

VMV 2019
Vision, Modeling, and Visualization

Rostock, Germany
September 30 – October 2, 2019

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Postfach 2926, 38629 Goslar, Germany

Published by the Eurographics Association
–Postfach 2926, 38629 Goslar, Germany–
in cooperation with
Institute of Computer Graphics & Knowledge Visualization at Graz University of Technology
and
Fraunhofer IGD (Fraunhofer Institute for Computer Graphics Research), Darmstadt

ISBN 978-3-03868-098-7

The electronic version of the proceedings is available from the Eurographics Digital Library at
<https://diglib.eg.org>

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Preface

These are the proceedings of the 24th International Symposium on Vision, Modeling, and Visualization (VMV 2019), which takes place from Sep 30 to Oct 2, 2019 at the University of Rostock in Germany. The annual symposium on Vision, Modeling and Visualization has a well-established tradition of contributing to the interaction of scientists from computer graphics, computer vision, visualization, and visual analytics to share their methodologies, experiences and visions. This year, the VMV symposium is jointly organized with the celebration of “50 Years of Computer Graphics Research in Rostock”, where a honorary doctorate of the University of Rostock will be presented to Prof. Dieter W. Fellner. The VMV symposium is also the annual meeting of the Computer Graphics Special Interest Group of the German Informatics Society.

39 manuscripts were submitted to VMV 2019. Each submission received three reviews from the 40 members of the International Program Committee. After a two-stage reviewing and revision process, 19 manuscripts were accepted as full papers. The accepted papers will be presented in a full paper track with seven sessions accompanied by two keynote speeches. The sessions cover the following topics: Modeling, Imaging, Machine Learning in Vision and Analysis, Ensemble Analysis and Visualization, GPU techniques, Image and Video Processing, and Visualization and Visual Analytics. The invited talks will be given by Holger Theisel from Magdeburg and by Thomas Ertl from Stuttgart, covering optimal reference frames and the visualization of large scientific data, respectively.

The long-term success of the VMV symposium relies on contributions from many persons. First of all, we thank all authors who have submitted their research results to the VMV 2019 for review. We also thank the members of the International Program Committee, who dedicated many hours of thorough reviewing and providing thoughtful reviews of great help for the program formation and providing many constructive comments for the submitters. We thank the general conference chair Oliver Staadt and the members of the local organization team at the University of Rostock. We further thank Heidrun Schumann and her team for organizing “50 Years of Computer Graphics Research in Rostock”. The proceedings would not have been possible without the great help of Stefanie Behnke of Eurographics, who was an important support for the paper co-chairs during the entire review process and in the proceedings production.

Rostock, September 2019

Hans-Jörg Schulz, Matthias Teschner, Michael Wimmer

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Invited Talk

Optimal Reference Frames, Scaling and Features in Visualization

Holger Theisel

Fakultät für Informatik, Institut für Simulation und Graphik, Magdeburg, Germany

Abstract

In Visualization, the success or failure of an analysis often depends on the choice of some subtle parameters or design choices. While simple heuristics are often sufficient, in some cases they make the analysis miserably fail. We present three approaches in visualization where a careful choice of optimal parameters results in completely new algorithms: 1) the choice of a reference frame for finding objective vortices in flow visualization, 2) the choice of a scaling of high-dimensional data sets for finding linear projections to 2D in information visualization, and 3) the choice of a feature definition along with numerical extraction methods for visualizing recirculation phenomena in flows.

Biographical Sketch

Holger Theisel is professor for Visual Computing at Magdeburg University (Germany). He received his Ph.D. (1996) and habilitation (2001) degrees from the University of Rostock (Germany), and had research stays at Arizona State University (USA), ICIMAF Havana (Cuba), MPI Informatik Saarbrücken (Germany), and Bielefeld University (Germany). His research interests focus on scientific visualization as well as on geometric design, geometry processing and information visualization and Visual Analytics. He co-authored more than 70 papers in the top journals in the field. He served as General Chair of the IEEE VIS 2018 conference in Berlin.

Invited Talk

Visualization and Analysis of Large Scientific Data – New Approaches for Volumes, Flows, and Particles

Thomas Ertl

Visualization Research Center, University of Stuttgart, Germany

Abstract

As size and complexity of data sets resulting from simulations and sensors continue to grow, more elaborate techniques for their interactive analysis and visualization are being developed. This talk presents some of our recent contributions focusing on dynamic volumes, multiphase flows, and particle data sets. For volumes we exploit similarity between time steps to select the most important characteristic temporal features, while still allowing exploration, and we develop adaptive algorithms for maintaining interactive frame rates by balancing quality and sampling errors.

In this context, a better understanding of the performance characteristics of visual computing systems is derived from large-scale measurements providing general guidelines for reporting runtime results. By direct multi-phase flow simulation, breakup and coalescence of droplets are studied which pose many visualization challenges like coupling the spatial representation with space-time diagrams showing the topological evolution or tracking droplet dynamics over time. We present our first attempts to learn interesting features in such complex 3D time series. In porous media, the behavior and distribution of bubbles influence physical properties of the material. We present an analysis pipeline which groups extracted bubbles and surrounding structures according to their similarity and clusters them, allowing visual comparison after registration. For large particle data sets, we report on recent results based on our MegaMol framework, especially rendering trillions of particles in-situ approaches based on raytracing on GPUs and CPUs.

Biographical Sketch

Thomas Ertl received a MSc in computer science from the University of Colorado at Boulder and a PhD in theoretical astrophysics from the University of Tübingen. Since 1999 he is a professor of computer science at the University of Stuttgart in the Visualization and Interactive Systems Institute (VIS) and he is a co-director of the Visualization Research Center (VISUS). From 2015 to 2018 he served as Vice President of Research of the University and since 2019 he is the spokesperson of the SimTech Cluster of Excellence. His research interests include visualization, computer graphics and human computer interaction in general with a focus on volume, flow and particle visualization, parallel and hardware accelerated rendering, large datasets and interactive exploration, visual analytics of text collections and social media with applications to geographic information and digital humanities. Thomas Ertl served on numerous program committees and as a papers co-chair for many conferences in the field. From 2007 to 2010 he was the Editor-in-Chief of the IEEE Transactions on Visualization and Graphics and in 2011/2012 he served as Chairman of the Eurographics Association. He received the Outstanding Technical Contribution Award and the Distinguished Career Award of the Eurographics Association as well as the Technical Achievement Award of the IEEE Visualization and Graphics Technical Committee. In 2007 he was elected as a Member of the Heidelberg Academy of Sciences and Humanities. He received Honorary Doctorates from the Vienna University of Technology in 2011 and from the University of Magdeburg in 2014.