VU Rendering SS
186.101

Károly Zsolnai-Fehér

Assignment 2

Results as email to Károly using the
[Rendering_SS($year)_2]_0123456,Thomas Auzinger
format (with your matriculation number and name) in both the email's **subject** and the attached zip archive file. If you use the wrong subject, it may end up in a different directory or not arrive at all.

Rendering Basics

Problem 1

Why are light transport simulations not based on radiant energy or radiant flux as basic measurement units? Why are irradiance/exitance/radiosity inadequate to build a simulation program upon them?
Optional question for pros: Is there a special case where irradiance/exitance/radiosity is sufficient?

Problem 2

Draw a simple test scene and run recursive ray tracing by hand for one ray until two bounces. The following should be contained in your drawing:

- The location of the viewer and an associated perspective camera plane.
- Reflection and refraction directions on suitable objects.
- Diffuse, specular and ambient shading.
- At least one shadow ray computation.
- What happens to V on the first bounce.

Note that for this exercise you have to perform the actual computations. Write both the symbolic expressions that capture the relevant formulae (e.g. writing $L \cdot N$ near an intersection) and the actual computed ray origins, directions (and everything else that is required). Use code snippets from the first assignment ray tracer code to check the validity of your solutions (or you can skip ahead to **smallpaint** if you feel it helps you - if not, disregard this comment). **Your solution should also contain the used code snippets - make them as short and relevant to the calculations as possible.** Again, the goal of running the code snippets is to verify the validity of your solution.

The final layout should contain the essential information on the characteristics above and should be clear and understandable.
Optional task for pros: write your own code for these and use that to verify your calculations.

Problem 3

Plot $(R \cdot V)^n$ as a function of $n \in \mathbb{R}_+$. What changes as n is increased? What is the intuitive meaning of this? Before you start, think about the intuitive meaning of the task and list your expectations. I know many feel like doing it the other way around. Don't do that. Check and verify the validity of your solution in the light of your initial expectations.
Hint: Choose fixed representative values for $R \cdot V$ to show the dependency on n.

Problem 4

Write down the rendering equation. **Don't copy-paste the image from the slides, make sure to write it down yourself at least once.** Sketch a technical drawing to demonstrate its meaning and give an intuitive explanation for every term in it. Explain why the Li() part (i.e., incoming radiance) is an issue.
Optional task for pros: Do the same for the surface integral formulation as well.