Scientific Visualization: Interactions, Features, Metaphors

Edited by

Hans Hagen

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Contents

Preface
Hans Hagen vii

CakES: Cake Metaphor for Analyzing Safety Issues of Embedded Systems
Yasmin I. Al-Zokari, Taimur Khan, Daniel Schneider, Dirk Zeckzer, Hans Hagen 1

2D Tensor Field Segmentation
Cornelia Auer, Jaya Sreevalsan-Nair, Valentin Zobel, and Ingrid Hotz 17

$\mathcal{A}$
Jean-Paul Balabanian and Eduard Gröller 36

Interpolants Induced by Marching Cases
Hamish Carr and Eoin Murphy 48

Comparative Visualization Using Cross-Mesh Field Evaluations and Derived Quantities
Hank Childs, Sean Ahern, Jeremy Meredith, Mark Miller, and Kenneth I. Joy ... 59

On the Computation of Integral Curves in Adaptive Mesh Refinement Vector Fields
Eduard Deines, Gunther H. Weber, Christoph Garth, Brian Van Straalen, Sergey Borovikov, Daniel F. Martin, and Kenneth I. Joy 73

Integrating Semantics into the Visualization Process
Sebastián Escarza, Martín L. Larrea, Dana K. Urribarri, Silvia M. Castro, and Sergio R. Martig 92

Simulation and Visualization of Medical Application to the Inner Ear of the Guinea Pig to Reduce Animal Experiments
Martin Hering-Bertram, Norbert Siedow, Oliver Tse, Stefan K. Plontke, Ruth Gill, and Alec N. Salt 103

Information-theoretic Analysis of Unsteady Data
Heike Jänicke 118

Construction of Implicit Surfaces from Point Clouds Using a Feature-based Approach
Patric Keller, Oliver Kreylos, Eric S. Cowgill, Louise H. Kellogg, Martin Hering-Bertram, Bernd Hamann, and Hans Hagen 129

Framework for Comprehensive Size and Resolution Utilization of Arbitrary Displays
Taimur Khan, Daniel Schneider, Yasmin I. Al-Zokari, Dirk Zeckzer, and Hans Hagen 144

Salient Frame Detection for Molecular Dynamics Simulations
Youngmin Kim, Robert Patro, Cheuk Yiu Ip, Dianne P. O'Leary, Andriy Anishkin, Sergei Sukharev, and Amitabh Varshney 160

3D Reconstruction of Human Ribcage and Lungs and Improved Visualization of Lung X-ray Images Through Removal of the Ribcage
Christopher Koehler and Thomas Wischgoll 176

A Visual Approach to Analysis of Stress Tensor Fields
Andrea Kratz, Björn Meyer, and Ingrid Hotz 188

Scientific Visualization: Interactions, Features, Metaphors. *Dagstuhl Follow-Ups, Vol. 2.*
Editor: H. Hagen
Dagstuhl Publishing
Schloss Dagstuhl – Leibniz-Zentrum fuer Informatik, Germany

Abstract Feature Space Representation for Volumetric Transfer Function Exploration
Ross Maciejewski, Yun Jang, David S. Ebert, and Kelly P. Gaither 212

Variational Level-Set Detection of Local Isosurfaces from Unstructured Point-based Volume Data
Vladimir Molchanov, Paul Rosenthal, and Lars Linsen 222

Reflections on QuestVis: A Visualization System for an Environmental Sustainability Model
Tamara Munzner, Aaron Barsky, and Matt Williams 240

Generation of Adaptive Streak Surfaces Using Moving Least Squares
Harald Obermaier, Martin Hering-Bertram, Jörg Kuhnert, and Hans Hagen 260

Interactive Isocontouring of High-Order Surfaces
Christian Pagot, Joachim Vollrath, Filip Sadl, Daniel Weiskopf, Thomas Ertl, and João L. D. Comba 276

HCI in Medical Visualization
Bernhard Preim 292

Visualizing Spatial Partitions
Penny Rheingans, Blazej Bulka, and Marie desJardins 311

Feature Extraction for DW-MRI Visualization: The State of the Art and Beyond
Thomas Schultz 322

Previewing Volume Decomposition Through Optimal Viewpoints
Shigeo Takahashi, Issei Fujishiro, Yuriko Takeshima, and Chongke Bi 346

Modeling Multiresolution 3D Scalar Fields through Regular Simplex Bisection
Kenneth Weiss and Leila De Floriani 360

ViSSaAn: Visual Support for Safety Analysis
Yi Yang, Dirk Zeckzer, Peter Liggesmeyer, and Hans Hagen 378

Preface

The Schloss Dagstuhl seminars on Scientific Visualization provide a dynamic setting for ongoing and future research in visualization. Numerous contributions in this active field originated at Schloss Dagstuhl, and were extended to large-scale collaborative research and high-impact works. This volume of the Dagstuhl Follow-Ups series contains the proceedings from the 2009 seminar.[1]

Resulting from a growth in data set size, complexity, and number of covered application areas, modern Scientific Visualization combines research from a wide variety of theoretical and practical fields such as mathematics, physics, biology and computer science. These research efforts yield a large number of different analysis, processing, and visualization techniques, allowing the efficient generation and presentation of visual results. This in turn directly contributes to the way domain experts are able to deduce knowledge from abstract data.

Emphasizing the heterogeneity of this research field, the Dagstuhl Seminar *Scientific Visualization* in 2009 focused on a wide range of visualization topics such as "Knowledge Assisted Visualization", "Visual Exploration Environment", "Biomedical Visualization", and "Visualization of Vector- and Tensorfields". The seminar aimed to provide an open and international environment for the discussion of recent trends, breakthroughs and future directions of research in the area of visualization, fostering scientific exchange and collaboration among researchers of the Sci-Vis community and identifying new research directions.

In the course of the seminar, leading international scientists presented state-of-the-art summaries as well as novel research results and ideas. Among the discussed key topics were:

- Interaction Techniques/Frameworks
  To efficiently perform visual data analysis, end users and domain experts need not just be presented with visualization results, but have to be offered intuitive and efficient real-time interaction techniques and frameworks. User-centered approaches demonstrate, how human factors can influence the way data is processed and presented. Presentations and results from this seminar illustrated and devised methods for interactive data exploration and analysis.

- Feature Definition and Extraction/Reconstruction
  New data types and application fields require new types of features, novel extraction techniques and visualization algorithms. Work from a broad context of feature extraction and reconstruction in areas such as scalar-, vector- and tensorfield visualization was presented in the course of this seminar.

- Visualization Metaphors
  As existing work from the field of visualization is adapted to new application areas or visualization problems, an increase in size, structure or complexity of the given data necessarily leads to the development of optimized algorithms. This seminar identified algorithms and data structures for performance and accuracy improvement in key areas of scientific visualization such as (vector) field analysis.

[1] See www.dagstuhl.de/09251.

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Besides these topics, participants gave valuable presentations about conceptual, philosophical and psychological questions in visualization regarding the impact and benefit of user-centered approaches, research classification and other topics. The productive setting at Dagstuhl made it possible, that a selection of ideas presented at this seminar as well as scientific results of this gathering are made available as Proceedings.

We would like to thank all the participants and many thanks go to Dr. Inga Scheler for her help editing this book.

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