

PROJECT PROPOSAL REPORT

SP-GAN: SPHERE-GUIDED 3D SHAPE GENERATION AND MANIPULATION

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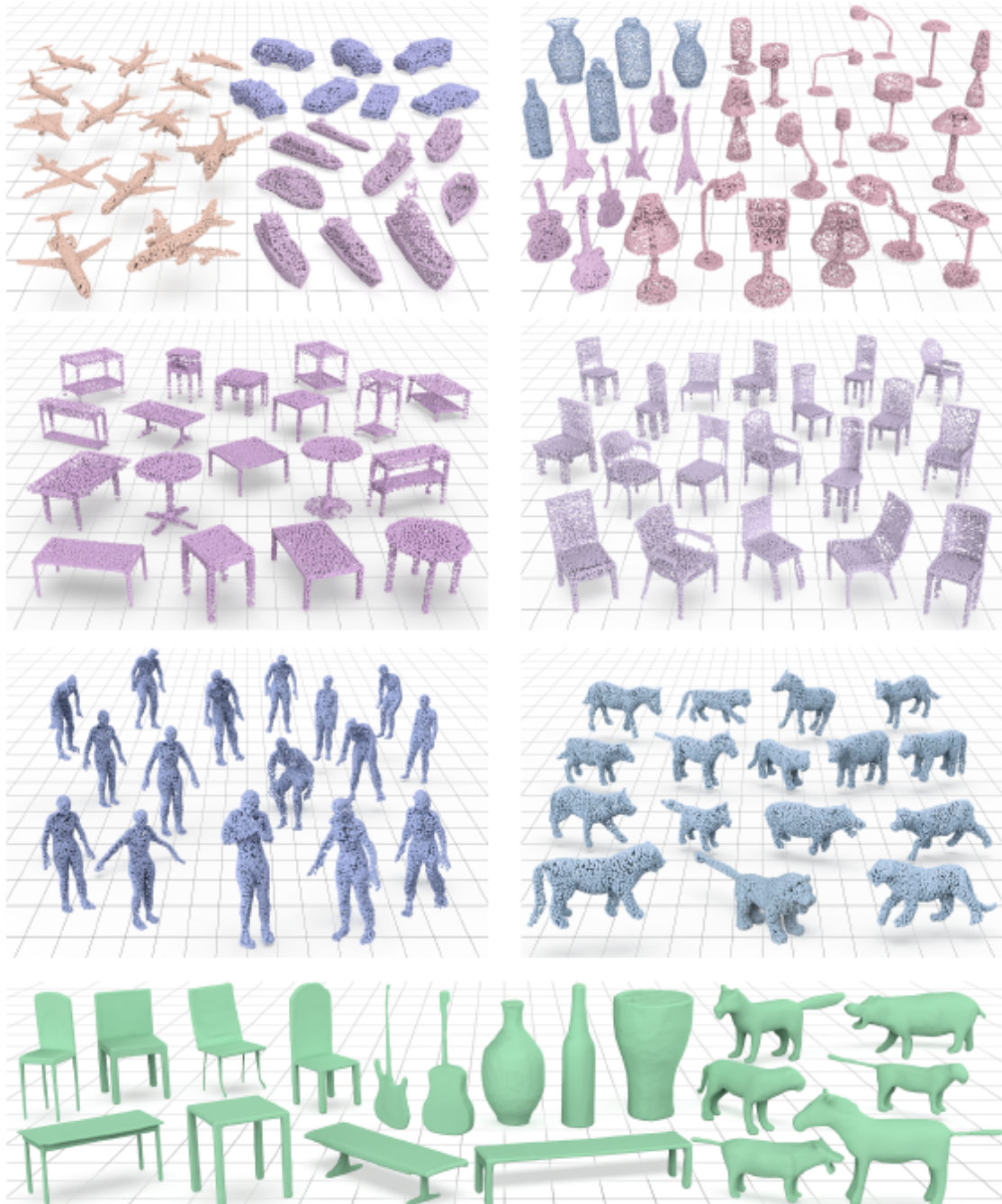
0.1 PROPOSAL

