Scientific Visualization: Interactions, Features, Metaphors

Edited by
Hans Hagen
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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.
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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