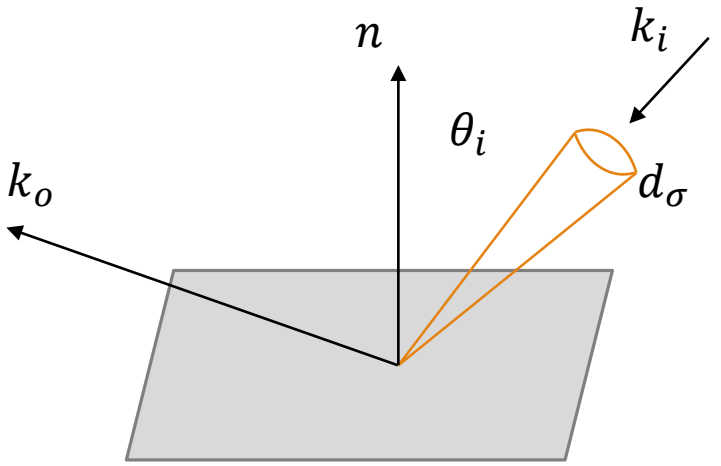
CT5202: Photorealistic Rendering

Light Transport Equation

BOCHANG MOON

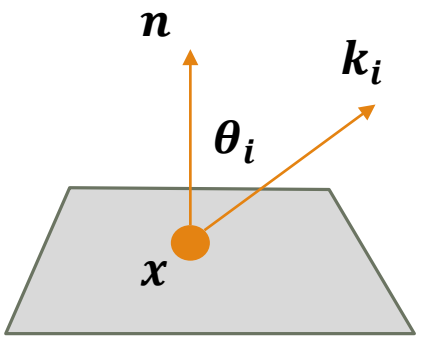
Transport Equation

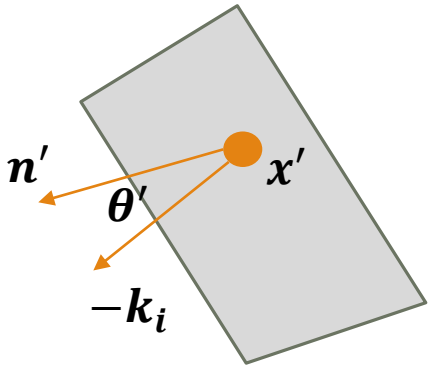
- $L_s(k_o) = \int_{all\ k_i} \rho(k_i, k_o) L_f(k_i) cos\theta_i d\sigma_i$
  - $L_f(k_i)$: field radiance from k_i direction
  - $L_s(k_o)$: surface radiance measured in k_o direction
  - *Rendering equation* [Immel, Cohen & Greenberg, 1986]
  - We can also write the equation with surface radiances only [Kajiya, 1986]



Transport Equation

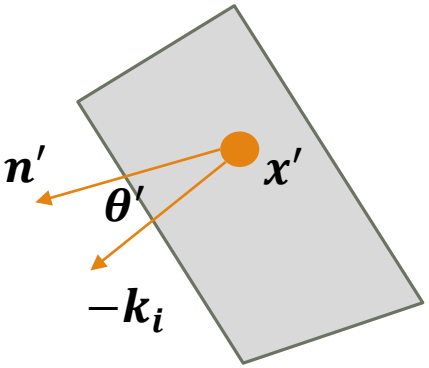
- $L_s(k_o) = \int_{all\ k_i} \rho(k_i, k_o) L_f(k_i) cos\theta_i d\sigma_i$
- $L_s(-k_i) = L_f(k_i)$
- Solid angle subtended by the point x'
  - Area on a unit sphere
  - $\Delta\sigma_i = \frac{\Delta A' cos\theta'}{||x - x'||^2}$
  - $\Delta A'$ is the area associated with x'
- Differential solid angle
  - $d\sigma_i = \frac{dA' cos\theta'}{||x - x'||^2}$

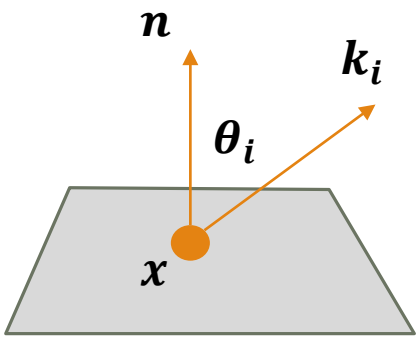




Transport Equation

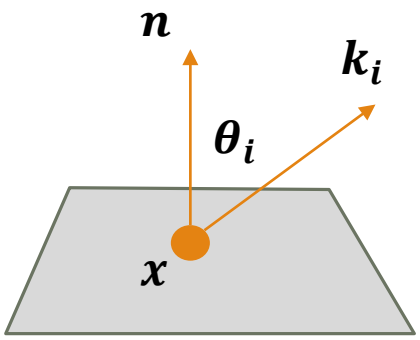
- $L_s(k_o) = \int_{all\ x' visible\ to\ x} \frac{\rho(k_i,k_o)L_s(x',x-x')cos\theta_i cos\theta'}{||x-x'||^2} dA'$

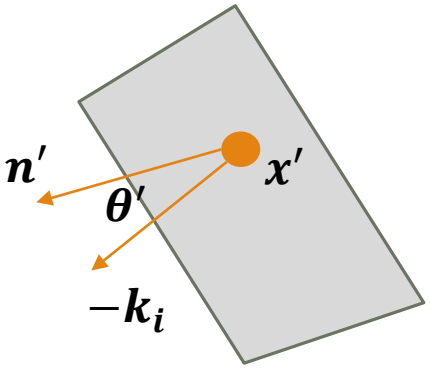




Transport Equation

- $L_s(k_o) = \int_{all\ x'} \frac{\rho(k_i,k_o)L_s(x',x-x')v(x,x')cos\theta_i cos\theta'}{||x-x'||^2} dA'$
  - Rendering equation [Kajiya, 1986]
  - $v(x,x')$: visibility function
  - 1 if x and x' are mutually visible
  - 0 otherwise





Paper Presentation & Project

- Each student should select an interesting problem, which is related to this course
  - Present two papers (20 min. presentation + 20 min. Q&A)
  - Perform a term project which includes the following:
    - Proposal presentation (10 min. presentation + 10 min. Q&A)
      - Explain the problem, related work, your idea, implementation plan
    - Final presentation (15 min. presentation + 10 min. Q&A) & technical report (4 pages)
      - Explain the problem, related work, a concrete idea, experimental results, future work