Discrete & Computational Geometry (2023) 70:305–306
https://doi.org/10.1007/s00454-023-00534-9

EDITORIAL

Guest Editors' Foreword

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Published online: 20 July 2023

The 37th International Symposium on Computational Geometry (SoCG) was held online, June 7–11, 2021, as part of the Computational Geometry Week. This special issue of *Discrete & Computational Geometry* contains a selection of papers from the symposium. Of the 164 submissions to SoCG'21, 58 were accepted by the Program Committee. Of these, a selection of six especially strong papers are included in this issue. They were submitted, refereed, and revised according to the usual high standards of *D&CG*. We thank the authors of all submitted papers for revising and polishing their work. We are grateful to the anonymous referees for their dedication and expertise that ensure the high quality of the articles in this special issue.

The articles appear in this special issue in alphabetical order of the names of the first authors. In the remainder of this foreword we briefly introduce each paper in the same order.

Interval graphs form one of the most fundamental classes of geometric intersection graphs. They are well structured, which makes many problems that are NP-hard for general graphs polynomial-time solvable on intersection graphs. *Ranendu Adhikary*, *Kaustav Bose*, *Satwik Mukherjee*, and *Bodhayan Roy* show that this is not the case for the maximum cut problem. They prove that this problem is NP-complete for interval graphs, solving a long-standing open problem that was already posed more than 35 years ago in Johnson's NP-completeness column.

The next paper returns to a classic problem in computational geometry: given a set of n points in d-dimensional space and given a bounding box, compute the largest (volume-wise) box inside the bounding box that does not contain any of the input points. *Timothy Chan* presents improved algorithms for this problem for $d = 2$, $d = 3$, and $d \geq 4$. For $d = 2$, a clever combination of interval trees, lower envelopes, and pseudo-lines are used to reduce the problem to subproblems of logarithmic size. This results in a time bound of $O(n2^{O(\log^* n)} \log n)$. The previous best bound was

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$O(n \log^2 n)$, dating back to 1987. For $d = 3$ and $d \geq 4$, the main approach is to map the problem to a different problem in two dimensions: boxes become points in 2d, and points become orthants in 2d. The problem then becomes that of optimizing a certain type of objective function over the complement of the orthants.

In computational topology, deciding whether a closed curve c in a 3-manifold M is contractible is known to be decidable, but the best known algorithms are very intricate. *Erin Wolf Chambers*, *Francis Lazarus*, *Arnaud de Mesmay*, and *Salman Parsa* prove that this problem, in the special case where the input curve c lies on the boundary of the input 3-manifold M, lies in the complexity class NP, and actually provide an algorithm that is fixed-parameter tractable in the size of the input 3-manifold. In passing, they develop new algorithms for compressed curves on surfaces, which can be of independent interest.

In topological data analysis, the multicover bifiltration of a point set $A \subset \mathbb{R}^d$, studied previously by Sheehy, Edelsbrunner, and Osang, is a natural two-parameter family of subsets of $\mathbb{R}^d$ with monotonicity properties, the study of which sheds light on the "shape" of A in a more refined way than one-parameter filtrations, e.g., the offset filtration. *René Corbet*, *Michael Kerber*, *Michael Lesnick*, and *Georg Osang* provide two topologically equivalent combinatorial bifiltrations which are both compact in size; they prove that one of them can be efficiently computed, and provide experimental results.

Sampling from high-dimensional distributions is a very general problem, fundamental in optimization, integration, statistical inference, among others. For this purpose, a natural approach is to design a Markov chain whose stationary distribution is the desired target distribution. This naturally leads to an iterative algorithm whose convergence rate is governed by the mixing time of the Markov chain. *Aditi Laddha* and *Santosh S. Vempala* focus on the Gibbs sampler, a very natural Markov chain introduced more than half a century ago, whose associated algorithm is faster than other ones such as Hit-and-Run or Ball Walk, and prove that it mixes rapidly.

The final paper of this issue concerns the problem of computing the farthest-point Voronoi diagram on a set of m points that lie in a simple polygon of n vertices. Posed as open problem in the Handbook of Computational Geometry more than two decades ago, this problem has seen a sequence of improved algorithms in recent years. *Haitao Wang* resolves the open problem by presenting an optimal deterministic algorithm that constructs the diagram in $O(n + m \log m)$ time.

Funding Open Access funding enabled and organized by Projekt DEAL.