

Computer Graphics

CS43 - Fall 2005

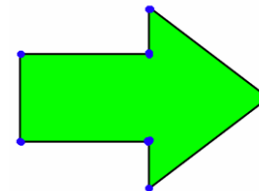
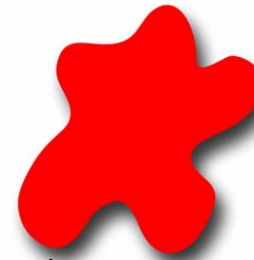
Introduction

Computer Graphics:

The study of creating images using computers.

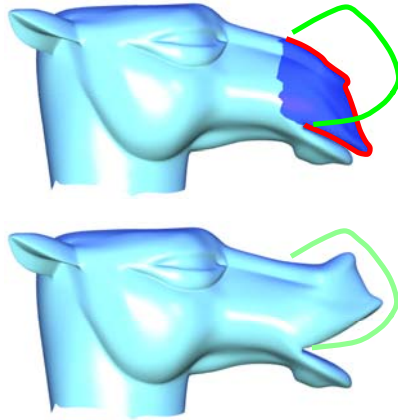
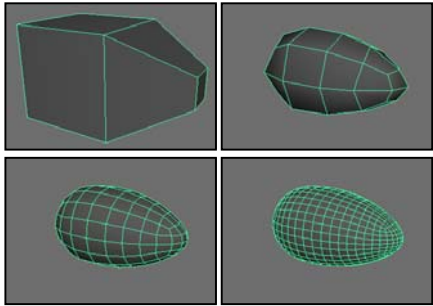
Problems in Graphics

- 2D imaging
 - compositing
 - filtering
 - painting
- 2D drawing
 - shape representation
 - editing



Problems in Graphics

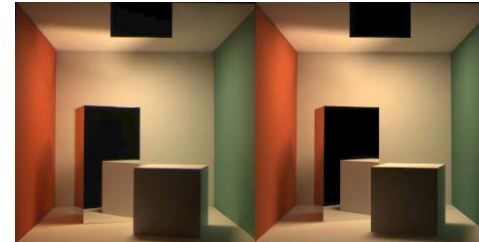
- 3D modeling
 - surface representation
 - surface editing



[Nealenv et al. 2005]

Problems in graphics

- 3D rendering
 - visibility estimation
 - lighting simulation
 - materials simulation



[Cornell PCG]



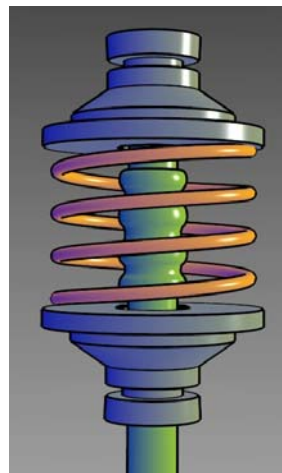
[Cornell PCG]

Problems in graphics

- 3D rendering
 - non-photorealistic styles



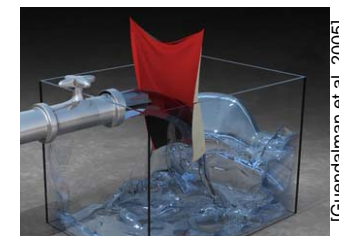
[Praun et al. 2001]



[Gooch et al. 1998]

Problems in graphics

- Animation
 - deformation representation
 - keyframe interpolation
 - physical simulation



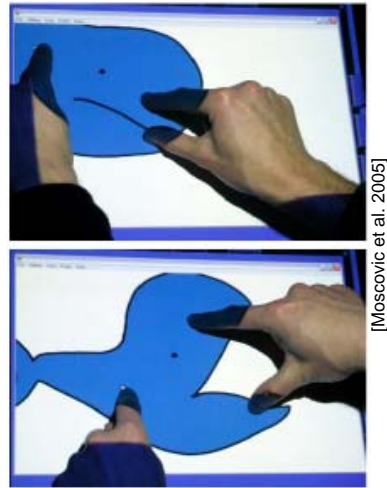
[Guendalman et al. 2005]



