

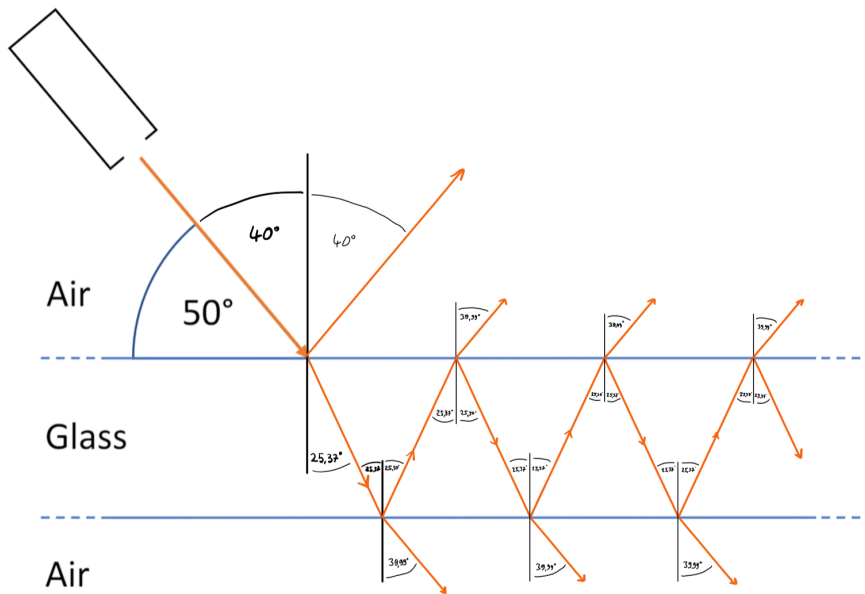
Advanced Topics in Computer Graphics I - Sheet R05

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Assignment 2

a)



b)

Fresnel equations:

Reflectance for unpolarized light:

$$R = \frac{T_{\perp}^2 + T_{\parallel}^2}{2} = \frac{\left(\frac{n_i \cos \theta_i - n_t \cos \theta_t}{n_i \cos \theta_i + n_t \cos \theta_t} \right)^2 + \left(\frac{n_t \cos \theta_i - n_i \cos \theta_t}{n_t \cos \theta_i + n_i \cos \theta_t} \right)^2}{2}$$

$$R \approx \frac{\left(\frac{1 \cdot \cos 40^\circ - 1.5 \cdot \cos 25.37^\circ}{1 \cdot \cos 40^\circ + 1.5 \cdot \cos 25.37^\circ} \right)^2 + \left(\frac{1.5 \cdot \cos 40^\circ - 1 \cdot \cos 25.37^\circ}{1.5 \cdot \cos 40^\circ + 1 \cdot \cos 25.37^\circ} \right)^2}{2}$$

$$R \approx 0.0457359$$

Transmittance:

$$T = 1 - R$$

$$T \approx 0.9542641$$

For infinite interactions:

Total emission to the top:

$$\begin{aligned} R_{\text{total}} &= R + T^2 R \sum_{k=0}^{\infty} (R^2)^k \\ \Rightarrow R_{\text{total}} &= R + \frac{T^2 R}{1 - R^2} \\ R_{\text{total}} &\approx 0.0457359 + \frac{0.9542641^2 \cdot 0.0457359}{1 - 0.0457359^2} \approx 0.087471 \end{aligned}$$

Total emission to the bottom:

$$\begin{aligned} T_{\text{total}} &= T^2 \sum_{k=0}^{\infty} (R^2)^k \\ \Rightarrow T_{\text{total}} &= \frac{T^2}{1 - R^2} \\ T_{\text{total}} &\approx \frac{0.9542641^2}{1 - 0.0457359^2} \approx 0.912529 \end{aligned}$$

Assignment 3