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Reconstruction of 3D Surfels from Neural Radiance Fields

by
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Abstract. The inference of 3D models from 2D images is a prominent study area in computer graphics and artificial intelligence. Among the various approaches, Neural Radiance Fields (NeRF), a multilayer perceptron-based model, excels at inferring 3D models from 2D representations. By training the NeRF model with a varied set of images captured from different viewing directions, it can generate opacity and color values using 5D vectors, which consist of 3D coordinates and 2D viewing directions. Regardless of NeRF's efficacy, selecting the most optimal form of 3D representation remains an ongoing challenge.

This thesis focuses on identifying and enhancing algorithms for generating suboptimal models by evaluating various settings. The main objectives include advancing the understanding of 3D reconstruction algorithms, optimizing their performance, and determining effective parameter combinations for high-quality 3D models. Point cloud models are generated from NeRF using diverse parameters to attain this goal, followed by the reconstruction of a surface mesh from the generated point clouds. Several evaluation metrics are employed to evaluate the models, and results show a substantial level of achieved reconstruction quality. The evaluation results show that the generated point clouds exhibit a higher level of quality in comparison to the mesh models.