CS-184: Computer Graphics

Lecture #1: Introduction, Overview, and Image Basics

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University of California, Berkeley

Today

- Introduction and Course Overview
- Special Announcement
- Homeworks #0 and #1
- Digital Images
The Subject: Computer Graphics

- **Computer Graphics:**
  Using computers to generate and display images

- **Issues that arise:**
  - Modeling
  - Rendering
  - Animation
  - Perception
  - Lots of details...

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Computer Graphics

- **Applications (in other words, why we care)**
  - Movies
  - Video Games
  - Simulation
  - Analysis
  - Design
  - Others...
Computer Graphics

- Applications (in other words, why we care)
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  - Others...

From Star Wars Episode 1, Lucasfilm Ltd.

From Finding Nemo, Pixar Animation Studios
Computer Graphics

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From Halo 2, by Bungie Entertainment

Computer Graphics

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From America's Army
Computer Graphics

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Image from CAE Inc.

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Computer Graphics

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Carlo Sequin
Computer Graphics

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Course Topics

- Image representation and manipulation
- 2D and 3D drawing algorithms
- Object representations
- Rendering
- Animation
- Interaction techniques
People

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Send class related email to cs184@imail.eecs.berkeley.edu

Contact Information

- Class web site:
  - http://inst.eecs.berkeley.edu/~cs184
  - Handouts assignments, etc. will be posted there
  - Lecture notes posted there (hopefully) before classes

- News group:
  - ucb.class.cs184
  - Not reading news group... bad idea

- Email addresses on previous page...
Computing Resources

- Class accounts handed out next week
- New lab with Power Mac G5s
- Can also use other labs (Linux or Windows)

Text Book

- *Fundamentals of Computer Graphics*
  by Peter Shirley
- Also handouts and other supplemental material will be provided
- See other books listed in course information handout
Grading

- Assignments: 30%
  - Mix of written and programming
  - Average 1 or 2 weeks to do them
- Final Project: 30%
  - Wednesday, May 4th, 2:30-5:30 pm
- Midterm: 20%
  - Wednesday, March 9th, in class
- Final: 20%
  - Saturday, May 14th, 5:00-8:00 pm
- Check now for conflicts!

Prerequisites

- You must know how to program C or C++
  - Big final project, several programming assignments
  - No hand holding
- Data structures (CS60C)
- Math: linear algebra, calc, trig
Waitlist

- Relax for now...

Class Participation

- Reasons to participate
  - More fun for me and you
  - You learn more
  - I won’t give stupid little annoying quizzes in class

- How to participate
  - Ask questions
  - Make comments

- Stupid questions/comments
  - That’s okay
Homeworks #0 and #1

- Homework #0
  - Setup CS184 account and let us know who you are
  - Do this ASAP (after you get the account sheet)

- Homework #1
  - Due Thursday, January 27th at midnight
  - Tests math prerequisites

Academic Honesty

- If you use an external resource cite it clearly!
- Don’t do things that would be considered dishonest... if in doubt ask.
- Cheating earns you:
  - An ‘F’ in the class and
  - Getting reported to the University
  - No exceptions.
Questions?

Announcement

- Participate in a perceptual experiment
  - Comparison of methods for human motion generation
  - You watch TV, fill out a questionnaire, and then get $5

  Date: Jan 21st
  Time: 2:00 pm
  Place: 330 Soda Hall

  For more information, contact:
  Okan Arikan, okan@eecs.berkeley.edu
Images

- Something that represents a **pattern of light** that will be **perceived** by something
- **Computer representations**
  - Sampled (pixel based)
  - Object based
  - Functional
Images

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**Computer representations**

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Well, this *used* to be in an object based representation...
Images

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Function → Polygons → Pixels
Think about making edits...

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Storing Images

○ Object and Function representations basically arbitrary ...later...

○ Raster Images
  ○ 2D array of memory
  ○ Pixels store different things
    ○ Intensity
    ○ RGB color
    ○ Depth
    ○ Others...
  ○ May be mapped to special HW

Stephen Chenney
Discretization

- Real world and “object” representations are continuous.

- Raster images have discrete pixel locations and discrete pixel values

- We will see problems from this soon...

High Dynamic Range Images

Jack Tumblin
High Dynamic Range Images

- Dynamic range of the human eye >> range of standard monitors
- Eye adjusts as we look around

Perception

- The eye does not see intensity values...
Storing Images

- Digital file formats
  - TIFF, JPEG, PNG, GIF, BMP, PPM, etc.
  - Compression (lossless and lossy)
  - Interlaced (e.g. NTSC television)
  - Tend to be complex... use libraries

- Mapping to memory

Suggested Reading

- Fundamentals of Computer Graphics by Pete Shirley
  - Chapters 1, 2.1 through 2.4, 3, and 4
  - 2.1-2.4 and 4 should be review of prerequisite materials
  - Chapter 3 was partially covered today... more on Monday.