

CT5202: Photorealistic Rendering

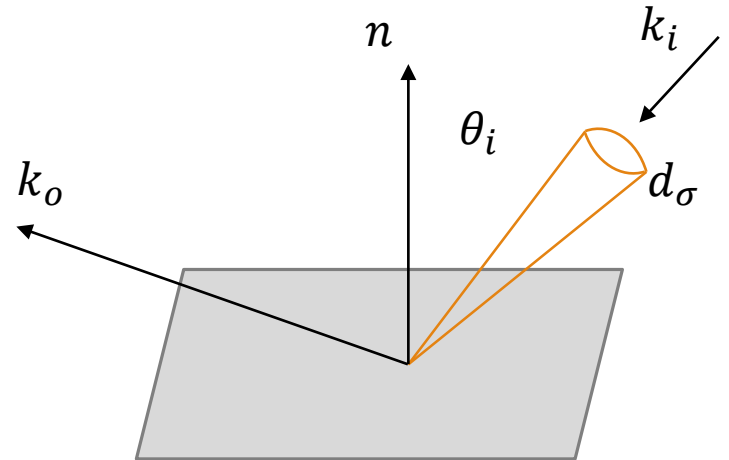
# Light Transport Equation

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Lecturer: Bochang Moon

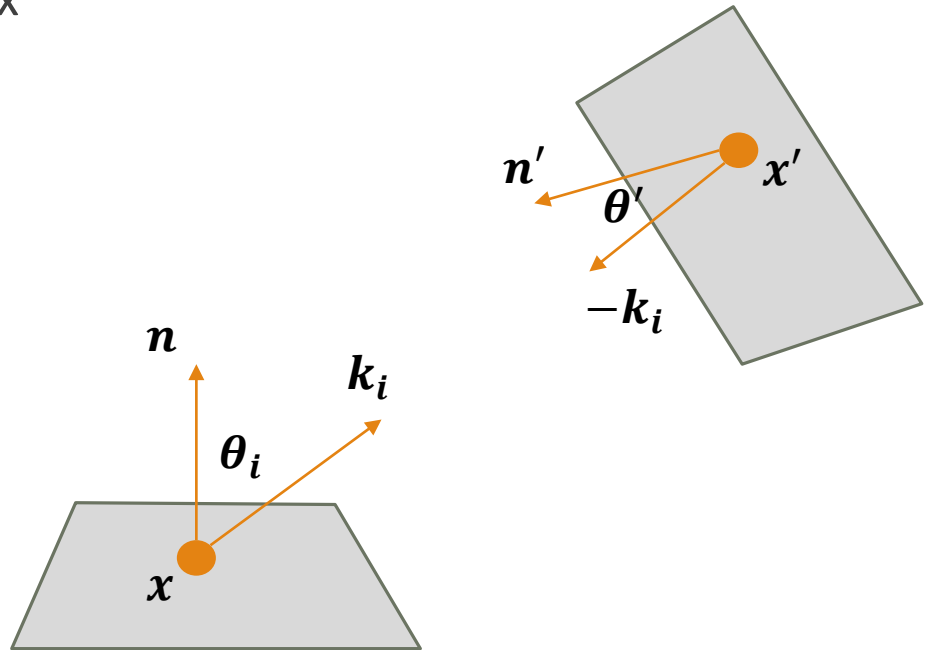
# Transport Equation

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



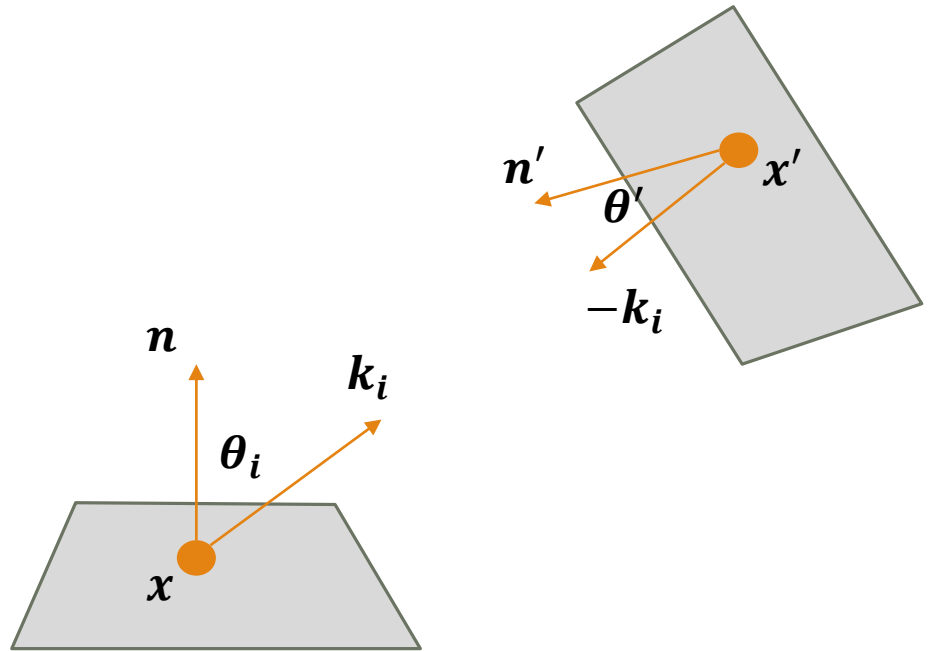
# Transport Equation

- $L_S(k_o) = \int_{all\ k_i} \rho(k_i, k_o) L_f(k_i) \cos\theta_i d\sigma_i$
