Proseminar Advanced Computer Graphics
Winter Semester 2015

Theoretical Exercise Sheet 1
Hand-out: October 15th, 2015
Discussion: October 19th, 2015

Physics of Light Transport

General Remarks

These theoretical exercises provide an opportunity to rehearse the theoretical concepts taught in the lecture. Try solving the exercises on your own. The appropriate solution to the exercises will be discussed during a following Proseminar.

There will be exercise sheets during the semester with 4-5 individual exercises each. The sheets will be made available on the lecture webpage. Each sheet will cover specific topics addressed in the previous lectures. Note that an online submission of your solution is not required.

Exercise 1

Assume a theoretical light bulb with a wattage of 100W. The light bulb has a 2% efficiency, i.e. only 2% of the power is turned into visible light, the rest is converred into heat. Further assume that light is emitted at one single wavelength of 500 nm. How many photons does the light bulb emit per second?

Exercise 2

With respect to the surface of the Earth globe, what is the solid angle subtended by the country of Austria? Assume Earth to be a perfect sphere.

Exercise 3

Assume a theoretical point light source emitting light equally into all directions. The point light shines on a surface with an arbitrary normal vector at some distance. Determine the formula for irradiance in this case for a differential surface area element.

Exercise 4

Assume a small, flat, square plate placed on top of the Patscherkofel, with the normal pointing upwards. It is during the day and there are no artificial light sources. The sky is covered in clouds, exhibiting a uniform radiance of 1000 W/(sr · m2). What is the irradiance at the center of the plate?