What is rendering?

Generation of a 2D image from a 3D scene

Applications

- virtual reality - a city
- invented reality, a.k.a visual metaphor
  - plastic molecules, medical scan as colored jello

Realism is important!

- 3D -> 2D involves loss of information
- 2D image must convey 3D scene
- plausible and familiar scene
- plausible and familiar illumination
- realistic rendering

Visual cues for realism

Occlusion

Transparency

Perspective and foreshortening

Aerial perspective: desaturation, blurring

Shading

Shadows

Stereopsis

Kinetic depth effect

Head motion parallax

The rendering pipeline

modeling

↓

visibility

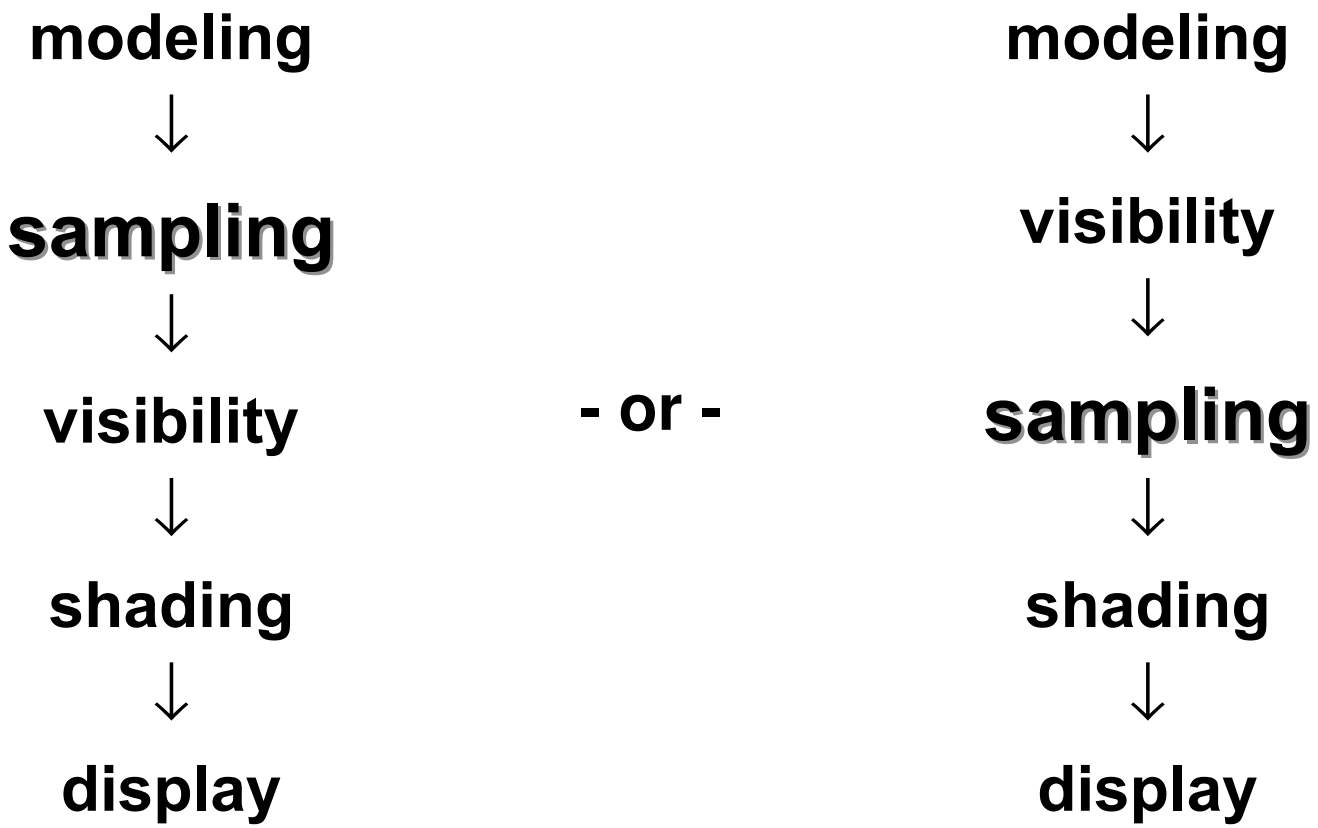
↓

shading

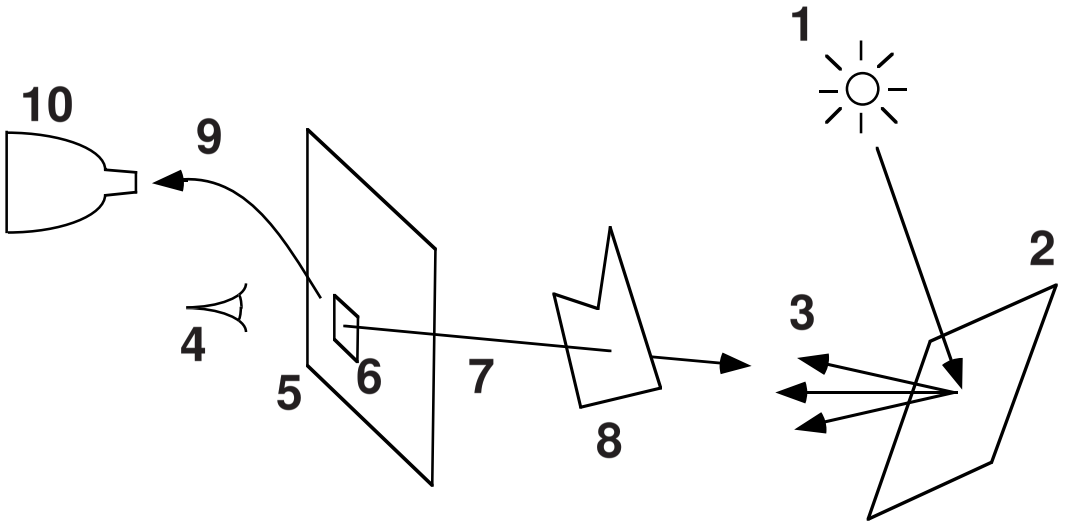
↓

display

The discrete rendering pipeline



Rendering a surface



1. light source
2. surface
3. reflection
4. observer
5. image plane
6. pixel
7. viewing ray
8. occluder
9. reproduction
10. CRT

Theoretical foundations

Interaction between light and surface

- physics
- material sciences

Drawing enough samples

- sampling theory
- statistics

Intersection of viewing rays and objects

- analytic geometry
- computational geometry

Display on CRT

- human psychophysics
- display engineering