Ray Tracing II

For ray tracing, we have an equation like the following for computing intensity along a ray:

$$I = k_a I_a + k_d I_d (n.l) + k_s I_s (r.v)^n + k_r I_r + k_t I_t$$

ambient, diffuse, and specular
contributions of light sources

recursively
computed
reflection

recursively
computed
transmission

The next slide (top half) shows a tradeoff between k_r and all other parameters on the horizontal axis and between k_t and all other parameters on the vertical axis. The diffuse color of the ball is red. The ceiling is blue.

The bottom half of the slide shows the effect of ray tracing to different depths.
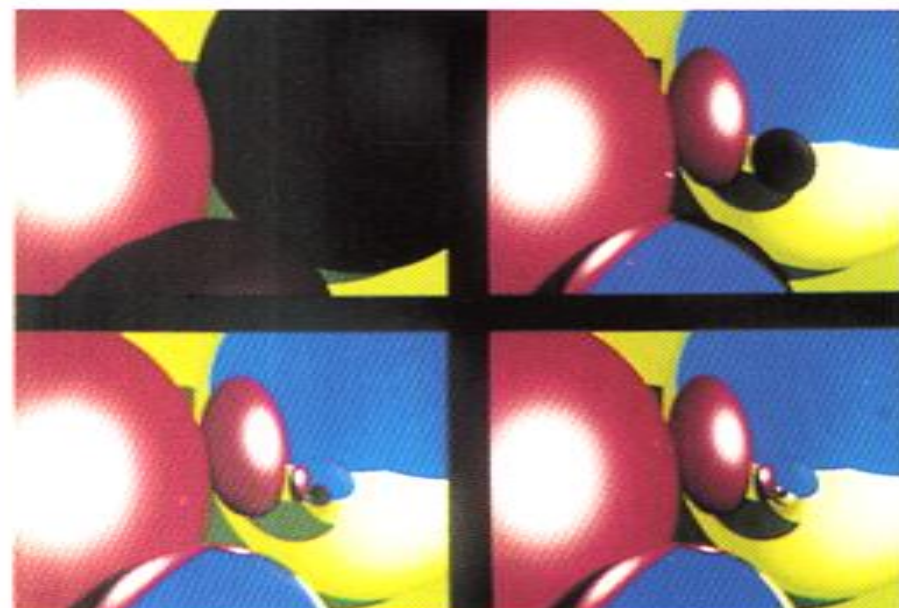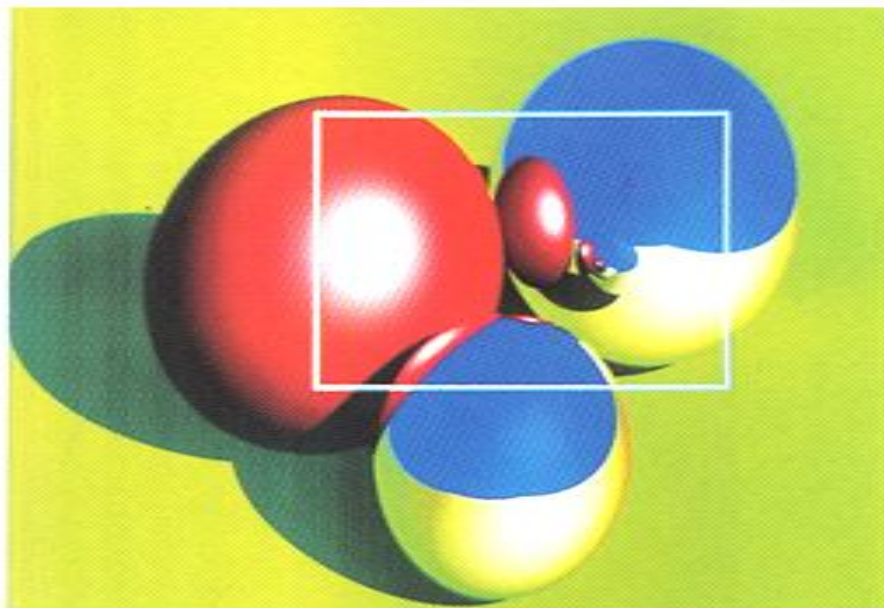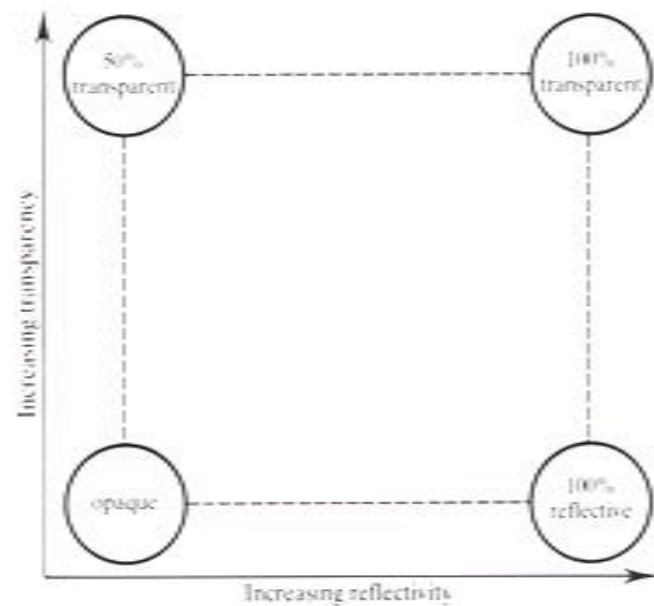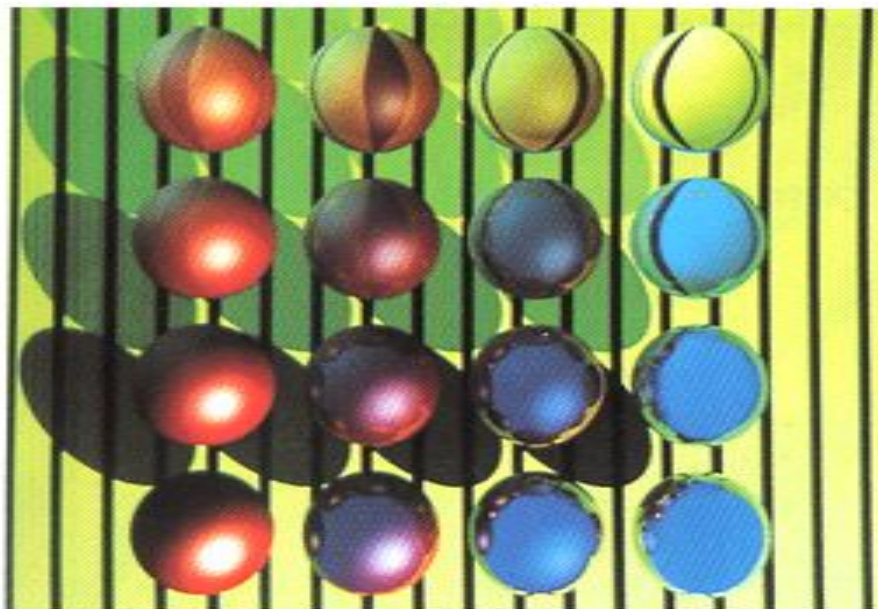
32 Ray tracing spheres. (*top*) Reflective and refractive spheres against a striped background (after an illustration by Apollo Computers). (*bottom left*) Ray tracing to a depth of 6. (*bottom right*) Part of the above image traced to a depth of 1, 2, 3 and 4.

