

Simulating object shadow creation from a light source in virtual reality

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Abstract: This thesis presents a method for simulating object shadowing from a single light source within a virtual reality environment. The primary objective is to develop a computationally efficient algorithm that generates realistic, dynamic shadows to enhance spatial perception and visual fidelity. The proposed approach leverages a modified shadow mapping technique optimized for real-time performance, addressing common artifacts such as aliasing and perspective distortion. By integrating the algorithm with a head-mounted display, the system accounts for the user's changing viewpoint, ensuring shadows remain consistent and immersive. Experimental evaluations demonstrate that the method achieves high frame rates while maintaining visual quality, significantly improving depth cues and object localization compared to standard non-shadowed rendering. The findings confirm that accurate, single-source shadow simulation is critical for creating convincing virtual spaces, with implications for training simulations, architectural visualization, and interactive 3D applications. This work contributes to the broader goal of achieving perceptual realism in virtual reality through efficient lighting simulation.

Keywords: shadow simulation, virtual reality, light source, object rendering