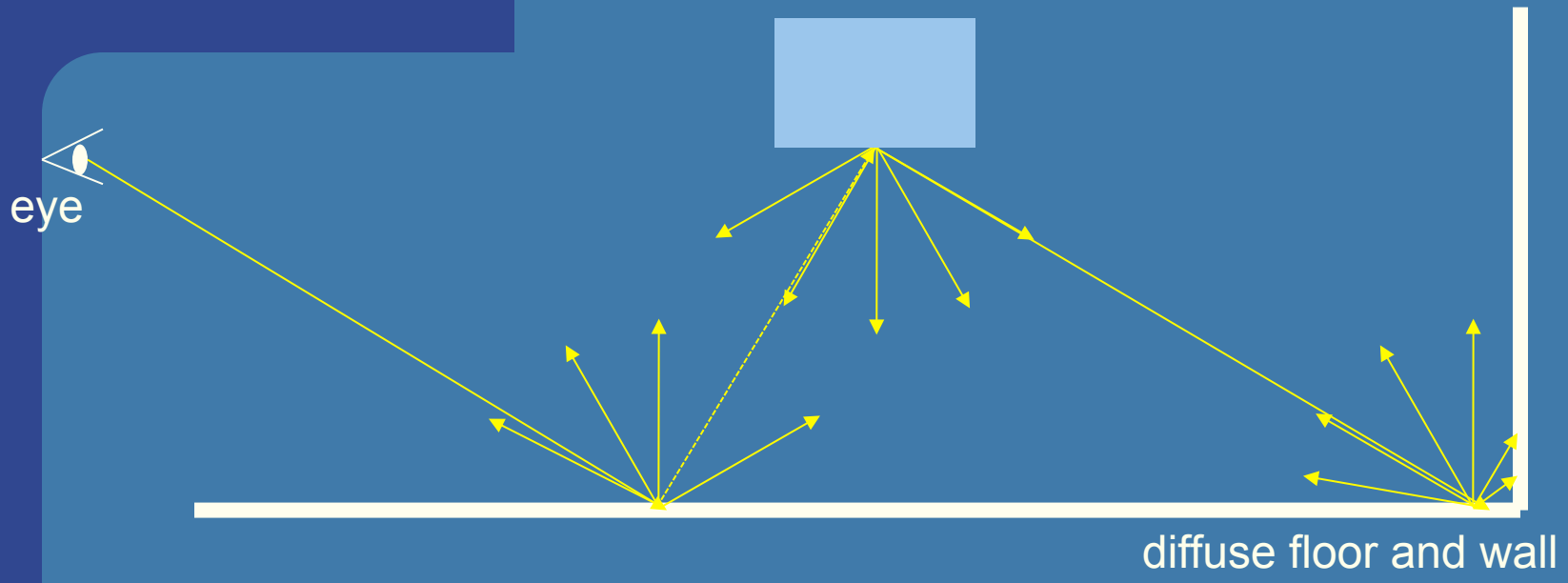
Clarification in addition to the lecture slides

