Interactive Texture Painting with Generative AI

Anita Hu
NVIDIA
anitah@nvidia.com

Nishkrit Desai
University of Toronto
nishkritdesai10@gmail.com

Ashley Goldstein
NVIDIA
agoldstein@nvidia.com

Hassan Abu Alhaija
NVIDIA
habualhaija@nvidia.com

Seung Wook Kim
NVIDIA
seungwookk@nvidia.com

Daniela Hasenbring
NVIDIA
dhasenbring@nvidia.com

Alexander Zook
NVIDIA
azook@nvidia.com

Rajeev Rao
NVIDIA
rajeevrao@nvidia.com

Maria Shugrina
NVIDIA
shumash@gmail.com

ABSTRACT

We present the first AI-powered tool for interactive texture painting on the surface of 3D objects. Our approach leverages an open-domain latent diffusion model adapted to support interactive texture painting with a vast variety of realistic textures. Using this tool, artists can augment their existing workflows, by turning any image into a brush that allows painting seamless infinite variations of any complex texture, while hallucinating realistic transitions between regions of different textures.

CCS CONCEPTS

• **Computing methodologies → Texturing**.

KEYWORDS

Generative Models, Materials, Textures, 3D

Figure 1: Fantasy cottage decorated using our system.

1 INTRODUCTION

Generative AI has reached new heights with open-domain image generation and even tiling material generation [Abu Alhaija et al. 2023], but direct artist control over material placement and local appearance on 3D objects has never been tackled with AI. To our knowledge, we show the first interactive painting system using AI to iteratively apply and interpolate any number of artist-selected textures directly on the surface of 3D objects. While there exist many comm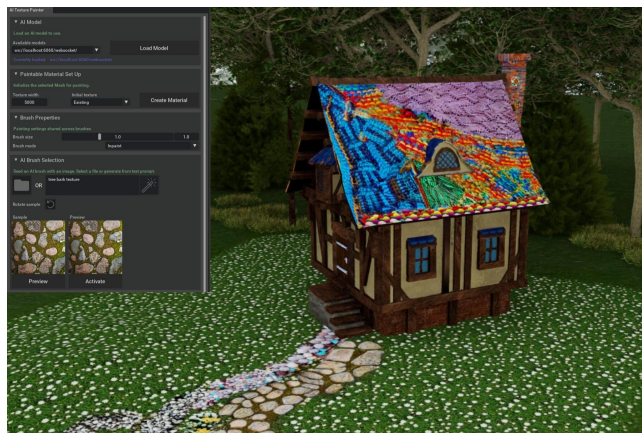ercial tools for 3D texture painting [Adobe 2023], these tools feature only simple stamp-based brushes or procedural techniques, and do not allow seamless application of complex artist-chosen textures, such as mossy rocks or knitting stitches as shown in Figure 1. In many cases, artists collect inspiration images to guide their texturing workflow, but are not able to source textures directly from these images. Using our tool, artists can turn any source image into a brush and paint with it, while AI generates variations and ensures seamless transitions.

2 METHOD

Our system leverages state-of-the-art Latent Diffusion Model [Rombach et al. 2021], which has been adapted for texture painting. To seamlessly paint a brush stroke onto a target texture, the AI model paints a brush stroke by inpainting multiple overlapping square brush stamps. The inpainting process is conditioned by a reference texture image which can also be AI generated from a text prompt. With this model, our system is capable of generating new texture variations in each stamp of the brush stroke while ensuring consistency with the artist-chosen target texture. To achieve a smooth painting experience, the model is highly optimized with NVIDIA TensorRT to generate brush stamps in real-time. Our model operates in render space that is tangent to the mesh surface at the brush tip and we backproject the generated output to the texture image

by rasterization and performing texture mapping. This allows the artist to control the directionality of the texture interactively and paint on curved areas with minimal distortion.

REFERENCES
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