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

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

Motion Blur

- Sample objects temporally

Depth of Field

- multiple rays per pixel

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

\[
\text{cost} \approx \text{height} \times \text{width} \times \text{num primitives} \times \text{intersection cost} \times \text{size of recursive ray tree} \times \text{num shadow rays} \times \text{num supersamples} \times \text{num glossy rays} \times \text{num temporal samples} \times \text{num focal samples} \times \ldots
\]

can we reduce this?
Spatial Data Structures

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

Questions?