Introductions

Pat Hanrahan
- My PhD is in biophysics
- Founding employee at PIXAR
- Two academy awards: RenderMan / Subsurface scattering
- Research: rendering, graphics systems and architecture, visualization, virtual worlds

Tim Foley (lead CA)
Jongmin Baek
Ed Luong
Leslie Wu
Why Study Graphics?

Entertainment

Movies
Toy Story, Pixar

Games
Spore, W. Wright, Elec. Arts
Computer-Aided Design

Computer-aided design
- Electronic blueprints
- Architectural CAD
- Mechanical CAD
- Electronic CAD

Visual simulation and training
- Apollo spacecraft
- Flight simulators
- Driving simulators
- Surgical simulation

Digital Media Technologies

Traditional media (analog to digital transition)
- Desktop publishing and printing
- Digital photography
- Digital video and HDTV

New media
- Multimedia computer and media servers
- Networked graphics and the WWW
- Sharing photos (flickr) and videos (youtube)
- Virtual worlds (Google Earth, Second Life)
Graphical User Interfaces

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

Ivan Sutherland, Sketchpad
Light-pen, toggle switches, oscilloscope

Douglas Engelbart
Mouse and bitmapped 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
Visualization

Science, engineering and medicine
Education

Interdisciplinary: 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, ...
Innovation in Platforms

- Game machines
  - e.g. Alienware, XBOX 360

- Personal computers
  - e.g. MacBook Pro

- Consumer electronics
  - e.g. HD PVR, HD TV

- Handhelds
  - e.g. PDAs, cell-phones, PSP

Innovation in Hardware and Software

GeForce 8800 replaces the pipeline model

The future of GPUs is programmable processing
So – build the architecture around the processor
Innovation in Hardware and Software

iPhone 3gs

Processor = CPU+GPU

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
www-cs.stanford.edu/degrees/undergrad/ProgramSheets/
CS_Graphics_0809PS.pdf

Course Wiki

https://graphics.stanford.edu/wikis/cs148-09-fall
Topics

Drawing and the Graphics Pipeline

Sand Dollar - J. Tared 2004
Input Devices and Interactive Techniques

Button Mappings:
- Z/C: Menu up/down
- Y: Changes menu selection
- B: Activates selected menu
- X/A: Increase/decrease view rate
- Start + Y/B: Cycle through available tours

Typography and Page Layout
Digital Cameras

Displays
Light and Color

Mattes, Layers, and Compositing
Filtering and Sampling

No Jaggies

Compression
Digital Video and HDTV

Modeling and Rendering
Animation and Simulation