EnVISION 2005

Exploring a New Visualization Infrastructure
Silicon Graphics Campus
January 19, 2005

http://vw.indiana.edu/envision05/

Workshop Organizers: Bonnie DeVarco & Katy Börner

1/3/2005
Participant Areas of Expertise

IV = Information Visualization
GV = GeoVisualization
SV = Science Visualization
GL = GeoLiteracy
II = Immersive Interfaces
C = Cyberinfrastructures
A = Art
Themes

Cross-fertilizing InfoVis, GeoVis & SciVis

Location Aware Computing & GeoLiteracy

New Architectures & Cyberinfrastructure Initiatives
Trends

• **Data**
  - Large datasets and data streams
  - Geo-located information
  - Datamining (acting as a “microscope” to make sense of data)
  - Data integration and correlation

• **Interfaces**
  - Rise of 3D interfaces
  - Interfaces to handheld devices
  - Visual interfaces to the Semantic Web
  - Collaborative visualization
  - Powerwalls and interfaces for handheld devices

• **Infrastructures**
  - Cyberinfrastructure initiatives

• **Standards**
  - Open Source and open standards
  - Privacy issues
Requirements

Need for:

- A systematic approach to the collective creation, curation, management and preservation of large datasets
- Distributed, community-wide access to databases and their associated computational analysis and visualization
- Geographically distributed cyberinfrastructures, connected via optical networks and grid computing
- Modular software frameworks facilitating easy assembly of extensible and customizable tools
- Tool in support of the analysis and display of spatio-temporal data
- Tools compatible with open source and emerging standards
Technologies

Tools for:
• Data Acquisition
  – Place-centered computing
  – GPS/RFID tagging - Geolocation

• Datamining
  – Temporal analysis
  – Spatial analysis
  – Semantic Analysis

• Data Visualization
  – High dimensional visualization
  – Geographic information systems
  – Simulation
  – Multimedia and multimodal displays
  – Knowledge mapping
  – Advanced human interfaces
Agenda

- History of Advanced Visualization at SGI and MediaFusion by David Hughes

- Geovisualization by Timothy Foresman, Paul Hansen and Chuck Stein

- Hands-On Collaborative Visualization (VAN) by Michael Brown and Eric Frost

- Information Visualization and the Spatialization of Knowledge by Katy Borner, André Skupin and Ramana Rao

- Theme 1 Discussion: Cross-fertilizing InfoVis, GeoVis and SciVis by Katy Bömer

- Theme 2 Discussion: Location-Aware Computing and Growing Cyberinfrastructures by Mike Liebhold

- Summary, Next Steps, Funding options by Katy Bömer, Bonnie DeVorco

- Advanced Visualization and Analysis with the Hyperwall, NASA’s Visualization Center and Columbia System Supercomputer tour (at NASA Ames) by Christopher Henze

- Informal Dinner/Reception
Wireless information streams add astronomical quantities of highly complex, heterogeneous data for analysis and display. This profusion of data needs a conduit – a common, expandable, high performance buffer space is required to provide a common location for management, composition, rendering, fusion, processing, storage and subsequent redistribution of pixel data streams through:

- Scalable shared memory architecture
- Ingestion, fusion and sharing of pixel data across numerous visual streams and output channels
- Data management and interaction in immersive visualization environments
Eric Frost

- Collaborative Visualization

- GEON Cyberinfrastructure for the GeoSciences
- Cal-(IT)$^2$ – OptIPuter optical network, a distributed cyberinfrastructure to support data-intensive scientific research and collaboration
- Sensor networks for realtime data – remote operation Centers
- Center for Information Technology and Infrastructure (CITI)
Eric Frost
Timothy W. Foresman

- Digital Earth & 3D GeoBrowsers
  - Evolution of Digital Earth Project
  - International Society for Digital Earth (ISDE)
  - Digital Earth Vision Infrastructure
  - Global Spatial Data Infrastructure
  - 3D Geobrowser Network
Cascading Benefits from 3-D Geobrowser
Global Information Network

- Disaster Management
- Hurricane Landfall Forecasting

City Planning
- Natural Resources
- Transportation
- Agriculture
- Education
- Biodiversity and Forest Management
- Food Security and Precision Farming

For all Nations:
- Solve practical problems
- Contribute to informed decision making
- Communicate with citizens

Global Connections:
- Governments
- NGOs
- Scientists
- Infoterra Centres
- National Focal points
- Citizens

3-D Visualization for a Digital Earth
- Cities Air Pollution, Water Quality and Waste Handling
- Student and Teacher Training

Abstract:

Title: Cascading Benefits from 3-D Geobrowser
Global Information Network

Presentation by: Timothy W. Foresman

Date: 1/3/2005
Paul Hansen & Chuck Stein

- **GeoMatrix – 3D GeoVisualization**
  - Dynamic geo-data and visualization on the sphere
  - Fusing data in realtime
  - Tiled, multi-resolution data packaging
  - 3D, scale-independent navigation
  - Spatio-temporal information in a geographic context by showing patterns on multiple scales
GeoFusion
Katy Bömer

- *Information Visualization*
  - InfoVis Cyberinfrastructure
  - Mapping Humanity’s Knowledge & Expertise
  - Knowledge Domain Visualization and Analysis
  - Mapping Social Patterns in Collaborative Virtual Worlds
  - Information “Landscapes”
André Skupin

 Spatialization

- Cartographic and geographic perspectives on information visualization
- Integration of document management, geographic metaphors, and GIS
- New methods for linking geolocation with spatialization of n-dimensional data
André Skupin
Ramana Rao

- The Information Universe

- Information Flow
- Navigating hierarchies: wide widgets for spatial management
- Content terrain maps – information properties
- Open Infrastructures
- Actionable intelligence
Mike Liebhold

• Place-Centered Computing

– GeoWeb and the Evolution of “Deep Place”
– Situated Knowledge / GPS Literacy
– Spatial Awareness / Spatial Thinking
– GPS/RFID Tagging / Geolocation
– Geocoded Hypermedia, Spatial Multimedia and Locative Media
– Semantic translation
Eileen Clegg

- Visual Journalism for the Theme Sessions
  - Using visual communication techniques encapsulated in a graphical ‘map’.
  - Capturing pivotal and defining points in the two theme Sessions that capture the big ideas and subtle sub-themes.
Chris Henze – NASA Ames Hyperwall

- NASA Ames Hyperwall Visualization Applications

  – Visualizing high dimensional, complex data for computational chemistry, climate and weather modelling, (bio)nanotechnology, computational cosmology, astrophysics and neuroscience
  – 49 high resolution screens for visualization-simulation-analysis
  – 64 million pixels distributed over 55 square feet of viewing surface with 100 Gb/s of visual output
NASA Ames’ Hyperwall
Next Steps

- Documentation of EnVISION as a part of the InfoVis Cyberinfrastructure at Indiana University
- EnVISION Report – lead, Katy Bömer
- Online Collaboratory for continued research – lead, Bonnie DeVarco
- Exploring funding options for new multi-institutional collaborations
Invitees

Encouraging a Cross-Disciplinary Dialogue

• Leaders in:
  – InfoVis, Knowledge Domain Visualization
  – Geospatial Literacy, Geovisualization and GIS
  – Immersive and Collaborative Visualization
  – Advanced Visualization
• Cognitive Scientists and Visual Perception Researchers
• SGI Principals

All invitees on the original list will receive the final report materials and will be invited onto the collaboratory after the workshop (whether they are able to attend or not).