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Editorial

Editorial: Surveys in Algorithm Analysis and Complexity Theory, Part II (Special Issue)

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Special Issue

Surveys in Algorithm Analysis and Complexity Theory, Part II

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Dr. Jesper Jansson

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Editorial: Surveys in Algorithm Analysis and Complexity Theory, Part II (Special Issue)

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1. Introduction

This is the second Special Issue of surveys published by the MDPI journal *Algorithms*. While the first Special Issue focused on traditional topics from theoretical computer science related to combinatorics, fundamental algorithms, and computational complexity, the surveys in this one are more application oriented.

The Special Issue received nineteen submissions, summarizing recent developments and important results from many different fields of research. Submissions that passed the initial screening were reviewed by independent, anonymous experts, revised by the authors accordingly, and then reviewed and revised again one or more times. After the conclusion of the reviewing process, six of the submitted surveys were ultimately accepted. We believe that they will be of general interest to a broad audience and also bring new perspectives to active researchers working in the respective areas.

2. Contents

The first contribution (Contribution 2) is a unique historical survey about the Lozi chaotic map, written by R. Lozi (the inventor of the map himself) 46 years after its creation. It tells the fascinating story of how the author conceived the idea for his map and what it was like to be a researcher in the 1970s, introduces the basic mathematical properties of the map, mentions some generalizations, and describes numerous unexpected applications to optimization algorithms and engineering that have been developed over the years. An extensive list of references, spanning across several decades, is provided in the bibliography.

The goal of post-quantum cryptography is to build and refine cryptographic systems that will be secure against cryptanalytic attacks by quantum computers in the future. To decide how to update the existing standards and security protocols, an ongoing competition organized by the National Institute of Standards and Technology (NIST) has been examining a huge number of proposed quantum-resistant cryptographic algorithms in detail. The survey by M. Vidaković and K. Miličević (Contribution 3) compares various efficiency- and security-related aspects of the three winners from the "Digital Signature Algorithms" category in round 3 of the competition: CRYSTALS-Dilithium, FALCON, and SPHINCS$^+$.

The third survey in the collection, written by K. J. Büscher, J. P. Degel, and J. Oellerich (Contribution 4), reviews methods for isosurface extraction from a given structured or unstructured dataset. The authors identify four major approaches that they refer to as marching cubes algorithms, tessellation-based algorithms, surface nets algorithms, and ray-tracing algorithms, and discuss the advantages, limitations, and applicability of each one. Practical applications of these methods include medical image processing, scientific data analysis, and visualization of simulations.

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The fourth survey was written by G. Cabodi, P. E. Camurati, M. Palena, and P. Pasini (Contribution 5). It covers SAT-based model-checking algorithms for the formal verification of sequential hardware circuits whose behavior can be specified using finite transition systems. Classic methods such as bounded model checking, temporal induction, and McMillan's interpolation algorithm, and more recent methods such as "Incremental Construction of Inductive Clauses for Indubitable Correctness" (IC3) and "Interpolation with Guided Refinement" (IGR), are explained, illustrated with examples, and compared to each other experimentally on a set of verification benchmarks derived from Hardware Model Checking Competition suites.

Next, A. D. R. Kulandai and T. Schwarz (Contribution 6) revisit an old technique for dynamic hashing called spiral storage. It was shown in the 1980s that a simpler and computationally less intensive technique known as linear hashing outperforms spiral storage (as well as various other alternatives for dynamic hashing) under assumptions that were reasonable at the time, and spiral storage gradually fell into oblivion. However, technological advancements since then have improved processor speeds much more than memory access times and storage access times, and the authors' reassessment of the spiral storage technique demonstrates that it is actually faster and more predictable than linear hashing in many cases relevant to today's computing environments, potentially reigniting interest in this technique.

Given a set r of tuples of non-negative real numbers, a skyline tuple is a tuple in r that is not dominated by any other tuple in r. Because the number of skyline tuples in high-dimensional datasets in big data applications can be impractically large, methods have been proposed for ranking them according to their robustness, thus allowing users to identify and focus on small subsets of important skyline tuples. In the last contribution of this collection (Contribution 7), D. Martinenghi evaluates different data partitioning strategies for the parallel computation of such a skyline tuple ranking measure called grid resistance, and investigates how the data distribution affects performance.

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Conflicts of Interest: The author declares no conflicts of interest.

List of Contributions

1. Jansson, J. Editorial: Surveys in Algorithm Analysis and Complexity Theory (Special Issue). *Algorithms* **2023**, *16*, 188. https://doi.org/10.3390/a16040188.
2. Lozi, R. Survey of Recent Applications of the Chaotic Lozi Map. *Algorithms* **2023**, *16*, 491. https://doi.org/10.3390/a16100491.
3. Vidaković, M.; Miličević, K. Performance and Applicability of Post-Quantum Digital Signature Algorithms in Resource-Constrained Environments. *Algorithms* **2023**, *16*, 518. https://doi.org/10.3390/a16110518.
4. Büscher, K.J.; Degel, J.P.; Oellerich, J. A Comprehensive Survey of Isocontouring Methods: Applications, Limitations and Perspectives. *Algorithms* **2024**, *17*, 83. https://doi.org/10.3390/a17020083.
5. Cabodi, G.; Camurati, P.E.; Palena, M.; Pasini, P. Hardware Model Checking Algorithms and Techniques. *Algorithms* **2024**, *17*, 253. https://doi.org/10.3390/a17060253.

6. Kulandai, A.D.R.; Schwarz, T. Performance of Linear and Spiral Hashing Algorithms. *Algorithms* **2024**, *17*, 401. https://doi.org/10.3390/a17090401.
7. Martinenghi, D. Parallelizing the Computation of Grid Resistance to Measure the Strength of Skyline Tuples. *Algorithms* **2025**, *18*, 29. https://doi.org/10.3390/a18010029.