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Algorithms for Sensor Systems

17th International Symposium on Algorithms and Experiments
for Wireless Sensor Networks, ALGOSENSORS 2021
Lisbon, Portugal, September 9–10, 2021
Proceedings

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University of Liverpool
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Tomasz Radzik
King's College London
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Ralf Klasing
CNRS and University of Bordeaux
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Preface

The 17th International Symposium on Algorithms and Experiments for Wireless Sensor Networks (ALGOSENSORS 2021) was originally scheduled to take place during September 9–10, 2021, in Lisbon, Portugal. Due to the COVID-19 pandemic, those original arrangements had to be changed. The symposium was run online on the originally set dates of September 9–10, 2021, as part of the ALGO 2021 event, organized and coordinated from Lisbon by the ALGO 2021 Organizing Committee.

ALGOSENSORS is an international symposium dedicated to the algorithmic aspects of wireless networks. Originally focused on sensor networks, it now covers algorithmic issues arising in wireless networks of all types of computational entities, static or mobile, including sensor networks, sensor-actuator networks, and systems of autonomous robots. The focus is on the design and analysis of algorithms, models of computation, and experimental analysis.

The Program Committee of ALGOSENSORS 2021 received 28 submissions. Each submission was reviewed by at least three Program Committee members and some trusted external referees, and evaluated on its quality, originality, and relevance to the symposium. The Committee selected 10 papers for presentation at the symposium and inclusion in the proceedings.

One invited talk was given at ALGOSENSORS 2021, by Bernhard Haeupler (CMU, USA, and ETHZ, Switzerland). The invited talk was integrated in the global ALGO 2021 program, as a joint keynote. This volume includes the abstract of the invited talk.

The Program Committee selected the same contribution for the Best Paper Award and the Best Student Paper Award, both sponsored by Springer:

- Jannik Castenow, Jonas Harbig, Daniel Jung, Till Knollmann, and Friedhelm Meyer auf der Heide for their paper “Gathering a Euclidean Closed Chain of Robots in Linear Time”.

We thank the Steering Committee for giving us the opportunity to serve as Program Chairs of ALGOSENSORS 2021, and for the responsibilities of selecting the Program Committee, the conference program, and publications.

We would like to thank all the authors who responded to the call for papers, the invited speaker for enriching the program of the ALGO 2021 event, and the Program Committee members, as well as the external reviewers, for their fundamental contribution in selecting the best papers resulting in a strong program. We would also like to warmly thank the ALGO 2021 organizers for kindly accepting to co-locate ALGOSENSORS with some of the leading events on algorithms in Europe. Furthermore, we would like to thank the local ALGO 2021 Organizing Committee, especially Arlindo Oliveira (chair), as well as the Steering Committee chair, Sotiris Nikolettseas, for their help in ensuring a successful ALGOSENSORS 2021.

We would like to thank Springer for publishing the proceedings of ALGOSENSORS 2021 in their LNCS series and for their support.

Finally, we acknowledge the use of the EasyChair system for handling the submission of papers, managing the review process, and generating these proceedings.

September 2021

Leszek Gąsieniec
Ralf Klasing
Tomasz Radzik

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Universally-Optimal Distributed Algorithms, (Congestion+Dilation)-Competitive Oblivious Routing, and Hop-Constrained Network Design

(Abstract of Invited Talk)

Bernhard Haeupler

CMU, USA & ETHZ, Switzerland
haeupler@cs.cmu.edu

Many tasks on graphs/networks are optimizing either

- ℓ_1 parameters like distances (e.g., computing short paths for low-delay communications),
- ℓ_∞ parameters like congestion (e.g., computing maximum flows for high-rate communications), or
- both parameter types jointly (e.g., asking for short & low-congestion paths for minimizing the completion time of a communication task)

While ubiquitous, tasks of this joint type tend to be much harder and are less well understood. This talk presents new tools to address this. These tools were developed during a 6-year-long freshly-completed effort to obtain the first universally-optimal distributed graph algorithms (e.g., for MST, min-cut, SSSP, etc.). A universally-optimal algorithm is (approximately) as fast as the fastest algorithm for every graph topology.

Other important results include:

- The first Oblivious Routings that give short & low-congestion routes.
- Fast distributed constructions of compact routing tables for such oblivious routings.
- The first approximation and online algorithms for many diameter-constrained versions of classical network design problems (e.g., (group) Steiner Tree/Forest).
- The first upper and lower bounds for how much (network) coding can speed up completion times of point-to-point network communications.

(joint work with M. Ghaffari, G. Zuzic, D. E. Hershkowitz, D. Wajc, J. Li, H. Raecke, T. Izumi)

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