

Supplementary Materials: MaterialSeg3D: Segmenting Dense Materials from 2D Priors for 3D Assets



Colored Mesh

Multi-View Renderings with PBR Material

Figure 1: Visualizations of the rendering effect on the colored meshes when attaching the PBR material predicted by our MaterialSeg3D method. .

1 PARAMETERS OF PBR MATERIAL

As mentioned in Sec. 4.3, we propose **Materialized Individual Objects (MIO)**, including labels of 14 material classes with the mapping with applicable PBR material (Roughness, Metallic). The specific parameters of PBR material for each label are displayed in Tab. 1. Each value is assigned through discussions among professional modelers, obtained by averaging similar materials included in the material library (*i.e.* smooth wood, rough wood, composite wood).

2 LIMITATION

We provide additional visualizations of our proposed workflow, MaterialSeg3D, applied on geometry meshes with Albedo UV information. As shown in Fig. 1, after attaching PBR materials predicted by MaterialSeg3D, 3D assets can produce correct reflection effects for illuminations in different environments, which can be observed obviously on the wheels of cars and the smooth edges of chairs. However, when we tried to expand the application scope of our method on

Table 1: Detailed parameters of PBR materials in label classes of MIO dataset.

label	roughness	metallic
metal	62.71	255.0
wood	195.44	0.0
plastic	46.78	0.0
glass	0.0	0.0
paint	129.12	0.0
rubber	150.53	0.0
leather	74.36	0.0
fabric	96.56	0.0
fruit&leaf	117.79	0.0
flower	132.10	0.0
brick	123.61	0.0
porcelain	16.59	0.0
clay terracotta	153.42	0.0
concrete	134.92	0.0

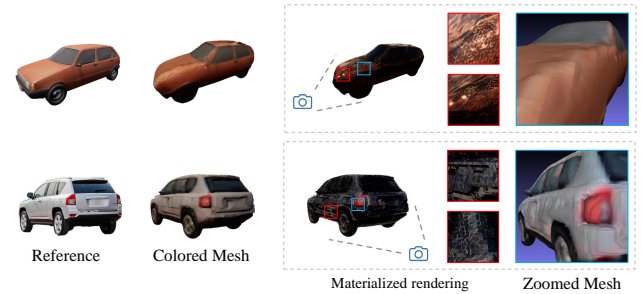
diverse 3D assets, some limitations appeared that influenced the visual performance of the rendering effect.

2.1 Baked RGB Texture

As mentioned in Sec. 7, the first limitation of our method is that if we try to apply the output mesh and Albedo from existing Single-Image-to-3D methods, their Albedos are unable to decouple default illumination from the reference image, resulting in a baked RGB texture with light reflection. Even though this phenomenon will not influence the segmentation accuracy of the material segmentation model and the final PBR material mapping as the dataset includes such distributions with lighting effects in real-world images, the final performance of the materialized rendering meshes will indeed be affected due to the incorrect Albedo baked with reflections. An example from Wonder3D [1] is shown in Fig. 2. In the reference image, the real RGB color of the engine cover should be red, but it is displayed as white due to the illumination and the reflected effects of the reference object. In novel-view constructions, the base color of the engine cover remains white, resulting in the Albedo UV of the final generated geometry mesh being white as well. This baked reflected effect will lead to distortion when material information is applied in further renderings. Our method currently does not provide countermeasures for this situation when dealing with automatically generated 3D meshes from Single-Image-to-3D methods. Subsequent research will try to refine the baked Albedo information through finetuning.

2.2 Poor Geometry Mesh Quality

Another limitation mentioned in the main body claims the impact of mesh quality on the rendering effect after attaching PBR materials. 3D assets obtained from Objaverse include geometry meshes with smooth surfaces and differentiable components, while meshes generated from 3D generation methods are covered with rugged triangular faces, resulting in discontinuous reflections when attaching materials with higher reflectivity. Two examples are provided in Fig. 3 with visualizations. The upper mesh is obtained from Wonder3D [1], and

**Figure 2: Visualization of the baked RGB texture in the generated 3D mesh from Single-Image-to-3D method. The sample is processed through Wonder3D [1].****Figure 3: Visualizations of the rendering effect on poor quality meshes. The upper sample is from Wonder3D [1], and the bottom sample is from TripoSR [3].**

another is from TripoSR [3]. Given a reference image, both methods generate an acceptable colored mesh rendered from the reference view. However, the visual performance becomes extremely unsatisfactory when the correct PBR material is applied to these meshes. In the materialized renderings, the surface tends to be uneven and discontinuous under illuminations with clear edges and rapid normal angle shifting. In the zoomed meshes, it is clear that the problem mentioned above is caused by the lack of continuity of the plane and surface constructed by triangular faces. As most current methods export meshes from NERF [2], they share this problem similarly. Further adjustments and refinements should be made on the generated meshes to maintain better performance on the geometry surface.

REFERENCES

- [1] Xiaoxiao Long, Yuan-Chen Guo, Cheng Lin, Yuan Liu, Zhiyang Dou, Lingjie Liu, Yuexin Ma, Song-Hai Zhang, Marc Habermann, Christian Theobalt, et al. 2023. Wonder3d: Single image to 3d using cross-domain diffusion. *arXiv preprint arXiv:2310.15008* (2023).
- [2] Ben Mildenhall, Pratul P Srinivasan, Matthew Tancik, Jonathan T Barron, Ravi Ramamoorthi, and Ren Ng. 2021. Nerf: Representing scenes as neural radiance fields for view synthesis. *Commun. ACM* 65, 1 (2021), 99–106.
- [3] Dmitry Tochilkin, David Pankratz, Zexiang Liu, Zixuan Huang, Adam Letts, Yangguang Li, Ding Liang, Christian Laforte, Varun Jampani, and Yan-Pei Cao. 2024. TripoSR: Fast 3d object reconstruction from a single image. *arXiv preprint arXiv:2403.02151* (2024).