Guest Editor's Foreword

This special issue contains a selection of six papers that appeared in preliminary form at the Twenty-First Annual Symposium on Computational Geometry, June 6–8, 2005, in Pisa, Italy. The program committee for the symposium, co-chaired by myself and Günter Rote, selected for presentation 41 papers from among 141 submissions. The six papers of this special issue were selected from among the 41 papers for their outstanding contributions to the research topics prominent in the journal *Discrete & Computational Geometry*.

Har-Peled and Kushal develop new results in the clustering of data points in high-dimensional spaces. They employ the powerful technique of coresets to obtain a small subset of the n input points that can be used for computing k -medians and k -means approximately, within factor $(1 + \varepsilon)$ of optimal. The subset, a (k, ε) -coreset, is of size $O(k^2/\varepsilon^d)$ for k -median clustering and of size $O(k^3/\varepsilon^{d+1})$ for k -means clustering; interestingly, the size of the subset is independent of n .

Ezra and Sharir obtain new bounds on the combinatorial complexity of a single cell in an arrangement of k convex polyhedra in 3-space having n facets in total. In particular, they show that for any $\varepsilon > 0$, a single cell has complexity $O(nk^{1+\varepsilon})$. This result settles a conjecture of Aronov et al.

Clarkson and Varadarajan study an important special class of set cover problems arising in geometric applications for which the geometric structure allows one to obtain substantially improved approximation algorithms. Applications of their general result yield improved approximation bounds for covering by fat triangles, pseudodisks, and other fat objects. Further applications yield $O(1)$ -approximation algorithms for covering by unit cubes in 3-space, and visibility covering (guarding) of x -monotone polygonal chains.

Attali and Edelsbrunner study inclusion–exclusion formulas for the union of a finite set of balls. They give a characterization of the minimal inclusion–exclusion formulas of a union of closed balls in d -dimensional space that correspond to simplicial complexes. Their results generalize previous formulas derived from Delaunay triangulations and dual complexes. The motivation comes from molecular models in biochemistry, with balls representing atoms within a molecule.

Chan and Chen study a variety of multi-pass geometric algorithms that utilize only a small amount of storage and make only a few passes over the input data. They develop

solutions within this new framework to fundamental geometric problems, such as convex hulls and low-dimensional linear programming.

Cohen-Steiner, Edelsbrunner, and Harer investigate the stability of the persistence diagram of a function on a topological space. The topological characteristics of a function can be encoded in its persistence diagram. The results of this paper shed light on the stability of this encoding. Two applications are given—the use of a finite point sample to estimate the homology of a closed subset of a metric space, and the comparison and classification of geometric shapes.

I thank all of the authors for their contributions to the special issue and extend a special thanks to the referees, who provided valuable feedback and suggestions in their thorough and timely reviews. I thank too the program committee and especially co-chair Günter Rote for their diligent efforts in the paper selection process.

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