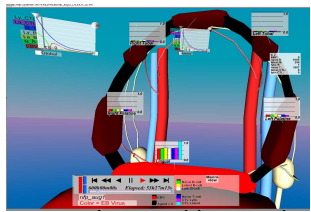
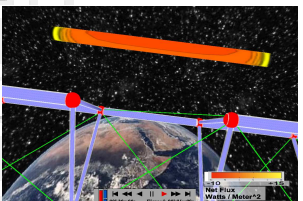


Introduction to Deep Media

FDI Track R Summer 2007

Nicholas F. Polys, Ph.D.
Andrew Ray, Ph.D. candidate

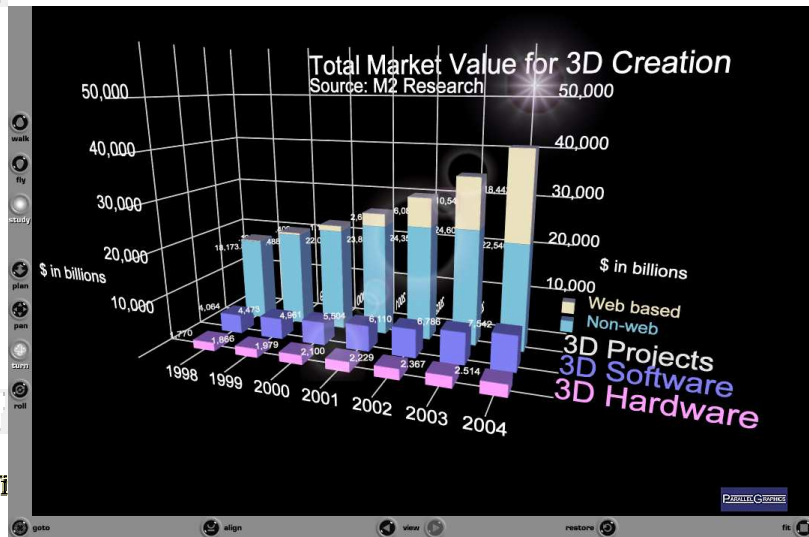


Inexorable climb

- Hardware power & speed
- Commodity platforms
- Informatics integration
- Compelling Content



Once upon a time



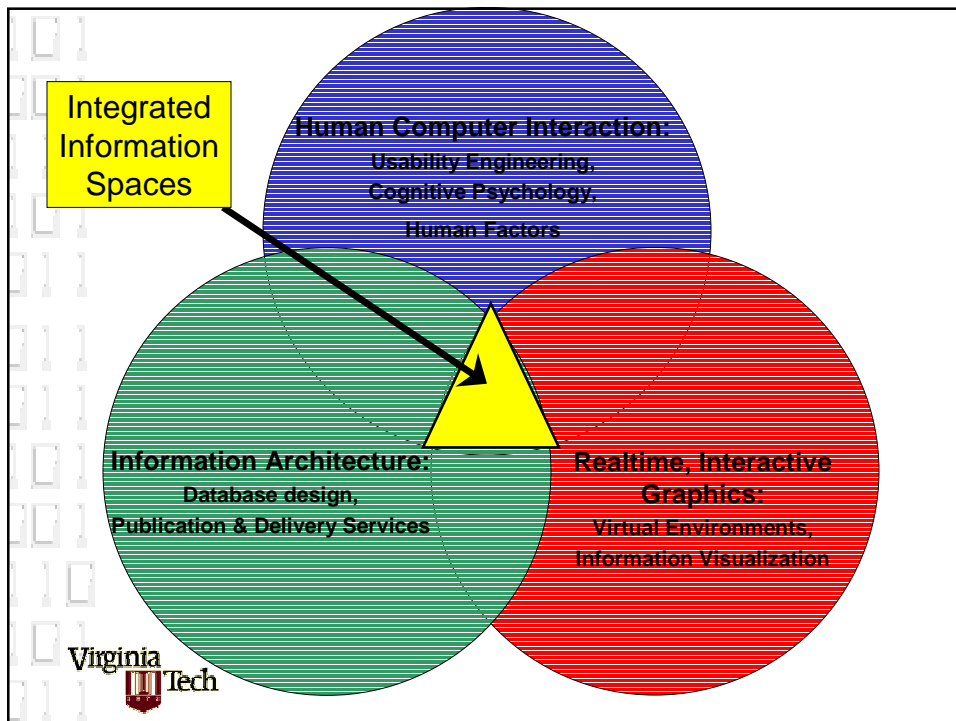
4D: a first-class citizen

What's new?