Four slide summary of pixel subsampling and distributed reflection in Cook's 1984 distributed ray tracing algorithm.

Check out the paper itself (CMU only) at /afs/andrew/scs/cs/15-462/papers/cook84.pdf

You can also get it from the ACM digital library www.acm.org/dl
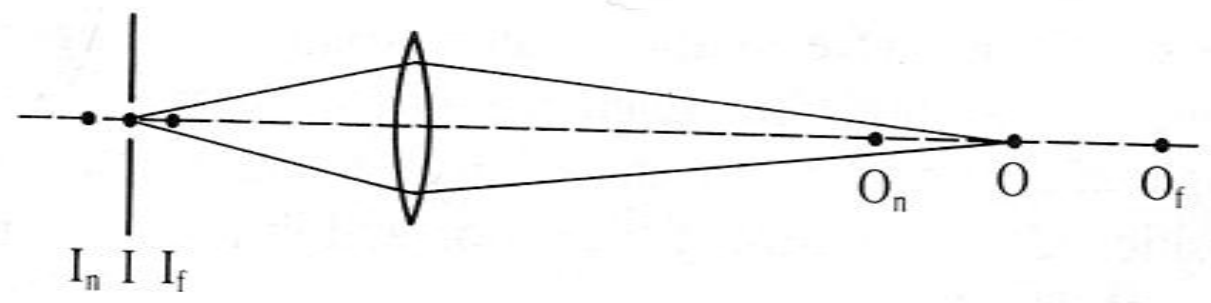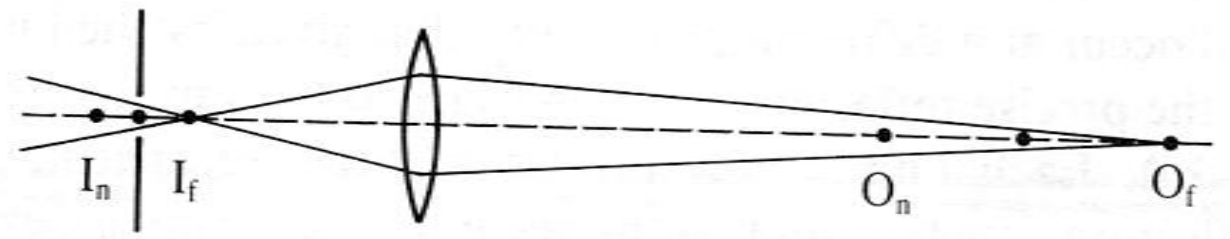
Jitter