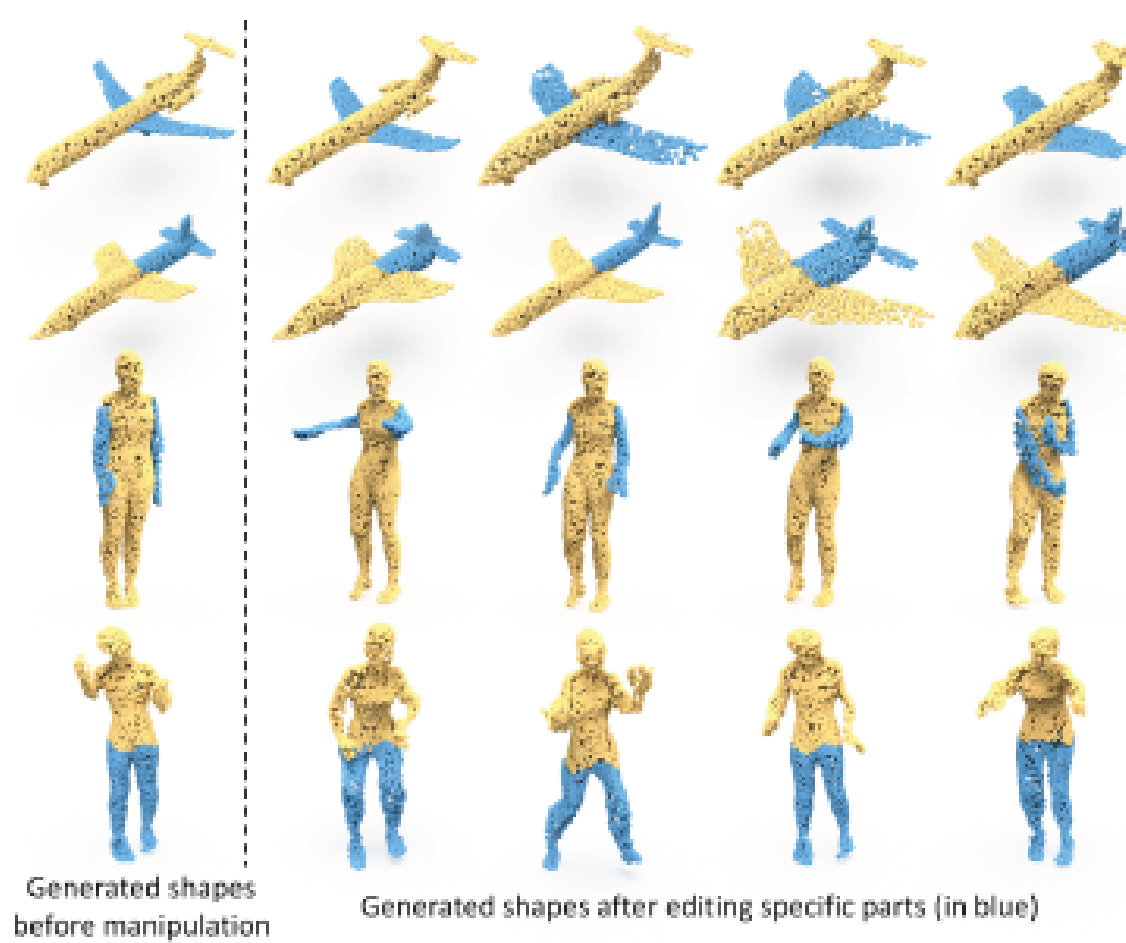
The paper presents a new approach of 3D shape generation with GAN's which they refer as SP-GAN. The approach is to generate spheres that are able to synthesize diverse and good quality shapes. The model is an unsupervised sphere-guided generative model. They used no annotations in any parts. The results of this model are very promising. They have more control over the generation and manipulation parts compared to other GAN's. There are 5 objectives and show cases achieved using SP-GAN in this paper [1]. My goal is to work on these 5 objectives and successfully implement each of them. The code is provided and open source.

