Ashikhmin Shirley 2000 - Anisotropic phong reflectance model

• R_s : a color (RGB) that specifies th e specular reflectance at normal incidence.

• R_d: a color (RGB) that specifies the diffuse reflectance

• n_u, n_v: two phong-like exponents that control th e shape of the spec- ular lobe

The model is a classical sum of a "specular" term and a "diffuse" term.

$$R_s = 0.4 \tag{1}$$

$$R_d = 0.9 \tag{2}$$

$$n_v = 1.5 \tag{3}$$

$$n_u = 300 \tag{4}$$

The specular component ρ_s of the BRDF is:

$$n = \vec{n} \tag{5}$$

$$h = \vec{h} \tag{6}$$

$$\text{normalize}(\vec{u}) = \frac{\vec{u}}{\sqrt{\vec{u} \cdot \vec{u}}} \tag{7}$$

Tangent vector:

$$u = \text{normalize}(0, \vec{1}, 0 \times n) \tag{8}$$

Bitangent vector:

$$v = \text{normalize}(\vec{n} \times u) \tag{9}$$

$$k = \vec{\omega_i} \tag{10}$$

$$\rho_s(\vec{\omega_i}, \vec{\omega_o}) = \frac{\sqrt{(n_u + 1) * (n_v + 1)}}{8 * \pi} * \frac{(n \cdot h)^{\left(\frac{n_u * (h \cdot u)^2 + n_v * (h \cdot v)^2}{1 - (h \cdot n)^2}\right)} * F(k \cdot h)}{(h \cdot k) * \max((n \cdot \vec{\omega_i}), (n \cdot \vec{\omega_o}))} \tag{11}$$

$$\rho_d(\vec{\omega_i}, \vec{\omega_o}) = \frac{28 * R_d}{23 * \pi} * (1 - R_s) * (1 - (1 - \frac{(n \cdot \vec{\omega_i})}{2})^5) * (1 - (1 - \frac{(n \cdot \vec{\omega_o})}{2})^5) \tag{12}$$

$$F(x) = R_s + (1 - R_s) * (1 - (k \cdot h))^5 \tag{13}$$

$$f = \rho_s(\vec{\omega_i}, \vec{\omega_o}) + \rho_d(\vec{\omega_i}, \vec{\omega_o}) \tag{14}$$