

# PROCEEDINGS OF SPIE

[SPIDigitalLibrary.org/conference-proceedings-of-spie](https://spiedigitallibrary.org/conference-proceedings-of-spie)

## Front Matter: Volume 7530

, "Front Matter: Volume 7530," Proc. SPIE 7530, Visualization and Data Analysis 2010, 753001 (18 January 2010); doi: 10.1117/12.856032

**SPIE.**

Event: IS&T/SPIE Electronic Imaging, 2010, San Jose, California, United States

# ***Visualization and Data Analysis 2010***

**Jinah Park  
Ming C. Hao  
Pak C. Wong  
Chaomei Chen**  
*Editors*

**18–19 January 2010  
San Jose, California, United States**

*Sponsored and Published by*  
IS&T—The Society for  
Imaging Science and Technology  
SPIE

*Cosponsored by*  
Hewlett-Packard Company (United States)

**Volume 7530**

Proceedings of SPIE, 0277-786X, v. 7530

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publishers are not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Visualization and Data Analysis 2010*, edited by Jinah Park, Ming C. Hao, Pak C. Wong, Chaomei Chen, Proceedings of SPIE-IS&T Electronic Imaging, SPIE Vol. 7530, Article CID Number (2010).

ISSN 0277-786X

ISBN 9780819479235

Copublished by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

and

**IS&T—The Society for Imaging Science and Technology**

7003 Kilworth Lane, Springfield, Virginia, 22151 USA

Telephone +1 703 642 9090 (Eastern Time) · Fax +1 703 642 9094

imaging.org

Copyright © 2010, Society of Photo-Optical Instrumentation Engineers and The Society for Imaging Science and Technology.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by the publishers subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at [copyright.com](http://copyright.com). Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/10/\$18.00.

Printed in the United States of America.

---

**Paper Numbering:** Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

# Contents

- v *Conference Committee*
- vii *Introduction*

---

## UNCERTAIN DATA EXPLORATION AND COLORING

---

- 7530 02 **Interactive visualization of fuzzy set operations** [7530-01]  
Y. Park, J. Park, Korea Advanced Institute of Science and Technology (Korea, Republic of)
- 7530 03 **Tile-based parallel coordinates and its application in financial visualization** [7530-02]  
J. Alsakran, Y. Zhao, Kent State Univ. (United States); X. Zhao, Kent State Univ. (United States) and Office of Comptroller of the Currency (United States)
- 7530 04 **Linked exploratory visualizations for uncertain MR spectroscopy data** [7530-03]  
D. Feng, L. Kwock, Y. Lee, R. M. Taylor II, The Univ. of North Carolina at Chapel Hill (United States)
- 7530 05 **Experiments on effective color combinations in map-based information visualization** [7530-04]  
S. Einakian, T. S. Newman, The Univ. of Alabama in Huntsville (United States)

---

## TECHNIQUES FOR BINNING CLUSTERING AND ONTOLOGY VISUALIZATION

---

- 7530 06 **Visual analytics of large multidimensional data using variable binned scatter plots** [7530-05]  
M. C. Hao, U. Dayal, R. K. Sharma, Hewlett-Packard Labs. (United States); D. A. Keim, H. Janetzko, Univ. Konstanz (Germany)
- 7530 07 **Different geometries in ontology visualization** [7530-06]  
J. Dmitrieva, F. J. Verbeek, Leiden Univ. (Netherlands)
- 7530 08 **Critical region analysis of scalar fields in arbitrary dimensions** [7530-07]  
M. Allili, Bishop's Univ. (Canada); M. Ethier, T. Kaczynski, Univ. de Sherbrooke (Canada)
- 7530 09 **A visual approach to improve clustering based on cluster ensembles** [7530-08]  
J. Zhou, S. Konecni, K. Marx, G. Grinstein, Univ. of Massachusetts Lowell (United States)