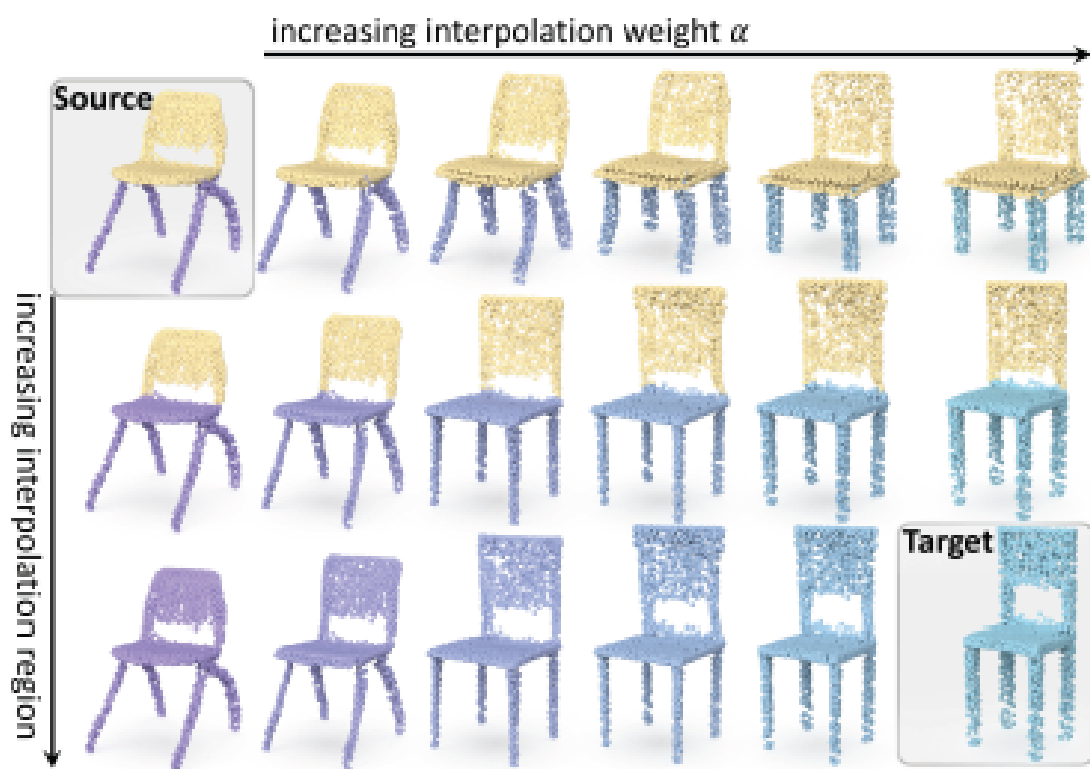
- Shape Generation: Output of SP-GAN's generate many different shapes of point clouds. Afterwards the goal is to reconstruct it into real world objects. Figure 1 is the given example of this case.
- Single-shape Part Editing: Two objects that have similar parts are targeted and generated in this case. They call it locating the local latent codes and replacing it with a similar shape to the original object. Figure 2 is the given example of this case.
- Shape Interpolation: In this case they linearly interpolate between shapes from source to target. They divide this interpolation into two sub parts. Shape-wise and part-wise interpolation. Figure 3 is the given example.
- Multi-shape Part Composition: The idea is to generate a shape from multiple generated compositions of shapes. The local parts of the shapes are different so the target learns from multiple local parts from the parent shapes. Figure 4 is the given example.
- Part Co-Segmentation: In this case, manual segmentation of one shape simultaneously creates point-wise labels of other shapes. The model creates automatically segmented shapes from manual segmentation. Figure 5 is the given example of this case.

