

Fortschritt-Berichte VDI

Reihe 10

Informatik/
Kommunikation

Herwig Unger,
Wolfgang A. Halang (Eds.)

Nr. 842

Autonomous Systems
2015

Proceedings
of the 8th GI Conference



FernUniversität in Hagen
Schriften zur Informations-
und Kommunikationstechnik

Unger, Herwig; Halang, Wolfgang A. (Eds.)

Autonomous Systems 2015

Proceedings of the 8th GI Conference

Fortschr.-Ber. VDI Reihe 10 Nr. 842. Düsseldorf: VDI Verlag 2015.

376 Seiten, 149 Bilder, 33 Tabellen.

ISBN 978-3-18-384210-0, ISSN 0178-9627,

€ 126,00/VDI-Mitgliederpreis € 113,40.

Keywords: Autonomous Systems – Methods and Algorithms – Concepts – Hardware Architectures – Computer Networks – Natural Language Processing – Modeling and Simulation – Security – Big Data

As foundations of autonomous (computing) systems, hardware modules being fast and as compact as on-chip networks, novel hardware-based security and verification procedures to prove their dependability are considered. Owing to their growing complexity and their embedding in complex environments, their design becomes more and more tedious. As a relief in this situation, interdisciplinary ideas combining models, analytical methods, simulations and architectural concepts are developed. Matching the broad application range of autonomous systems, theoretical approaches and algorithmic solutions based on game and graph theory, but also on methods such as simulation, big data processing, data mining and classification aim to ensure secure, fault-tolerant and uninterrupted operation and data communication with their environments. It is striven to endow autonomous systems with capabilities of self-organisation and adaptability as necessary to meet the needs of users and the surrounding world by employing methods from statistics, machine learning, searching, content and natural language processing.

Bibliographische Information der Deutschen Bibliothek

Die Deutsche Bibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliographie; detaillierte bibliographische Daten sind im Internet unter <http://dnb.ddb.de> abrufbar.

Bibliographic information published by the Deutsche Bibliothek

(German National Library)

The Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliographie (German National Bibliography); detailed bibliographic data is available via Internet at <http://dnb.ddb.de>.

Schriften zur Informations- und Kommunikationstechnik

Herausgeber:

Wolfgang A. Halang, Lehrstuhl für Informationstechnik

Herwig Unger, Lehrstuhl für Kommunikationstechnik

FernUniversität in Hagen

© VDI Verlag GmbH · Düsseldorf 2015

Alle Rechte, auch das des auszugsweisen Nachdruckes, der auszugsweisen oder vollständigen Wiedergabe (Fotokopie, Mikrokopie), der Speicherung in Datenverarbeitungsanlagen, im Internet und das der Übersetzung, vorbehalten.

Als Manuskript gedruckt. Printed in Germany.

ISSN 0178-9627

ISBN 978-3-18-384210-0

**I never made one of my discoveries
through the process of rational thinking.**

Albert Einstein

Being away from daily duties and troubles, surrounded by colleagues and friends discussing the same or (apparently) completely different problems, and being inspired by the beauty, but also the rough elements built by nature in a long, evolutionary process are the best circumstances to let the human brain generate new ideas or find connections it has never thought of before.

For already eight consecutive years, the workshop and later conference on 'Autonomous Systems' tries to establish exactly such an atmosphere. Only bothered by the ubiquitously available Internet and mobile telephone networks, some 50 participants find back to the origins of science: to discover, ponder and discuss the issues pushing research ahead. Hosting all participants in the same hotel and including full board in the conference fee facilitates and fosters relaxed group interaction. As new ideas usually sound whimsical at first, and usually have the most unexpected origins as well, the conference organisers consider peer reviewing of any oral or written contributions both illegal as unconstitutional censorship, and inadequate for the progress of science, since it perpetuates mainstream thinking and often suppresses novel ideas. About 100 years ago the seminal papers of Einstein, Planck and many others, and still the one of Bednorz and Müller on high-temperature superconductivity in the 1980s were not reviewed, but their authors earned Nobel prizes for them. These authors did not publish contributions with which they feared to make fools out of themselves, thus exercising quality assurance very effectively. Following this approach, the organisers decided to renounce for peer reviewing in favour of obtaining highly novel and unconventional submissions. The bigger its deviation from the mainstream is, the more they will like a paper.

The contributions to this volume were only subject to some copy-editing for proper English and formatting for consistent book layout. We like to thank Jutta Düring, Barbara Kleine and Werner Schubert, who worked hard in the background preparing the book as well as setting up every, maybe not immediately perceivable detail of the conference in a perfect manner. Also, the support provided by FernUniversität in Hagen in creating this volume is highly appreciated.

