

Scaling Mesh Generation via Compressive Tokenization

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Code & Ckpt

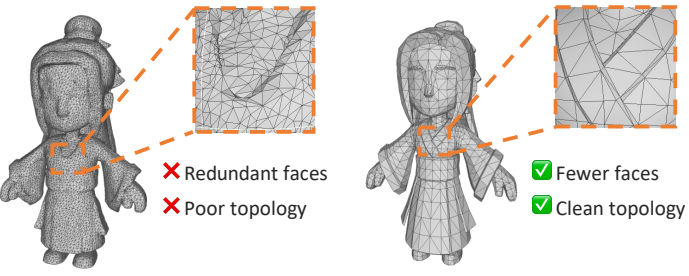


Hunyuan3D



Author WeChat

Topology Matters For 3D Meshes

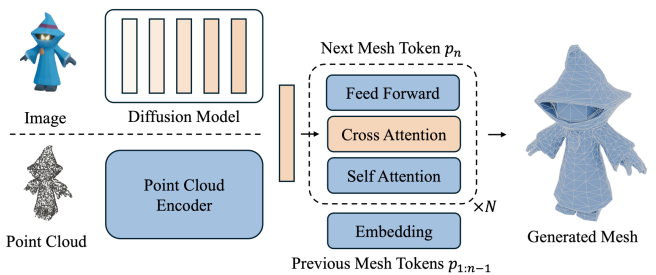


Mesh Extracted From Implicit Field Mesh Crafted by Designers

Challenges for existing 3D generative models:

- **Redundant Faces**: extracted meshes typically contain excessive polygons, which are unsuitable for real-time applications (e.g., games).
- **Poor Topology**: Chaotic edge flow in extracted meshes blocks animation-ready workflows (e.g., rigging/skinning).

Native Mesh Generation via Autoregression

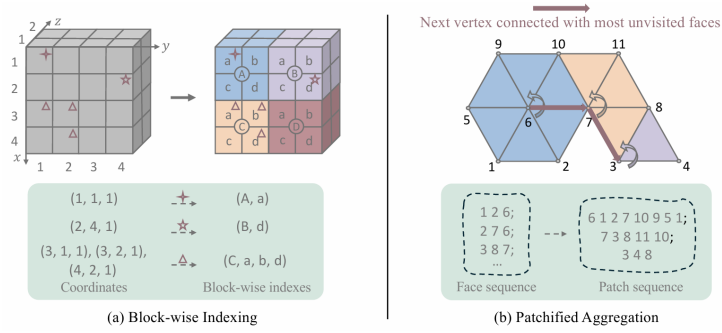


Formulate mesh generation as **next-mesh-token prediction**:

1. Tokenize mesh (triangle soups) into a 1D coordinate sequence.
2. Model the mesh sequence with GPT-style Transformer. → It's difficult due to the LONG mesh sequence.
3. Decode the sequence back to the final mesh.

Q: How to design an effective (compressive) tokenization for 3D mesh?

BPT: A Highly Compressive Mesh Tokenization



(a) **Block-wise Indexing (vertex level)**: convert x-y-z (3 token) coordinates into block-wise indexes (at most 2 token). Achieve around 50% compression.

(b) **Patchified Aggregation (face level)**: aggregate multiple adjacent faces into a patch (one for patch center and others for patch border). Reduce around 50% tokens per face.

Pioneer the Long Context Era for Mesh Generation

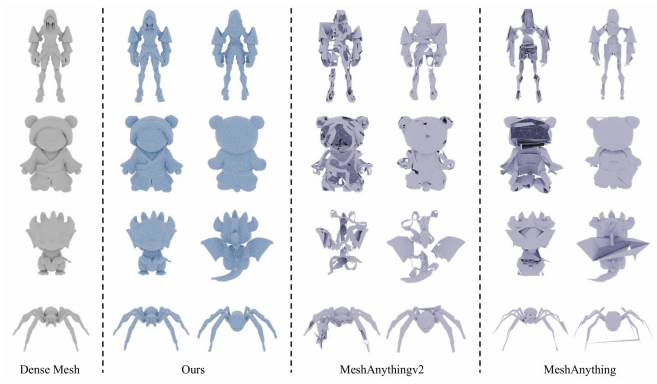
With BPT, our model handles at most 8k faces within the same context window, allowing **the learning of highly complex topology**.

Tokenization	MeshAnythingV2	EdgeRunner	BPT
Compression (%)	46%	47%	26%

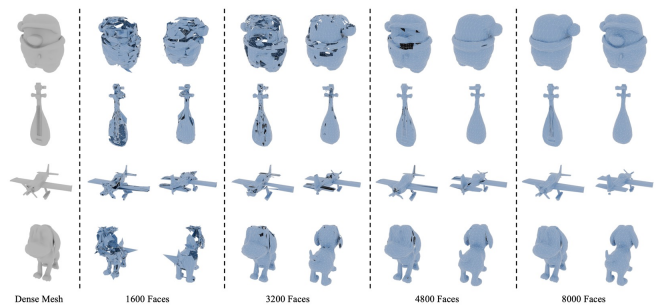
0-2k Faces	2k-4k Faces	4k-6k Faces	6k-8k Faces
MeshAnything	EdgeRunner	Ours	

Experiments

1. Dominant performance improvement compared with baselines



2. Performance is boosted as max #faces of training mesh scaled



3. Textured mesh generation combined with Hunyuan3D 2.0