[Essa et al. 2005]

Problems in graphics

- Interaction
 - 2D/3D user interfaces
 - Virtual reality
 - Augmented reality



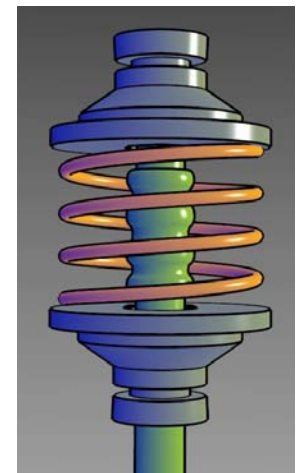
Computer Graphics:
Mathematics made visible
by computer simulations.

Applications

- Entertainment
 - movies
 - games

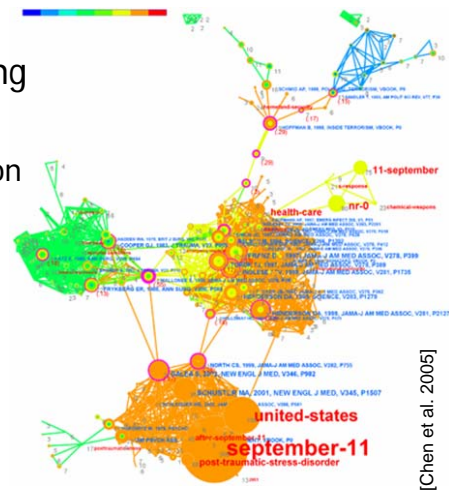
Applications

- Entertainment
- Science and Engineering
 - computer-aided design
 - scientific/medical visualization



Applications

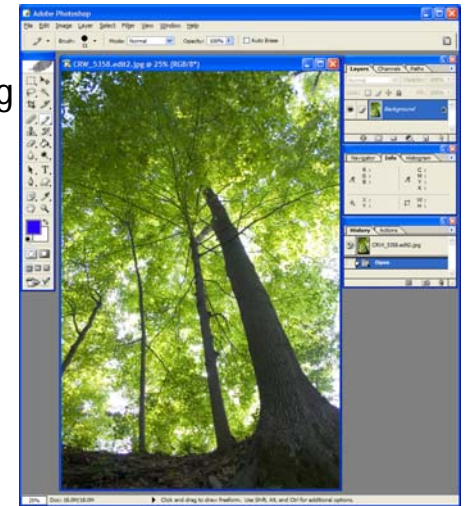
- Entertainment
- Science and Engineering
- Visualization
 - information visualization



[Chen et al. 2005]

Applications

- Entertainment
- Science and Engineering
- Visualization
- Graphic Arts
 - digital photography
 - graphic design



[Adobe Photoshop]

Applications

- Entertainment
- Science and Engineering
- Visualization
- Graphic Arts
- Fine Arts

Mechanics

Content

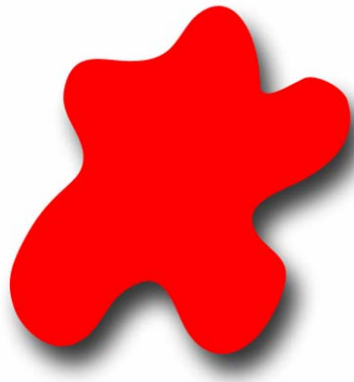
- You will
 - understand image synthesis principles
 - learn math to make images
 - implement key algorithms
 - write cool apps
- You will not
 - learn graphics APIs (OpenGL, DX)
 - though you will use a bit of GL
 - implement large systems

Topics

- Digital Images
- Rendering 3D environments
- Geometric Transformations
- Graphics Pipeline
- Curve and Surface Representation
- Animation

