

CMSC427

L08P1: Shading

Intro

Credit: slides from Dr. Zwicker



Today

Shading

- Introduction
- Radiometry & BRDFs
- Local shading models
- Light sources
- Shading strategies



Shading

- Compute interaction of light with surfaces
- Requires simulation of physics
 - Solve Maxwell's equations (wave model)?
http://en.wikipedia.org/wiki/Maxwell's_equations
 - Use geometrical optics (ray model)?
http://en.wikipedia.org/wiki/Geometrical_optics
[http://en.wikipedia.org/wiki/Ray_\(optics\)](http://en.wikipedia.org/wiki/Ray_(optics))
- Too computationally expensive

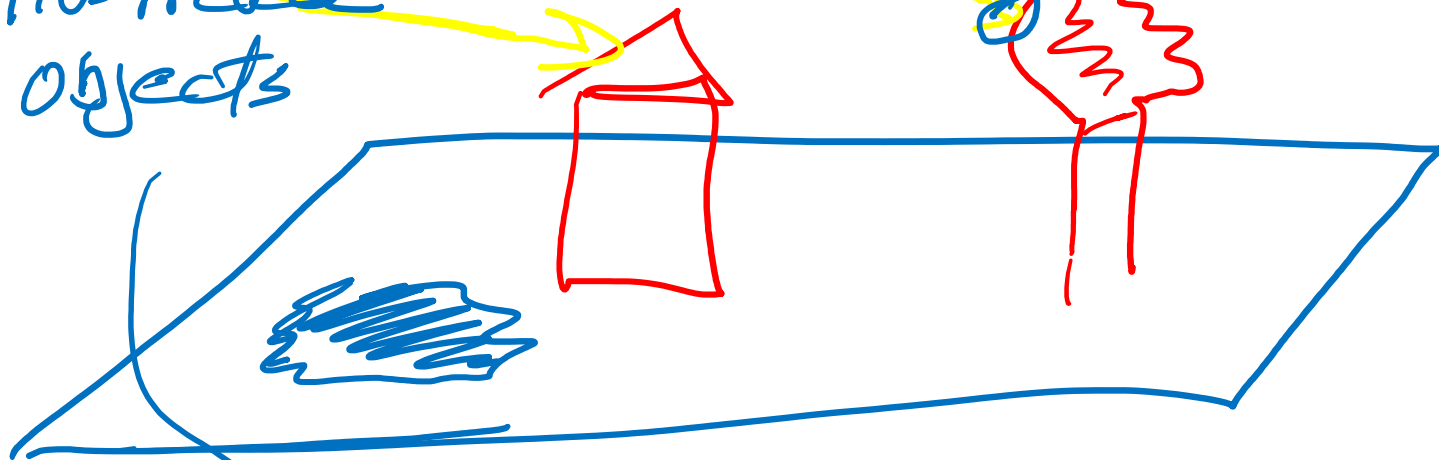


Shading and Media

Transparent/translucent
media

model light rays thru media
air, water, glass, air with fog

Solid media
objects



reflectivity of the surface

“Global illumination” in computer graphics

http://en.wikipedia.org/wiki/Global_illumination

- “Gold standard” for photorealistic image synthesis *Ray tracing, Radiosity*
- Based on geometrical optics (ray model)
- **Multiple bounces of light**
 - Reflection, refraction, volumetric scattering, subsurface scattering
- **Computationally expensive, minutes per image**
- Movies, architectural design, etc.



