Distribution Ray Tracing

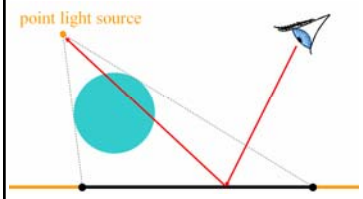
Last Time?

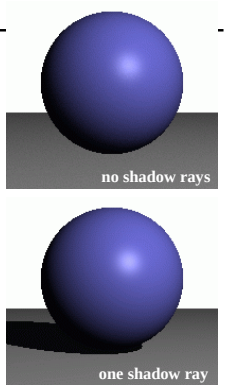
Today

- Distribution Ray Tracing
  - Soft shadows
  - Antialiasing (getting rid of jaggies)
  - Glossy reflection
  - Motion blur
  - Depth of field (focus)
- Monte-Carlo Integration
- Probabilities and variance
- Analysis of Monte-Carlo Integration

Shadows

- one shadow ray per intersection per point light source

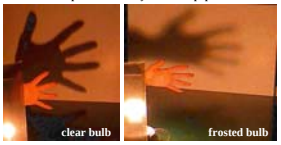




Shadows & Light Sources

http://3media.initialized.org/photos/2000-10-18/index_gall.htm

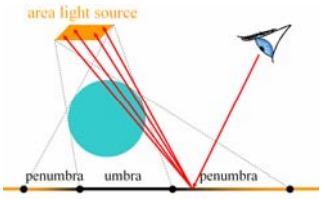
http://www.davidfay.com/index.php

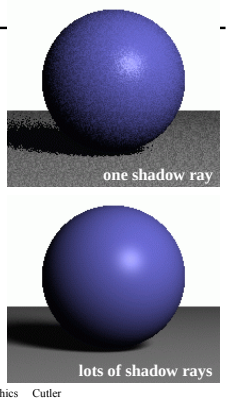


http://www.pa.uky.edu/~sciworks/light/preview/bulb2.htm

Soft Shadows

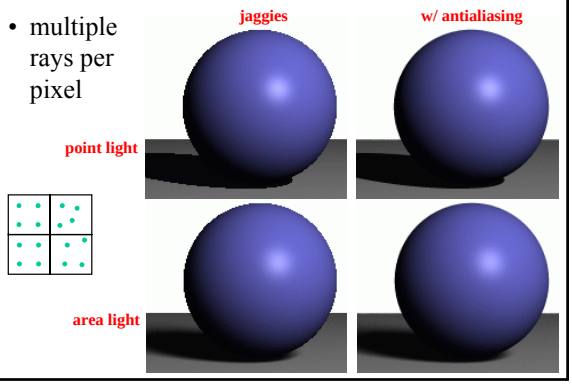
- multiple shadow rays to sample area light source





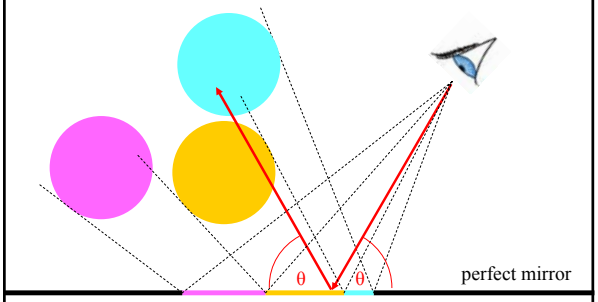
Antialiasing – Supersampling

- multiple rays per pixel



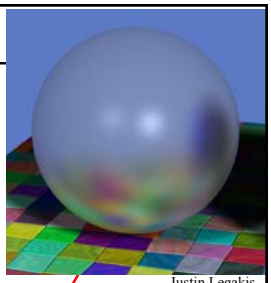
Reflection

- one reflection ray per intersection



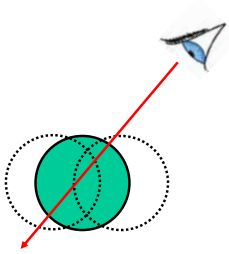
Glossy Reflection

- multiple reflection rays


Justin Legakis

Motion Blur

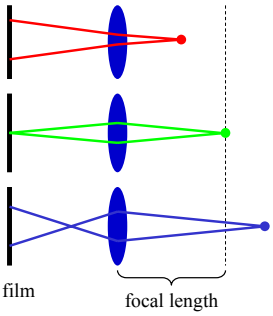
- Sample objects temporally

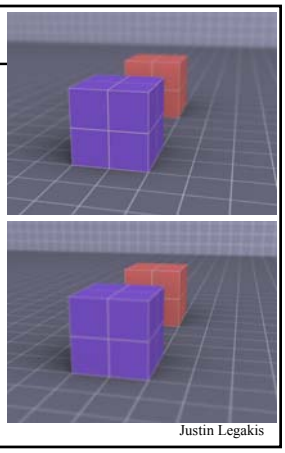



Rob Cook

Depth of Field

- multiple rays per pixel




Justin Legakis

Ray Tracing Algorithm Analysis

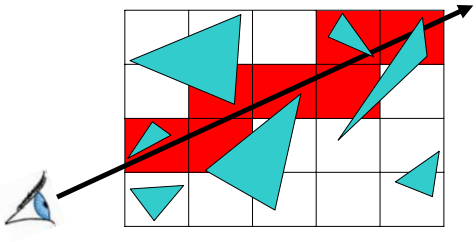
- Ray casting
- Lots of primitives
- Recursive
- Distributed Ray Tracing Effects
  - Soft shadows
  - Anti-aliasing
  - Glossy reflection
  - Motion blur
  - Depth of field

cost ≈ height * width *
num primitives *
intersection cost *
size of recursive ray tree *
num shadow rays *
num supersamples *
num glossy rays *
num temporal samples *
num focal samples *
. . .

can we reduce this?

Spatial Data Structures

- regular grid, nested grids, octree, kd tree, bsp tree, bounding volume hierarchy, etc.



Questions?