



Tamara Munzner

Intro

Week 1, Mon Jan 4

<http://www.ugrad.cs.ubc.ca/~cs314/Vjan2010>

Outline

- defining computer graphics
- course structure
- course content overview

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What is Computer Graphics?

- create or manipulate images with computer
 - this course: algorithms for image generation



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What is CG used for?

- movies
 - animation
 - special effects



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What is CG used for?

- computer games



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What is CG used for?

- images
 - design
 - advertising
 - art



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What is CG used for?

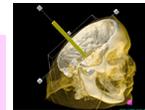
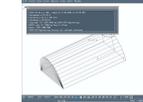
- virtual reality / immersive displays



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What is CG used for?

- graphical user interfaces
 - modeling systems
 - applications
- simulation & visualization



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Real or CG?

<http://www.alias.com/eng/etc/fakeorfoto/quiz.html>

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Real or CG?

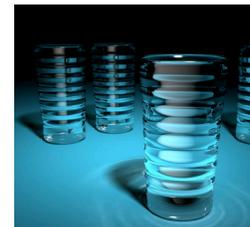
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Real or CG?

3



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Real or CG?

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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)

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Course Structure

- 39% programming projects
 - 8% project 1 (building beasts with cubes and math)
 - 8% project 2
 - 8% project 3
 - 15% project 4 (create your own graphics game)
- 25% final
- 20% midterm (week 8 Mon 3/8)
- 16% written assignments
 - 4% each HW 1/2/3/4
- programming projects and homeworks synchronized

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Programming Projects

- structure
 - C++, Linux
 - OK to cross-platform develop on Windows, Mac
 - OpenGL graphics library
 - GLUT for platform-independent windows/UI
 - face to face grading in lab
- Hall of Fame
 - first project: building beasts
 - previous years: bison, spiders, armadillos, giraffes, frogs, elephants, birds, poodles, dinos, cats...
 - last project: create your own graphics game

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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) unless H1N1 reported
 - <http://www.ugrad.cs.ubc.ca/~cs314/Vjan2010/illness.html>

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Regrading

- to request assignment or exam regrade
 - give me paper to be regraded, and also in **writing**
 - what problem you're disputing
 - detailed explanation why you think grader was wrong
 - I will not accept until next class after solutions handed out
 - exception: simple arithmetic errors
- I may regrade entire assignment
 - thus even if I agree with your original request, your score may nevertheless end up higher or lower

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Course Information

- course web page is main resource
 - <http://www.ugrad.cs.ubc.ca/~cs314/Vjan2010>
 - updated often, reload frequently
- discussion group
 - <http://groups.google.com/group/ubc-cpsc-314-spr-2010>

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Teaching Staff

- instructor: Tamara Munzner
 - call me Tamara or Prof. Munzner, your choice
 - tmm@cs.ubc.ca
 - office hrs in ICICS/CS 011 (our lab)
 - dates TBD
 - or by appointment in X661
- TAs: Shailen Agrawal, Kai Ding, Garrett Livingston
 - shailen@cs
 - dingkai@cs
 - gij3@cs
- use discussion group, not direct email, for all questions that other students might care about or know answers to

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Labs

- labs start next week, no labs this week
- attend one lab per week
 - Mon 2-3, Tue 1-2, Thu 10-11, Fri 12-1
 - TA coverage TBA
 - mix of activities
 - example problems in spirit of written assignments and exams
 - help with programming projects
 - tutorials
 - no deliverables (unlike intro classes)
 - strongly recommend that you attend
 - if you can't attend your regular one, ok to drop by another if there's space

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Required Reading



- Fundamentals of Computer Graphics
 - Peter Shirley, AK Peters, 3rd edition



- OpenGL Programming Guide, v 3.1
 - OpenGL Architecture Review Board
 - v 1.1 **available for free online**
 - aka "The Red Book"

- readings posted on schedule page

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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

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Plagiarism and Cheating

- don't cheat, I will prosecute
 - insult to your fellow students and to me
- programming and assignment writeups must be individual work
 - can discuss ideas, browse Web
 - cannot just copy code or answers
 - cannot do team coding
 - exception: final project can be team of two or three
- you must be able to explain algorithms during face-to-face demo
 - or no credit for that part of assignment
 - and possibly prosecution

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Citation

- cite all sources of information
 - what to cite
 - study group members, books, web sites
 - where to cite it
 - README for programming projects
 - end of writeup for written assignments
- <http://www.ugrad.cs.ubc.ca/~cs314/Vjan2010/policies.html#plag>

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Course Content Overview

- 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

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This Course

Other Graphics Courses

- CPSC 424: Geometric Modeling
 - offered next year
- CPSC 426: Computer Animation
 - offered last 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

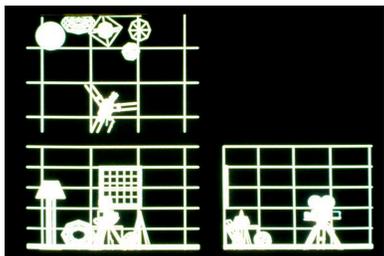
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Rendering

