Report project 3 - Advanced Graphics (2020)

Amber Elferink(5491525) & Ymke Wegereef (3971457)

Implemented functionality

We converted our existing ray tracer into a path tracer (using lighthouse 2) with the following new functionality:

- Multiple importance sampling
- A photon map (with 1000000 photons) is build during initialization. Photons are stored in a hashed grid that is build around the scene.
- Photon based Next Event Estimation as described in the master thesis of Andreas Mikolajewski (see sources).
- Packet Traversal as described in Overbeck et al. in their paper “Large Ray Packets for Real-time Whitted Ray Tracing”. This was implemented for the whitted raytracer primary rays with frustra, for the pathtracer for the primary rays and the metallic rays. The intersection methods for both the nodes and the primitives are fully AVX.

One can switch between ray and pathtracer within the core_settings.h, although the light is a bit too strong in current scene for the raytracer.

Division of work

For this assignment we first implemented a basic path tracer together. Once this was finished, Ymke worked further on the importance sampling and PNEE and Amber worked on packet traversal.

Sources

- Efficient data structures and sampling of many light sources for Next Event Estimation, by Andreas Mikolajewski
- Large Ray Packets for Real-time Whitted Ray Tracing, by Overbeck et al.