UNIFIED DISTRIBUTED SENSOR AND ENVIRONMENTAL INFORMATION PROCESSING WITH MULTI-AGENT SYSTEMS

epubli, ISBN 9783746752228 (2018)

epubli, ISBN 9783746752228 (2018)

UNIFIED DISTRIBUTED SENSOR AND ENVIRONMENTAL INFORMATION PROCESSING WITH MULTI-AGENT SYSTEMS

MODELS, PLATFORMS, AND TECHNOLOGICAL ASPECTS

PD DR. RER. NAT. STEFAN BOSSE

Habilitation Thesis
University Of Bremen,
Bremen, Aug. 2016,
Germany
Extended Book

epubli, ISBN 9783746752228 (2018)

PD Dr. Stefan Bosse

University of Bremen
Department of Computer Science,
D-28359 Bremen, Germany
University of Koblenz-Landau
Faculty Computer Science,
D-56070 Koblenz, Germany

Print: epubli - a service of neopubli GmbH, Berlin

ISBN: 978-3-746752-22-8

Preface

This book addresses the challenge of unified and distributed computing in strong heterogeneous environments ranging from Sensor Networks to Internet Clouds by using Mobile Multi-Agent Systems. An unified agent behaviour model, agent processing platform architecture, and synthesis framework should close the operational gap between low-resource data processing units, for example, single microchips embedded in materials, mobile devices, and generic computers including servers. Robustness, scalability, self-organization, reconfiguration and adaptivity including learning are major cornerstones.

The range of fields of application is unlimited: Sensor Data Processing, Load monitoring of technical structures, Structural Health Monitoring, Energy Management, Distributed Computing, Distributed Databases and Search, Automated Design, Cloud-based Manufacturing, and many more.

This work touches various topics to reach the ambitious goal of unified smart and distributed computing and contributing to the design of intelligent sensing systems: Multi-Agent Systems, Agent Processing Platforms, System-on-Chip Designs, Architectural and Algorithmic Scaling, High-level Synthesis, Agent Programming Models and Languages, Self-organizing Systems, Numerical and AI Algorithms, Energy Management, Distributed Sensor Networks, and multi-domain simulation techniques. None of these topics may be considered stand-alone. Only a balanced composition of all topics can meet the requirements in future computing networks, for example, the Internet-of-Things with a billion of heterogeneous devices.

Smart can be defined on different operational and processing levels and having different goals in mind. One aspect is the adaptivity and reliability in the presence of sensor, communication, node, and network failures that should not compromise the trust and quality of the computed information, for example, the output of a Structural Health Monitoring System. A Smart System can be considered on node, network, and network of network level. Another aspect of "smartness" is information processing with inaccurate or incomplete models (mechanical, technical, physical) requiring machine learning approaches, either supervised with training at design time or unsupervised based on reward learning at run-time. Some examples of Self-organizing and Adaptive Systems are given in this work, for example, distributed feature recognition and event-based sensor processing.

epubli, ISBN 9783746752228 (2018)

epubli, ISBN 9783746752228 (2018)

epubli, ISBN 9783746752228 (2018)

epubli, ISBN 9783746752228 (2018)