

TRACK: Homeland Security & Emerging Technology
TITLE: The Science and Technology Agenda for Visual Analytics: Science and Technology Recommendations
DATE: Sunday, February 20, 2005
TIME: 1:45 p.m. - 4:45 p.m.
ORGANIZERS: Kris Cook, Pacific Northwest National Laboratory

PARTICIPANTS: * = *invited, not yet confirmed.*

William Ribarsky (Speaker), University of North Carolina, Charlotte
The Science of Analytic Reasoning

Stephen Eick (Speaker), SSS Research
Science of Visual Representations and Interactions

David Kasik (Speaker), The Boeing Company
Data Representations and Transformations

Nancy Chinchor (Speaker), Advanced Technologies and Programs, U.S. Government
Presentation, Production, and Dissemination

David Laidlaw (Speaker), Brown University
Moving Research into Practice

Kris Cook (Discussant), Pacific Northwest National Laboratory

AVAILABLE ABSTRACTS:

[The Science of Analytic Reasoning](#)

[Presentation, Production, and Dissemination](#)

[Science of Visual Representations and Interactions](#)

[Data Representations and Transformations](#)

[Moving Research into Practice](#)

SYNOPSIS:

The Department of Homeland Security (DHS) is sponsoring the development of a research agenda in visual analytics to address the core issue of identifying potential terrorist threats. The envisioned suite of technologies will also provide value to many areas of business and scientific research, encouraging broad application and growth in this field. Experts from academia, industry, and government laboratories are partnering with many government agencies to develop the science and technology agenda that will drive future research activities. This session will provide an overview of the technical challenges to be addressed in responding to the needs of DHS. These technical agendas will provide the description of needs so that government officials, industry, academia, and National Laboratories can be responsive to DHS and other government agencies in future funded programs. A selected group of government officials and senior scientists from academia and industry will present the recommended technology directions. Presentation topics will include: the science of analytical reasoning; the science of visual representations and interactions; data representations and transformations; presentation, production, and dissemination; and moving research into practice.

Title:
The Science of Analytic Reasoning

Presenter:
William Ribarsky

Authors:
William Ribarsky, University of North Carolina, Charlotte

Abstract:

This science of analytical reasoning provides the reasoning scaffolding that underpins visual analytics. Through the theory and modeling of the interaction between perceptual and cognitive processes, analytical reasoning provides the principles that can maximize human capacities to perceive and understand complex and dynamic data. These are foundational components of successful analysis and related processes that involve immense flows of data.

Analytical reasoning research will draw from work in multiple disciplines, including perceptual and cognitive psychology, neuroscience, cognitive science, human-computer interaction, design, and computing. The research must build on this work to forge a new, fundamental bond with interactive visualization.

Title:
Presentation, Production, and Dissemination

Presenter:
Nancy Chinchor

Authors:
Nancy Chinchor, Advanced Technologies and Programs, US Government

Abstract:

Once an analysis is complete, the results must be communicated to other people in order to have any effect. Results of analytical assessments may need to be shared with decision-makers and policy-makers, or in some cases with emergency response personnel or border guards. Transformation of analytical results into clear and concise communications is a challenging and underexamined problem.

Presentation of results, production of reports, and dissemination of information have long been the purview of the commercial office suite and the organizational practices of the analytic shops. The state of the practice is that visualization analytics tools are entirely separate from the use of tools for composing a presentation. Integrating these tools will not suffice because analytic reasoning, note taking, production, presentation, and dissemination need to occur simultaneously.

This presentation describes the state of the art and provides several recommendations for more fully integrating production, presentation, and dissemination needs into future visual analytics tools.

Title:
Science of Visual Representations and Interactions

Presenter:
Stephen Eick

Authors:
Stephen Eick, University of Illinois at Chicago and SSS Research

Abstract:

Visual representations are central to visual analytics. Information that will be analyzed must be represented with concrete visual forms. The science of visual representations is involved with all aspects of constructing these representations. This includes deep insights into ways to represent information, methods to produce software that embodies the representations, insights into the scalability of the representations, methods to produce representations for new domains that will be perceptually effective, and techniques to interact with the representations

Title:
Data Representations and Transformations

Presenter:
David Kasik

Authors:
David Kasik, The Boeing Company

Abstract:

This presentation focuses on the essential representations and transformations needed to support interpretation of massive amounts of data. Providing tools to assist an analyst in making assessments of complex situations requires sophisticated mathematical analysis. In the National Visualization and Analytics Center (NVAC) context, the primary goal of transformation is to reduce complexity to the extent that an analyst can comprehend facts and data in a way that facilitates accurate and timely decision-making. When data representations and transformations are tightly coupled with visualization, an analyst has multiple tools and techniques available that build upon his or her cognitive abilities.

The data representation and transformation methods described in this presentation help the analyst make decisions about complex situations. Many challenges exist. Representations and transformations must be chosen carefully based on both the analytical task and the data characteristics. Data must be restructured into forms suitable for computer manipulation without compromising the information and knowledge content of that data. Data from multiple sources must be synthesized in ways that transcend the data's original form or format. This allows an analyst to interact with data at the "meaning" level rather than at the "container" level.

Title:
Moving Research into Practice

Presenter:
David Laidlaw

Authors:
David Laidlaw, Brown University

Abstract:

The National Visualization and Analytics Center's (NVAC) objective is to accelerate the technology pipeline from research into practice. To accomplish this, several issues must be addressed. New evaluation methods must be developed to identify the most promising techniques and their appropriate applications. Planning must be done to ensure interoperability of diverse systems through flexible architectures and approaches for communications and data handling. Techniques must be implemented to provide robust information system security and to make the protection of personal privacy a paramount priority. Approaches must be developed for lowering the organizational barriers associated with deployment of advanced technologies in complex organizations.