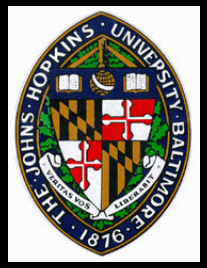
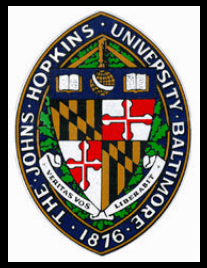


Global Illumination



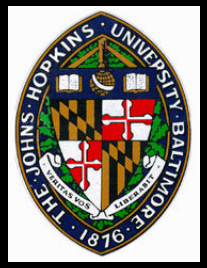
Local vs. Global Illumination

Local

- Direct illumination of surfaces by light sources
- e.g. Phong and Cook/Torrence illumination

Global

- all light/surface interactions for entire environment
- Recursive ray tracing and radiosity compute this partially...



Rendering Equation

$$I(x,x') = g(x,x')\left[e(x,x') + \int_S r(x,x',x'')I(x',x'')dx''\right]$$

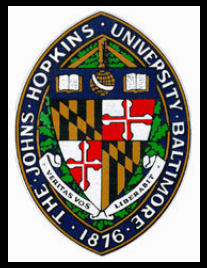
I: illumination at first point from second

g: geometry term for visibility and distance

ε: emitted light from second point to first

ρ: reflectivity of light from x'' to x via x'

Note that the equation is recursive

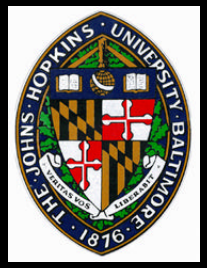


Ray Tracing

Modifies reflectivity term

- **Computes specular interreflections among surfaces**
- **Computes diffuse and specular reflections between light sources and surfaces**

Typically integrates using point sampling of direction space

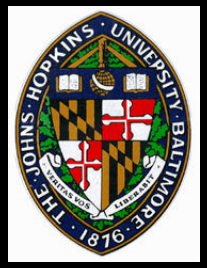


Radiosity

Also modifies reflectivity term

- **Computes diffuse interreflections among surfaces (light sources not distinguished)**

Integrates by quantizing surface points and summing

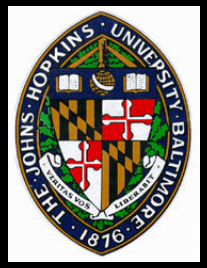


Path Tracing

Similar to distribution ray tracing

Applies Monte Carlo sampling to estimate integral

Traces a single path for each eye ray (only a single ray spawned at each surface intersection)



Two-Pass Radiosity/Ray Tracing

First pass: radiosity

- Compute extended form factors and diffuse illumination

Second pass: ray tracing

- Perform standard ray tracing
- Diffuse component of illumination radiosity solution rather than just local illumination

Note: still doesn't handle light reflected specularly and later diffusely