

CS-184: Computer Graphics

Lecture #1: Introduction, Overview,
and Image Basics

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University of California, Berkeley

V2006-F-01-1.0

Today

- Introduction and Course Overview
- 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...

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Computer Graphics

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From Star Wars Episode I, Lucasfilm Ltd.

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From Finding Nemo, Pixar Animation Studios

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From Halo 2, by Bungie Entertainment

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From America's Army

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Image from CAE Inc.

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Computer Graphics

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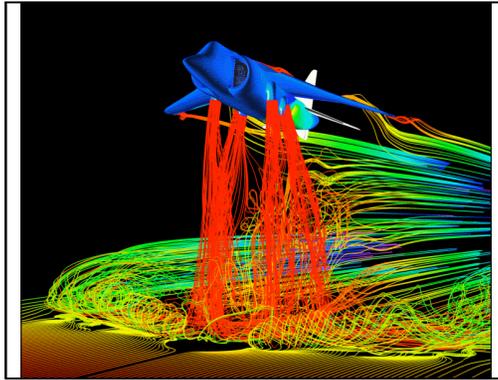
Carlo Sequin

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Computer Graphics

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- Others...



Fluid simulation w/ NASA FAST

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Course Topics

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

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People



Prof. James O'Brien

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Mao Ye

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Office hours location: TBA

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 shortly
- Can also use CS Labs
 - Linux
 - Windows
 - Mac

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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

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Grading

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

- **Dates in course handout**
 - Check *now* for conflicts!

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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**

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Waitlist

- Relax for now...

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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

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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

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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.

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Questions?

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Images

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

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Images

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

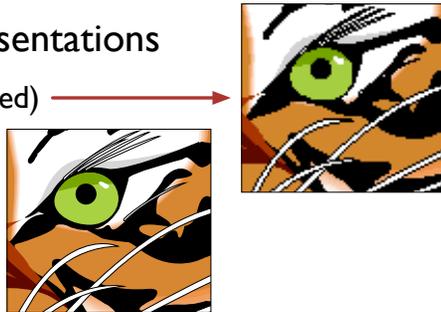
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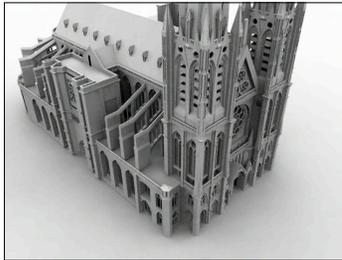
PS Type 1 font →



← Vector- or stroke-based

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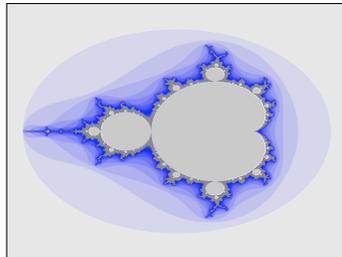
Okan Arikan

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

Images

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Mandelbrot Fractal Plot by Vincent Stahl

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Images

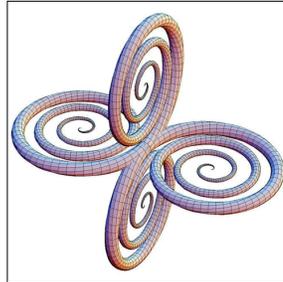
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Function → Polygons → Pixels

Think about making edits...

"Spiral Crossed" by Sandor Kabai

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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



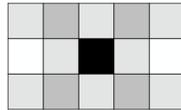
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Storing Images

- 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...



0.25	0.5	0.25	0.5	0.25
1	0.25	0	0.25	1
0.25	0.5	0.25	0.5	0.25

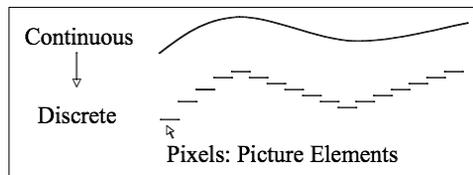
Stephen Cheney

- May be mapped to special HW

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Discretization

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

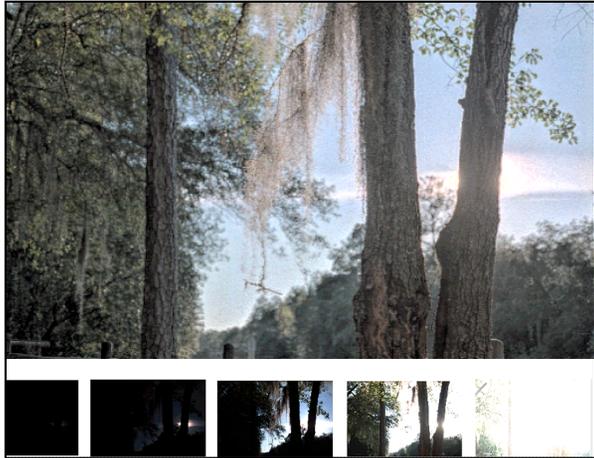


Stephen Cheney

- We will see problems from this soon...

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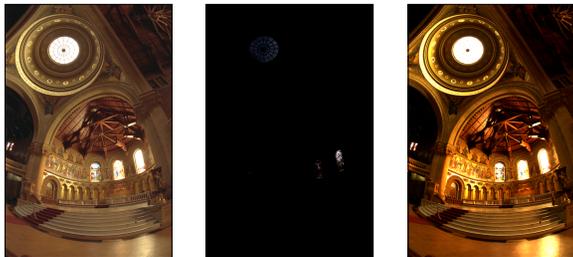
High Dynamic Range Images



Jack Tumblin

High Dynamic Range Images

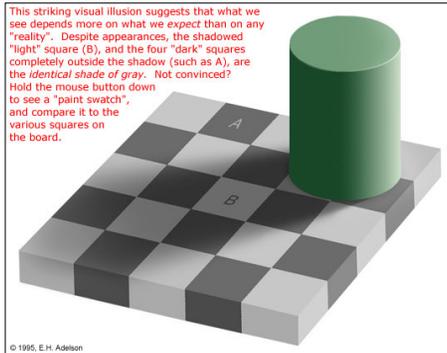
- Dynamic range of the human eye \gg range of standard monitors
- Eye adjusts as we look around



Paul Debevec and Jitenrda Malik

Perception

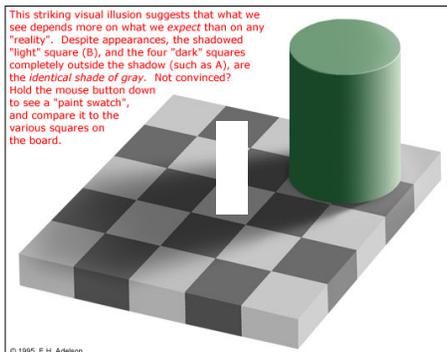
- The eye does not see intensity values...



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Perception

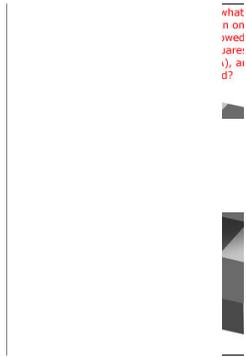
- The eye does not see intensity values...



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Perception

- The eye does not see intensity values...



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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

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