$\mathbb{M}$ = model-view matrix

$\mathbb{p}' = \mathbb{M}\,\mathbb{p}$ ← positions
$\mathbb{n}' = (\mathbb{M}^{-1}_{3\times3})^T\,\mathbb{n}$ ← normals

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17. The rendering equation

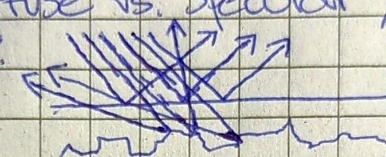
Created by Jim Kajiya, in 1986.

$$L_o(\omega_o) = \int_\Omega L_i(\omega_i)\cos\theta_i\, f_r(\omega_i, \omega_o)\, d\omega_i$$

Ω - Hemisphere of all light dir.
L_i = Incoming light
ω_i = Incoming light direction
L_o = Outgoing —"—
ω_o = Outgoing —"—
θ_i = Incoming light angle

Surface reflections

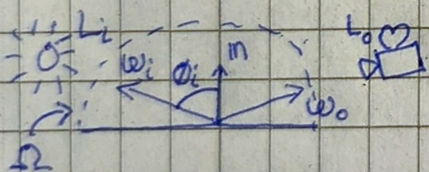
~~Scattering~~ Diffuse vs. specular, can be because of coating (polish):



← coating (specular)
← material (diffuse)

If some light (a beam) is specular, it needs to be subtracted from the diffuse part. (I.e. can't have 100% light on both specular and diffuse part).

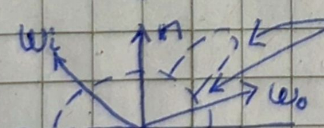
Bidirectional Reflectance Distribution Function (BRDF), $f_r(\omega_i, \omega_o)$. Statistical average of amount of light scattered.



$$\int_\Omega f_r(\omega_i, \omega_o)\, d\omega_o \leq 1$$

$f_r(\omega_i, \omega_o) = f_r(\omega_o, \omega_i)$ ← Doesn't matter which direction we calc., how light works

Blinn/Phong: $f_r(\omega_i, \omega_o) = K_d + K_s \frac{(\cos\varphi_i)}{\cos\theta_i}$



Blinn/Phong is a crude approx. to the rendering equation.

Isotropic vs. anisotropic BRDFs
Anisotropic takes a material direction from the normal into account, making the reflection different based on the direction of the object.