Introduction to the Special Issue on SODA'18

We are delighted to present a Special Issue of *ACM Transactions on Algorithms*, containing full versions of six papers that were presented at the 29th Annual ACM-SIAM Symposium on Discrete Algorithms, SODA 2018, in New Orleans on January 7–10, 2018. These papers, selected on the basis of their high rating by the conference program committee, have been thoroughly reviewed according to the journal's highest standards.

In “[A Faster Algorithm for the Minimum-Cost Bipartite Perfect Matching in Planar Graphs](#),” Mudabir Kabir Asathulla, Sanjeev Khanna, Nathaniel Lahn, and Sharath Raghvendra provide a new algorithm with running time $\tilde{O}(n^{4/3} \log(nC))$ for maximum-weight matching on n -vertex planar bipartite graphs with positive integer edge-weights not exceeding C . The algorithm is a blend of the bit-scaling approach of Gabow and Tarjan with a speed-up achieved by an involved use of the r -divisions of planar graphs.

In the classic *distinct elements* problem, given a stream of elements from $\{1, 2, \dots, n\}$, one asks for a $(1 + \epsilon)$ -approximation to the number of distinct elements of the stream. Since 2010, we know that an optimal amount of space needed for a constant success probability is $\Theta(\epsilon^{-2} + \log n)$. Jarosław Błasiok, in “[Optimal Streaming and Tracking Distinct Elements with High Probability](#),” shows that if one wants to boost the success probability to $(1 - \delta)$, only $O(\epsilon^{-2} \log(\delta^{-1}) + \log n)$ space is needed, instead of $O(\log(\delta^{-1}) \cdot (\epsilon^{-2} + \log n))$ needed for $\log(\delta^{-1})$ parallel and independent runs. The space complexity is asymptotically optimal with respect to all three parameters.

In “[A Fast Generalized DFT for Finite Groups of Lie Type](#),” Chloe Ching-Yun Hsu and Chris Umans give a $O(|G|^{\omega/2+o(1)})$ -time algorithm for the generalized Discrete Fourier Transform over group G for finite groups of Lie type. If the matrix multiplication exponent ω is 2, then running time of the algorithm is essentially optimal.

An algorithm of Papadimitriou from 1981 solves an integer linear program in standard form $\max\{c^T x \mid Ax = b, x \geq 0, x \in \mathbb{Z}^n\}$ where $A \in \mathbb{Z}^{m \times n}$, $b \in \mathbb{Z}^m$, and $a \in \mathbb{Z}^n$ in time $(m \cdot (\|A\|_\infty + \|B\|_\infty))^{O(m^2)}$. Friedrich Eisenbrand and Robert Weismantel, in “[Proximity Results and Faster Algorithms for Integer Programming Using the Steinitz Lemma](#),” improve this bound to $(m \cdot \|A\|_\infty)^{O(m)} \cdot \|B\|_\infty^2$ using the classic Steinitz Lemma.

In “[Tight Analysis of Parallel Randomized Greedy MIS](#),” Manuela Fischer and Andreas Noever study the parallel randomized greedy algorithm for MAXIMUM INDEPENDENT SET: In each round order, the vertices, at random, select to the independent set every vertex appearing in the order before its neighbors and delete the neighborhoods of the chosen vertices from the graph. They prove that with high probability the algorithm finishes after $O(\log n)$ rounds, finishing the analysis of an algorithm that was initiated in 1987.

Finally, in “[More Logarithmic-factor Speedups for 3SUM, \(median, +\)-Convolution, and Some Geometric 3SUM-Hard Problems](#),” Timothy M. Chan improves an upper bound for the famous 3-SUM problem on n arbitrary reals to $O(n^2 (\log \log n)^{O(1)} / \log^2 n)$; that is, by about a logarithmic factor. Interestingly, the approach generalizes to a number of 3-SUM-hard problems in computational geometry, giving there first known subquadratic algorithms.

The editors would like to thank the authors and the reviewers for their contributions in bringing this Special Issue out on time.

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Guest Editors