Angle about R
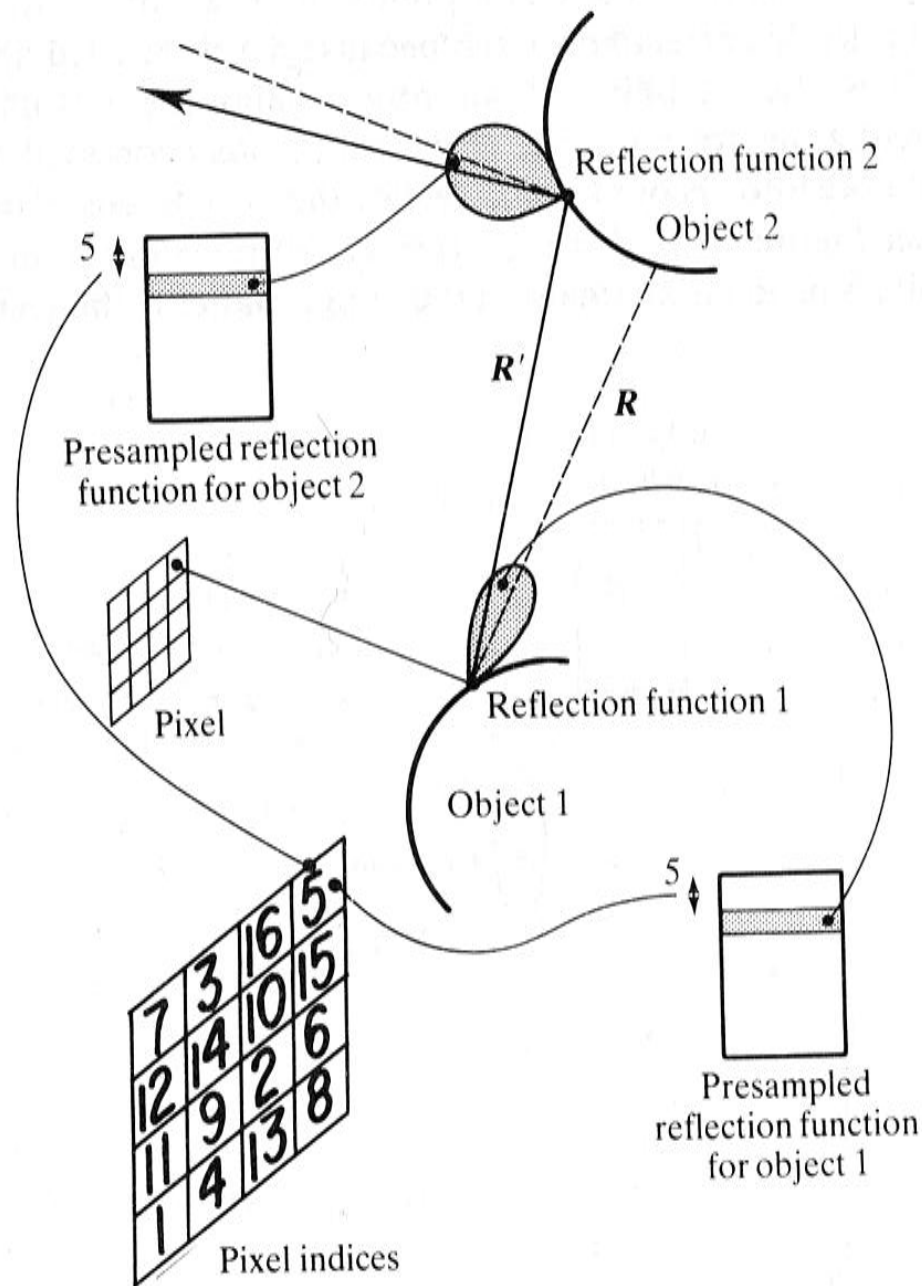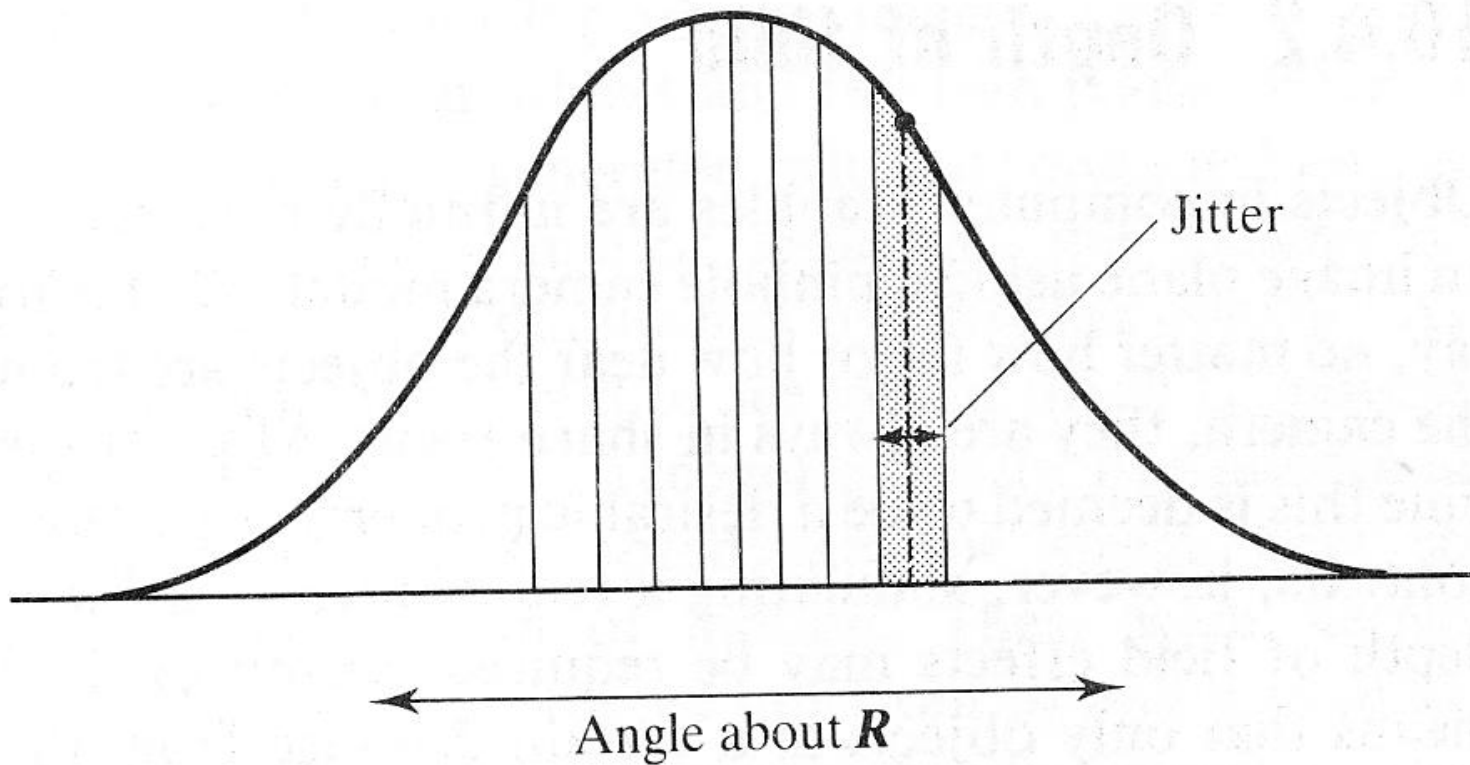
Parameters such as reflection directions are selected based on the index of the outgoing ray and then jittered randomly within a prespecified area
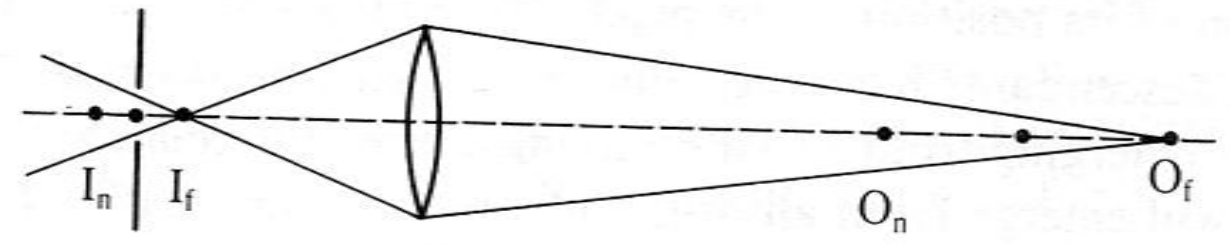