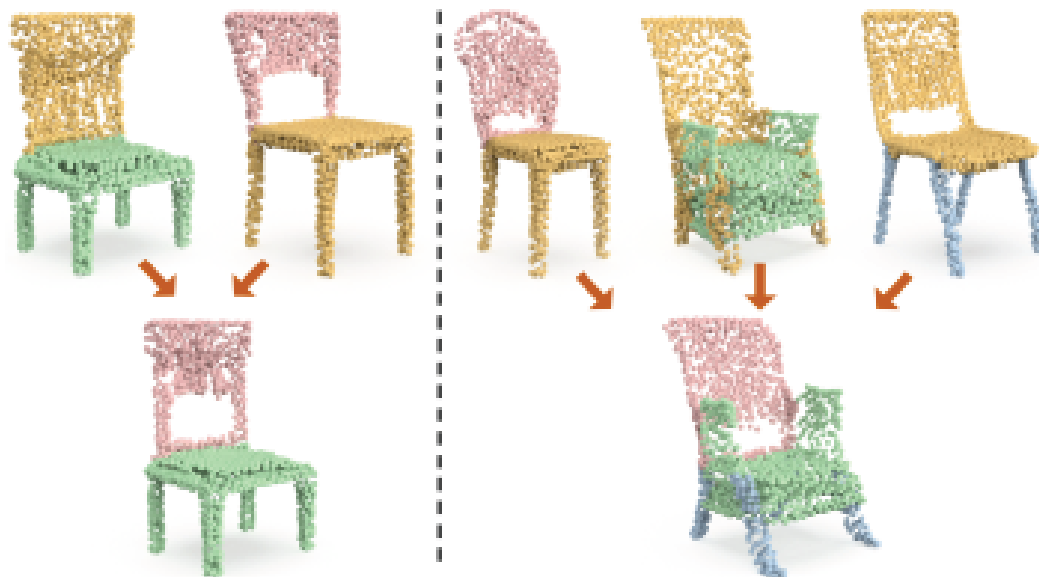
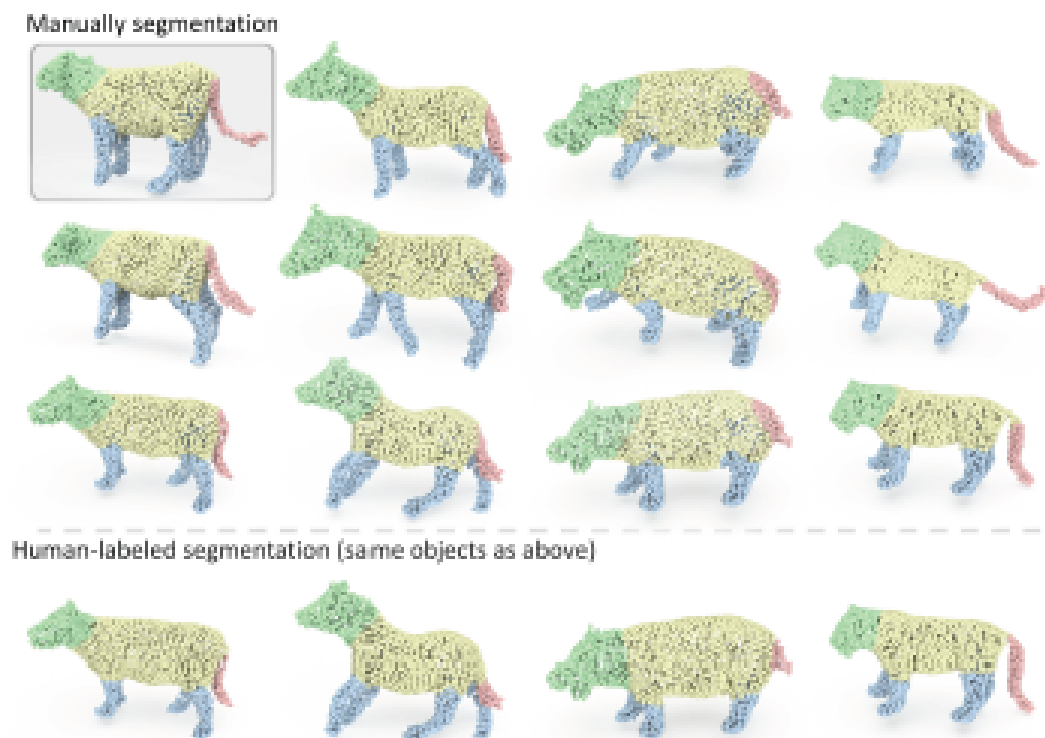
0.2 APPENDIX

The associated repository can be found at: [here](#)

**Figure 1:** Shape Generation Graph

**Figure 2:** Single Shape Part Editing Graph

**Figure 3:** Shape Interpolation Graph

**Figure 4:** Multi-shape Part Composition Graph**Figure 5:** Part Co-Segmentation Graph

Bibliography

- [1] Ruihui Li, Xianzhi Li, Ka-Hei Hui, and Chi-Wing Fu. Sp-gan: Sphere-guided 3d shape generation and manipulation, 2021.