

Chapter 9 Shading

9.1 Image Irradiance

Polar coordinate system

$$(\rho, \theta, \phi)$$

9.1.1 Illumination

- * Point light source
- * Uniform light source

9.1.2 Reflectance

BRDF: Bidirectional reflectance distribution function

- * Lambertian Reflectance

BRDF for Lambertian: $f(\theta_i, \phi_i, \theta_e, \phi_e) = \frac{1}{\pi}$

Lambert cosine law:

point source

$$L(\theta_e, \phi_e) = \frac{I_o}{\pi} \cos \theta_s$$

uniform source; total intensity I_o

$$L(\theta_e, \phi_e) = I_o$$

- * Specular Reflectance

BRDF for a specular surface: $f(\theta_i, \phi_i, \theta_e, \phi_e) = \frac{\delta(\theta_e - \theta_i) \delta(\phi_e - \phi_i - \pi)}{\sin \theta_i \cos \theta_i}$

$$L(\theta_e, \phi_e) = I(\theta_e, \phi_e - \pi)$$

* Combination of Lambertian and Specular reflectance

$$f(\theta_i, \phi_i, \theta_e, \phi_e) = \frac{\rho_v}{\pi} + (1 - \rho_v) \frac{\delta(\theta_e - \theta_i) \delta(\phi_e - \phi_i - \pi)}{\sin \theta_i \cos \theta_i}$$

9.2 Surface orientation

9.3 The Reflectance Map