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EDITORIAL

Guest Editors' Foreword

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It has been a longstanding tradition that goes back to 1986, when *Discrete & Computational Geometry* (*DCG*, in short) was launched, that the journal publishes a selection from the best papers presented at the *Annual Symposia on Computational Geometry* (*SoCG*). The first such issue (Volume 2, Issue 2) was guest-edited by David Dobkin, and contained six papers from the program of the Yorktown Heights meeting held in June 1986. All of those papers have become classics in the field. The later special issues were also of exceptionally high quality. It is considered a honor if a paper gets invited to a *SoCG* special issue, and these invitations are rarely turned down.

The 31st *SoCG* was held in Eindhoven, the Netherlands, in June 2015. From the 59 papers accepted by the program committee, whose extended abstracts were published in the conference proceedings, 8 were invited to this special issue. They were reviewed according to the high standards of *DCG*. They represent a wide range of topics in the subject.

Ahn, Barba, Bose, De Carufel, Korman, and *Oh* solved an old problem of Pollack, Rote, and Sharir, originally published in *DCG* (Volume 4, Issue 1, 1989). They designed a deterministic linear-time algorithm to compute the geodesic center of a simple closed polygon of n vertices in the plane. The running time of the best previously known algorithm is $O(n \log n)$.

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It was first proved by Chazelle 25 years ago, using rather complicated techniques, that the intersection of two 3-dimensional convex polyhedra of size at most n can be computed in $O(n)$ time. In dual formulation, the convex hull of the union of two convex polyhedra can be found in linear time. *Chan* found an extremely elegant and short $O(n)$-time algorithm for the solution of this problem, based on a simple and well known construction of Dobkin and Kirkpatrick.

The notion of shallow cuttings was introduced by Matoušek as a tool for half-space range reporting. Given n hyperplanes in $\mathbb{R}^d$ and a parameter r, a collection of simplices that cover a region is said to form a $1/r$-cutting, if the interior of every simplex intersects at most n/r hyperplanes. The number of simplices is called the size of the cutting. A k-shallow cutting is a shallow cutting that covers the set of all points that lie below at most k hyperplanes. Improving several previous results of Clarkson, Haussler and Welzl, Matoušek, Chazelle and Friedman, Ramos, and others, *Chan* and *Tsakalidis* found an optimal deterministic algorithm for constructing shallow cuttings in the plane and in $\mathbb{R}^3$. This enabled them to derandomize many previous geometric algorithms.

Dadush and *Hähnle* modified the shadow simplex method to solve linear programming and diameter problems in the special case, where the angles at the vertices of the underlying polyhedra are "sharp" (are separated from π by a constant $\varepsilon > 0$). Under this assumption, they were able to guarantee good bounds on the diameter of the polyhedron, in terms of the dimension, the number of constraints, and the parameter ε, and designed efficient algorithms to find an optimal vertex. Their results improved on several previous bounds of Bonifas, Di Summa, Eisenbrand, Niemeier, Vempala, and others.

Haussler's packing lemma (1995) is a powerful tool in combinatorial and computational geometry. It gives an asymptotically tight upper bound, constant times $(n/\delta)^d$, on the number of subsets of an n-element set with Vapnik–Chervonenkis dimension d, provided that the symmetric difference of any two subsets is at least δ. *Dutta, Ezra,* and *Ghosh* refined this bound for "shallow" set systems, i.e., in the special case where the number of subsets of a certain size is limited in all induced subsystems.

In their breakthrough paper that nearly settled Erdős's conjecture on the minimum number of distinct distances determined by n points in the plane, Guth and Katz proved a 3-dimensional version of the Szemerédi–Trotter theorem on incidences between points and lines. Generalizing this result to higher dimensions, *Dvir* and *Gopi* gave a new upper bound on the number of lines containing at least r points in a set of n points in the complex d-dimensional space, provided that not too many points lie in a hyperplane. Using the polynomial method pioneered by Dvir, they also showed that the number of r-term arithmetic progressions (r equidistant points along a line) is asymptotically maximized by a d-dimensional grid.

In a recent breakthrough, Adiprasito and Sanyal used deep tools from combinatorial commutative algebra to solve the upper bound conjecture for Minkowski sums: they derived precise upper bounds on the number of k-dimensional faces of the Minkowski sum of r convex polytopes in $\mathbb{R}^d$, in terms their vertex numbers. *Karavelas* and *Tzanaki* gave a purely geometric proof of this result, based on f- and h-vector calculus, stellar subdivisions, and shellings. They also analyzed the relationship between the two proofs.

Aronov and O'Rourke proved in 1992 that the star-unfolding of a convex polyhedron from a source point cannot lead to any overlap. The notion can be generalized by using a simple geodesic curve in place of a source point. Demaine and Lubiw conjectured that star unfolding from geodesic curves cannot lead to overlaps either. In the paper of *Kiazyk* and *Lubiw*, this conjecture was verified in some interesting special cases, and it was shown that every star-unfolding from a geodesic curve can be separated into two nonoverlapping pieces.

We would like to thank the authors and the reviewers for their great work and for the efforts to keep the deadlines.