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Special Issue on Analysis of Algorithms

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This special issue is devoted to the Analysis of Algorithms (AofA). Most of the papers are from the *Eighth Seminar on Analysis of Algorithms*, held in Strobl, Austria, June 23–29, 2002.

This area had its origin in the work of D. E. Knuth. It is concerned with accurate estimates of complexity parameters of algorithms, and aims at predicting the behaviour of algorithms. It develops general methods for obtaining closed-form formulae, asymptotic estimates, and probability distributions for combinatorial or probabilistic quantities that are of interest in the optimization of algorithms. Attention is also given to the methods themselves, whether combinatorial, probabilistic, or analytic. Combinatorial and statistical properties of discrete structures (strings, trees, tries, dags, graphs, and so on) as well as mathematical objects (*e.g.*, continued fractions, polynomials, operators) relevant to the design of efficient algorithms are investigated.

In 1993 the first seminar entirely devoted to the analysis of algorithms took place in Dagstuhl, Germany. These seminars were repeated in 1995 and 1997. Since 1998 AofA meetings have occurred every year at different locations: Princeton (USA, 1998), Barcelona (Spain, 1999), Krynica Morska (Poland, 2000), Tatihou (France, 2001), Strobl (Austria, 2002), and San Miniato (Italy, 2003). The 10th meeting is scheduled to take place in Berkeley (USA, 2004).

After each meeting, a special journal issue has been produced, open to all researchers in the field. The first special issue appeared in *Theoretical Computer Science*, followed by two issues in *Random Structures and Algorithms*, three in *Algorithmica* and one in the *Journal of Algorithms*. This is the first time that the special issue has appeared in *Combinatorics, Probability and Computing*. We are very grateful to Béla Bollobás, the Editor-in-Chief, for providing this opportunity.

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Contributions

This special issue contains 13 papers covering various topics of analysis of algorithms, combinatorics, applied probability, and computing. The first paper, by L. Alonso, P. Chassaing, F. Gillet, S. Janson, E. Reingold and R. Schott, 'Quicksort with unreliable comparisons: A probabilistic analysis', presents a probabilistic analysis of Quicksort when comparisons are noisy and errors can occur. In 'Max Cut for random graphs with a planted partition', B. Bollobás and A. D. Scott define and analyse a new algorithm for recovering a planted partition in a random graph; the algorithm is simple and runs in linear time.

B. Chauvin, P. Flajolet, D. Gardy and B. Gittenberger, in 'And/or trees revisited', investigate the connection between the size of the minimal formula expressing a Boolean function f and the limiting probability that a randomly selected formula of increasing size represents f.

The main result of the paper 'Dynamical analysis of the parametrized Lehmer–Euclid Algorithm', by B. Daireaux and B. Vallée, describes the asymptotic behaviour of the average bit complexity of a variant to the Lehmer–Euclid Algorithm. The next paper, by O. Dubois, G. Louchard and J. Mandler, 'Additive decompositions, random allocations, and threshold phenomena', analyses threshold phenomena in the additive decompositions of integers.

A new algorithm, and an interesting analysis of a simple framework for the random generation of combinatorial configurations, is presented by P. Duchon, P. Flajolet, G. Louchard and G. Schaeffer in 'Boltzmann samplers for the random generation of combinatorial structures'. The next paper also has an algorithmic flavour: in 'Optimizing LRU caching for variable document sizes', P. R. Jelenković and A. Radovanović analyse Web caching. Using probabilistic techniques, they describe the performance of a class of randomized LRU algorithms. Most notably, the analysis is applicable to variable size documents.

Urn models are very popular in combinatorics and the analysis of algorithms. In 'Probabilistic transforms for combinatorial urn models', O. Milenkovic and K. J. Compton present a unified way of describing several probabilistic transforms related to classical urn models.

The paper by K. Morris, A. Panholzer and H. Prodinger, 'On some parameters in heap ordered trees', focuses on the analysis on the Steiner distance in heap ordered trees and on related questions. It also proves a central limit theorem.

Brownian motion has found applications in the analysis of algorithms since the seminal paper of G. Louchard ('Brownian motion and algorithm complexity', *BIT* **26** (1986) 17–34). M. Nguyen The, in 'Area and inertial moment of Dyck paths', studies the joint distributions of some functionals of the Brownian bridge and excursion (in the continuous-time world) and some of their discrete-time counterparts, namely, Dyck paths and bilateral Dyck paths.

The Steiner distance is again analysed by A. Panholzer in 'Distribution of the Steiner distance in generalized M-ary search trees', which discusses in particular the asymptotic

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behaviour of the minimal spanning tree of a fixed number of random nodes in a generalized M-ary search tree, as well as related quantities.

The next paper has a methodological flavour. In 'Asymptotics of multivariate sequences II: Multiple points of the singular variety', R. Pemantle and M. C. Wilson continue to derive (multivariate) asymptotic expansions for the coefficients of power series $F(z_1, \ldots, z_d)$ in several complex variables under suitable assumptions on the singular behaviour $F(z_1, \ldots, z_d)$.

Finally, W. Schachinger, in 'Concentration of size and path length of tries', considers random bucket tries under rather general probabilistic models, such as memoryless, Markov, and continued fraction sources. The author proves concentration properties (around the mean) of some parameters (*e.g.*, the number of internal nodes and the path length).

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