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Editorial

Special Issue on Solid Modeling Theory and Engineering Applications

The ACM Symposium on Solid Modeling and Applications is an annual international forum for the exchange of recent research and applications of spatial modeling and computations in design, analysis and manufacturing, as well as in emerging biomedical, geophysical and other areas. Following what now has become an annual tradition, this Special Issue of JCISE includes a collection of papers that were presented at the Eighth ACM Symposium on Solid Modeling and Applications that was held at the University of Washington, Seattle, on June 16–20, 2003. The symposium was co-chaired by George Turkiyyah of University of Washington and Pere Brunet of Technical University of Catalonia in Barcelona, Spain. The international program committee included 26 leading industry and academia experts from 12 countries around the world and was co-chaired by Gershon Elber of Technion, Israel, and Vadim Shapiro of University of Wisconsin-Madison, USA. Close to eighty papers were received and reviewed for the conference by an international program committee and reviewers from around the world. At least three external reviewers and members of the program committee reviewed each paper. A total of 25 papers were selected for plenary presentation at the conference, 13 papers were selected for poster presentation, and 5 papers for shorter presentations in the new Emerging Concepts session.

Based on quality and engineering relevance, the Guest Editors invited 9 outstanding papers from the conference plenary papers, for submission to this special issue of JCISE. All papers were revised and reviewed by at least two additional referees. The subjects of the papers reflect recognition that geometric and solid models have become the primary medium for creating, editing, exchanging, analyzing, and simulating computational models in engineering. As such, the disciplines of geometric and solid modeling now play central role in computing and information science at large. The selected papers reflect this prominent role of solid modeling by describing a wide range of impressive advances in the field. These include novel engineering applications, dramatic improvements in efficiency of geometric algorithms, significant extensions of geometric techniques for new applications, and new insights on shape classification and matching through intrinsic properties of surfaces and solids.

The paper ''Efficient Computation of a Simplified Medial Axis'' by M. Foskey, M. C. Lin, and D. Manocha proposes a new approximation of the medial axis that is parameterized by an angle and may be computed rapidly for complex polyhedral solids. The next paper ''Surface and Volume Discretization of Functionally Based Heterogeneous Objects,'' coauthored by E. Kartasheva, V. Adziev, A. Pasko, O. Fryazinov, and V. Gasilov, develops strategies and algorithms for meshing functionally defined models with non-uniform distribution of materials and other attributes. B. M. Kim and J. Rossignac describe new strategies for collision prediction with dramatic speed improvements in their paper ''Collision Prediction for Polyhedra under Screw Motions.'' An effective technique for reconstructing triangulated surfaces from sampled data points is described in the paper ''Tight Cocone: A Water-tight Surface Reconstructor.'' In the following paper ''Generalization of the Kantorovich Method of Dimensional Reduction,'' K. Suresh shows that problems of engineering analysis may be automatically mapped on the lower dimensional skeletal representations with substantial savings in required time and effort. The next two papers deals with issues of identification, classification, and authentication of geometric models. The paper ''Scale-Space Representation and Classification of 3D Models'' by D. Bespalov, A. Shokoufandeh, W. C. Regli, and W. Sun undertakes a systematic study of methods for solid comparison and classification. Methods for comparison and authentication of surfaces are proposed in the paper ''Shape Intrinsic Properties for Free Form Object Matching'' by K. H. Ko, T. Maekawa, N. M. Patrikalakis, H. Masuda, and F.-E. Wolter.

The above research papers are followed by two shorter papers, demonstrating effective applications of solid modeling techniques to solve important or emerging problems. S. Azernikov, A. Miropolsky, and A. Fischer describe an efficient and robust procedure for reverse engineering in their paper ''Surface Reconstruction of Freeform Objects Based on Multiresolution Volumetric Method.'' The paper ''Dynamic Remeshing and Applications'' by J. Vorsatz, Ch. Rossl, and H.-P. Seidel concludes the special issue by describing improved techniques for incremental optimization of triangular meshes relying only on local parameterization of the original surface.

We hope that JCISE readers will enjoy reading these papers and will find them stimulating and thought-provoking. We also hope that, by focusing on the key role of geometric computations in engineering applications and demonstrating the many exciting opportunities for further advances, this issue will encourage you the readers to participate in the future solid modeling events and conferences. For additional information, visit *www.solidmodeling.org*, the home page of the Solid Modeling Association that oversees the symposia series. This issue, and indeed the symposium itself, is possible only due to hard work of many individuals. We wish to thank the authors for their willingness to contribute to this special issue, the referees for their thorough reviews under very tight deadlines, and the journal Technical Editor, Jami Shah, for his support and encouragement.

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