- $L_S(-k_i) = L_f(k_i)$
- 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
  - $d\sigma_i = \frac{dA' \cos\theta'}{||x-x'||^2}$



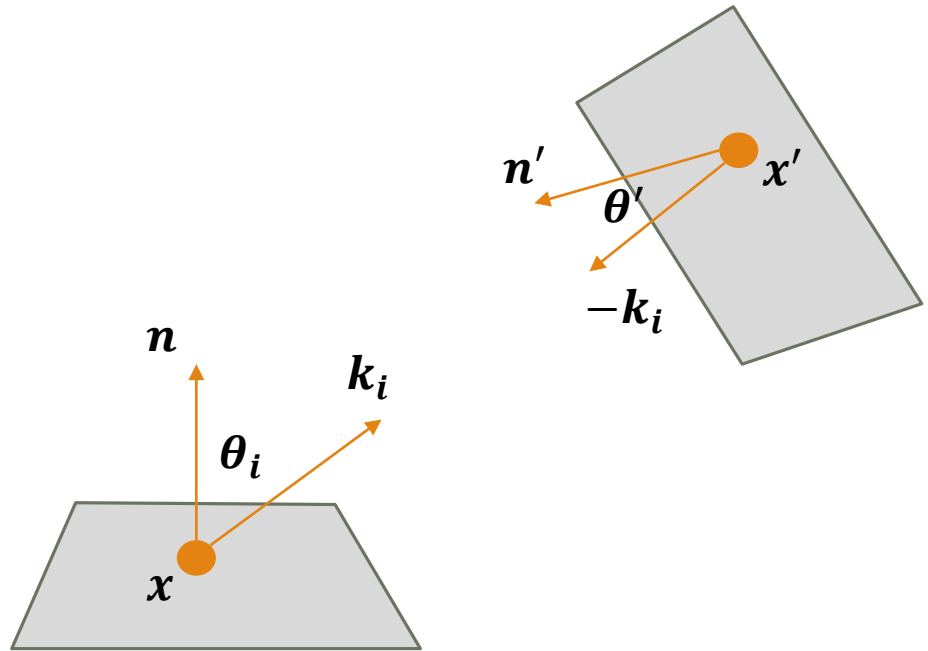
# Transport Equation

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



# 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

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- 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