

CS 354

Computer graphics

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Fall 2012

Syllabus

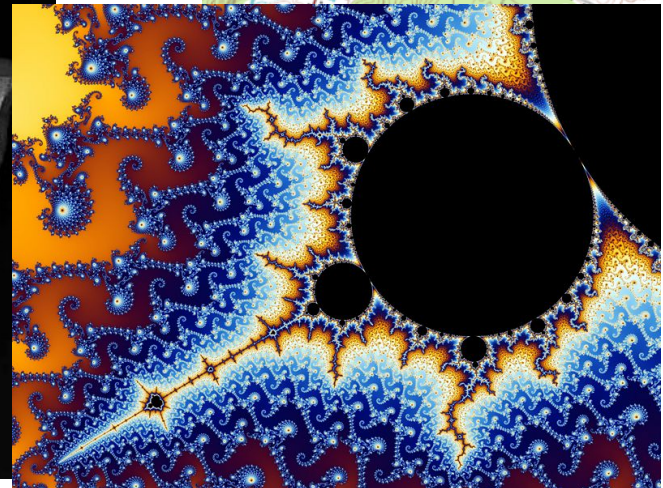
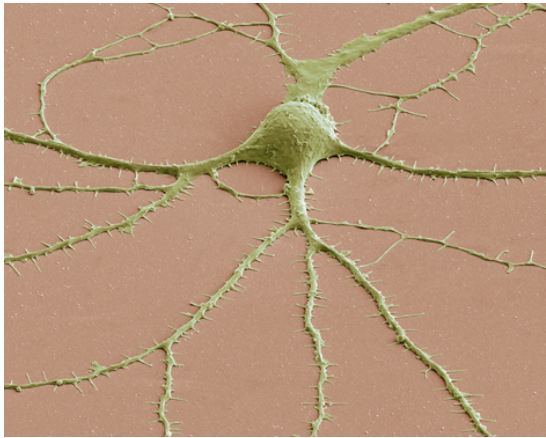
[http://www.cs.utexas.edu/~edwardsj/
teaching/2012fall/cs354/index.html](http://www.cs.utexas.edu/~edwardsj/teaching/2012fall/cs354/index.html)

4 purposes of computer graphics

1. Display of information
2. Design
3. Simulation and animation
4. User interfaces

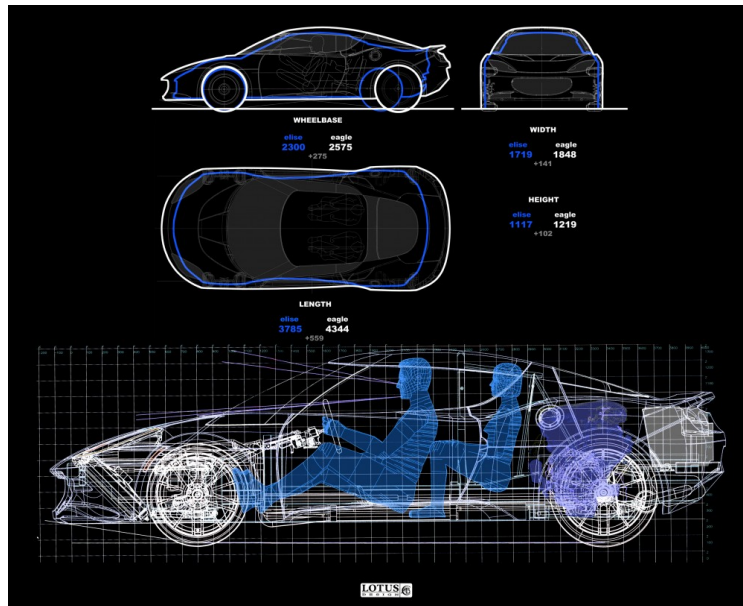
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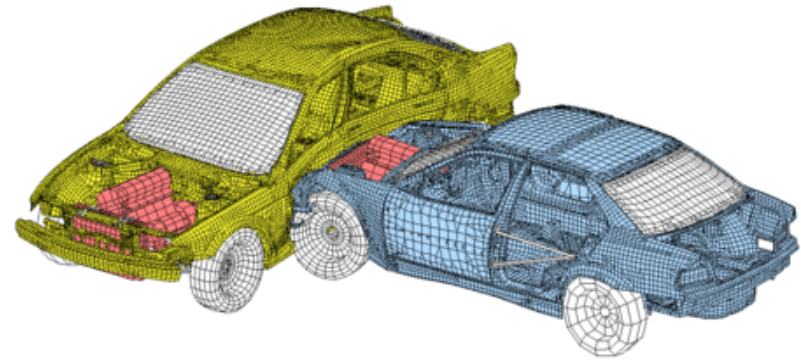
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Raster image

