

2020 Selected Papers from Algorithms' Editorial Board Members

Frank Werner 

Faculty of Mathematics, Otto-von-Guericke, University Magdeburg, P.O. Box 4120, D-39016 Magdeburg, Germany; frank.werner@ovgu.de; Tel.: +49-391-675-2025

1. Introduction

This Special Issue of *Algorithms* is of a different nature than other Special Issue in the journal, which are usually dedicated to a particular subjects in the area of algorithms. During the last years, the editorial board of the journal has been considerably extended. At the end of 2020, there were 119 scientists from 29 countries, among them 18 countries from Europe. This follows the very positive development of the journal during the last years. From 2017 to 2020, the number of submissions has almost doubled and exceeded in 2020 for the first time the number of 1000. So, the journal decided to setup an issue where our editorial members can present their latest work so that the readers of the journal *Algorithms* get an impression about the broad research spectrum of the editorial Board members of the journal.

2. Special Issue

After a careful refereeing process, eight papers were selected for this issue. As a rule, all submissions have been reviewed by three experts in the corresponding area. Subsequently, we survey the published papers in increasing order of their publication dates for this Special Issue.

The paper [1] deals with the inference of chemical compounds having particular desired properties. This subject plays a role for instance for the drug design or also in bioinformatics. For this problem, there exists a rather new method that uses artificial neural networks and also mixed integer linear programming. For this method, which is composed of a training and an inverse prediction phase, the authors extend the framework and derive a method for the inference problem for rank-2 chemical compounds. Computer results confirm the superiority of this method over an earlier one.

The second paper [2] deals with the compression of Next-Generation Sequencing data. It analyzes different approaches for compressing digital files obtained by Next-Generation Sequencing tools, and the compression performance is evaluated by confronting the generic compression algorithm with the system *Quip*, designed for genomic file compression. The paper also presents an effective compression technique for DNA sequences by considering only the relevant DNA data.

In the paper [3], a survey of parametrized parallel complexity is given. It is shown how classical fixed parameter tractability (FPT) techniques for sequential algorithms can be used to obtain fixed-parameter parallelizable (FPP) algorithms. The authors present also relationships between different complexity classes. Moreover, the paper discusses some problems that are intractable in the FPP sense.

The paper [4] introduces spatially adaptive regularization in a variational segmentation model, where the segmentation of images is improved by taking into account their smooth and nonsmooth regions in an appropriate way. Three techniques were introduced, based on the application of spatial filters and thresholding. The model presented by the authors was obtained by a modification of a well-known image segmentation model given by Chan, Esedoglu and Nikolova. It turned out that the locally adaptive methods showed the effectiveness of the proposed approaches.



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The paper [5] deals with parsing which has applications in many branches of computer science, e.g., in compilers or formal language theory. The authors present a version of the traditional Cocke-Younger-Kasami (CYK) algorithm which is completely defined over distributed representations. Their algorithm uses matrix multiplication on real number matrices of a size which is independent on the length of the input string. It turned out that their version approximates the original CYK algorithm.

The paper [6] deals with radioisotope identification (RIID) algorithms for gamma-ray spectroscopy. Many of those RIID algorithms, which use only energy channels, rely on locating peaks and estimating the net area of each peak. In this paper, the authors demonstrate that approximate Bayesian computation turns out to be effective for peak location and area estimation. Algorithms for locating peaks can be applied both to raw and smoothed data and among the smoothing options, the authors recommend the iterative bias reduction algorithm.

The paper [7] deals with the heuristic solution of the Traveling Salesman Problem (TSP). k -opt neighborhoods, where a neighbor is generated by replacing k edges with k other ones, are a popular heuristic for the TSP. In this paper, the authors present a strategy to find the best 3-OPT move by searching only a fraction of the possible moves. This approach is then extended to some other types of cubic moves, e.g., special 5-OPT and 6-OPT moves. It turned out that the algorithm presented in this paper runs in average subcubic time for a large class of random graphs and instances from the library TSPLIB.

The last paper [8] deals with an interesting practical problem, namely with a comparison of the performance of two sliding mode control (SMC) algorithms for an anti-lock braking system (ABS). One of them is based on the Lyapunov-based SMC, and the other one is based on the reaching-law-based SMC. Their complete design and a stability analysis demonstrate that an SMC control is sufficiently robust to account for uncertainty in the design. Moreover, the SMC-based controllers are compared to four other controllers and showed a good performance capability. So, they turn out to be attractive also for industrial implementations.

Finally, as the current editor-in-chief, it is my pleasure to thank all the editorial board members for their support of the journal during the last years. It is intended that such an annual issue with recent research results of the editorial board members will become a future tradition. So I invite the members to present their latest high-quality work in the 2021 issue of this type which is now open for submissions.

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