Computer Vision, 3D Lab 2

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Part A: Silhouette Rendering

1. Silhouette Rendering, Differentiability.

Silhouette Rendering provides a non-parametric differential resterizer based on the silhouettes.

We achieve differentiability we solve the **Z** and **XY discontinuity** problems by using Soft Aggregation:

Z discontinuity: Blend the closet K faces in the Z-direction.

XY discontinuity: Consider faces within a blur radius.

2. 3 Views.

Generally speaking, the more the training silhouette examples the better the predictions are, but the slower the convergence becomes, **Figures 1.a** and **2.a**. However, the limited angles of the silhouettes gives good predictions on these training angles, while giving wrong precision in the remaining views, **Figures 1.b** and **2.b**.

Part B: Textured Rendering

1. Textured Rendering vs. Silhouette Rendering.

In **Silhouette Rendering** we deform the geometry of the target shape by minimizing the four geometrical losses, Chamfer, Normal, Edge, and Laplacian of the projected Silhouette. While in **Textured Rendering** we're trying to deform the initial mesh geometry to the target geometry, and assigning a color (RGB) value to the mesh faces, by having an additional **RGB loss** term.

2. TexturesUV.

I. UV vs Vertex

TexturesUV: vertex UV coordinates and one texture map for the whole mesh. For a point on a face with given barycentric coordinates, the face color can be computed by interpolating the vertex uv coordinates and then sampling from the texture map. This representation requires two tensors (UVs: (N, V, 2), Texture map:(N, H, W, 3)`), and is limited to only support one texture map per mesh.

TexturesVertex: D dimensional textures for each vertex (for example an RGB color) which can be interpolated across the face. This can be represented as an (N, V, D) tensor. This is a fairly simple representation though and cannot model complex textures if the mesh faces are large.

II. Observations

The RGB in UV is better than the Vertex, **Figure 3.a** and **4.a**.

The UV Map is trying to mimic the ground truth textures, **Figure 5**.

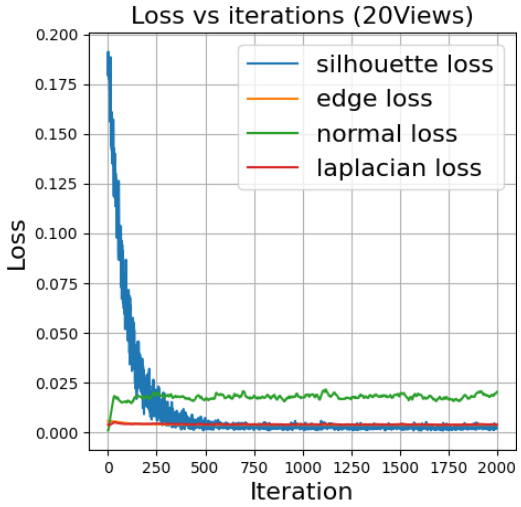

Figure 1.a.

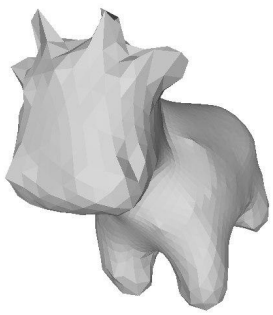

Figure 1.b

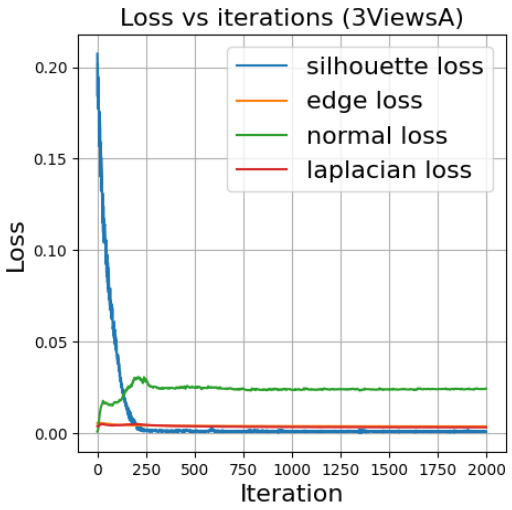

Figure 2.a.

