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Algorithms for Sensor Systems

12th International Symposium on Algorithms and Experiments for Wireless Sensor Networks, ALGOSENSORS 2016
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Preface

ALGOSENSORS, the International Symposium on Algorithms and Experiments for Wireless Sensor Networks, is an international forum dedicated to the algorithmic aspects of wireless networks, static or mobile. The 12th edition of ALGOSENSORS was held on August 25, 2016, in Aarhus, Denmark, as a part of the ALGO 2016 event.

Originally focused solely on sensor networks, ALGOSENSORS now covers more broadly algorithmic issues arising in all wireless networks of computational entities, including sensor networks, sensor-actuator networks, and systems of autonomous mobile robots. In particular, it focuses on the design and analysis of discrete and distributed algorithms, on models of computation and complexity, on experimental analysis, in the context of wireless networks, sensor networks, and robotic networks and on all foundational and algorithmic aspects of the research in these areas. This year papers were solicited for three tracks: Distributed and Mobile, Experiments and Applications, and Wireless and Geometry.

In response to the call for papers, 20 submissions were received, out of which nine papers were accepted after a rigorous reviewing process by the (joint) Program Committee, which involved at least three reviewers for each accepted paper. This volume contains the technical papers as well as an invited paper of the keynote talk by Fabian Kuhn (University of Freiburg).

We would like to thank all 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 2016 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 2016 Organizing Committee for their help regarding various administrative tasks, especially the local organizers Gerth Stølting Brodal (chair) and Trine Ji Holmgaard Jensen, as well as the Steering Committee chair, Sotiris Nikoletseas, for their help in ensuring a successful ALGOSENSORS 2016.

December 2016

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Invited Talk: Developing Robust Wireless Network Algorithms

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Over the last 30 years, we have seen a tremendous effort in the development of distributed algorithms and abstract models to deal with the characteristic properties of wireless communication networks. The models range from simple graph-based characterizations of interference to more accurate physical models such as the so-called signal-to-noise-and-interference (SINR) model. As different as the typically considered models are, most of them have one thing in common. Whether a node can successfully receive (and decode) a message is determined using some fixed, deterministic rule that depends only on the topology and structure of the actual network and on some additional model parameters.

While in classical wired networks, assuming reliable communication might be a reasonable abstraction, this seems much more problematic in a wireless network setting. The propagation of a wireless signal depends on many diverse environmental factors and it does not seem to be realistic to explicitly model all of these factors or to exactly measure the properties of the wireless communication channels. In addition, the environmental factors might change over time and there can also be additional independent sources of signal interference that cannot be predicted or controlled by the network. Further, wireless devices might also be mobile so that we not only have unreliable communication channels, but potentially even almost arbitrary dynamically changing network topologies. Because the classic abstract wireless communication models do not capture such unpredictable behavior, many existing radio network algorithms might only work in the idealized formal setting for which they were developed.

In the talk, we describe ways to develop more robust wireless network algorithms. In particular, we show that complex, unstable, unreliable, and also dynamic behavior of wireless communication networks can be modeled by adding a non-deterministic component to existing radio network models. As a result, any behavior which is too complex or impossible to predict or model explicitly is determined by an adversary. Clearly, such models might lead to less efficient algorithms. However, they also lead to more robust algorithms which tend to work under a much wider set of underlying assumptions. Very often, such models also lead to much simpler algorithms.

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