

NIH/NSF
Visualization
Research Challenges
Draft Report

NIH/NSF
VISUALIZATION RESEARCH
CHALLENGES



Chris Johnson
Robert Moorhead
Tamara Munzner
Hanspeter Pfister
Penny Rheingans
Terry Yoo

Process

Workshops

- First workshop Sept 2004
- Second workshop May 2005
- Input from panelists and invited speakers
- Limited room, chose representative sample

Report Drafts

- First draft April 2005
- Penultimate draft report available Oct 2005
- **Feedback before Nov 11 useful**
- Final version by late 2005

Thanks to Participants

Panelists: Maneesh Agrawala, Liz Bullitt, Steve Cutchin, David Ebert, Thomas Ertl, Steve Feiner, Bob Galloway, Mike Halle, Pat Hanrahan, Chuck Hansen, Helwig Hauser, Karl Heinz Hoehne, Ken Joy, Arie Kaufman, Daniel Keim, David Laidlaw, Ming Lin, Bill Lorensen, Alan MacEachren, Kwan-Liu Ma, Chris North, Art Olson, Catherine Plaisant, Jerry Prince, Will Schroeder, Jack Snoeyink, John Stasko, Barbara Tversky, Matthew Ward, Colin Ware, Turner Whitted, Jarke van Wijk

Guest Speakers: Felice Frankel, Alyssa Goodman, Leslie Loew, Wayne Loschen, Patrick Lynch

Why This Report?

Original 1987 NSF report jumpstarted field

- Time for a follow-on; it's been 18 years

Graphics hardware now commodity

- Repurpose all that rendering energy

NSF justifiably looking for other agencies to partner in funding visualization

Malaise perceived by some

- Field losing momentum/focus/drive

Panel Overview

Report on report

- Chris Johnson, Tamara Munzner, Penny Rheingans

Panelists

- Bill Lorensen, Jarke van Wijk, David Laidlaw

Audience comments/feedback

Report Structure

Value of Visualization

Process of Visualization

Power of Visualization

Roadmap

State of the Field

Value of Visualization

Definition

- Helps people explore or explain data through software systems that provide static or interactive visual representations
- Human perceptual system in loop

Enabling technology for other disciplines

- Statistics analogy: also discipline itself
- Necessary (but not sufficient)

Information big bang

Process of Visualization: Moving Beyond Moore's Law

Issues that won't get addressed by waiting

- Collaboration with application domains
- Integrating with other methodologies
- Examining why and how visualizations work
- Exploring new visualization techniques systematically
- Designing interaction

Process of Visualization: Determining Success

Quantitative

- Time, memory performance
- Quantitative user study with metrics on abstract task

Qualitative

- Anecdotal evidence: eureka moments
- User community size
- Qualitative user studies: ethnographic analysis, longitudinal field studies, informal usability evaluation
- Conceptual framework

Process of Visualization: Open Science

Need for repositories

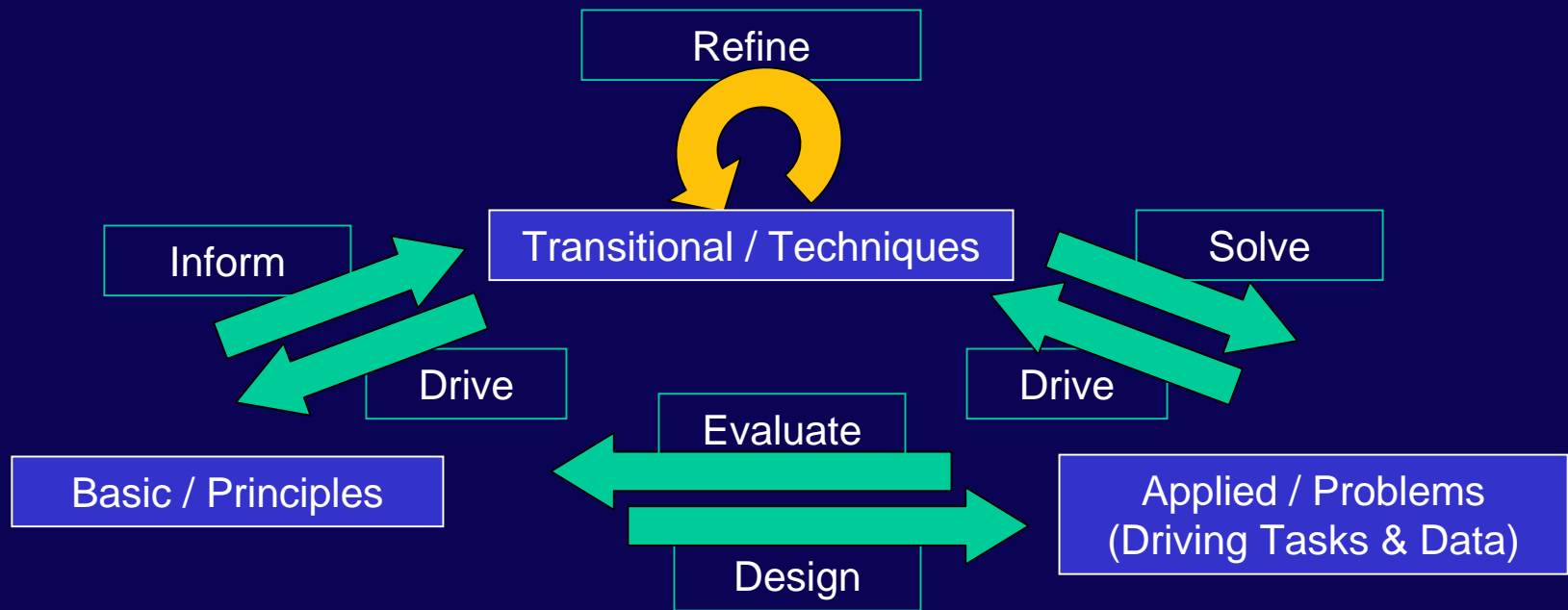
- Reproducibility
- Open science: open data + open source
- Data and task
- Curation and maintenance

