Lighting is a critical aspect of creating immersive and visually appealing video game environments, setting the mood, guiding player attention, and enhancing the overall aesthetic of virtual worlds (El-Nasr et al). However, achieving high-quality lighting in video games is a complex task that requires careful consideration of performance, artistic style, technical constraints, and target hardware (Akenine-Möller et al). Game developers must strike a balance between visual fidelity and computational efficiency, employing optimization techniques such as pre-computed lighting, light probes, level-of-detail (LOD) techniques, hardware acceleration, and the utilization of graphics APIs like DirectX and Vulkan to reduce computational overhead while maintaining acceptable visual quality (Akenine-Möller et al; Lambru et al; Iones et al; Wang).

This research paper will explore various lighting techniques used in video games, including static lighting (pre-computed, non-dynamic lighting), dynamic lighting (real-time lighting that updates with changes in the environment), global illumination, and physically based rendering (a lighting model that simulates light behavior based on real-world physical properties). It will examine their implementations, performance considerations, and suitability for different game types and platforms. The paper argues that balancing performance and visual quality in video game lighting is a dynamic equilibrium that varies based on factors such as artistic style, technical constraints, targeted hardware, and intended gaming experience (El-Nasr et al). By analyzing the trade-offs between performance and visual quality, this paper aims to provide insights into achieving the desired balance that enhances the overall gaming experience without compromising performance.

**The impact of advanced lighting techniques on game realism**