Special Issue on Approximation and Online Algorithms

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Approximation and online algorithms deal with problems that are difficult to solve due to two different reasons: Either the search space is too large and complex to efficiently look for an optimum solution, or the search space is not completely known as the input for the problem is gradually disclosed throughout the execution of the algorithm. There is extensive research on approximation and online algorithms and advances made in one of these fields have contributed to new discoveries in the other.

This special issue of *Theory of Computing Systems* is devoted to the publication of a selected set of papers that were presented at the 9th International Workshop on Approximation and Online Algorithms (WAOA 2011) which took place in Saarbrücken, Germany, September 8-9 of 2011. Each one of the 21 papers accepted for presentation at the workshop was reviewed by at least 3 members of the program committee. The program committee invited the authors of the six best papers presented at the workshop to write full versions of their papers and to submit them to the special issue. Each one of these papers was thoroughly reviewed by 2 experts, in accordance with the high standards of the journal.

The six papers that appear in this issue give just a tiny sample of the diversity of problems for which approximation and online algorithms are of crucial importance. In *On Online Algorithms with Advice for the k-Server Problem*, the problem of moving a set of k servers on a metric space to satisfy a set of online requests is studied. This is a fundamental problem in online computations with applications in networks, operating systems, and Operations Research, among others. One of the interesting aspects of this paper is that it considers online computations with advice,

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which aim at reducing the uncertainty of future user requests. A special version of the k-server problem, the paging problem, is considered in ONLINEMIN: *A fast strongly Competitive Randomized Paging Algorithm*. The paging problem is of high relevance in operating systems and Internet applications. This paper presents a fast online algorithm for the paging problem with optimal competitive ratio.

Packing and Scheduling problems have received a lot of attention from the algorithms community in recent years. In *Improved Lower Bound for Online Strip Packing*, the problem of packing a set of rectangles in a bin of unit width and minimum height is considered. This problem is of importance in resource allocation and scheduling problems. This paper deals with the complex issue of proving how difficult an online problem is. *A Lower Bound on Deterministic Online Algorithms for Scheduling on Related Machines without Preemptions* also studies the issue of computing lower bounds for online problems, but this time for an important online scheduling problem. *Non-Clairvoyant Weighted Flow Time Scheduling on Different Multi-Processor Models* deals with a classical scheduling problem, but studies the problem under the non-clairvoyant model, where the scheduler does not know in advance the duration of the jobs.

The last paper, *Approximation Algorithms for Fragmenting a Graph Against a Stochastically-Located Threat*, considers several interesting NP-hard stochastic optimization problems on graphs arising from planning problems related to how to allocate limited resources to prevent catastrophic events.

We would like to thank all the authors who contributed to this special issue and we also want to thank the reviewers, who carefully read the papers and made many valuable suggestions. Finally, we thank Springer and the staff of *Theory of Computing Systems* for their help in publishing this issue.