- Networked 3D digital assets
 - Objects and components
 - Appearances & materials
 - Environments
- Animation and Timeseries databases
- Metadata & web-aware referencing
- Interaction semantics

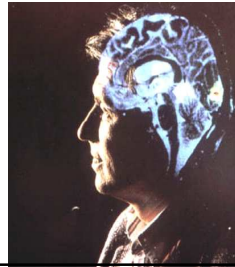
Deep Media

- Interactive spaces that evolve over time
- Contain spatially-located media resources
 - Audio
 - Video
 - Vector animations
- Hyperlinked worlds



Big Picture: Convergence & Utility

- Unified environment for analysis & learning
- Scalability for heterogeneous data types (spatial, abstract, temporal)
- Represent real world objects and systems
 - Reduce cognitive distance by putting information in familiar context
 - Leverage spatial abilities of users



Who am I

- CS / HCI doctorate – perception and action in information-rich virtual environments
- Environment and interface developer of deep media for research and education
- Web3D Consortium: Director, Co-author X3D Specification
- Working with Research Computing to advance visualization capabilities @ VT



Who are you?



Goals of this Workshop

Foundations of Interactive 3D development and deployment:

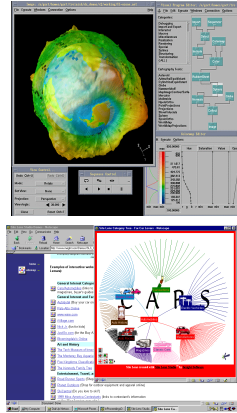
- Familiarity with tools and technologies
- Basic competence in authoring and production
- Pathway to utilize VT's Visualization expertise and facilities



Visualization: definition

- Generally:
 - The use of computer-supported, interactive, visual representations of data to amplify cognition
- Scientific Visualization
- Information Visualization
- Virtual Environments

Card, McKinlay and Schneiderman



Visual Thinking

- Many of the great scientists were good at visual thinking:
 - Leonardo da Vinci
 - James Clerk Maxwell
 - Michael Faraday
 - Albert Einstein
- This was often at the expense of verbal skills
- Tom West : “In the Mind’s Eye”
 - See also http://www.krasnow.gmu.edu/twest/maxwell_visual.html

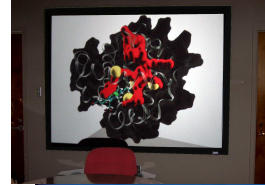
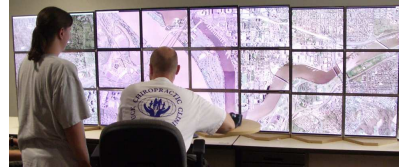


Maxwell's clay model now in New Cavendish Laboratory, Cambridge (picture by Tom West)



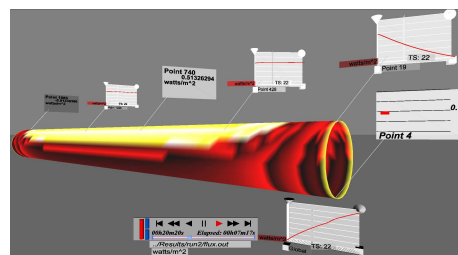
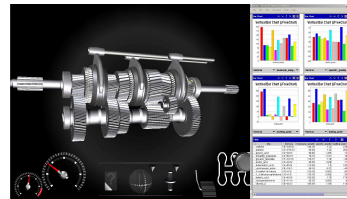
Recent Research – Display Venues

- VT Computer Science, Center for HCI show high-res and immersive display venues CAN improve task performance:
 - Analyze 22x more data in only 3x more time while maintaining accuracy
 - Reduce virtual navigation actions by 75%
 - Reduce frustration by 50%
 - Short initial learning time



