



Preface

Wireless sensor networks have already become a very important research and technological subject, due to their potential of providing diverse services to numerous applications, including environmental monitoring, health applications, home automation, security, ambient intelligence, etc. Such environments are composed of very large numbers of tiny, smart sensors of limited computing and energy resources, that communicate wirelessly to form an ad hoc network.

The effective realization of such robust and efficient ad hoc networking and communication infrastructures requires intensive research and development efforts, especially in providing power aware, scalable, fault-tolerant and secure protocols, due to the unusual user and application requirements of these networks and the severe constraints of the sensor devices involved.

At the same time, a solid theoretical and analytical background is necessary for wireless sensor networks to achieve their full potential. It is an algorithmic challenge to achieve efficient and robust realizations of such extremely large, highly dynamic, complex, non-conventional environments. Features and technological specifications including the huge number of sensor devices involved, the severe power, computational and memory limitations, their dense deployment, complex interactions and frequent failures, pose new design, analysis and implementation challenges.

Indeed, algorithmic design for wireless sensor networks is different not only with respect to classic distributed computing, but also with respect to other, recently emerged, networking environments, like ad hoc mobile networks. Abstract but still realistic models of wireless sensor networks are needed; new algorithms and protocols should be designed, along with a rigorous analysis of their performance properties, including correctness, efficiency and fault-tolerance; new techniques, methodologies and even theories, possibly of a multidisciplinary nature, should be devised.

This Special Issue is based on selected best papers of theoretical, algorithmic flavor from the successful First International Workshop on Algorithmic Aspects of Wireless Sensor Networks, that was held July 16, 2004, in Turku, Finland (ALGOSENSORS 04, <http://ru1.cti.gr/algosensors04/>), in conjunction with the 31st International Colloquium on Automata, Languages and Programming (ICALP 04). Papers from other recent state of the art have also been invited.

This Volume is an attempt to reinforce the algorithmic, complexity-theoretic perspective in the wireless sensor networks research. The selected papers cover a diverse variety of important problems in wireless sensor networks, including routing, data aggregation, data

gathering, positioning and localization, and energy modeling. The results presented in all papers are derived by rigorous, analytic means.

The authors of the papers were invited to submit extended versions of their work. Submitted papers have been allocated to well-known, active scientists in the field, asking them to review the papers according to the high standards and the character of the TCS Journal.

We would like to thank the Editor-in-Chief of TCS-A Prof. Giorgio Ausiello for inviting us to act as Guest Editors of this Special Issue and for his support throughout its preparation. We also wish to thank the authors of all papers for a fruitful cooperation and especially the referees for their high-quality review work.

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