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Fernando A. Kuipers Poul E. Heegaard (Eds.)

Self-Organizing Systems

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Proceedings

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Volume Editors

Fernando A. Kuipers
Delft University of Technology
Faculty of Electrical Engineering, Mathematics and Computer Science
P.O. Box 5031, 2600 GA Delft, The Netherlands
E-mail: f.a.kuipers@tudelft.nl

Poul E. Heegaard
Norwegian University of Science and Technology
Department of Telematics
O.S. Bragstads plass 2B, 7491 Trondheim, Norway
E-mail: poul.heegaard@item.ntnu.no

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Preface

This book contains research articles from the IFIP International Workshop on Self-Organizing Systems (IWSOS), held in Delft, The Netherlands, in March 2012.

This was the sixth workshop in a series of multidisciplinary events dedicated to self-organization in networked systems with the main focus on communication and computer networks. The concept of self-organization is becoming increasingly popular in various branches of technology. A self-organizing system may be characterized by global, coordinated activity arising spontaneously from local interactions between the system's components. This activity is distributed over all components, without a central controller supervising or directing the behavior. Self-organization relates the behavior of the individual components (the microscopic level) to the resulting structure and functionality of the overall system (the macroscopic level). Simple interactions at the microscopic level may give rise to complex, adaptive, and robust behavior at the macroscopic level.

The necessity of self-organization in technological networks is caused by the growing scale, complexity, and dynamics of future networked systems. This is because traditional methods tend to be reductionistic, i.e., they neglect the effect of interactions between components. However, in complex networked systems, interactions cannot be ignored, since they are relevant for the future state of the system. In this sense, self-organization becomes a useful approach for dealing with the complexity inherent in networked systems. Since self-organization principles do not only apply to the Internet, but also to a variety of other complex networks, like transportation networks, telephony networks, smart electricity grids, smart cities, financial networks, social networks, and biological networks, IFIP IWSOS 2012 also invited articles on "Network Science" and "Complex Networks Theory" that focus on self-organizing systems.

The IFIP IWSOS 2012 committee received 28 submissions from 16 countries. Three papers were immediately rejected due to wrong scope or non-conformance with the template. Each of the remaining 25 submissions found to be eligible was in general reviewed by three members (papers with only two reviews had consistent reviews) of the Technical Program Committee. In total, 65 reviews were performed. Based on these reviews, ten papers were accepted. Five full papers were accepted out of the 20 full papers submitted, i.e., 25% acceptance rate. In addition, five short papers were accepted, which included three out of the eight short paper submissions, plus two full papers that were accepted as short papers. Two additional publications were invited for the workshop. The authors of the papers are from Italy, The Netherlands, Czech Republic, Germany, UK, South Korea, USA, Israel, Austria, and Norway.

The following key IWSOS topics were addressed:

- Design and analysis of self-organizing and self-managing systems
- Inspiring models of self-organization in nature and society
- Structure, characteristics and dynamics of self-organizing networks
- Techniques and tools for modeling self-organizing systems
- Robustness and adaptation in self-organizing systems
- Self-organization in complex networks like peer-to-peer, sensor, ad-hoc, vehicular and social networks
- Control of self-organizing systems
- Decentralized power management in the smart grid
- Self-organizing group and pattern formation
- Self-organizing mechanisms for task allocation, coordination and resource allocation
- Self-organizing information dissemination and content search
- Risks and limits of self-organization

The IWSOS series brings together leading international researchers to create a visionary forum for discussing the future of self-organization. It addresses theoretical aspects of self-organization as well as applications in communication and computer networks and complex networks.

IFIP IWSOS 2012 was technically sponsored by IFIP—the International Federation for Information Processing—and cosponsored by the European Network of Excellence Euro-NF.

The IFIP IWSOS 2012 workshop featured two keynote talks given by Shlomo Havlin, Bar-Ilan University, Israel, and Karl Aberer, EPFL, Switzerland. In addition, two panel sessions were organized: (1) Self-Organizing Smart Grids, and (2) Self-Organized Resilience, as well as a poster session with a student research competition.

January 2012

Fernando A. Kuipers
Poul E. Heegaard

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