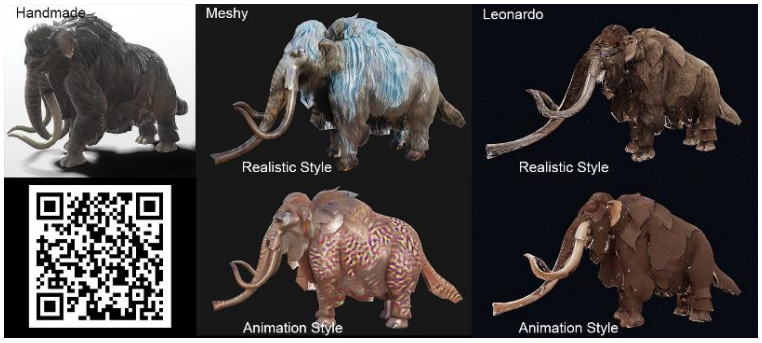


**Figure 7. A Mammoth**

When generating textures in a realistic style, both tools are capable of producing accurate textures. However, Meshy introduces unnatural blue areas. When creating textures in an animated style, Meshy generates peculiar patterns.

## 5. Conclusions

In conclusion, Meshy demonstrates exceptional proficiency in handling animated styles, while Leonardo showcases a distinct capability in realistic styles. The textures generated by Meshy exhibit a more vibrant and diverse color palette, whereas Leonardo excels in maintaining a consistent and uniform color style. However, due to the inherent unpredictability in artificial intelligence and existing technical constraints, both software options are currently best suited for managing models of lower complexity, often encountering unforeseen issues.

As advancements in artificial intelligence technology progress, AI texture generation is poised to fundamentally reshape the workflow of 3D designers, significantly boosting the efficiency of 3D model creation. In the current phase, users, such as 3D designers, can make their tool selection based on the specific features offered by each. For instance, Meshy proves ideal for crafting animated-style textures, while Leonardo is well-suited for the creation of realistic-style textures. Larger models exceeding 20MB can be effectively handled in Meshy, while those seeking a harmonized color texture may find Leonardo to be a more suitable option.

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