Algorithmica (2009) 55: 269–270
DOI 10.1007/s00453-008-9222-y

Foreword

Lars Arge · Emo Welzl

Received: 16 July 2008 / Accepted: 18 July 2008 / Published online: 31 July 2008

This issue is dedicated to a selection of papers of the 15th Annual European Symposium on Algorithms (ESA) held in Eilat, Israel, October 8–10, 2007. Three papers each were invited from the "Design and Analysis Track" and the "Engineering and Applications Track" including the recipient of the best student paper award, *Order Statistics in the Farey Sequences in Sublinear Time* by Jakub Pawlewicz (this paper appears here coauthored by Mihai Pătraşçu). We thank both, authors and referees, for their cooperation that allowed a timely publication of this special issue.

The Farey sequence of order n is the increasing sequence of all irreducible fractions from [0, 1] with denominators at most n, i.e. the set $\{\frac{a}{b} \mid 0 \le a \le b \le n\}$ sorted; the size of this set is roughly $\frac{3}{\pi^2} n^2$. In *Order Statistics in the Farey Sequences in Sublinear Time and Counting Primitive Lattice Points in Polygons* Jakub Pawlewicz and Mihai Pătraşçu consider the problems of (i) producing the kth element in this list and (ii) determining the rank of a given fraction in this list. Linear time algorithms were known before, but the authors show how the problems can be solved in time close to $O(n^{2/3})$.

The ray shooting problem asks for preprocessing a scene so that the first point hit by a query ray can be retrieved efficiently. In *Linear Data Structures for Fast Ray-Shooting admidst Convex Polyhedra* by Haim Kaplan, Natan Rubin, and Micha Sharir the scene is assumed to consist of k convex polyhedra with overall n facets,

L. Arge (✉)
Center for Massive Data Algorithmics (MADALGO), Department of Computer Science, University of Aarhus, Aarhus, Denmark
e-mail: large@madalgo.au.dk

E. Welzl
Department of Computer Science, Institute of Theoretical Computer Science, ETH Zurich, Zurich, Switzerland
e-mail: emo@inf.ethz.ch

with k significantly smaller than n. The goal is to achieve polylogarithmic query time while keeping space and preprocessing close to linear in n. This is demonstrated for a number of special cases, e.g. in the situation when the rays are restricted to emanate from a fixed line (with space $O(n\,\mathrm{poly}(k))$).

Suppose a player is required to buy k units of some asset while she is confronted with a sequence of prices. Whenever a proposed price appears, she immediately has to decide whether to buy for that price or not. The problem is to develop an online strategy that is competitive with the optimal offline solution. The contribution *Optimal Algorithms for k-Search with Application in Option Pricing* by Julian Lorenz, Konstantinos Panagiotou, and Angelika Steger supplies such strategies, deterministic and randomized, and also for the corresponding selling variant. There is no assumption about the development of the prices other than a known upper and lower bound for the prices. In this scenario optimal strategies with competitive ratios in terms of k and the max/min ratio of the prices can be derived. This can be applied to pricing of so-called "lookback option".

The Minkowski sum of two point sets P and Q is the set $\{p + q : p \in P, q \in Q\}$. Minkowski sums are used in a wide range of applications such as robot motion planning and computer-aided manufacturing. In *Exact Minkowski Sums of Polyhedra and Exact and Efficient Decomposition of Polyhedra into Convex Pieces* by Peter Hachenberger, the first exact and robust implementation of the 3D Minkowski sum of two non-convex polyhedra is presented. Interesting in its own right, the first robust implementation of a certain decomposition of polyhedra into convex pieces is also presented.

An (α, β)-spanner of a graph G is a subgraph S such that for each pair of vertices the distance in S is at most α times the distance in G plus β. In *Graph Spanners in the Streaming Model: An experimental Study* by Giorgio Ausiello, Camil Demetrescu, Paolo G. Franciosa, Giuseppe F. Italiano and Andrea Ribichini, the first experimental analysis of algorithms for computing graph spanners in the data streaming model is presented. In the data streaming model algorithms should process the graph in a single scan of the edges in arbitrary order.

Chvátal-Gomory cuts are among the most well-known classes of cutting planes for general integer linear programs. In the case where the constraint multipliers are either 0 or $\frac{1}{2}$ such cuts are known as $\{0, \frac{1}{2}\}$-cuts; separation of $\{0, \frac{1}{2}\}$-cuts is NP-hard. In *Algorithms to Separate $\frac{1}{2}$-Chvátal-Gomory Cuts* by Arie M.C.A. Koster, Adrian Zymolka, Manuel Kutschka, ways to separate $\{0, \frac{1}{2}\}$-cuts effectively in practice are studied.