

Guest Editors' Introduction: Special Section on the IEEE Pacific Visualization Symposium

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THIS special issue of *IEEE Transactions on Visualization and Computer Graphics (TVCG)* presents extended versions of the five best papers from the 2013 IEEE Pacific Visualization Symposium (PacificVis'13) which was held in Sydney, Australia from February 26 to March 1, 2013. The objective of this symposium series is to foster greater exchange between visualization researchers and practitioners, with a focus on the Asia-Pacific region.

Visualization continues to be an expanding and an increasingly active area of research due to its usefulness in a wide range of applications. PacificVis'13 is a unified visualization conference, welcoming all areas of visualization research such as: information, scientific, graph, security, software and biological visualization. The accepted papers covered a broad range of visualization topics including: text and map visualizations; big data visualizations; volume visualization and rendering; visualization in medicine and natural sciences; time-varying and multivariate visualization; visual analytics; tree and graph visualization; and visualization of vector and tensor fields. In fact, the papers at PacificVis'13 show research at the conflux of scientific visualization, information visualization and visual analytics. The top five best papers chosen for this special issue represent the best 4 percent of papers submitted to PacificVis'13. These papers were extended for this special issue and underwent a normal journal review process. In the rest of this introduction we provide a brief overview of the included papers.

The paper, "Dynamic Network Visualization with Extended Massive Sequence Views" presents a technique that extends the massive sequence view (MSV). MSV supports exploration of temporal properties including such factors as trends, counter trends, periodicity, temporal shifts, and anomalies. The extensions include the introduction of circular MSV to further reduce visual clutter and the ability to convey more of the time-series data that is associated with the nodes. The prevalence of network and time series data makes these new abilities to analyze complex correlations timely and important. The authors

demonstrate the effectiveness of their techniques on both synthetic and real-world dynamic data.

In the paper "Joint Contour Nets: Multi-Variate Analysis, Computation and Acceleration," a data structure called the Joint Contour Net is proposed with a capability of quantizing the variation of multiple variables. Contour nets and Reeb graphs are powerful tools for analyzing topology of scalar fields, and have been widely used in visualization and graphics applications. Specifically, the authors have shown that the contour tree can be extended to multivariate fields, opening up possibilities for topological analysis and visualization. The algorithm for constructing the Joint Contour Net is elaborately described, together with some properties that make it practical and useful for visualization, and an accelerating computation scheme that exploits a relationship with rasterization in the range of the function.

The paper "Ovis: A Framework for Visual Analysis of Ocean Forecast Ensembles" presents an integrated visualization and analysis system that supports visualization and analysis of ensemble simulations of the sea surface height. The core of the framework consists of a suite of statistical analysis and visualization features, and is implemented in an efficient GPU-based pipeline. The authors illustrate the utility of the framework for two real-world applications based on ocean forecasting. The system was developed in close collaboration with domain expert partners, and has proven to be useful for ocean forecasting, e.g., for marine scientists to study simulation data of the largely unexplored Red Sea. The system is now used on a regular basis by the domain expert collaborators.

The paper "A Graph-Based Interface for Visual Analytics of 3D Streamline and Pathlines" introduces FlowGraph, a hierarchical representation of 3D flow field data that organizes field line clusters and spatio-temporal regions for occlusion-free exploration and visual analytics. More specifically, it enables observation and exploration of relationships among field line clusters, spatio-temporal regions and their interconnection. The authors describe how to construct FlowGraphs of streamlines for steady flow fields and how to use it for hierarchical exploration and interrogation. They also extend the method to pathlines for unsteady flow fields. Five cases studies and an evaluation with domain experts are presented to demonstrate effectiveness of this approach.

The paper "Bundled Visualizations of Dynamic Graph and Trail Data" presents two techniques for edge bundling of dynamic graphs and trails (temporal path) for simplified visualizations and visual analytics. The first method uses an image-based bundling method for smooth continuous

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bundling of stream graphs. The second method adds edge-correspondence data atop of static bundling for graph sequences. The authors evaluate their techniques using data sets from aircraft monitoring, software engineering, and eye-tracking data from static scenes (viewing infographics) and dynamic scenes (pilot training).

Together these papers present an exciting collection of research that straddles the boundaries between scientific visualization, information visualization and visual analytics, showing the rich opportunities for excellent research in this space.

We would like to thank Ming Lin, the Editor-in-Chief, for the strong support to this special issue, and the staff of TVCG for their numerous efforts that have helped make this successful. We especially thank the anonymous reviewers for their constructive reviews in enhancing the quality of the final papers. We expect to have more submissions in forthcoming Pacific Visualization symposiums and more visualization research activities in Asian-Pacific ring area.

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Guest Editors



Sheelagh Carpendale is currently a professor in Computer Science at the University of Calgary where she is a Canada Research chair in Information Visualization and NSERC/AITF/SMART Technologies Industrial Research chair in Interactive Technologies. She has received the E.W. R. NSERC STEACIE Memorial fellowship; a BAFTA (British Academy of Film & Television Arts Interactive Awards), an ASTech Innovations in Technology award, and the CHCCS Achievement Award, which is presented periodically to a

Canadian researcher who has made a substantial contribution to the fields of computer graphics, visualization, or human-computer interaction. She is an internationally renowned leader in both information visualization and multi-touch tabletop interaction and has recently served in such roles as Papers, Program, or Conference chair for IEEE InfoVis, and ACM Tabletop and has received both the IEEE and ACM recognition of service awards. She is a member of the IEEE Computer Society.



Wei Chen received the bachelor's and PhD degrees from the Department of Mathematics, Zhejiang University, in 1996 and 2002, respectively. He is currently a professor of State Key Lab of CAD&CG, Zhejiang University, China. He was a joint PhD student in Fraunhofer Institute for Graphics, Darmstadt, Germany from June 2000 to June 2002. From July 2006 to Sep. 2008, he was a visiting scholar at Purdue University, working with Prof. David S. Ebert. He has performed research in visualization and visual analytics, and has published more than 30 peer-reviewed papers in *IEEE Visualization*, *IEEE Transactions on Visualization and Computer Graphics*, *EuroVis*, *Eurographics*, etc. He was a paper co-chair of IEEE Pacific Visualization 2013 Symposium. He is a member of the IEEE Computer Society.



Seok-Hee Hong is currently a professor in Computer Science and a future fellow at the University of Sydney. Her research interests include graph drawing, algorithms, information visualization and visual analytics. In 2006, she won the CORE Chris Wallace Award for Outstanding Research Contribution in the field of Computer Science, for her research "Theory and Practice of Graph Drawing." She has more than 140 publications including five edited books, seven book chapters, 40 journal papers, and 90 conference papers. She has given 10 invited talks at international conferences as well as 50 invited seminars worldwide. She is a Steering Committee member of Graph Drawing Symposium, IEEE Pacificvis Symposium, and International Symposium on Algorithms and Computation (ISAAC), and an editor of *Journal of Graph Algorithms and Applications (JGAA)*. She was a Program Committee chair of six international conferences (GD2007, ISAAC 2008, Pacificvis 2013), and a Program Committee member of 40 international conferences. In particular, she has formed the Information Visualisation research community in the Asia-Pacific Region, by founding IEEE PacificVis Symposium. She is a member of the IEEE Computer Society.

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