11/6

Visability and Lighting

Meta-Topic: Realism

What is it?
What is Photo-Realism?
Why (or why not) Photo-Realism?

Graphics Quest For Photorealism

- make a picture
  find something wrong with it
  find a way to make that effect

Sometimes a radical shift - but not the stuff we'll talk about

~~Already~~

Effects we want:

opacity - objects in front block ones behind
solidity

SURFACE SHADING / LIGHTING

↓

nicer shapes
nicer shading / textures

How to make objects solid

① completely rethink drawing
eye oriented
ray-tracing ← can't use fast drawing methods

② analytically compute visable things
Hidden LINE removal

③ PAINTERS ALGORITHM
DRAW FARTHER OBJECTS FIRST ← Z-SORT
FILL IN ALL OBJECTS
PROBLEMS:
Cycles
Need All Triangles
FANCY DATA STRUCTURES HELP
BSP TREES

n log n SORT
TOTAL ORDERING

NOTICE: OVERDRAW
POTENTIAL FOR CULLING
must be less work than sorting / drawing

DEPTH COMPLEXITY

Z-Buffer

A hardware visibility solution
↑ useful in software, but still really hardware
throw memory at the problem

FOR ALL PIXELS, STORE DEPTH OF OBJECT @ THAT PIXEL

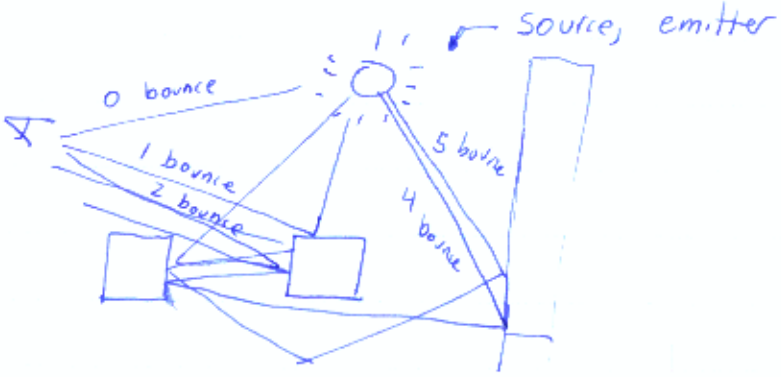
No object? need ∞
computers can't do ∞
Closest Object?
limited resolution
need the range that objects might be in
far - near / B
↑ # of buckets
This is why need to set far and near reasonably

SOME THINGS TO NOTICE:
PRETTY MUCH ORDER INDEPENDENT
- What if z = ?
z-fighting
- transparent objects
ANTI-ALIASING?
- NEED TO SUPER SAMPLE

What Color do we make these solid objects?

Depends on object AND Light!

How Does Lighting Work?



In the real world ....

Light bounces off everything

All objects influence all others

Global Illumination

hard to do - must consider all objects, interactions, ... interdependence (1 depends on 2 depends...)

good for getting complex lighting effects

an advanced topic

In the CG world .....

Local Lighting -

decision of how to light a point on ~~that~~ an object depends on:

- surface AT that point
- eye position
- lights

LOCAL LIGHTING

Consider only 1 point on 1 object

- No shadows
- No self shadows
- No color spill
- No inter-reflection

} if you want these, add with a hack

- No area light sources - point sources only
  - might be at infinity

3 parts (per light)

- specular (direct reflection)
- diffuse (scattering)
- ambient (hack for indirect)

Lighting is a hack

real lighting is complex
microstructure of materials

get "biggest" features of lighting correct

fancier models are still hacks & just get more features right