02562 Rendering - Introduction DTU Compute

Worksheet 10

The purpose of this worksheet is to show the links between rendering using software toolsets for 3D computer graphics (we will use Blender) and the rendering techniques implemented during the course. When using the rendering tools integrated into 3D modelling softwares, we can more easily compose a nice scene and prepare content for being rendered. However, integrated rendering tools are often also limited in their capabilities and therefore often restrict our freedom to operate.

Learning Objectives

- Render a scene using a production-ready path tracer.
- Use a high dynamic range (HDR) panoramic image as environment lighting.
- Cast shadows on the environment.
- Use a principled shader for simulating light-material interaction in a global illumination context.

Production rendering

Render synthetic objects into a photographed environment. This is a very common rendering task when special effects are produced for movies and when new product designs and architectural designs need to be visualised. We will try this out using Blender (https://www.blender.org/). Make sure that you have Blender installed and then work on the following exercises.

- Render the Blender default scene with a cube using the Cycles renderer (enable GPU Compute if you prefer).
- Select a panoramic 360 degrees high dynamic range (HDR) image as an environment texture for the background color. Delete the default point light to let the environment constitute the lighting environment for the scene.
- Add a planar quad to the scene. Scale the quad and position it below the cube. Set its object properties so that it is invisible but catches shadows.

1. Add a sphere to the scene and place it next to the cube. Render both objects with a Principled BSDF material set up to produce mirror appearance.
2. Modify the Principled BSDF so that the sphere becomes a metallic, glossy, colored ball and the cube becomes a transmissive glass cube (IOR 1.5) and render the scene.
3. Import a triangle mesh make a cool scene and include your best rendering(s) in your lab journal. Adjustment of rendering parameters (e.g. Max Bounces) may be needed to get the right result. Explain the material settings that you used and your choice of rendering parameters.
4. Discuss the pros and cons of working with a third party software tool (Cycles in Blender) for rendering as opposed to working with a customizable renderer like WebGPU. What are you missing in Cycles that WebGPU enables you to? What features in Cycles would you consider a significant challenge to implement in WebGPU?

Worksheet 10 Deliverables

Mirror sphere and cube in a photographed environment including shadows cast onto a holdout plane. Metallic sphere and glass cube in a photographed environment. One or more other objects placed in a photographed

environment and shaded with a realistic material shader. Provide the explanation and the discussion listed above. Put the deliverables in an HTML file to make them compatible with the rest of the lab journal.

Reading Material

The curriculum for Worksheet 10 is (40 pages)

- Burley, B. Burley, B. Physically Based Shading at Disney. In *Physically Based Shading in Film and Game Production*. SIGGRAPH 2012 Courses.
- Burley, B. Extending the Disney BRDF to a BSDF with Integrated Subsurface Scattering. In *Physically Based Shading in Theory and Practice*. SIGGRAPH 2015 Courses.