

## Preface

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This special issue of Theory of Computing Systems consists of extended journal papers originally presented at the 7th International Computer Science Symposium in Russia (CSR 2012) held on July 3–7, 2012 in Nizhny Novgorod, Russia. The event was organized by Lobachevsky State University of Nizhny Novgorod and chaired by Michail Prilutskii. Preliminary versions of papers presented at the conference appear in LNCS 7353. The Program Committee, chaired by Juhani Karhumäki, invited several authors to submit extended journal versions of their papers to this special issue.

The CSR conference series is devoted to various theoretical questions in Computer Science.

A short description of contributions in this problem is as follows: Two papers concern graph-theoretic problems: The paper *Towards Optimal Degree Distributions for Left-Perfect Matchings in Random Bipartite Graphs* by Martin Dietzfelbinger and Michael Rink and the paper *Some results on more flexible versions of Graph Motif* by Romeo Rizzi and Florian Sikora

Rizzi and Sikora study the problem to determine whether a multiset of colors occurs in a connected subgraph of a vertex-colored graph. They prove both negative (inapproximability, NP-completeness) and positive (fixed-parameter tractability) results for several versions of this problem.

Dietzfelbinger and Rink investigate the structure of certain random bipartite graphs. They prove the existence of a sequence of probability mass functions that

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maximizes the probability that the random bipartite graph has a matching that covers all left nodes such that it concentrates the degree of the left nodes around  $\lfloor \Delta \rfloor$  and  $\lceil \Delta \rceil$ , for given  $\Delta$ . They also show how to find this sequence in some cases.

The paper *New Lower Bounds on Circuit Size of Multi-Output Functions* by Evgeny Demenkov, Alexander S. Kulikov, Olga Melanich, and Ivan Mihajlin gives two new lower bounds for the circuit complexity over the basis  $U_2$  (the full binary basis without the parity function and its complement) of explicitly given multi-output functions. The paper has been significantly extended compared to the proceedings version. In addition to the lower bound  $7n - o(n)$  for a function with  $n$  output bits, it now contains also a proof of a lower bound  $5n - o(n)$  for a linear function with  $\log n$  output bits.

The paper *On extracting space-bounded Kolmogorov complexity* by Daniil Musatov extends results about extracting Kolmogorov complexity to the space-bounded setting. Namely, the author proves counterparts of Zimand's and Muchnik's theorem in this framework strengthening previous results.

The paper *Two-way automata characterizations of  $L/poly$  versus  $NL$*  by Christos A. Kapoutsis and Giovanni Pighizzini deals with a fundamental question of comparing two-way deterministic and nondeterministic automata. More concretely, they analyse the question whether nondeterministic logarithmic space computations can be simulated by deterministic logarithmic space computations with nonuniform advice. The authors prove that this question is equivalent to a question about deterministic and non-deterministic finite-state two-way automata and also formulate a combinatorial conjecture that would imply the negative answer. The paper was selected to be the best paper of the conference.

The paper *Omega-rational expressions with bounded synchronization delay* by Volker Diekert and Manfred Kufleitner belongs to classical automata theory. It introduces new tools by which the authors reprove the classical Schützenberger's Theorem on aperiodic languages, and also generalize it to infinite words.

Finally, the paper *Generalized Post Embedding Problems* by P. Karandikar and Ph. Schnoebelen studies the Regular Post Embedding Problem. The problem asks for two morphisms  $u$  and  $v$  and a regular language  $\mathcal{R}$  whether there exists a  $\delta \in \mathcal{R}$  such that  $u(\delta)$  is a (scattered) subword of  $v(\delta)$ . Some decidable as well as undecidable extensions of this are given.

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