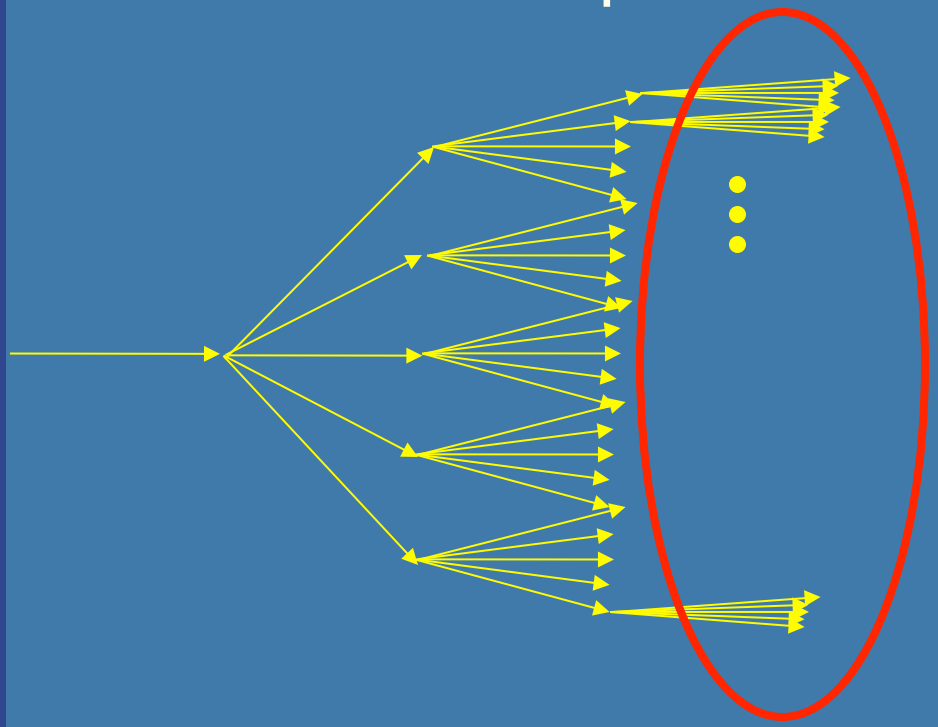
Monte Carlo Ray Tracing



- Sample indirect illumination by shooting sample rays over the hemisphere, at each hit.
  - At some recursion depth, stop and compute standard local lighting (i.e., without indirect illumination)

Monte Carlo Ray Tracing

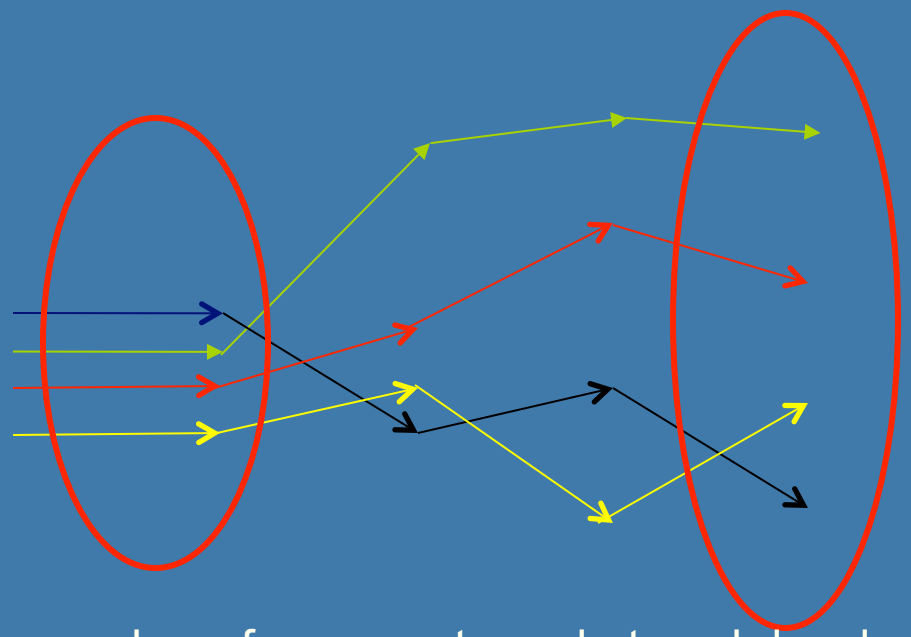
- This gives a ray tree with most rays at the bottom level. This is bad since these rays have the lowest influence on the pixel color. I.e., most effort is spent on the least important rays.



- For point lights (hard shadows) one shadow ray is shot at each bounce location.
- For soft shadows (area or volumetric light sources) several shadow rays are traced per bounce location.

PathTracing

- Path Tracing instead only traces one of the possible ray paths at a time. This is done by randomly selecting only one sample direction at a bounce (also, **one** shadow ray is shot at each bounce-location). Hundreds of paths per pixel are traced. This is more efficient.



Equally number of rays are traced at each level

Photon Mapping

- Creating Photon Maps: Trace photons (~100K-1M) from light source. Store them in kd-tree when they hit diffuse surface. Then, use russian roulette to decide if the photon should be absorbed or specularly or diffusively reflected. Create both global map and caustics map. Caustics map sends more photons towards reflective/refractive objects.
- Ray trace from eye: At an intersection point **p**, compute direct illumination and shoot reflection/refraction rays. Also, grow sphere around **p** in caustics map to get caustics contribution. Also sample indirect slow varying light around **p** by sampling the hemisphere with ~1000 rays (also called Final Gather) and use the global photon map where those rays hit a surface.

- Growing sphere: Uses the kd-tree to expand a sphere around **p** until a fixed amount (e.g. 50) photons are inside the sphere. The radius is an inverse measure of the intensity of indirect light at **p**. The BRDF at **p** could also be use to get a more accurate color and intensity value.