---

## VISUAL EXPLORATION

---

- 7530 0A **Multichannel transfer function with dimensionality reduction** [7530-09]  
H. S. Kim, J. P. Schulze, A. C. Cone, G. E. Sosinsky, M. E. Martone, Univ. of California, San Diego (United States)
- 7530 0B **Visual discovery in multivariate binary data** [7530-10]  
B. Kovalerchuk, F. Delizy, L. Riggs, Central Washington Univ. (United States); E. Vityaev, Institute of Mathematics (Russian Federation)

- 7530 0C **Vide: an editor for the visual exploration of raw data** [7530-11]  
M. Wörner, G. Reina, S. Grottel, T. Ertl, Univ. Stuttgart (Germany)

---

#### EVALUATION AND VISUAL DESIGN

---

- 7530 0E **Techniques for precision-based visual analysis of projected data** [7530-13]  
T. Schreck, Technische Univ. Darmstadt (Germany); T. von Landesberger, Technische Univ. Darmstadt (Germany) and Fraunhofer IGD (Germany); S. Bremm, Technische Univ. Darmstadt (Germany)
- 7530 0F **Flow Web: a graph based user interface for 3D flow field exploration** [7530-14]  
L. Xu, H.-W. Shen, The Ohio State Univ. (United States)
- 7530 0G **Visualizing search results: evaluating an iconic visualization** [7530-15]  
M. Erfani Joorabchi, A. Dalvandi, H. Seifi, L. Bartram, C. D. Shaw, Simon Fraser Univ. (Canada)

---

#### VISUALIZATION OF FRAMEWORK AND METHODOLOGY

---

- 7530 0H **Cognitive task analysis of network analysts and managers for network situational awareness** [7530-16]  
R. F. Erbacher, Utah State Univ. (United States); D. A. Frincke, P. C. Wong, Pacific Northwest National Lab. (United States); S. Moody, Utah State Univ. (United States); G. Fink, Pacific Northwest National Lab. (United States)
- 7530 0I **Applying the metro map to software development management** [7530-17]  
A. Aguirregoitia, J. J. Dolado, C. Presedo, Univ. of the Basque Country (Spain)
- 7530 0J **Operator-centric design patterns for information visualization software** [7530-18]  
Z. Xie, Z. Guo, M. O. Ward, E. A. Rundensteiner, Worcester Polytechnic Institute (United States)
- 7530 0K **Distributed visualization framework architecture** [7530-19]  
O. Mishchenko, S. Raman, R. Crawfis, The Ohio State Univ. (United States)

---

#### INTERACTIVE PAPER SESSION

---

- 7530 0L **MTVis: tree exploration using a multitouch interface** [7530-20]  
D. Andrews, S. T. Teoh, San Jose State Univ. (United States)
- 7530 0M **Visualizing multidimensional data through granularity-dependent spatialization** [7530-21]  
S. Kontaxaki, E. Tomai, M. Kokla, M. Kavouras, National Technical Univ. of Athens (Greece)
- 7530 0N **Multivariate visualization of 3D turbulent flow data** [7530-22]  
S.-W. Wang, V. Interrante, E. Longmire, Univ. of Minnesota (United States)
- 7530 0O **Lifting business process diagrams to 2.5 dimensions** [7530-23]  
P. Effinger, J. Spielmann, Eberhard Karls Univ. Tübingen (Germany)