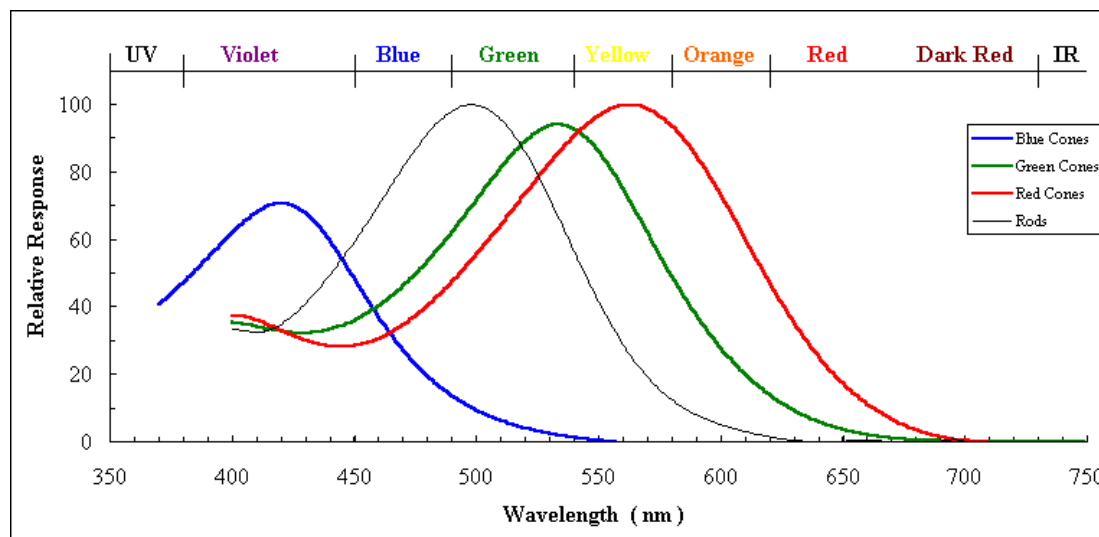
- raster - array of pixels
- frame buffer - memory storage of pixels
- resolution - number of pixels
- depth (precision) - number of colors
 - full/true color is 24 bits deep

Rasterization

- CPU - central processing unit
- GPU - graphics processing unit
 - contains frame buffer
 - specific and optimized functions
- vertices - object descriptors
- viewer - how the final image is formed
 - back of the eye
 - film plane
- rasterization (scan conversion) - image formation

Light

- light
 - visible - 350-780 nm
 - red - 650 nm
 - green - 520 nm
 - blue - 450
- Leads naturally to RGB description of color



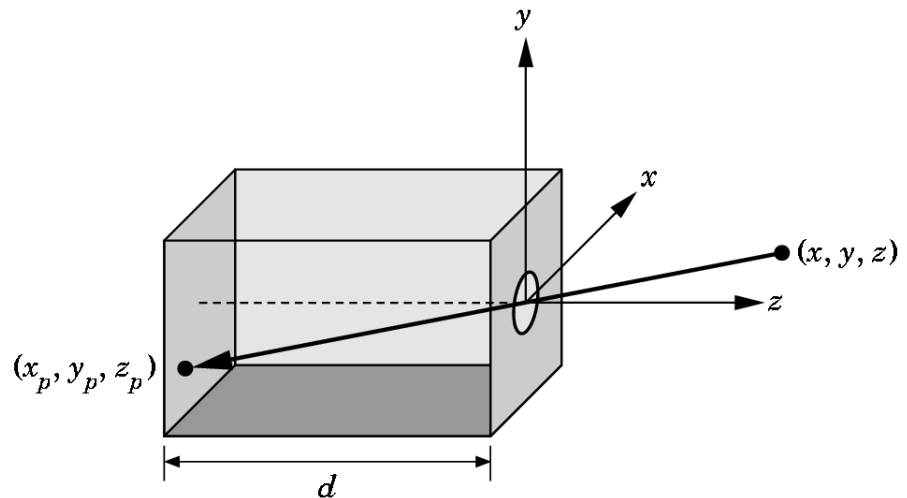
Basic optics

- pinhole camera - infinite depth of field (everything is in focus)
- lens camera - finite depth of field
- projection

$$y_p = -\frac{y}{z/d}$$

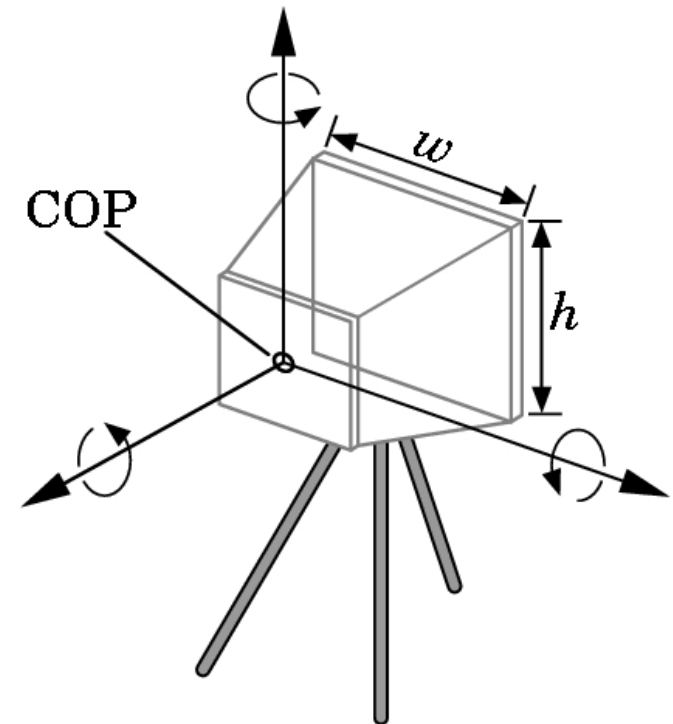
- field of view

$$\theta = 2 \tan^{-1} \frac{h}{2d}$$



Synthetic-camera model

- camera specification
 - position / center of projection (COP)
 - orientation
 - focal length
 - film plane (size, orientation)
- synthetic model
 - move projection plane in front



Application programming interface (API)

- pen-plotter model
 - turtle graphics demo
- 3D API
 - objects
 - viewer (camera)
 - light sources
 - point
 - spot lights
 - color
 - material properties
 - absorption
 - scattering
 - diffuse
 - specular

Geometric primitives

- line segments
- polygons
- curves and surfaces

Graphics pipeline

1. vertex processing - coordinate transformations
2. clipping - don't render anything outside view frustum
3. rasterization - primitives to fragments
4. fragment processing - update frame buffer