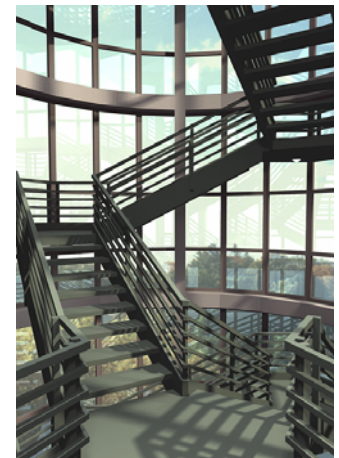
Topics - Digital Images

- Image representation
- Compositing
- Antialiasing



Topics - Rendering 3D environments

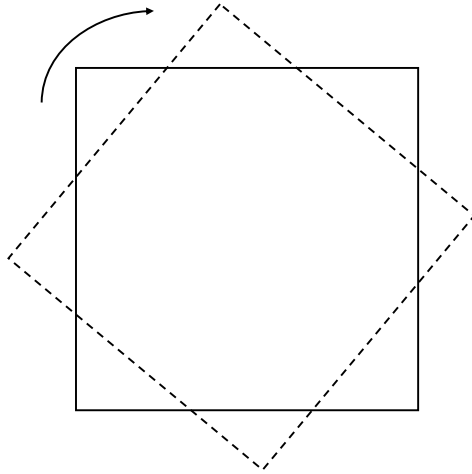
- raytracing
- shading models
- realistic materials
- lighting simulation



[Cornell PCG]

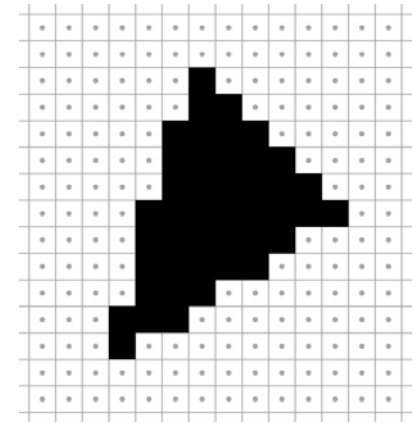
Topics - Geometric Transformations

- 2D transformations
- 3D transformations
- projections
- hierachies



Topics - Graphics Pipeline

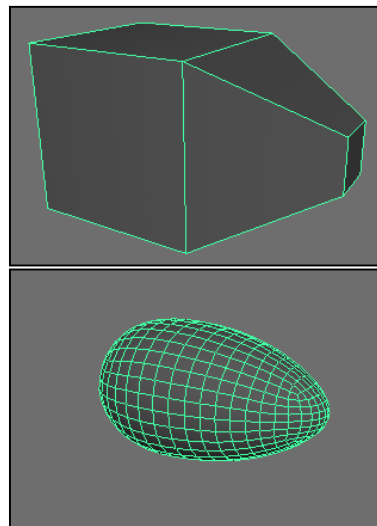
- rasterization
- z-buffer
- graphics architectures



[Marschner 2003]

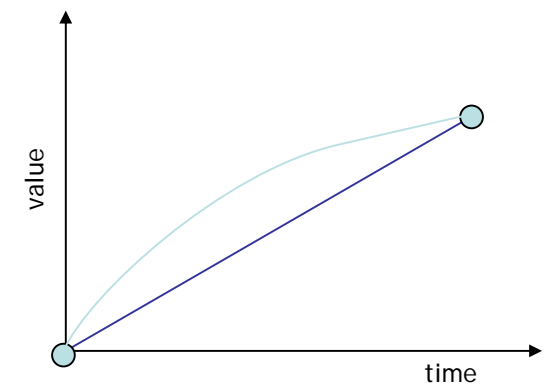
Topics - Curves and Surfaces

- parametric curves
- polygonal meshes
- subdivision surfaces



Topics - Animation

- keyframe interpolation
- skeletal animation
- skinning



Administration Details

www.cs.dartmouth.edu/~cs43/