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Guest Editors' Foreword

This special issue collects papers from the Twentieth ACM Symposium on Computational Geometry, held on June 9–11, 2004 in Brooklyn, NY, USA. From the forty-nine papers that were presented at the symposium, we selected eight papers with significant new results in combinatorial and computational geometry.

The first paper, "On Distinct Distances from a Vertex of a Convex Polygon" by A. Dumitrescu, makes the first significant progress in 50 years on one of Erdos' old conjectures: every convex n-gon has a vertex for which the number of distinct distances is at least $n/2$. Moser's lower bound of $n/3$ is increased to $(13n - 6)/36$.

In the second paper, "On the Union of κ-Round Objects in Three and Four Dimensions" by B. Aronov, A. Efrat, V. Koltun and M. Sharir, the authors prove that the union of a collection of n so-called κ-round objects in three and four dimensions have respectively near-quadratic and near-cubic complexity. This is the first result on the union-complexity of fat objects in more than two dimensions that does not require the objects to have similar sizes.

The Crossing Lemma has had many important applications in Discrete and Computational Geometry as well as in Number Theory. The results in the third paper, "Improving the Crossing Lemma by Finding More Crossing in Sparse Graphs" by J. Pach, R. Radoičić, G. Tardos and G. Tóth, significantly improve the value of the best known bound using arguments that combine combinatorial reasoning with deep geometrical arguments.

In the fourth paper, "Extreme Elevation on a 2-Manifold", P. Agarwal, H. Edelsbrunner, J. Harer and Y. Wang introduce the notion of an elevation function over a smoothly embedded 2-manifold in R^3. They also give an algorithm for finding points of locally maximum elevation. Motivation comes from the protein docking problem where one looks for cavities and protusions and a way to measure their size.

The fifth paper, "A Two-Dimensional Kinetic Triangulation with Near-Quadratic Topological Changes" by P. Agarwal, Y. Wang and H. Yu, presents a randomized recursive construction that maintains a triangulation of moving points in the plane and processes a near-quadratic number of events for algebraic point trajectories. This is a major improvement on earlier results, nearly matching the known quadratic lower bound for the problem.

The sixth paper, "On the Least Median Square Problem" by J. Erickson, S. Har-Peled and D. Mount, deals with lower bounds on the computational complexity of algorithms (exact or approximate) for the least median square regression estimator. In addition, the paper provides algorithms whose complexities are very close to these bounds. The lower bound for the exact least median square problem settles a 20-year old open problem.

The seventh paper, "Low-Dimensional Embedding with Extra Information" by M. Bădoiu, E. Demaine, M. Hajiaghayi and P. Indyk, considers the problem of embedding a geometric structure given only partial and approximate information. This problem has numerous applications, e.g. in the analysis of proteins or in sensor networks. Given a graph, the approximate lengths of the edges and possibly extra information (such as distances or angles) the authors give several approximate algorithms as well as some hardness results.

The eighth paper, "Range Counting over Multidimensional Data Streams" by S. Suri, Cs. Tóth and Y. Zhou, considers the fundamental problem of range counting in the data stream model. Several algorithms, both deterministic and randomized, are presented for two classes of ranges halfspaces and axis-parallel rectangles. The techniques developed have interesting connections to deep results in discrepancy theory.

We thank all the authors who contributed to this issue. We also thank the referees for their thorough efforts and the editors of *Discrete & Computational Geometry* for their support. We hope that the stimulating atmosphere of the symposium will be reflected in this special issue.

Jean-Daniel Boissonnat
Jack Snoeyink

Symposium co-chairs