CS 4731: Computer Graphics
Lecture 1: Introduction

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About This Course

- Course about Computer Graphics
- NOT a course in OpenGL
  - OpenGL only used as example
  - Concerned with how to build graphics tools
  - Concerned with underlying mathematics
  - Concerned with underlying data structures
  - Concerned with underlying algorithms
- This course is a lot of work:
  - Requires extensive coding
  - You will really know C++ when done

Syllabus Summary

- 2 Exams (50%), 5 Projects (50%)
- Will use openGL
- Code base provided: miniGL
- Required to extend miniGL functionality
- Write code on any platform.
- Must run on CCC machines
- Can work in pairs, unique projects
- All slides, material on class website

Homeworks

- Many phases to homework:
  - Understanding/design/coding/debugging/ tesing
  - Encouraged to work together
  - Must only hand in your own work
- Cheating:
  - Heavily frowned on
  - Immediate NR in the course
- Advice:
  - Come to class
  - Keep up with the reading
  - Make sure you understand before coding
- Homework 1 on website tomorrow

What is Computer Graphics

- Use a computer to create pictures
- Started early '60s: Ivan Sutherland (MIT)
- SIGGRAPH conference:
  - started 1969, 30,000 annually
  - SIGGRAPH 2003: San Diego 18,000
- Tools to make a picture
  - Hardware tools
  - Software tools

Tools

- Hardware tools
  - Output devices: Video monitors, printers
  - Input devices:Mouse/trackball, pen/drawing tablet, keyboard
- Software tools
  - Operating system
  - Editor
  - Compiler
  - Debugger

Motivation for CG

- Appealing pictures produced
- Humans respond better to pictorial information
- Human brain recognizes visual patterns

Reasons to study CG

- Better information presentation
- Job in computer graphics (games, movies, etc)
- New medium for artistic expression
- Communicate ideas better
- Get a grade??

Uses of Computer Graphics

- **Art, entertainment, publishing:**
  - movies, TV, books, magazines, games





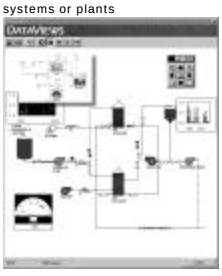
Courtesy: Pixar.com,Quake3world.com

Uses of Computer Graphics

- **Image processing:**
  - alter images, remove noise

Uses of Computer Graphics

- **Process monitoring:**
  - large systems or plants



Courtesy: Dataviews.de

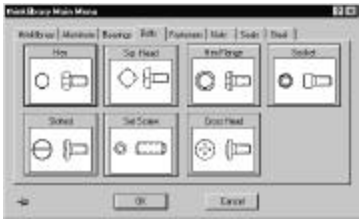
Uses of Computer Graphics

- **Display simulations:**
  - flight simulators, virtual worlds

Courtesy: Evans and Sutherland

Uses of Computer Graphics

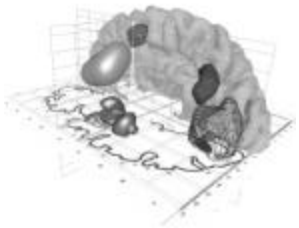
- **Computer-aided design:**
  - architecture, electric circuit design



Courtesy:
cadalog.com

Uses of Computer Graphics

- **Scientific analysis and visualization:**
  - molecular biology, weather, matlab, Mandelbrot set



Courtesy:
Human Brain Project, Denmark

CG use example

- Animated movies
  - Toy story
  - Finding Nemo
- Special effects
  - Terminator 3
  - Matrix Reloaded

Elements of CG

- **Polylines:** connected straight lines (edges, vertices)
- **Text:** font, typeface
- **Filled regions:** colors, patterns
- **Raster images:** pixels have values (pixmap)

Computer Graphics

- Functions/routines to draw line or circle, etc
- Elaborate: pull-down menus, 3D coordinate system, etc
- Previously device-dependent
  - Difficult to port
  - Error Prone
- Now device-independent libraries
  - APIs: OpenGL, DirectX, java3D

References

- Hill, Chapter 1