Introductions

Pat Hanrahan
- My PhD is in biophysics
- Founding employee at PIXAR
- Academy awards: RenderMan / Subsurface
- Research: rendering, graphics systems and architectures, and visualization

Kate Swanson
Yi-Ting Yeh
Imran Haque
+2 others TBD
Why Study Computer Graphics?

Entertainment

Movies
Toy Story 3
Pixar

Games
Spore
W. Wright, Elec. Arts

Spore-Monsters.com
Computer-Aided Design

Mechanical CAD
Architectural CAD
Electronic CAD

AutoCAD

Sketchup

Visualization

Science, engineering and medicine

The Virtual Human
Karl-Heinz Hoehne

Outside-In
The Geometry Center
Visual Simulation and Training

Apollo spacecraft
Flight simulators
Driving simulators
Surgical simulation

Boeing 747 flight simulator
NASA

davinci surgical robot
Intuitive Surgical

Digital Media Technologies

Convert traditional analog media to digital media
- Desktop publishing and printing
- Digital photography
- Digital video and HDTV
Digital Media Technologies

Emergence of media
- Multimedia computer and media servers
- Networked graphics and the WWW
- Electronic books, magazines and newspapers
- Sharing photos (flickr) and videos (youtube)
- Virtual worlds (Google Earth, Second Life)

With new possibilities for creating and mixing content from different sources

Graphical User Interfaces

Desktop metaphor
- Input: Keyboard, mouse
- Output: Cathode-ray tube

Douglas Engelbart
Mouse

Ivan Sutherland, Sketchpad
Light-pen, oscilloscope
Emerging User Interfaces

Different scales: Small and large
Emerging sensors: Multi-touch, accelerometers, ...

Apple iPad

Microsoft Surface

CS148 Lecture 1
Pat Hanrahan, Fall 2010

Innovation in Hardware & Software

iPhone and iPad

Apple A4 = CPU+GPU

CS148 Lecture 1
Pat Hanrahan, Fall 2010
**Ultimate Display: Virtual Reality**

**Immersive interfaces**
- Input: 3D 6-DOF tracking, gloves
- Output: Head-mounted and projection displays

Ivan Sutherland
Head-mounted displays, mechanical tracker

Wolfgang Krueger, Pat Hanrahan
Responsive Workbench
Projection display, magnetic tracker

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**Theory and Practice**

**Science and Mathematics**
- Physics of light, color and appearance
- Geometry and perspective
- Mathematics of curves and surfaces

**Engineering**
- Hardware: Graphics processors, sensors
- Software: Graphics libraries, window systems

**Art and Psychology**
- Perception: Color, displays, ...
- Art and design: Composition, form, lighting, ...
Administration

Prerequisites

Mathematics
- Math 41 and 42: Calculus 1 & 2
- Vectors, matrices, basic linear algebra
- Polynomials
- Basic signal processing, Fourier transform
- Helpful: Math51, Math 103/104/113, CS205, ...

Programming
- CS107
- Fluent in C++
- Fluent with development environment
Evaluation

Weekly programming assignments (70% of grade)
■ 8 assignments
■ Expect 5-10 hours per assignment
■ Handed out on Thu; due following Thu
■ No late days
■ Drop assignment with lowest score (count 7/8)
Midterm and final (30% of grade)
■ Written exams
■ Open-book/notes/computer, closed-network
■ Cover concepts and problem-solving

Graphics Track

Two required graphics courses
CS148
■ Broad overview of graphics and imaging
■ Designed to be a standalone course
CS248
■ CS148 is a prerequisite (both should be taken)
■ Emphasizes real-time 3D graphics (games)
■ Modeling, rendering, animation

More information

Course Wiki

https://graphics.stanford.edu/wikis/cs148-10-fall

Topics
Drawing and the Graphics Pipeline

Sand Dollar - J. Tared 2004

Input Devices & Interactive Techniques

Acts as a shift key
Unused
Reserved for future use
Controls telescope movement
Button Mappings:
Z/C: Menu up/down
Y: Changes menu selection
B: Activates selected menu
X/A: Increase/decrease slew rate
Start + Y/B: Cycle through available tours
Typography and Page Layout

Digital Cameras
Displays

CS148 Lecture 1
Pat Hanrahan, Fall 2010

Light and Color

CS148 Lecture 1
Pat Hanrahan, Fall 2010
Compression

Digital Video and HDTV

Stratix II or Cyclone II Device

Non-Altera
Modeling and Rendering

Animation and Simulation