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TECHNISCHE
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Exercise 7

For bonus points upload your solutions until **Tuesday, December 12th, 13:29**

General Information

- The exercises may be solved by teams of up to three people.
- The solutions have to be uploaded to the Git repositories assigned to the individual teams.
- **The submission date (for practical and theoretical tasks) is noted on top of each exercise sheet.**
- If you have questions about the exercises write a mail to game-technology@kom.tu-darmstadt.de or use the forum at https://www.fachschaft.informatik.tu-darmstadt.de/forum/viewforum.php?f=557

P7 Practical Task: Physically Based Rendering (5 Points)

Implement the microfacet BRDF specified in the current lecture (Schlick's Fresnel Approximation, the Trowbridge-Reitz Normal Distribution Term, Cook and Torrance's Geometry Factor).

The program that is provided for you allows you to switch between a visualization of the effect of each term and the overall effect of the shader. The keys to use are the following:

- B: Complete BRDF
- F: Schlick`s Fresnel Approximation
- D: Trowbridge-Reitz Normal Distribution Term
- G: Cook and Torrance's Geometry Factor
- T: Toggle (switches whether the two following commands increase or decrease the value)
  - E: Modify roughness
  - D: Modify specularity

https://github.com/TUDGameTechnology/Exercise7.git contains additional code to help you out. You can either copy the code changes manually or just pull them into your own repository using
git pull https://github.com/TUDGameTechnology/Exercise7.git

Please remember to push into a branch called "exercise7".

T7 Theoretical Tasks (5 Points)

T7.1 Staring at the sun (2 Points)

The sun is described as a directional light in the lecture - a light that emits light rays which all face in the same direction. Quantify this simplification: look up the sizes and distances of the sun and the earth and calculate the maximum angle between light rays from the sun which hit the earth. Outline your calculation path.

T7.2 Scattered (1 Point)

Diffuse reflection is a simplified model, because light that enters a material does not leave at the same position. This is ignored by the BRDF formulation. In realtime applications the BRDF is typically evaluated in the fragment shader. Consider the average distance between light entry and light exit positions for a material. The error is visible when this distance is larger than …?

T7.3 Cardboard work (2 Points)

Pick up a light source, a camera and two polarization filters. How do they have to be used to create the pictures in slides 30 and 31 (diffuse and specular cardboard)?