Advocacy

- Often not our data to give

Process of Visualization: Achieving Our Goals

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Disproportionate percentage of current research is transitional technique refinement

Balanced vis portfolio should also be driven by applied problems and grounded in basic research



Power of Visualization

Transforming Health

Bioinformatics
Surgical support
Prevention and policy
Biological imaging
Personalized medicine

Transforming Science and Engineering

Physical sciences
GeoSciences
Engineering
Social sciences

Transforming Life

Mass market
Security
Business
Education

Road Map



Short term: policy

- Reviews for proposals, papers, promotion
 - Acknowledge/accommodate interdisciplinary and enabling nature of vis
 - Need in domain areas for validation and vis of results
- Add small percentage for vis in domain areas
 - More commensurate with benefit than current situation

Road Map



Medium term: direction

- Fund pilot program to encourage vis and domain people to work together
 - Foster collaboration
 - Lower entry barriers

Road Map

Long term: investment

- Long-term funding commitment
- Coordinated investment across agencies
- Support for core and collaborative research
- Increase emphasis on:
 - Curated data repositories
 - Emerging technologies: displays, interaction
 - Foundational research

State of the Field: Other Reports



NVAC

- Establish intellectual foundations for new field
- Very specific domain focus on security
- Complementary and synergistic

PITAC

- Aimed at congressional level

Many other

State of the Field: Infrastructure

Hardware

- Polygon hw is commodity, volume hw exists
- Display technology now improving rapidly

Networking is commodity

Software

- Commercial and open source thriving

State of the Field: Funding Patterns

Concerns about decline in money for long-range research

Not enough funding to meet needs

Few enduring funding sources for collaborative research

Distribution of funding sources do not reflect potential benefits to application areas

What's Missing On Purpose



Comprehensive survey/bibliography of all good vis work

Examples of bad visualization

Definitions of infovis vs. scivis

NVAC book recapitulation

Success Stories

Sidebars with picture, paragraph, reference

- Current set gathered with help from panelists
- Open to change if we get better ones from you
 - Need picture, paragraph (what is it, why is it successful, future challenges), reference
- Criteria (final curatorial decisions made by us)
 - Better coverage of research areas
 - More compelling image
 - Greater application impact

Via email before Nov 11 to Terry Yoo
(tyoo@mail.nih.gov)

What Now

Panelists

- Bill Lorensen
- Jarke van Wijk
- David Laidlaw

Live feedback from you at microphones

- Also, email feedback by Nov 11

Helpful, Not Helpful, Offline Email

I like it, ship it.

You left my work out...

- please cite it (and it's useful to back up our arguments)
- please cite it (and it's gratuitous)

I disagree with finding X...

- because it's wrong / not supported / counterproductive
- because it picks on my work

Sections X and Y are strong,

- but Z is repetitive / weak / buzzwordy / handwavy
- but rewrite the whole thing my way
- except, yuk, I don't want to do user studies
- but there's a typo/grammar/fact error on page W

I have a fabulous success story