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/testing
  - 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

- Image processing:
  - alter images, remove noise

- Process monitoring:
  - large systems or plants
  Courtesy: Dataviews.de

- 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