

Some types of light sources and illumination in virtual reality

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Abstract: This thesis investigates the representation and application of various light source types and illumination techniques within virtual reality (VR) environments. While realistic lighting is crucial for immersion, VR presents unique challenges, including the need for high frame rates and dynamic interaction. This study systematically examines the implementation of point, directional, spot, and area lights, alongside global illumination methods such as baked lightmaps and real-time approximations like screen-space reflections. A comparative analysis evaluates the visual fidelity and computational performance of each technique within an interactive VR framework. The findings demonstrate that a hybrid approach, combining precomputed static lighting with dynamic local sources, offers the optimal balance between realism and real-time efficiency. Furthermore, the research explores the perceptual impact of lighting on depth perception and spatial presence. The results provide practical guidelines for developers to achieve convincing, performance-optimized illumination in VR, contributing to the advancement of immersive virtual experiences.

Keywords: Virtual reality, light sources, illumination, rendering