Reflection function 2
Object 2

5

Presampled reflection function for object 2

R'

R
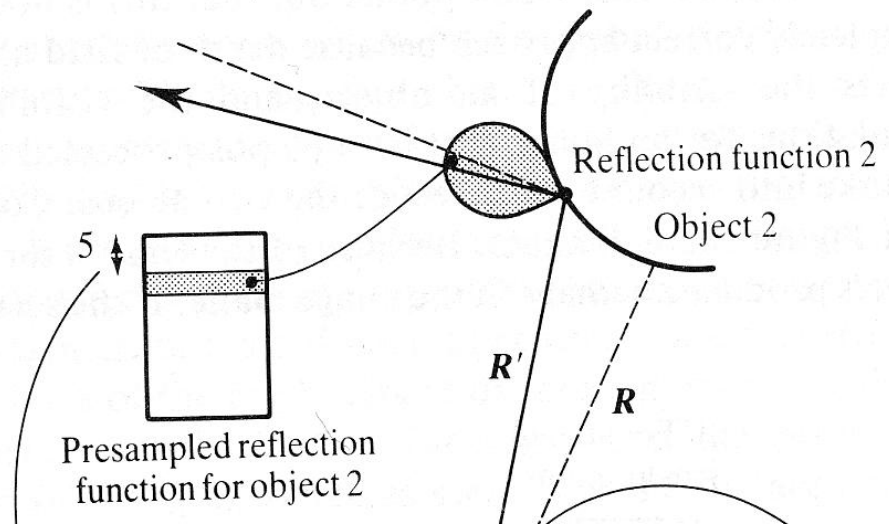
Here is a sketch of how the physics of a camera lens can create depth of field effects. Point O is at the focal distance.

I_n I I_f

O_n O O_f

(a)

I_n | I_f

O_n O_f

(b)

I_n | I_f

O_n O_f

(c)

In a distributed ray tracing scheme, depth of field effects can be created using a model of a lens. Locations where the light ray passes through the lens are jittered.

LUT of jittered lens locations

Focal point

Primary ray into scene

Eye point

Image plane