New Opportunities – Display Techniques

- Spatial, Abstract, and Temporal data can be combined, delivered and presented in an 'integrated information space'
- Attributes and annotations plus objects and groups can be rendered with a variety of (in)consistent perceptual cues



The Challenge

- The real digital divide is the last ten feet between the interface and the mind

Perception

color, shading, lines
characters, squares,
spatial organization

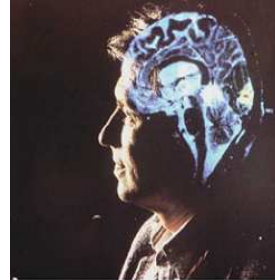


Interpretation

(Working Memory)
Excel worksheet, a part
is selected, formula is
displayed at top

Making Sense

Proposed design will
cost too much in long term
maintenance

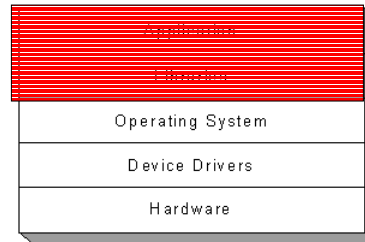


Why Learn This?

- Integrated visualization capabilities are necessary for users to gain a full understanding of complex relationships in their heterogeneous data
- Application designers must take account of how humans build their cognitive models and what perceptual predispositions and biases are in play
- With such knowledge, designers can take steps to minimize or leverage their effect and create advantageous research, design, and decision-support applications

State of the Art

- Successive layers of abstraction allow developers to design and build at higher levels
- Shaders and new rendering algorithms improve realism & performance
- Concrete benefits of large format, high-res, and immersive displays



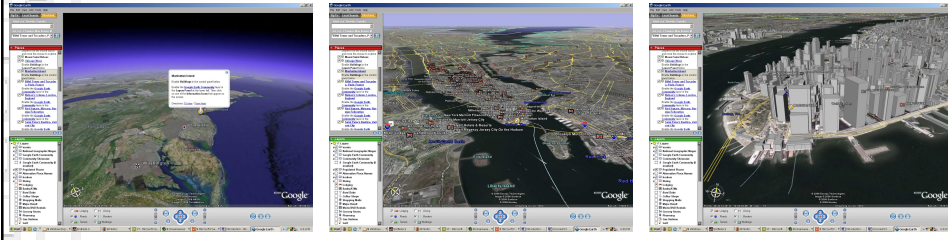
Graphics Engines

- Games
 - e.g. Unreal, Delta3D, ...
- Consumer solutions
 - e.g. Cortona, Bitmanagement, Octaga, FreeWrl, Xj3D, Flux, H3D...
- Multi-User spaces
 - e.g. ActiveWorlds, Blaxxun, BeThere, SecondLife, ...
- Industrial grade toolkits
 - e.g. DIVERSE, Paraview & VTK, ...



Services & Servers

- Integrated databases
- Interoperable file formats
- Referenced resources across the web
- Visualization middleware services
- Multi-user & persistent worlds



Proprietary vs. Opensource

- Who owns the data?
- Who owns the tools to access that data?
- How are bugs/new features accomplished?
- How much does it cost?

Games, Google, Second Life
vs. open standards



Data Formats

- VRML & X3D:
 - expressive data and runtime behavior
 - Interoperation with WWW
- Import and export from many commercial and free tools
- A capable 'common denominator'



Open Standards

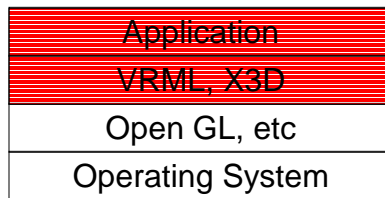
www.web3d.org

- Portability
- Durability
- IP independence
- International recognition and support



Foundations

- ISO standard, openly published
- Multiple implementations including open source codebases
- X3D includes Transformation graph and behavior graph



