Outline
- Defining Computer Graphics
- Course Structure
- Course Content Overview

What is Computer Graphics?
- create or manipulate images with computer
  - this course: algorithms for image generation

What is CG used for?
- movies
  - animation
  - special effects

What is CG used for?
- computer games

What is CG used for?
- images
  - design
  - advertising
  - art

What is CG used for?
- virtual reality / immersive displays

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Real or CG?
http://www.alias.com/eng/etc/fakeorfoto/quiz.html

Expectations
- hard course!
  - heavy programming and heavy math
- fun course!
  - graphics programming addictive, create great demos
  - programming prereq
  - CPSC 221 (Program Design and Data Structures)
  - course language is C++/C
- math prereq
  - MATH 200 (Calculus III)
  - MATH 221/223 (Matrix Algebra/Linear Algebra)

Course Structure
- 39% programming projects
  - 8% project 1 (building beasties with cubes and math)
  - 8% project 2 (flying)
  - 8% project 3 (ray tracer)
  - 15% project 4 (create your own graphics game)
  - 25% final
  - 20% midterm (week 8 Fri 3/7)
  - 16% written assignments
  - 4% each HW 1/2/3/4
  - programming projects and homeworks synchronized

Programming Projects
- structure
  - C++, Linux
  - OpenGL graphics library
  - GLUT for platform-independent windows/UI
  - face to face grading in lab
- Hall of Fame
  - first project: building beasties
  - previous years: spiders, armadillos, giraffes, frogs, elephants, birds, poodles, dinos, cats,…
  - last project: create your own graphics game

Late Work
- 3 grace days
  - for unforeseen circumstances
  - strong recommendation: don’t use early in term
  - handing in late uses up automatically unless you tell us
  - otherwise: 50% if one day (24 hrs) late, 0% afterwards
- only exception: severe illness or crisis
  - as per UBC rules
  - must let me know ASAP (in person or email)
  - at latest, 7 days after return to school
  - must also turn in form with documentation (doctor note)

Real or CG?

Real or CG?

Real or CG?

Real or CG?

Real or CG?
Regrading
- to request assignment or exam regrade
  - give me paper to be regraded, and also in writing
  - detailed explanation why you think grader was wrong
  - I will not accept until next class after solutions handed out
  - I may regrade entire assignment
  - thus even if I agree with your original request, your score may nevertheless end up higher or lower

Course Information
- course web page is main resource
  - updated often, reload frequently
  - newsgroup is ubc.courses.cpsc.414
  - note old course number still used
  - readable on or off campus
  - (no WebCT)

Teaching Staff
- instructor: Tamara Munzner
  - tmm@cs.ubc.ca
  - office hrs in ICICS/CS 011 (our lab)
  - Wed/Fri 2-3
  - or by appointment in X661
- TAs: Stephen Ingram, Cody Robson, Michael Weltman-Dinelle
  - sfingram@cs.ubc.ca
  - cjrobson@cs.ubc.ca
  - mweltman@cs.ubc.ca
- use newsgroup, not email, for all questions that other students might care about

Required Reading
- Fundamentals of Computer Graphics
  - Peter Shirley, AK Peters, 2nd edition
- OpenGL Programming Guide, v 2.1
  - Open GL Architecture Review Board
  - v 1.1 available for free online
- readings posted on schedule page

Learning OpenGL
- this is a graphics course using OpenGL
  - not a course "on" OpenGL
- upper-level class: learning APIs mostly on your own
  - only minimal lecture coverage
    - basics, some of the tricky bits
    - OpenGL Red Book
    - many tutorial sites on the web
      - nehe.gamedev.net
- we cover
  - basic algorithms for
    - rendering – displaying models
      - (modeling – generating models)
      - (animation – generating motion)
      - programming in OpenGL, C++
  - we do not cover
    - art/design issues
    - commercial software packages

Other Graphics Courses
- CPSC 424: Geometric Modeling
  - offered next year
- CPSC 426: Computer Animation
  - offered this term
- CPSC 514: Image-based Modeling and Rendering
- CPSC 526: Computer Animation
- CPSC 533A: Digital Geometry
- CPSC 533B: Animation Physics
- CPSC 533C: Information Visualization
- CPSC 530P: Sensorimotor Computation

Rendering
- creating images from models
  - geometric objects
    - lines, polygons, curves, curved surfaces
    - camera
      - pinhole camera, lens systems, orthogonal
      - shading
        - light interacting with material
  - illustration of rendering capabilities
    - Shutterbug series by Williams and Siegel using Pixar's Renderman
      - www.siggraph.org/education/materials/HyperGraph/shutbug.htm

Modelling Transformation: Object Placement

Viewing Transformation: Camera Placement

Perspective Projection

Depth Cueing
Depth Clipping

Colored Wireframes

Hidden Line Removal

Hidden Surface Removal

Per-Polygon Shading

Gouraud Shading

Specular Reflection

Phong Shading

Curved Surfaces

Complex Lighting and Shading

Texture Mapping

Displacement Mapping

Modelling
- generating models
  - lines, curves, polygons, smooth surfaces
  - digital geometry

Animation
- generating motion
  - interpolating between frames, states

Readings
- today
  - FCG Chap 1
- Wed
  - FCG Chap 2
  - except 2.5.1, 2.5.3, 2.7.1, 2.7.3, 2.8, 2.9, 2.11.
  - FCG Chap 5.1-5.2.5
  - except 5.2.3, 5.2.4

http://www.cs.ubc.ca/~van/papers/doodle.html