Autonomous systems are employed in various (unstructured and sometimes unknown) environments for a plenitude of different purposes, usually without any human control or interaction. Thus, a multitude of solutions is required enabling them to acquire information from the environments, (pre-) process it, make decisions, act for longer periods without any supervision and communication, and to move through uncooperative environments in a fault-tolerant and safe manner.

Therefore, the topics of interest presented in this volume range from hardware architectures and computer networks via scheduling, statistics and algorithms to contributions on content and natural language processing. In order to foster fruitful, interdisciplinary discussions, the present book is divided into two main parts. In 'Methods and Algorithms', the authors survey their respective work or fields of interest, or present already existing results of their recent work and projects. Differing from many conventional conferences, the part 'Concepts' contains on-going scientific work including the introduction of still unsolved problems or open developments, and aims to be the basis for further discussions on Majorca Island in the years to come.

The organisers sincerely hope that all participants will enjoy the open, informal and unconventional spirit of our conference, that they may obtain valuable stimuli for their research, and that the upcoming conferences of the series will become fixed entries in their future schedules.

Herwig Unger
Wolfgang A. Halang

Contents

Methods and Algorithms

Extending Static Scheduling Algorithms for Moldable Tasks towards Dynamic Scheduling of Multiple Applications with Soft Real-time Properties J. Keller	1
A Cloud-based Building Automation System D. Versick, T. Jaster, J. Karow, D. Tavangarian	6
Adaptive Instructional Videos I. Wassmann, M. Müller, D. Tavangarian	18
An Approach to Model-based Code Generation for a Specialized Soft Microprocessor E. Rozova, B. Däne	30
Architecture of Universal Routing Element for Networks on Chip A. Osadchuk, W. Fengler	42
Design of a Consensus-oriented and Crowd-verifiable Control Unit M. Schaible	52
Automatic Classification of Serrated Patterns in Direct Immunofluorescence Images C. Shi, J. Guo, G. Azzopardi, J. M. Meijer, M. F. Jonkman, N. Petkov	61
Automatic Optic Disk Localization and Diameter Estimation in Retinal Fundus Images J. Guo, C. Shi, N. M. Jansonius, N. Petkov	70
Towards Unsupervised Familiar Scene Recognition in Egocentric Videos E. Talavera, N. Petkov, P. Radeva	80
Cellular Neural Networks-based Emulation of Analog Filters: Theory and Design Principle N. A. Akwir, J. C. Chedjou, K. Kyamakya	92
Cellular Neural Networks-based Emulation of Analog Filters: Selected Applications N. A. Akwir, J. C. Chedjou, K. Kyamakya	103

Neurocomputing-based Matrix Inversion Involving Cellular Neural Networks: Black-box Training Concept A. Haj Mosa et al.	119
A Recurrent Neural-network-based Ultra-Fast, Robust and Scalable Solver of Linear Equation Systems with Potential Integration in a Speeding-up of FEM Solver Architectures V. Tavakkoli, J. C. Chedjou, K. Kyamakya	133
A Model-based Approach on Superpopular Contents in Online Social Networks H. Coltzau, H. Unger	145
Text Mining with Graph Databases: Traversal of Persisted Token-level Representations for Flexible On-demand Processing T. Efer	157
Social Media in Disaster Response – A Literature Review J. Schwarter, U. Lechner	168
Robustness and Resilience in Transport Logistics – A Literature Review F. Maurer, U. Lechner	181
Natural Disaster Classification in Thai Tweets M. Sodanil	197
Applying User Preferences and Co-purchasing Analysis for Item Recommendations S. Sodsee, M. Komkhao	208
CLAUDE: Cloud Computing for Non-interactive Long-running Computationally Intensive Scientific Applications A. Lapin, E. Schiller, P. Kropf	221
Automatic Code Generation – Some Observations T. Tempelmeier	232
In-circuit Verification of Logic Controllers M. Doligalski, J. Tkacz	244

Concepts

Role-specific Node Selection via Activating Areas in MANETs	
A. Dilo	257
Why Google Isn't the Future. Really Not.	
R. Eberhardt, M. M. Kubek, H. Unger	268
The Role of Context Information for Email Analysis	
C. Klotz, A. M. Ocaña	282
Empiric Studies of Word Use in Heterogeneous Text Corpora	
P. Krause	295
Ein IR-Verfahren im P2P-Netz auf Basis dezentraler Indizierung	
D. Samorukov	310
Mutual Influences between Trust and Online Social Network Systems	
S. T. Doan, M. M. Kubek, H. Unger	325
Refining User Lifetime Model by Big Five Characteristics	
S. Vongsingthong, S. Boonkrong, H. Unger	342
Evaluation and Adaptation of Synchronisation Primitives in PEARL-90	
C. Houben	358
<i>Index of Authors</i>	367