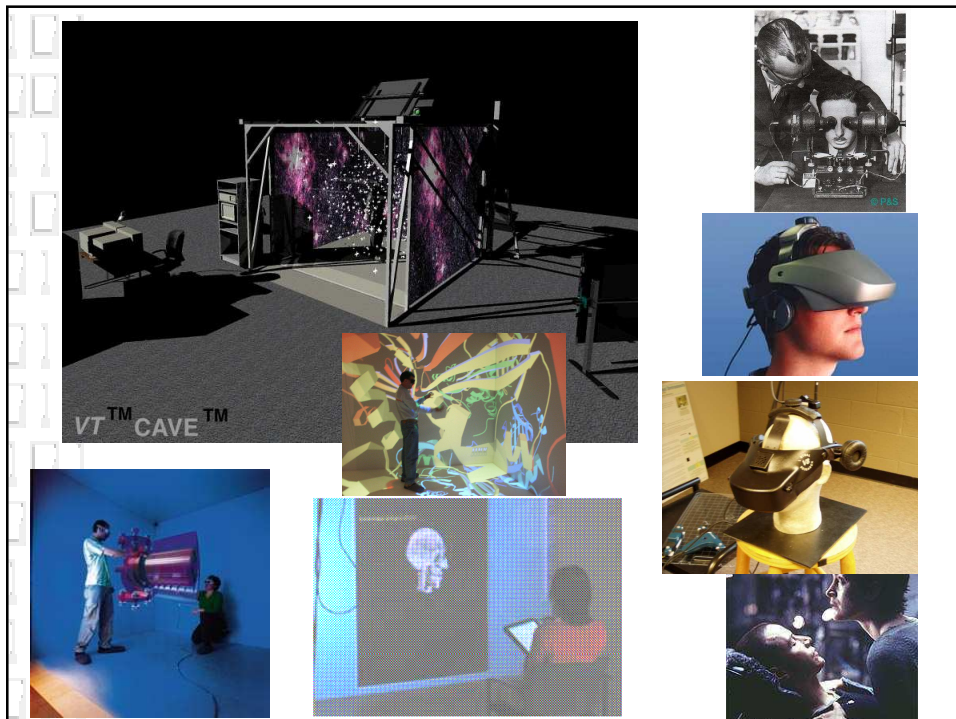
Source of Specs, Models, Links,
Bulleting boards, Blogs, Mailing
lists, ...

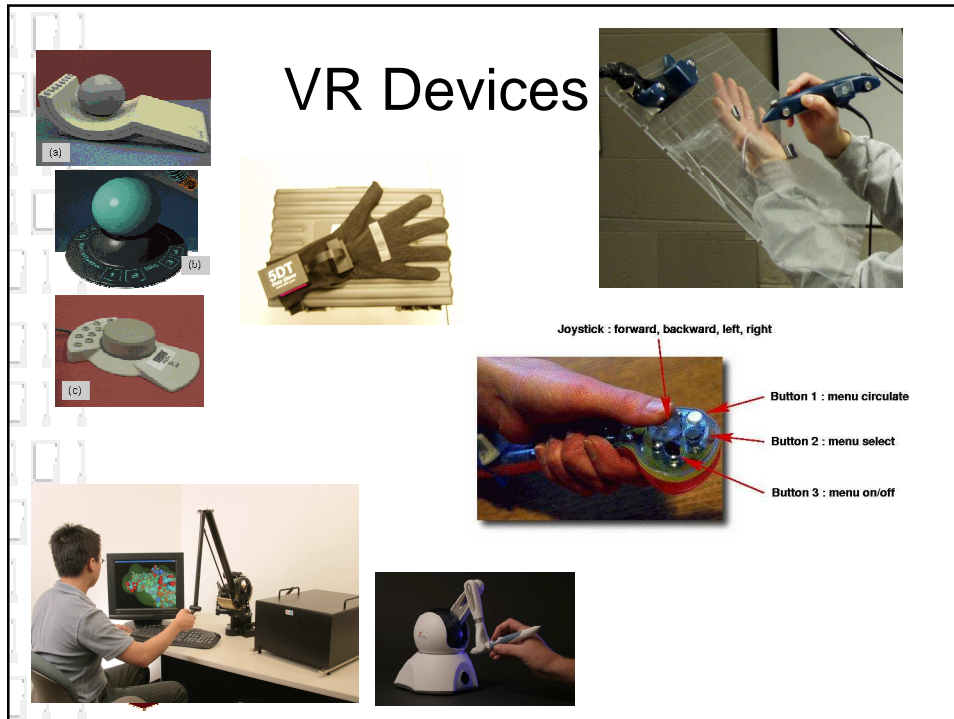
<http://www.web3d.org>



Immersion

- Technology that helps you 'be there' ...
to 'be present'
 - Display surround
 - Stereoscopic rendering
 - Head and input tracking