- 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

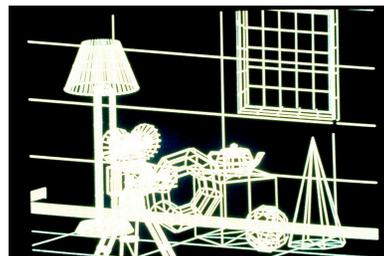
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Modelling Transformation: Object Placement



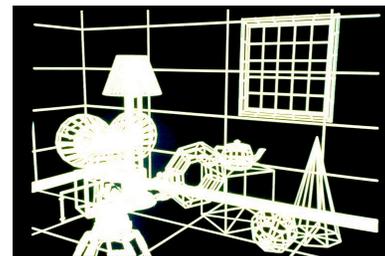
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Viewing Transformation: Camera Placement



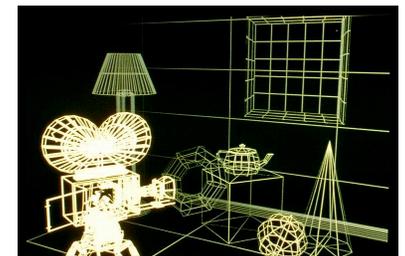
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Perspective Projection



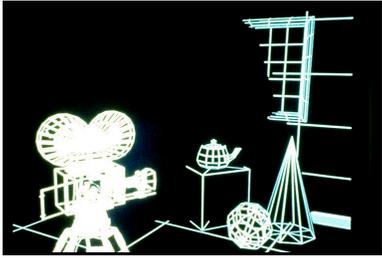
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Depth Cueing



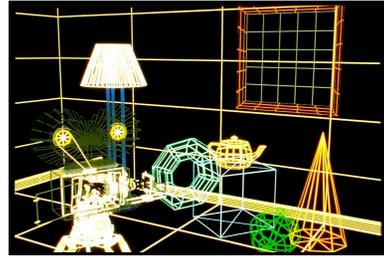
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Depth Clipping



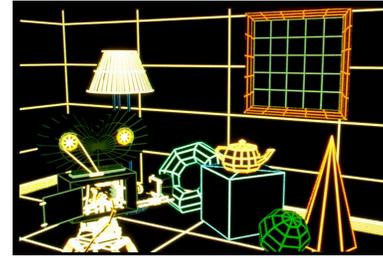
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Colored Wireframes



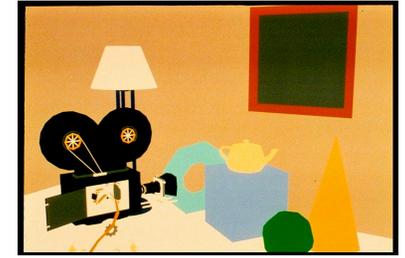
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Hidden Line Removal



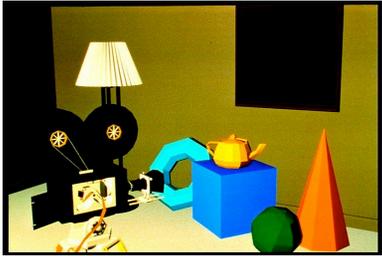
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Hidden Surface Removal



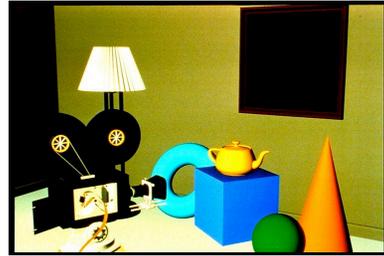
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Per-Polygon Shading



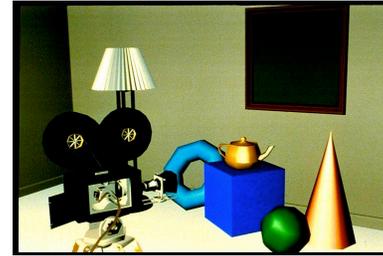
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Gouraud Shading



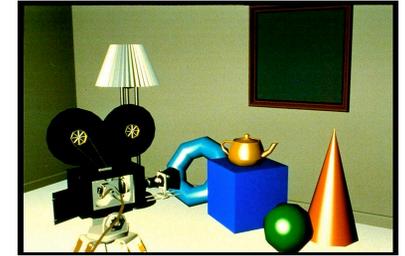
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Specular Reflection



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Phong Shading



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Curved Surfaces



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Complex Lighting and Shading



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Texture Mapping



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Displacement Mapping



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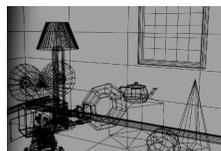
Reflection Mapping



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Modelling

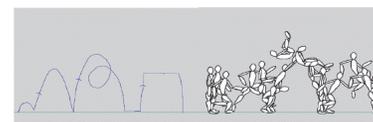
- generating models
 - lines, curves, polygons, smooth surfaces
 - digital geometry



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Animation

- generating motion
 - interpolating between frames, states



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

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Readings

- today
 - FCG Chap 1
- Wed
 - FCG Chap 2
 - except 2.7 (covered later)
 - FCG Chap 5
 - except 5.4

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Announcements

- no lecture this Friday Jan 8
- UBC CS dept announcements