Computer Graphics

Introductions

12 September 2016
Computer Graphics

- **Imaging** - storage and representation of 2D images
- **Modeling** - storage and representation of 3D objects
- **Rendering** - transformation of 3D models to 2D representations
- **Animation** - displaying changes to models over time
Image processing
Games

images counter-clockwise from top left: StarCraft 2 - Blizzard, Portal 2 - Valve, Batman: Arkham City - Rocksteady Studios, Sauerbraten - dot3 labs, FIFA 12 - EA Games
Serious gaming

images counter-clockwise from top left: America’s Army - United State Army, First Person Cultural Trainer - University of Texas, Unknown health simulation
Film: Animation

Images counter-clockwise from top left: Toy Story - Pixar, Shrek - DreamWorks, Wall-e - Pixar, How to Train Your Dragon - DreamWorks
Film: Special Effects

Film: Virtual Actors

images clockwise from top left: Return of the King - New Line Cinema, Avatar - 20th Century Fox, The Rise of the Planet of the Apes - 20th Century Fox
Film: Virtual Actors
Virtual people?
Virtual people?
Mathematics
Information visualization

Clockwise from top: Stacked graph, Byron and Wattenberg; 2D Current, Ware; Treemap, Grand Perspective; Network diagram.
Scientific visualization

Clockwise from top left: Brain pathways, Constandi; Fluid dynamics, DesJardin; Volume visualization, Guo et al.; Vortex visualization, Koehler et al.; ZoomRadar
Computer-aided design
Virtual/augmented reality

Clockwise from top left: Virtusphere; Cave at VT; Oculus Rift with Myo armband; Pokemon Go; Google Cardboard
The desktop...
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Back to the beginning

Ivan Sutherland’s Sketchpad
Raster images
Pixel depth

8 bit  4 bit  2 bit  1 bit
24 bit color

http://www.brucelindbloom.com
RGB color

"RGB Cube Show lowgamma cutout a" by Frank Horst
HSV color

Saturation

Value

Hue

"HSV color solid cylinder alpha lowgamma" by HSV_color_solid_cylinder.png: SharkD
Color gamut
Vector vs raster
The graphics system
The graphics system

Transfers graphics primitives to the graphics processor
“Rasterizes” the graphics primitives into pixels
The graphics system

Stores the pixels to be displayed on the screen
The display: CRTs

image from E. Angel and D. Shreiner “Interactive Computer Graphics”

image from F. Hill “Computer Graphics Using OpenGL”
The display: Flat panels

**LCD / LED displays**

![Diagram of LCD/LED display](http://www.laptop-lcd-screen.co.uk/laptopsParts/what-is-lcd-how-laptop-screen-works.asp)

**Plasma displays**

![Diagram of Plasma display](http://electronics.howstuffworks.com/plasma-display2.htm)