Global illumination

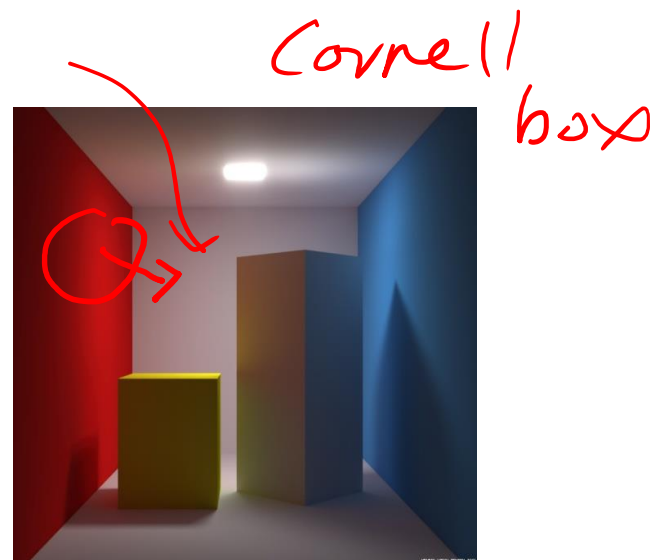
blooming bleeding



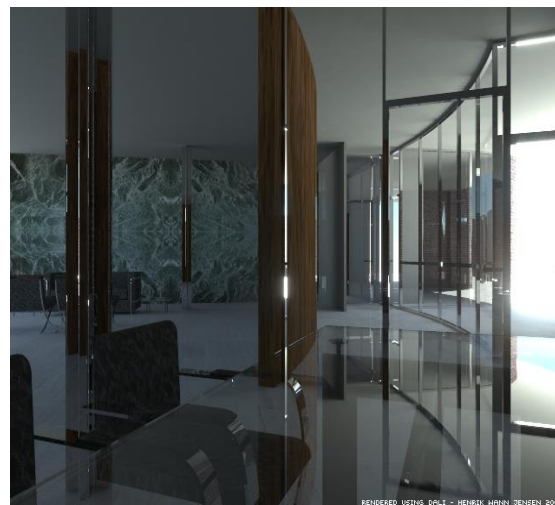
<http://www.pbrt.org/gallery.php>



Henrik Wann Jensen



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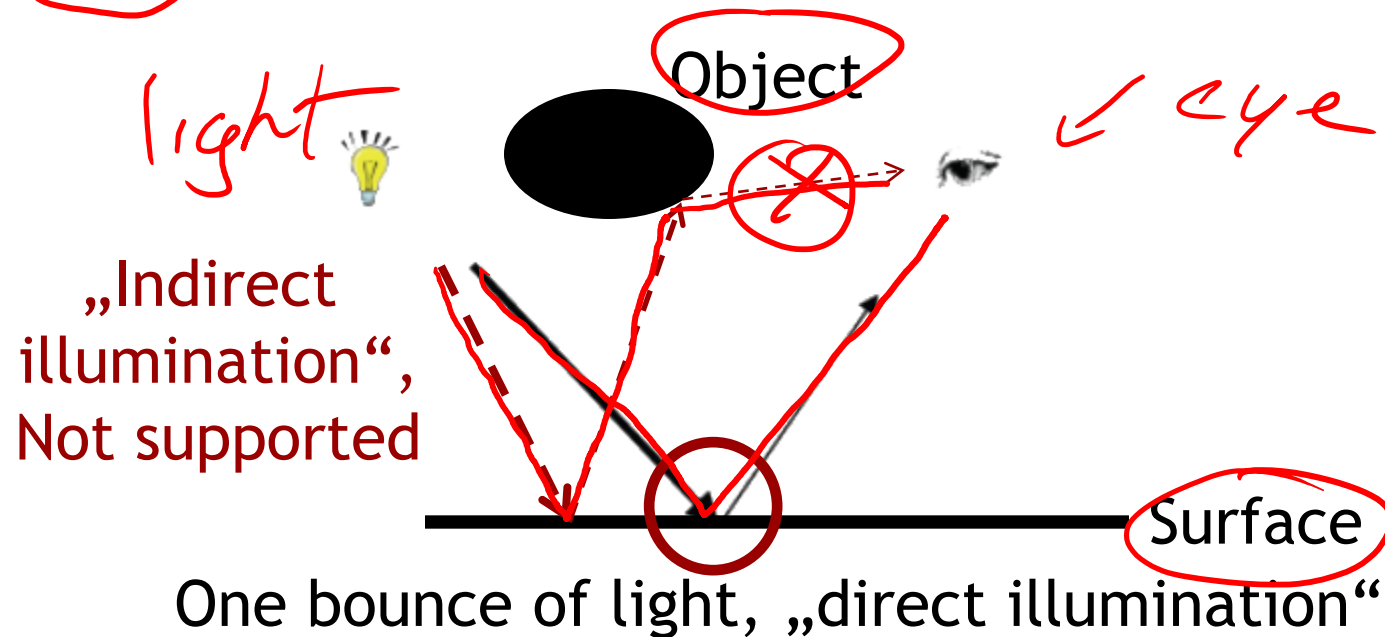


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Interactive applications

- Approximations to global illumination possible, but not standard today
- Usually
 - Reproduce perceptually most important effects
 - One bounce of light between light source and viewer
 - “Local/direct illumination”



Local illumination

Each object rendered by itself




Flat

Gouraud

Phong

each tri.
rendered independently

A hand-drawn red diagram showing a triangle and its vertices. The triangle is drawn with a dashed line. The vertices are marked with small circles. Arrows point from the text 'each tri.' to the triangle and from 'rendered independently' to the vertices.

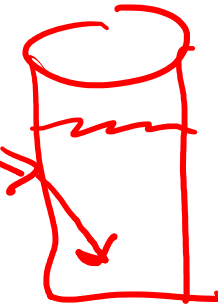
Global vs. local models

- Local

- Model one bounce
- No interaction between objects

- Global

- Model multiple bounces
- Complex interactions between surfaces
- Complex surfaces



more
media to
medice
~~trans~~
transmission