DH2323 Project Specification : Implementing a Pathtracer

Jonathan Guichard

Background

Pathtracing is a computer graphics method of rendering images of three-dimensional scenes such that the global illumination is faithful to the reality. It "naturally" simulates many effects, such as shoft shadows, ambient occlusion and indirect lighting, that otherwise have to be coded into rendering methods like raytracing. The fundamental principle allowing this consists of casting light rays starting from the camera, then recursively casting new random rays in order to determine the color of the hit area, by using the rendering equation.
This method can produce photorealistic results as shown below, but also requires a long rendering time in order to obtain a noiseless image - as a great number of rays must be traced. Pathtracing plays a significant role in the movie industry and is often used to generate reference images used to judge other rendering methods.

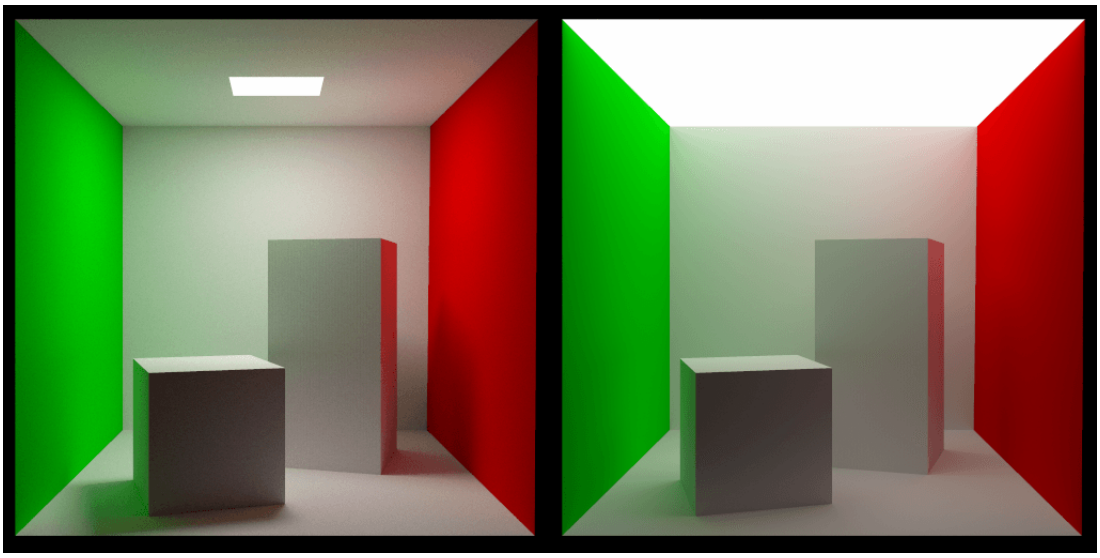

Figure 1: Example of cornell box rendered with pathtracing

Specification

The goal of this project is to implement a very simple pathtracer, capable of rendering a scene of the same complexity as the one used in labs 2 and 3 of the rendering track.
In other words, the pathtracer we implement must be capable of rendering a simple Cornell

Box with a fixed surface light source on the roof, of variable size and emitted color. The camera has a fixed position and can not rotate, and we consider all the objects present in the scene to be made of the same material and to be ideally diffuse. We do not render any complex materials and phenomenons that would require some specific handling, such as water, glass, specular surfaces or caustics, to only name a few.
Time permitting, more complex features might be added on top of this initial kernel.

The objective of this project is to be able to render a cornell box and to compare pathtracing to the two other different rendering methods implemented during the labs of the rendering track. We also want to explore the effect of the number of samples (i.e. the number of rays being recursively traced) and the maximum recursion depth on the final rendered image.