What is this class about?

This is a programming class. It is about algorithms that are used to create computer graphics images.

We will not learn how to use animation or rendering software to create animations. Our goal is to learn the basics that are necessary to develop such software.

Computer Graphics

Prerequisites

- Basic linear algebra and calculus
- Solid C/C++ programming
- no Java

Hardware/Software

- PC, Linux or Windows, MacOS X
- other requires permission
- need OpenGL and GLUT; instructions for installation will be available
Grading

- 1-2 written assignments
- 5 programming assignments
- Programming
  - up to 30% quality of code
  - 50% off for crashes without assert

Computer Graphics

- Late policy:
  - 24 hours: 20% off
  - 48 hours: 40% off
  - 72 hours: 80% off

Extensions are for exceptional circumstances only and have to be requested in advance, meaning at least 4 days before the due date;

NO extensions on the last day.
Prerequisites

Programming:
Good programming skills are essential.
Good working knowledge of C++ (or at least C)
is assumed.
The programming load is high; the grade is
primarily determined by programming.

Math:
Elementary geometry and linear algebra.

Topics

Emphasis on OpenGL rendering pipeline
Scan conversion
Image processing
Basic modeling
Lighting
Rendering algorithms
What is computer graphics?

**Computer science:** software and hardware systems, vision, computational geometry

**Mathematics:** transformations, curves, surfaces, PDEs, numerical integration

**Physics:** light, dynamics

**Psychology:** perception

**Art**

Applications

**Entertainment**
- Animation and special effects
- Games

**CAD**

**Scientific Visualization**

**Medicine**

**System Visualization**
Animation

Computer Animation
Games

Games
Games

Special effects

Merge real and virtual objects
Special effects

Special effects
Computer-Aided Design

Conceptual design

Computer-Aided Design

Simulation
Visualization

Thunderstorm Simulation
NASA’s FAST

Airflow around a Harrier Jet
FAST System
Nasa Ames

Visible Human

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Modeling

Create the environment
- shapes
- appearance
- views
make it move
- define parameters
- compute how object shape, position, appearance changes

Rendering

Physics-based: simulate light propagation
Empirical: use trial and error to get pictures that are good enough
Nonphotorealistic: imitate artistic styles
Image-based: generate directly from photos or video (no modeling)
Image Processing

Output: typically a raster device (CRT, LCD, printer)
Discrete colors/intensities
Need to convert continuous data to discrete
Combine real and synthetic

Graphics hardware