Guest Editor's Foreword

This special issue contains a selection of seven papers whose preliminary versions appeared at the Eighteenth Annual Symposium on Computational Geometry held June 5–7, 2002, in Barcelona, Spain.

Chazelle explores the power of subtraction in the computational complexity of range searching. For a “natural” range searching problem, he shows that the arithmetic complexity is $\Theta(n^{3/2})$ if only addition is allowed, but the complexity drops to $\Theta(n \log n)$ if subtraction is also allowed.

Aichholzer, Aurenhammer and Palop describe the city Voronoi diagram, induced by quickest paths in the L_1 plane, with streets arranged in the north–south and east–west directions. They explore geometric properties of these diagrams, describe algorithms to construct them and answer quickest-path queries.

Erickson and Har-Peled describe how to obtain a topological disk from a polyhedral manifold by cutting a small subset of the edges. They prove that the optimization problem is NP-complete and describe exact and approximation algorithms.

Cabello, Liu, Mantler and Snoeyink describe algorithms for testing if two given paths are homotopic. For paths consisting of n line segments and obstacles described by n points, their algorithm runs in time $O(n \log n)$ if the paths are simple, and in time $O(n^{3/2})$ if the paths are self-intersecting.

Koltun and Sharir consider the complexity of the polyhedral Voronoi diagram in three dimensions. They show that the polyhedral Voronoi diagram of n line segments or, more generally, the polyhedral Voronoi diagram of a collection of disjoint polyhedra with a total of n vertices has near quadratic size.

Cheong, Har-Peled, Linial and Matoušek analyze the following one-round Voronoi game in the plane: the first player chooses an n -point set W in a unit square; the second player chooses another n -point set B ; each player's payoff is his fraction of the Voronoi diagram of $W \cup B$. They show that the second player can always win at least $\frac{1}{2} + \alpha$, for a constant $\alpha > 0$.

Asano, Kirkpatrick and Yap consider approximate solutions to optimization problems. They present an efficient scheme for converting a pseudo ε -approximation algorithm into a true ε -approximation algorithm, and apply this technique to compute ε -approximations for three-dimensional shortest paths and planar rod motion problems.

I wish to thank the authors for contributing their papers to this special issue and the referees for their timely and thorough reviews.

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