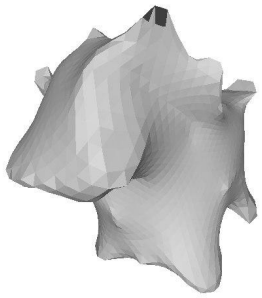

Figure 2.b

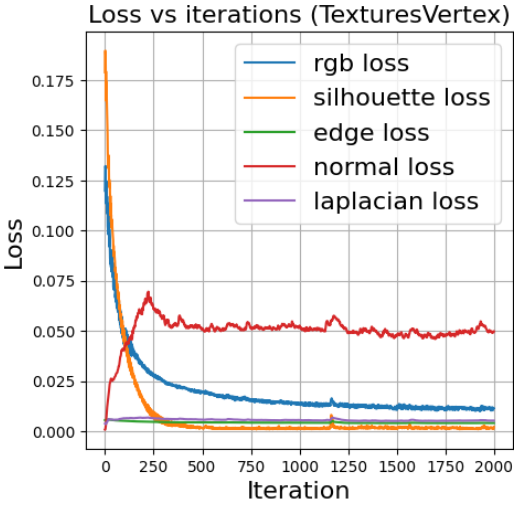

Figure 3.a.

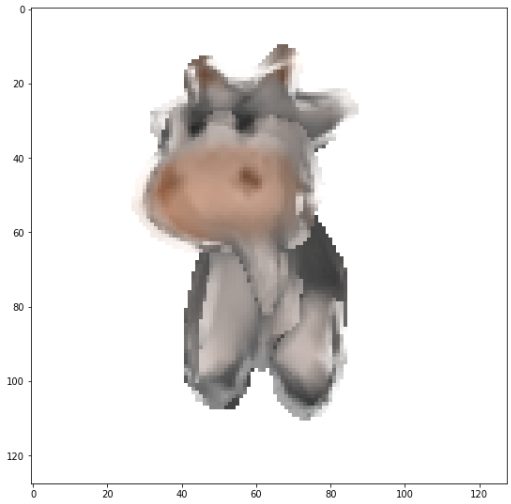

Figure 3.b

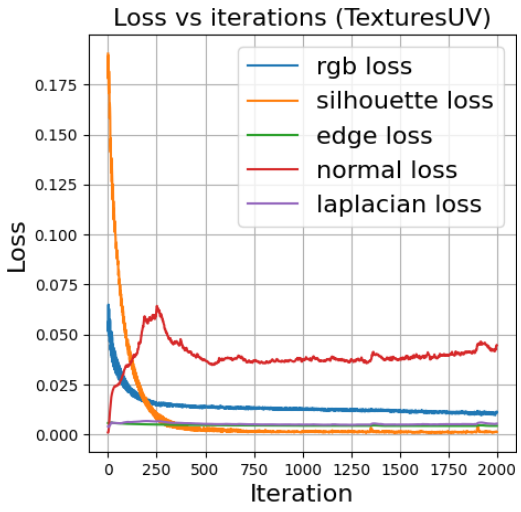

Figure 4.a.

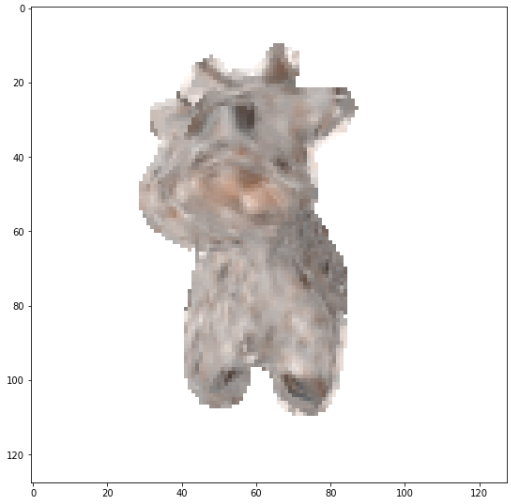

Figure 4.b

Figure 5.a.

Prediction

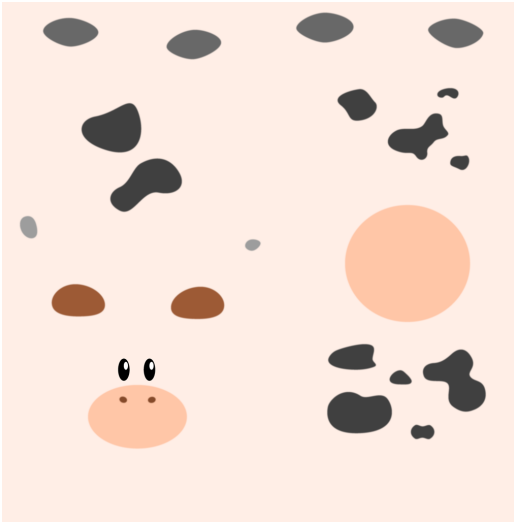

Figure 5.b

GroundTruth