CS465: Computer Graphics I

Professor: Steve Marschner
Computer graphics: The study of creating, manipulating, and using visual images in the computer.
Problems in graphics

- 2D imaging
  - compositing and layering
  - digital filtering
  - color transformations

- 2D drawing
  - illustration, drafting
  - text, GUIs
Problems in graphics CONT’D

• 3D modeling
  – representing 3D shapes
  – polygons, curved surfaces, …
  – procedural modeling

[Differential Geometry]

[Headus—Cysurf]

[Numeral Optimization]

[Hoppe et al. 1993]

[Prusinkiewicz et al. 2001]

[Grammars]
Problems in graphics CONT’D

• 3D rendering
  – 2D views of 3D geometry
  – projection and perspective
  – removing hidden surfaces
  – lighting simulation
Problems in graphics CONT’D

• Interaction
  – 2D graphical user interfaces
  – 3D modeling interfaces
  – virtual reality
Problems in graphics CONT’D

- Animation
  - keyframe animation
  - physical simulation

FIGURE 3. Squash & stretch in Luxo Jr.’s hop.

Pixar

Enright et al. SIGGRAPH 2003
Problems in graphics cont’d

- Animation
  - keyframe animation
  - physical simulation

Enright et al. SIGGRAPH 2003

PIXAR

FIGURE 3. Squash & stretch in Luxo Jr.’s hop.
Particle system (PDEs)
Computer graphics:
Mathematics made visible.
Computer graphics: Mathematics made visible --- and when that is not feasible, approximate it!
Graphics Applications

• Entertainment
  – film production
  – film effects
  – games

Pixar—Monsters, Inc.

ID Software—Quake III Arena

New Line Cinema—The Two Towers
Graphics Applications

- Entertainment
  - film production
  - film effects
  - games

- Science and engineering
  - computer-aided design
  - scientific visualization
Graphics Applications

• Entertainment
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• Graphic Arts
Graphics Applications

- Entertainment
  - film production
  - film effects
  - games
- Science and engineering
  - computer-aided design
  - scientific visualization
- Graphic Arts
- Fine Arts
Graphics Applications

• Entertainment
  – film production
  – film effects
  – games

• Science and engineering
  – computer-aided design
  – scientific visualization

• Graphic Arts

• Virtual Reality
Graphics Applications

- Entertainment
  - film production
  - film effects
  - games
- Science and engineering
  - computer-aided design
  - scientific visualization
- Graphic Arts
- Fine Arts
- Virtual Reality
- Training & Simulation

MapBlast—LineDrive map

NASA/Ames—ACFS