Base Install (Windows)

- Drag the 'Classroom files' /npolys folder to a folder with you name on the local Project drive
 - Install Flux Studio authoring IDE
 - <http://www.mediamachines.com/downloads.php>
 - Install Cortona viewer (select OpenGL renderer)
 - <http://www.parallelgraphics.com/products/cortona>
 - Fix IE security settings in Internet Options:
 - Medium; allow Active X
 - Point IE to <http://www.parallelgraphics.com/products/cortona/best>
 - Flux player will work in Firefox; see:
 - <http://www.mediamachines.com/browse.php?number=600>



Bonus Installs (Win)

- Chisel: opensource optimizer & translator
 - <http://www2.hrp.no/vr/tools/chisel/install.htm>
- Paraview: opensource full-featured Vis app
 - <http://www.paraview.org>
- X3D Edit: opensource structured editor & translator
 - <http://www.web3d.org/x3d/content/README.X3D-Edit.html>
- Xj3D: opensource jogl rendering engine
 - <http://www.xj3d.org/snapshots.html>



Base Install (Mac)

All opensource:

- White Dune: opensource VRML authoring IDE
 - <http://vrml.cip.ica.uni-stuttgart.de/dune/>
- FreeWrl: opensource viewer
 - <http://freewrl.sourceforge.net/>



Bonus Install (Mac)

- Chisel: optimizer & translator
 - <http://www2.hrp.no/vr/tools/chisel/install.htm>
- Paraview: full-featured Vis app
 - <http://www.paraview.org>
- Xj3D: opensource jogl rendering engine
 - <http://www.xj3d.org/snapshots.html>



Deep Media

Examples:

- <http://people.cs.vt.edu/~npolys/IT/FDI/links.html>



Other tool links

- Ask me about it!
- Linux platforms supported in VT Vis



Viewers

Cortona (Win)	Stable and easy to use; VRML only http://www.parallelgraphics.com/products/cortona
Contact (Win)	Great rendering speed, expert interface; VRML and X3D http://www.bitmanagement.de/download/play/download.en.html
Octaga (Win, Linux)	Nice rendering features, VRML and X3D http://www.octaga.com/
FreeWrl (Mac, Linux)	A robust and compliant opensource viewer, Canadian Gov't. opensource project; VRML and X3D http://freewrl.sourceforge.net/
Xj3D (Win, Mac, Linux)	A robust and compliant opensource engine written over Java and OpenGL. You'll be surprised! VRML and X3D http://www.xj3d.org/snapshots.html



VRML / X3D Authoring Tools

VizX3D	Free beta of a mature product; Win only http://mediamachines.com/make.php
Blender	Opensource; animation can be exported; Win, Mac, Linux (C++) http://www.blender.org/cms/Home.2.0.html
ArtofIllusion	Opensource; Win, Mac, Linux (Java) http://www.artofillusion.org/



Authoring / translation

X3D-Edit	http://www.web3d.org/x3d/content/X3D-EditAutoInstall/Web_Installers/install.htm
Blender import / export	http://people.mech.kuleuven.be/~pissaris/misc/blender/blenderx3d.html http://www.bitbucket.ca/~acheater/blender/
3D Object Converter	Shareware, Win only http://web.axelero.hu/karpo/



Toolkits

Coin	http://www.coin3d.org/
OpenVRML	Included in FedoraExtras http://www.openvrmf.org
CyberX3D	http://www.cybergarage.org/



VisIT	http://www.llnl.gov/VisIt/executables.html
ParaView	http://www.paraview.org/HTML/Download.html
VTK / ITK	http://www.vtk.org/ http://www.itk.org/
Visual designers, dicom, for VTK	http://www.vtk.org/Wiki/VTK_Tools

