Radiosity

[electricimage.com]
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 Radiosity Example

reflectivity   emission
A   0.8   A   0 W
B   0.8   B   0 W
L   0.85  L   100 W

form factors
from to
A 0.35 0.05
B 0.3 0 0.06
L 0.25 0.45 0
Computing an Energy Balance

More formally...

- **flux**, $I$: energy per unit time (W)
- **radiosity**, $B$: exiting flux density ($W/m^2$)
  
  flux = radiosity * area
  
  $I = B \times A$

- **E**: exiting flux density for light sources ($W/m^2$)
- **reflectivity**, $R$: fraction of incoming light reflected

More formally (cont.)

- emitted flux density
- exiting flux density

light leaving = light emitted + light reflected

$I_L = 100 + 0.85 \times (0.05 I_A + 0.06 I_B)$

$I_A = 0 + 0.8 \times (0.3 I_B + 0.25 I_L)$

$I_B = 0 + 0.8 \times (0.35 I_A + 0.45 I_L)$

$B_i A_i = E_i A_i + R_i \sum_j B_j F_{ji} A_j$

$E_i = E_i + R_i \sum_j B_j F_{ij} A_j$
Issues

- need to solve $N$ simultaneous equations
  What to do when $N = 50,000$?
  - use iterative, hierarchical methods
- form factor computation is costly due to visibility
- need to reconstruct a continuous image from patches
  - interpolation schemes, non-constant basis
- curved surfaces?
- sharp shadows?
- specular reflection, translucency, refraction?
  - hybrid radiosity / ray-tracing techniques