The Subject: Computer Graphics

- Computer Graphics:
  Using computers to generate and display images

- Issues that arise:
  - Modeling
  - Rendering
  - Animation
  - Perception

Computer Graphics

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

Today

- Introduction and Course Overview
- Homeworks #0 and #1
- Digital Images
Computer Graphics

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

From Star Wars Episode I, Lucasfilm Ltd.

From Finding Nemo, Pixar Animation Studios

From Halo 2, by Bungie Entertainment

From America’s Army
Computer Graphics

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

Image from CAE Inc.

Computer Graphics

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

Carlos Sopiar

Course Topics

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

**Prof. James O’Brien**

Email: job@eecs.berkeley.edu
Office hours: Fridays 2:00-4:00pm
Office location: 633 Soda Hall

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Office hours: TBD
Office hours location: 751 Soda Hall

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

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**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 newsgroup... bad idea

- **Email addresses on previous page...**

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**Computing Resources**

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

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**Text Book**

- *Fundamentals of Computer Graphics*
  - by Peter Shirley
  - *Get the current version!*

- Also handouts and other supplemental material will be provided
- See other books listed in course information handout
Grading

- Assignments: 30%
  - Mix of written and programing
  - Average 1 or 2 weeks to do them
- Final Project: 30%
- Midterm: 20%
- Final: 20%

- Dates in course handout
  - Check now for conflicts!

Prerequisites

- You must know how to program C or C++
  - Big final project, several programing 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 (see handout)
  - 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?

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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  - Vector- or stroke-based
Images

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Computer representations

- Sampled (pixel based)
  - Object based
  - Functional

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

Images

- Something that represents a *pattern of light* that will be *perceived* by something

Computer representations

- Sampled (pixel based)
  - Object based
  - Functional

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

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

- Object and Function representations basically arbitrary...later...
- Raster Images
  - 2D array of memory
  - Pixels store different things
    - Intensity (scalar value, e.g., float, int)
    - RGB color (vector value)
    - Depth
    - Others...
  - May be mapped to special HW

Discretization

- Real world and “object” representations are continuous.
- Raster images have discrete pixel locations and discrete pixel values

<table>
<thead>
<tr>
<th>Continuous</th>
<th>Discrete</th>
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</thead>
<tbody>
<tr>
<td>Pixels: Picture Elements</td>
<td></td>
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- We will see problems from this soon...

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