

Generative AI: An Innovative Approach for 3D Printing

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Abstract: The advancements in generative artificial intelligence (AI) and deep learning have transformed 3D modeling, opening up 3D printing to people who have never used computer-aided design (CAD) tools like Blender, AutoCAD, or SolidWorks. In order to eliminate the necessity for manual 3D modeling, this study investigates the creation of an AI-driven system that can automatically produce stereolithography (STL) files from natural language descriptions. The suggested approach combines audio-to-image production with text-to-3D conversion, enabling users to supply audio inputs that are transformed into 2D graphics. Then, utilizing sophisticated 2D-to-3D conversion models, these produced images are converted into 3D-printable STL files. Based on user-specified characteristics including shape, size, and functionality, the system creates 3D models using diffusion models, deep learning algorithms, and Natural Language Processing (NLP). Iterative refinement is made possible via an interactive feedback loop, which guarantees model fidelity prior to the final STL creation. This study also emphasizes the drawbacks of AI-driven 3D model creation, such as the lack of datasets, computational difficulty, and structural errors. This study offers a strong framework for democratizing 3D printing, lowering dependency on sophisticated CAD software, and enabling users to turn their concepts into actual items with little technical know-how by combining audio-to-image and 2D-to-3D conversion techniques.

Keywords: 3D Printing, STL Generation, AI-driven Modeling, Text-to-3D, Generative AI, Deep Learning, Neural Networks, Audio-to-image.

