
Computer Graphics III

Light reflection & BRDF – Exercises

Jaroslav Křivánek, MFF UK

Jaroslav.Krivanek@mff.cuni.cz

Reflectance of a Lambertian surface

- Derive

$$\rho_d = \pi \cdot f_{r,d}$$

Irradiance environment mapping

- Let us assume a scene consisting of a single convex object with Lambertian (ideally diffuse) BRDF with a constant albedo (i.e. untextured). The object is illuminated by an environment map.
- What quantity is sufficient to parameterize the outgoing radiance? That is, on which of the following quantities does the outgoing radiance depend and on which one it does not: \mathbf{x} , $\mathbf{n}_{\mathbf{x}}$, ω_o ?

The law of reflection

- Derive the following formula for the direction of the reflected ray

$$\omega_o = 2(\omega_i \cdot \mathbf{n})\mathbf{n} - \omega_i$$

Physically plausible Phong BRDF

- Derive the reflectance of the Phong BRDF for a viewing direction aligned with the surface normal:

$$\rho^{\text{Phong modif}}(\omega_o) = \int \left[\frac{n+2}{2\pi} \rho_s \cos^n \theta_r \right] \cos \theta_i \, d\omega_i, \quad \omega_o = 0$$