Guest Editors' Introduction: Special Section on the IEEE Pacific Visualization Symposium 2012

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This special section of the *IEEE Transactions on Visualization and Computer Graphics* (*TVCG*) presents extended versions of three selected papers from the IEEE Pacific Visualization Symposium 2012 (PacificVis) which took place in Songdo, Korea from 28 February to 2 March 2012. The main objectives of this annual symposium include fostering the exchange between visualization researchers and practitioners, and attracting more researchers from the Asia-Pacific region to this fascinating and relevant area of research. PacificVis 2012 received, in total, 89 paper submissions from a broad international community. After a rigorous review process, with at least four reviews per paper, 30 papers were accepted and presented at the symposium. The three best papers were chosen by the paper cochairs (acting here as guest editors for this special section), based on the original reviews and the presentations. These papers were significantly extended for this special section and underwent a full review process as usual for *TVCG*. The three papers cover different topics in both scientific visualization and information visualization.

In "Visual Analysis of Cardiac 4D MRI Blood Flow Using Line Predicates," Silvia Born, Matthias Pfeifle, Michael Markl, Matthias Gutberlet, and Gerik Scheuermann describe the interactive visual analysis of blood flow through the heart based on predicates which they compute for integral lines of the blood flow. Using time-dependent 3D magnetic resonance imaging (MRI), the blood flow through the heart is captured and then delineated. Two types of integral lines are computed for the blood flow, i.e., stream lines and path lines. For either stream or path lines, Boolean line predicates are computed, depending on a variety of different evaluation functions, including, for example, measures to identify vortices or to relate to specific regions within the heart. Other predicates relate to the maximal or mean velocity along a line. For visualization, selected predicates are used to formulate a selection of lines that corresponds to individual aspects of a particular blood flow analysis. The authors demonstrate, for example, the examination of a tetralogy of fallot (TOF) patient after surgical treatment. Retrograde blood flow, i.e., pathological blood from the pulmonary trunk to the right atrium, is analyzed and related to deformations of the heart anatomy.

In "Ambient Occlusion Effects for Combined Volumes and Tubular Geometry," Mathias Schott, Tobias Martin, A.V. Pascal Grosset, Sean T. Smith, and Charles D. Hansen present a method to compute ambient occlusion effects for direct volume rendering of combined volumes and tubular geometry. Many applications involve volumetric data with both scalar fields and vector fields. As streamlines or DTI fibers are commonly used to represent vector fields arising from these applications, it is desirable to develop visualization techniques for data with both volumetric primitives and tube shaped geometric objects representing streamline or DTI fibers. The proposed method allows interactive direct volume rendering with combined occlusion effects for solid and transparent features in volumetric data sets and solid tube-like geometry. The method extends the recently proposed volumetric directional occlusion shading method and can correctly resolve the mutual occlusion between volumetric structures and tube-like geometry, which can help people better comprehend the spatial arrangement of the geometry with respect to the volume.

In "A Maxent-Stress Model for Graph Layout," Emden R. Gansner, Yifan Hu, and Stephen North propose an application of maximal entropy to graph visualization. In particular, many algorithms rely on edge distances between nodes in the given graph when creating a drawing for the graph. The motivation comes from the observation that, for graph drawing, the ideal distance of each edge is often the only given information. To assume that the missing ideal distance between non-neighboring vertices should be the shortest graph-theoretic distance is reasonable, but does add artificial information that is not given in the input. Since it is not practical to calculate all-pairs shortest distances for large graphs anyway, we need some way to resolve the extra degrees of freedom in the node placement. The maximum entropy principle provides the least-biased estimate possible on the given information and it is also believed to give rise to aesthetic beauty in nature. Then, an optimal layout should be one that attempts to satisfy the given ideal distances as much as possible. Since this itself is not sufficient to determine the layout of all nodes, the remaining degrees of freedom can be resolved through the principle of maximum entropy.

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As the guest editors of this special section, we thank Ming Lin, the Editor-in-Chief of *TVCG*, for the opportunity to present this work and the staff of *TVCG* for the support they have provided. We especially thank the anonymous reviewers whose comments and suggestions helped improve the final papers. We look forward to future IEEE Pacific Visualization symposia and encourage our colleagues to continue submitting their work to IEEE PacificVis.

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Guest Editors

Helwig Hauser is a professor at the University of Bergen, Norway, where he leads a research group on visualization since 2007. Before that, he was the scientific director of the VRVis Research Center in Vienna, Austria. He has been a visualization researcher (and teacher) since the mid-1990s, after having graduated from Vienna University of Technology in Austria. He was/is a member of the editorial boards of several major visualization/computer graphics journals, including *IEEE Transactions on Visualization and Computer Graphics* and *Computer Graphics Forum*. He is also member of several steering committees, including the EuroVis Steering Committee. He is a member of the IEEE Computer Society.

Stephen Kobourov received the BS degree in mathematics and computer science from Dartmouth College in 1995, and the PhD degree in computer science from Johns Hopkins University in 2000. He is a professor of computer science at the University of Arizona. He has also worked as a research scientist at AT&T Research Labs, at the University of Botswana as a Fulbright Scholar, and at the University of Tübingen, Germany, as a Humboldt Fellow. He works on graph drawing and information visualization, geometric algorithms and data structures, human computer interaction, and pervasive computing. He is a member of the IEEE Computer Society.

Huamin Qu received the BS degree in mathematics from Xi'an Jiaotong University, China, the MS and PhD (2004) degrees in computer science from Stony Brook University. He is an associate professor in the Department of Computer Science and Engineering at the Hong Kong University of Science and Technology. His main research interests are in visualization and computer graphics. He is on the steering committee of the IEEE Pacific Visualization Conferences, and served as the program cochair for IEEE PacificVis 2011 and 2012 and the conference cochair for VINCI 2011 and VINCI 2012. He received the Honorable Mention for Best Paper Award at IEEE Visualization 2009 and is a winner of the 2009 IBM Faculty Award. He is a member of the IEEE Computer Society.