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GENERATIVE ADVERSARIAL NETWORKS & NEURAL RENDERING, IS TRADITIONAL RENDERING BECOMING OBSOLETE?

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dans L'ingénierie

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Traditional rendering has long been the backbone of computer graphics to generate digital scenes and bring them to life. These methods, often reliant on ray tracing and rasterization, simulate the interaction of light with objects and materials, resulting in realistic visual representations.

The problem, however, is that traditional rendering comes with its challenges. Achieving photorealistic images demands enormous computational resources and significant time investment. These limitations have fueled the search for more efficient and effective rendering solutions. To make matters worse, any alteration to the virtual scenes requires us to redo the rendering process from scratch, making the process even more tedious.

The evolution of Artificial Intelligence and Deep Learning in recent years has given rise to a groundbreaking approach known as **neural rendering**. The latter leverages neural networks, inspired by the human brain's structure, to tackle the complexities of scene generation. This innovative technique represents a paradigm shift in computer graphics.

Amongst the approaches of neural rendering, **Generative Adversarial Networks (GANs)** are at the forefront. GANs consist of two neural networks (the generator and the discriminator) engaged in a competitive process. The generator strives to render increasingly realistic output (images or videos) while the discriminator assesses and critiques the generated output. This adversarial training leads to the generation of highly detailed and convincing renders, making GANs a powerful tool in neural rendering.

What we propose is to construct a Generative Adversarial Network capable of capturing key features of a virtual scene (i.e., **scene geometry**, **material properties**, and **light interaction**) and using them to render a realistic render in real time.

Neural rendering holds immense capabilities for addressing the shortcomings of traditional rendering techniques. By harnessing the power of neural networks, it significantly reduces the computational power and time required for rendering realistic scenes. Neural rendering also offers the potential to **alter** the rendered scene on the fly by changing its lighting, geometry, and material properties in real time.

This proposal builds upon two 2022 research papers that employ GANs for ambient occlusion and fog generation. The primary objective is to develop an approach capable of producing photorealistic renders while allowing for the implementation of various lighting and material setups, all without the resource-intensive and time-consuming demands of traditional rendering.