From Projection to Perception: A Mathematical Exploration of Shadow-based Neural Reconstruction

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Abstract

This paper explores ShadowNeuS [LWX23], a neural network that reconstructs 3D geometry from single-view camera images using shadow and light cues. Unlike traditional 3D reconstruction methods relying on multi-view cameras or sensors, ShadowNeuS leverages a neural signed distance field (SDF) for accurate 3D geometry reconstruction. Analysis of the training process reveals deep connections to projective geometry, spatial reasoning in $\mathbb{R}^3$, and the network's perception of three-dimensional space.

Contents

1 Introduction

References

[LWX23]   Jingwang Ling, Zhibo Wang, Feng Xu. *ShadowNeuS: Neural SDF Reconstruction by Shadow Ray Supervision*. arXiv: 2211.14086, 2023.