Analytic single and double scattering

$f_2(\omega_i,\omega_o)\langle\omega_o,\omega_g\rangle =$

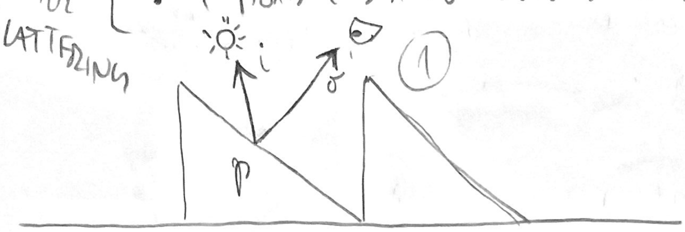
(1) $\lambda_p(\omega_i)\, f_p(\omega_i,\omega_o,\omega_p)\langle\omega_o,\omega_p\rangle\, G_1(\omega_o,\omega_p)$

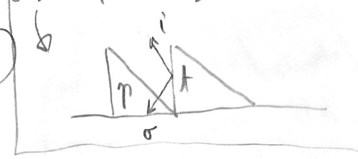
(2) $+\,\lambda_p(\omega_i)\, f_p(\omega_i,\omega_o',\omega_p)\langle\omega_o',\omega_p\rangle\,(1-G_1(\omega_o',\omega_p))\, G_1(\omega_o,\omega_t)$

(3) $+\,\lambda_t(\omega_i)\, f_p(\omega_i,\omega_o,\omega_p)\langle\omega_o,\omega_p\rangle\, G_1(\omega_o,\omega_p)\,(1-G_1(\omega_i',\omega_t))$

(1) $\lambda_p(\omega_i)\, f_p(\omega_i,\omega_o,\omega_p)\langle\omega_o,\omega_p\rangle\, G_1(\omega_o,\omega_p)$

SINGLE SCATTERING
- paths $i \to p \to o$
- (paths $i \to t \to o$ evaluates to $\emptyset$ because reflect(ω_o,ω_t) is in lower hemisphere)



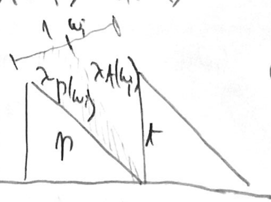


$\boxed{\lambda_p(\omega_i)}$ - intersection probability of incoming ray with perturbed facet

$[\omega_i, \omega_g, \omega_t, \omega_p]$

$$= \frac{a_p(\omega_i)}{a_p(\omega_i)+a_t(\omega_i)}, \quad a_p(\omega_i) = \frac{\langle\omega_i,\omega_g\rangle}{\langle\omega_p,\omega_g\rangle}$$

$$a_t(\omega_i) = \frac{\langle\omega_i,\omega_t\rangle\sqrt{1-\langle\omega_p,\omega_g\rangle^2}}{\langle\omega_p,\omega_g\rangle}$$



$\boxed{f_p(\omega_i,\omega_o,\omega_p)}$

↳ evaluation of perturbed facet BRDF.
- ω_i, ω_o are used in local space transformed using basis around ω_p

$\boxed{\langle\omega_o,\omega_p\rangle}$

↳ cosine weight for perturbed facet

$\boxed{G_1(\omega_o,\omega_p)}$ - masking of ω_o by ω_p

$$G_1(\omega_i,\omega_m) = H(\langle\omega_i,\omega_m\rangle)\min\left[1, \frac{\langle\omega_i,\omega_g\rangle}{a_p(\omega_i)+a_t(\omega_i)}\right]$$

curr dir

ω_p or ω_t