*Author Index*

# Conference Committee

## *Symposium Chair*

**Jan P. Allebach**, Purdue University (United States)

## *Symposium Cochair*

**Sabine Süsstrunk**, Ecole Polytechnique Fédérale de Lausanne  
(Switzerland)

## *Conference Chairs*

**Jinah Park**, Korea Advanced Institute of Science and Technology  
(Korea, Republic of)

**Ming C. Hao**, Hewlett-Packard Laboratories (United States)

**Pak Chung Wong**, Pacific Northwest National Laboratory  
(United States)

**Chaomei Chen**, Drexel University (United States)

## *Conference Cochairs*

**Katy Börner**, Indiana University (United States)

**Matti T. Gröhn**, Center for Scientific Computing (Finland)

**Jonathan C. Roberts**, Bangor University (United Kingdom)

## *Program Committee*

**Uwe Brinkschulte**, Johann Wolfgang Goethe-Universität Frankfurt am  
Main (Germany)

**Paul Craig**, Napier University (United Kingdom)

**Steve Eick**, Visual Insights (United States)

**Robert F. Erbacher**, Utah State University (United States)

**Daniel Keim**, Universität Konstanz (Germany)

**Zhanping Liu**, Mississippi State University (United States)

**Joerg Meyer**, University of California, Irvine (United States)

**Chris North**, Virginia Polytechnic Institute and State University  
(United States)

**Hans-Georg Pagendarm**, Deutsches Zentrum für Luft- und Raumfahrt  
e.V. (Germany)

**Alex T. Pang**, University of California, Santa Cruz (United States)

**Aaron J. Quigley**, University College Dublin (Ireland)

**William Ribarsky**, The University of North Carolina at Charlotte  
(United States)

**Tobias Schreck**, Technische Universität Darmstadt (Germany)

**Deborah E. Silver**, Rutgers University (United States)

**Kalpathi R. Subramanian**, The University of North Carolina at Charlotte  
(United States)  
**Yinlong Sun**, Purdue University (United States)  
**J. Edward Swan II**, Naval Research Laboratory (United States)  
**Matthew O. Ward**, Worcester Polytechnic Institute (United States)  
**Yingcai Xiao**, University of Akron (United States)  
**William J. Yurcik**, University of Illinois at Urbana-Champaign  
(United States)

*Session Chairs*

- 1    Uncertain Data Exploration and Coloring  
**Robert F. Erbacher**, Utah State University (United States)
- 2    Techniques for Binning Clustering and Ontology Visualization  
**Pak Chung Wong**, Pacific Northwest National Laboratory  
(United States)
- 3    Visual Exploration  
**Zaixian Xie**, Worcester Polytechnic Institute (United States)
- 4    Invited Presentation  
**Tobias Schreck**, Technische Universität Darmstadt (Germany)
- 5    Evaluation and Visual Design  
**Pak Chung Wong**, Pacific Northwest National Laboratory  
(United States)
- 6    Visualization of Framework and Methodology  
**Robert F. Erbacher**, Utah State University (United States)
- 7    Interactive Paper Session  
**Ming C. Hao**, Hewlett-Packard Laboratories (United States)

## Introduction

This year's Visualization and Data Analysis is the 10th meeting in a series about many aspects of visualization. The conference has grown rapidly over the years and has attracted participants from throughout the world. The need for visualizing large amounts of information arises in all areas of science, technology, industry, and even in everyday life. New applications constantly pose new requirements, and the amount of information to be displayed is rapidly increasing.

The program committee accepted 22 papers out of the 40 submissions, including posters, received. Five of these papers have been selected as best papers and authors are invited to extend their papers and submit to a special issue in the journal *Information Visualization*. The guest editors are Jinah Park, Ming C. Hao, and Pak Chung Wong.

The accepted papers cover a wide range of visualization and data analysis techniques, systems, and applications. Many interesting topics have been explored and developed in the following four areas:

- Uncertain data exploration and coloring
- Techniques for binning and clustering and for creating ontologism
- Visual exploration
- Evaluation and visual design.

Our program is further enhanced by the invited keynote speaker, Umeshwar Dayal of Hewlett Packard Labs at Palo Alto. Dr. Dayal has made contributions in numerous areas, most notably in business intelligence, data mining, and industry visual analytics applications. He will introduce us with a talk titled "Visual analytics for operational business intelligence." We are delighted to welcome Dr. Dayal to VDA10.

We would like to thank and recognize our authors for their research work and contributions to writing papers and designing posters. We also would like to thank the reviewers listed in the cochairs and program committee for their helpful and informative comments and contributions to the quality of the proceedings. In the meantime, we appreciate the generous sponsorship for this conference by Hewlett Packard. Finally, we want to thank SPIE for its support of the conference, marketing the conference, and publishing the proceedings.

**Jinah Park**  
**Ming C. Hao**  
**Pak Chung Wong**  
**Chaomei Chen**



