Editorial

Nikolay Vereshchagin

Published online: 1 December 2013
© Springer Science+Business Media New York 2013

This special issue of Theory of Computing Systems consists of selected papers presented at the 6th International Computer Science Symposium in Russia (CSR 2011) held on 14–18 June 2011 in St. Petersburg, Russia. This nice conference was organized by Alexander Kulikov and hosted by Academic University of the Russian Academy of Sciences. It was the sixth event in the series of regular international meetings starting in 2006.

The CSR conference series and hence the published journal papers are devoted to various theoretical questions in Computer Science. In *The Equivalence of Sampling and Searching* Scott Aaronson shows that for every sampling problem one can find an equivalent search problem. Equivalence here means that the problems reduce to each other in a quite strong sense. This surprising result was obtained by using Kolmogorov complexity as a tool. The topic of Kolmogorov complexity is continued in *Improving the Space-Bounded Version of Muchnik's Conditional Complexity Theorem via "Naive" Derandomization*, where Daniil Musatov shows how the Nisan and Wigderson pseudorandom generator can be used for compression in small space. These two papers were awarded “Best paper” and “Best student paper” at CSR 2011.

The Nisan and Wigderson pseudorandom generator is further used in *Pseudorandom graphs and bit probe schemes with one-sided error* by Andrei Romashchenko to construct a scheme to store a finite set so that membership queries can be answered very efficiently. The generator is used to show the existence of effective graphs with certain nice properties.

The papers *An extended tree-width notion for directed graphs related to the computation of permanents* by Klaus Meer and *Join-Reachability Problems in Directed*

N. Vereshchagin (✉)
Dept. of Mathematical Logic and Theory of Algorithms, Moscow State University,
Leninskie Gory 1, Moscow, 119991, Russian Federation
e-mail: nikolay.vereshchagin@gmail.com

Graphs by Loukas Georgiadis, Stavros Nikolopoulos and Leonidas Palios also deal with graphs. In the former paper the author identifies a new class of graphs for which the permanent can be efficiently computed. In the latter one it is shown how, given a family of directed planar graphs sharing the same set of nodes, to construct a structure that allows to efficiently answer questions of the following type: given nodes u and v find whether they are connected in *all* the graphs in the family.

Reachability in directed graphs is also investigated in *The complexity of solving reachability games using value and strategy iteration* by Kristoffer Arnsfelt Hansen, Rasmus Ibsen-Jensen and Peter Bro Miltersen. However this time in the game context: two player move a pebble along the edges of a directed graph, the second player trying to prevent the first player to reach a certain GOAL node. For such a games one can show that there are optimal strategies for both players in a certain natural class of randomized strategies. The paper investigates how hard is to find those strategies given the graph.

The paper *Learning Read-Constant Polynomials of Constant Degree Modulo Composites* by Arkadev Chattopadhyay, Ricard Gavalda, Kristoffer Arnsfelt Hansen and Denis Thérien exhibits a polynomial time algorithm to learn an unknown Boolean function represented in a certain way by a polynomial over a ring of residues modulo a composite number, assuming that the polynomial has constant degree and each variable appears in constant number of monomials.

The paper *Two-way automata versus logarithmic space* by Christos Kapoutsis represents structural complexity theory. It is shown there that non-deterministic 2-way finite automata are polynomially equivalent (with respect to the number of states) to deterministic 2-way finite automata if and only if NL is included in L/poly.

The preliminary versions of the papers appear in Proceedings of CSR 2011 (Lecture Notes in Computer Science series, Volume 6651, 2011). The final versions published here differ significantly from the preliminary ones in the quality of presentation, presence of omitted proofs and other added material. All papers went through the full Theory of Computing Systems journal reviewing process and one of the initial submissions was rejected. We are grateful to all the reviewers for their careful work.