

Introduction to the Special Issue on SPAA 2014

This special issue contains revised and extended versions of selected papers presented at the *26th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2014)*, held on June 23-25, 2014 in Prague, Czech Republic. After the conference, the authors of several papers that received excellent reviews were invited to submit extended versions of their papers for consideration for this special issue. After rigorous peer review process the following seven papers have been selected for publication in this special issue.

In “Executing Dynamic Data-Graph Computations Deterministically Using Chromatic Scheduling”, Kaler, Hasenplaugh, Schardl, and Leiserson extend chromatic scheduling from static to dynamic data-graph computations. Their technique can be adopted to support deterministic execution of work-efficient, dynamic data-graph computations on the existing frameworks, such as GraphLab, Pregel, Galois, PowerGraph, Ligra, or GraphChi.

Computation, communication and synchronizations are three complexity metrics that typically affect the overall running time of distributed processing the most. In “Tradeoffs between Synchronization, Communication, and Computation in Parallel Linear Algebra Computations”, Solomonik, Carson, Knight and Demmel derive trade-off bounds between these metrics for a number of numerical linear algebra problems.

In “Competitively Scheduling Tasks with Intermediate Parallelizability”, Im, Moseley, Pruhs, and Torng study scheduling a batch of jobs consisting of a mix of both fully parallelizable and inherently sequential jobs. They show lower bound for the competitive ratio of scheduling such mix of jobs and present an algorithm that achieves this competitive ratio.

Finding maximal independent set (MIS) in hypergraphs is a fundamental problem in parallel computing. In “On Computing Maximal Independent Sets of Hypergraphs in Parallel”, Bercea, Goyal, Harris, and Srinivasan present a randomized EREW PRAM algorithm for finding MIS on hypergraphs with a restricted number of edges in $n^{o(1)}$ time and near linear number of processors.

The goal of network creation games is to generate a network by having each node of the network activate links to other nodes, subject to the cost of activating the links and the cost of routing on the final network. In “Locality-based Network Creation Games”, Bilò, Gualà, Leucci, and Proietti present upper and lower bounds for the price of anarchy in network creation games, where each node has knowledge of the network limited to a fixed radius from that node, rather than the global knowledge of the whole network.

The paper “Parallel Peeling Algorithms” by Jiang, Mitzenmacher, and Thaler received the Best Paper Award at SPAA 2014. In this paper the authors study the number of rounds required when peeling random regular hypergraphs. They show a tight bound of $O(\log \log n)$ rounds for hypergraphs that are highly likely to have an empty k -core. In contrast, they also present $\Omega(\log n)$ lower bound for hypergraphs that are highly likely to contain a non-empty k -core.

Scheduling threads which take into account the effects of memory hierarchies in modern multicore processors has been a subject of several papers recently. In “Experimental Analysis of Space-Bounded Schedulers”, Simhadri, Blleloch, Fineman, Gibbons, and Kyrola present the first empirical evaluation of a class of such schedulers – the space-bounded schedulers. Their experiments show that space-bounded schedulers

reduce the number of cache misses and this reduction results in better performance on memory-intensive benchmarks, in spite of increased overhead of such schedulers.

We would like to thank the numerous people who made this special issue possible: first of all, the authors for their extra work in extending their papers; the reviewers for their thorough reviews and thoughtful comments which improved the presentation of several papers; Editor-in-Chief Phil Gibbons for suggesting this special issue; the ACM publication staff for making the whole process run smoothly; and the original program committee and external reviewers of SPAA 2014 for helping select the original group of papers.

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Guest Editors