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EDITORIAL

Guest Editors' Foreword

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This special issue of *Discrete & Computational Geometry* contains a selection of the best papers that were presented at the 29th Annual ACM Symposium on Computational Geometry, which was held in Rio de Janeiro, Brazil, on June 17–20, 2013. The six papers in this special issue were invited, submitted, reviewed, and revised according to the usual high standards of this journal. It is our pleasure to briefly introduce these contributions.

Jeff Erickson solves a problem of long standing. A given topological mesh with convex quadrilateral faces on a closed surface can be extended to a hexahedral mesh of the interior domain (using Steiner points) if and only if the number of given quadrilaterals is even and if no odd cycle in the quadrilateral mesh bounds a surface in its interior. This generalizes previous results for topological spheres. If the given surface is polyhedral, the interior hexahedral mesh can be constructed in polynomial time, if it exists.

The paper by Erin Chambers, Kyle Fox, and Amir Nayyeri presents a quadratic time algorithm for counting minimum cuts in weighted directed graphs that are embedded on orientable surfaces of constant genus. The improvement over a similar, recent result for planar graphs is obtained by counting cycles in a particular integer homology class.

Gary Miller and Donald Sheehy introduce a novel output-sensitive algorithm for constructing Voronoi diagrams and Delaunay triangulations of n points in Euclidean space of constant dimension. It runs in time proportional to the output complexity times $\log n \log \Delta$, where Δ denotes the spread of the input set. This algorithm avoids

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computing convex hulls. Instead, it first adds $n \log \Delta$ many Steiner points to obtain a well-spaced superset of sites whose Voronoi diagram is linear in size. Later, the extra points are removed by controlled flipping.

Antoine Vigneron and Lie Yan present a faster algorithm for constructing motorcycle graphs of n rays, whose running time is bounded by $n^{4/3+\varepsilon}$. This improvement is obtained by relaxing the chronological order of collisions. As a consequence, they obtain more efficient algorithms for constructing the straight skeleton of polygons with holes that are non-degenerate or have $\log n$-bit rational numbers as coordinates. In the latter case, the straight skeleton can be constructed in expected time $n \log^3 n$ if the number of holes is constant.

David Eppstein defines, by means of three-dimensional hyperbolic geometry, a new type of power diagram which is invariant under Möbius transforms. It has surprising applications. For a circle packing realizing the dual of a planar 3-vertex-connected, 3-regular graph G, this power diagram yields a Lombardi drawing of G, that is, a planar embedding where edges are represented by circular arcs that meet at equal angles. The existence of planar Lombardi drawings is generalized to 2-connected graphs of maximum degree three. Another application concerns the characterization of graphs formed by soap bubbles between two parallel sheets of glass. Exactly the 2-vertex-connected, 3-regular planar graphs occur.

Pankaj Agarwal, Sariel Har-Peled, Haim Kaplan, and Micha Sharir consider a system of pairwise disjoint convex sets in the plane that are enlarged by forming Minkowski sums with disks of random radii. While the union of the enlarged sets can be of quadratic combinatorial complexity in the worst case, its expected complexity is upper bounded by $n^{1+\varepsilon}$ if radii are assigned to disks by a random permutation of a given multiset. This result has applications to the vulnerability analysis of networks.

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