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Preface of STACS 2012 Special Issue

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This special issue contains eight articles which are based on extended abstracts that were presented at the 29th *Symposium on Theoretical Aspects of Computer Science (STACS)*, which was held at the Université Pierre et Marie-Curie, Paris, France from February 29th to March 3rd, 2012. These extended abstracts were among the top papers of those that were chosen for presentation at STACS 2012 in a highly competitive peer-review process (after which only 54 papers out of 274 submission were accepted).

Compared with the original extended abstracts the articles have been extended by full proofs and additional results. They underwent a further rigorous reviewing process, following the TOCS standard, completely independent from the selection process of STACS 2012.

The topics of the papers cover data structures, approximation algorithms, compressed data, languages and logic.

The article *13/9-approximation for the Graphic TSP* by Marcin Mucha improves the analysis of an approximation algorithm for the traveling salesman problem (TSP) for graphic metrics, which received considerable attention in the last year. Improving the bound of a circulation in a network arising in the analysis, he succeeds to show the ratio $13/9$ for the TSP and the ratio $19/12$ for the traveling salesman path problem in graphic metrics.

The article *Playing Mastermind with Constant-Size Memory* by Benjamin Doerr and Carola Winzen, analyzes the game Mastermind with n holes and a constant num-

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ber of colors. It was known that the number of rounds needed by a codebreaker is $\Theta(n/\log n)$. Benjamin and Carola address the question of the amount of memory needed for this task and present a winning strategy with constant memory. This result combines some earlier findings on the Mastermind game with a previously unsolved question on the black-box complexity of linear functions.

In *The Complexity of Compressed Membership Problems for Finite Automata*, Artur Jeż proves that the compressed membership problem for nondeterministic (resp. deterministic) automata with compressed labels belongs to NP (resp. P), which solved an open problem stated in 1999. In this context, compressed strings are represented by straight-line programs (SLPs), which are context-free grammars G that generate exactly one string. Many other practically relevant compressed string representations can be converted in polynomial time into SLPs.

The article *Linear-Space Data Structures for Range Mode Query in Arrays* by Timothy M. Chan, Stephane Durocher, Kasper Green Larsen, Jason Morrison and Bryan T. Wilkinson presents new data structures for the range mode problem: Preprocess an array $a[1], \ldots, a[n]$ so that, for any query (i, j), a most frequently occurring value in the multiset $a[i], \ldots, a[j]$ can be reported quickly. The previous best linear-space data structure for this problem had a query time of $O(\sqrt{n}\log\log n)$, which the authors improve to $O(\sqrt{n/\log n})$ with a linear space data structure. For this they show a relationship between range mode queries and Boolean matrix multiplication, and address also the dynamic problem.

In *Efficient algorithms for highly compressed data: The Word Problem in Generalized Higman Groups is in P*, Jürn Laun considers the complexity of the word problem, a very substantial problem in group theory that asks whether a given word over the generators of a group represents the unit element of that group. In the past this problem has been solved in polynomial time for the Baumslag-Gersten group and the Higman group H_4, using power circuits. This paper generalizes these circuits to arbitrary basis, allowing to solve the word problem for generalized Higmans groups in time $O(n^6)$.

Christopher Broadbent, in his article *On First-Order Logic and CPDA Graphs*, studies higher-order pushdown automata. His main result consists in proving that, from the level 3 on, the first-order theory of the computation graphs of collapse pushdown automata, is undecidable. This contrasts with the decidability of the monadic second-order theory of the infinite trees generated by higher-order pushdown automata and the μ-calculus over the computation-graphs of colapse pushdown automata. In addition Christopher exhibits a natural sub-hierarchy enjoying limited decidability.

In *On the Separation Question for Tree Languages*, André Arnold, Henryk Michalewski, and Damian Niwiński study the Rabin-Mostowski index hierarchy, which organizes regular languages of infinite trees, similar to the arithmetic or Borel hierarchy. The authors prove that the separation property fails for Σ_n classes of the hierarchy. This means that for every n there are two Σ_n sets that cannot be separated by a Δ_n set. In passing the paper completely settles separation questions for languages of infinite words.

The article *Model-theoretic Properties of ω-automatic Structures*, by Faried Abu Zaid, Erich Grädel, Łukasz Kaiser and Wied Pakusa presents two results. One is that

infinite fields of characteristic 0 have no injective ω-automatic presentations and one is that no field of characteristic 0 with definable linear order has an omega-automatic presentation.

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The Guest Editors