

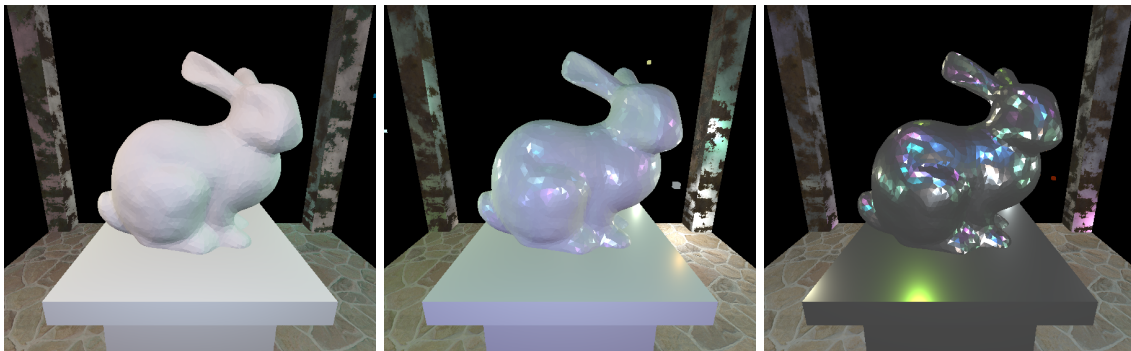
Summer Semester 2024

Assignment on Advanced Computer Graphics - Sheet 5

Due Date 19.06.2024

Exercise 1 (Physically Based Rendering (PBR), 10 Credits)

In this assignment, you will implement physically based rendering in GLSL.



(a) non-metallic, high roughness (b) non-metallic, low roughness (c) metallic, low roughness

Figure 1: results of the physically-based rendering when implemented correctly.

On the CGVR-homepage you will find the *PBRFramework*. In default mode, the scene is rendered with standard Phong lighting. Using the radio buttons (a) *Phong lighting* and (b) *Physically-based-Rendering*, you can switch between the default Phong lighting and your PBR-implementation on the fly. Additionally, you can dynamically control the object-wide roughness and metallicness via the two corresponding sliders.

The PBR-model is implemented in the `getPBRLighting()`-method of the fragment shader (s. `shader/lighting.frag`). It has a specular and diffuse component, as described on lecture slide 31 (s. lecture *Physically-Based Lighting / Rendering*).

The diffuse component is already implemented. Therefore, your task is to implement the Micro-FacetBRDF for the specular component of the PBR-model (s. lecture slide 38). For that, you also have to implement its sub-components, such as the `fresnel()`-method. This includes the:

- Normal Distribution Function (NDF), abbreviated to D (s. slide 53, Trowbridge-Reitz/GGX)
- Geometry-Function, abbreviated to G (s. slide 55, Smith equation)
- Fresnel Function, abbreviated to F (s. slide 39, Schlick approximation)