CS148: Introduction to Computer Graphics and Imaging

Pat Hanrahan
Winter 2007

Motivation
Entertainment

Games
Spore, W. Wright

Movies
Toy Story, PIXAR

Computer-Aided Design; Training

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

Visual simulation and Training
- Apollo spacecraft
- Flight simulators
- Ship
- Automobile and 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 experiences
  Multimedia personal computer
  Networked graphics and the www
  Photo (flickr) and video sharing (YouTube)

Graphical User Interfaces

Desktop metaphor
  Input: Lightpen, mouse, keyboard
  Output: CRT

Sutherland’s Sketchpad 1960’s
Xerox Alto 1970’s
Virtual Reality

Immersive interfaces
- Input: 3D tracking, gloves
- Output: HMD, projection display

Responsive Workbench
Mechanical tracker
Magnetic tracker

Visualization

Mathematics, science, engineering, medicine, ...

Education

The Visible Man, K. H. Hoehne
Outside In, The Geometry Center
Interdisciplinary: Theory & Practice

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

Engineering
- Hardware: Graphics/media processors
- Software: Graphics libraries, window systems

Art and Perception
- Color: harmony and perception
- Composition, lighting, ...

Innovation in Platforms

Game and Enthusiast Machines
- e.g. Alienware, XBOX-360, PS3

Personal computer
- e.g. Macbook

Consumer electronics
- e.g. HDTV, PVR, Set-top box

Handhelds
- e.g. Cell-phone, 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

Topics
Drawing

Sand Dollar - J. Tared 2004

Typography and Page Layout

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Input Devices and Interactive Techniques

Acts as a shift key

Does nothing, but can be used to wake up gamepad

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

Digital Cameras
Displays

Light and Color
Exposure and Tone Reproduction

Sixteen photographs of the Stanford Memorial Church taken at 1-stop increments from 30s to 1/1000s.
From Debevec and Malik, High dynamic range photographs.

Mattes, Layers, and Compositing
Filtering and Sampling

Compression
Digital Video and HDTV

Modeling and Rendering

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Animation