Lecture Notes in Computer Science

6567

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Alfred Kobsa

University of California, Irvine, CA, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Germany

Madhu Sudan

Microsoft Research, Cambridge, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbruecken, Germany

Wireless Sensor Networks

8th European Conference, EWSN 2011 Bonn, Germany, February 23-25, 2011 Proceedings



Volume Editors

Pedro José Marrón Universität Duisburg-Essen Fakultät für Ingenieurwissenschaften, Abteilung Informatik Bismarckstraße 90, 47057 Duisburg, Germany E-mail: pjmarron@uni-due.de

Kamin Whitehouse
University of Virginia, School of Engineering and Applied Science
Department of Computer Science
151 Engineer's Way, Charlottesville, VA 22904-4740, USA
E-mail: whitehouse@cs.virginia.edu

ISSN 0302-9743 e-ISSN 1611-3349 ISBN 978-3-642-19185-5 e-ISBN 978-3-642-19186-2 DOI 10.1007/978-3-642-19186-2 Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2011920570

CR Subject Classification (1998): C.2.4, C.2, F.2, D.1.3, D.2, E.1, H.4, C.3

LNCS Sublibrary: SL 5 – Computer Communication Networks and Telecommunications

© Springer-Verlag Berlin Heidelberg 2011

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

This volume contains the proceedings of EWSN 2011, the 8th European Conference on Wireless Sensor Networks. The conference took place in Bonn, Germany during February 23–25, 2011. The aim of the conference was to discuss the latest research results and developments in the field of wireless sensor networks.

EWSN received a total of 87 paper submissions of which 14 were selected for publication and presentation, yielding an acceptance rate of about 16%. Paper submissions were received from 29 different countries in all parts of the world. EWSN adopted a double-blind review process, where the identities of the paper authors were also withheld from the reviewers. The selection process involved around 250 reviews with all papers being evaluated by at least three independent reviewers. In addition, the reviews where discussed by the Technical Program Committee in a virtual meeting after collecting all reviews and prior to making final decisions. The final program covered a wide range of topics which were grouped into five sessions: Routing and Mobility, Optimization Techniques, MAC Protocols, Algorithms for Wireless Sensor Networks, and Systems and Abstractions. It included theoretical and analytical approaches, together with empirical research and protocol/system design and implementation.

The conference included a keynote by Mani Srivastava with the title "System Issues in Wireless Sensor Networks," a demo and poster session, co-chaired by Luca Mottola and Daniel Minder, for which separate proceedings are available, and an industrial demo session, co-chaired by Herman Tuininga and Siebren de Vries, where companies working in the area of wireless sensor networks had the chance to exhibit their products throughout the conference. The conference also included a tutorial on "Machine Learning for Wireless Sensor Networks" by Anna Förster and a tutorial on "TeenyLIME" by Amy Murphy.

We would like to thank everyone who contributed to EWSN 2011. In particular, we would like to thank the Technical Program Committee for their reviews and input in forming the program. We also would like to thank the local administration at the University of Bonn for their help with the conference planing and last, but certainly not least, our sponsors: Networked Embedded Systems Group at the University of Duisburg-Essen (Gold Sponsor), CONET Network of Excellence (Gold Sponsor), Boeing (Bronze Sponsor), and Libelium (Bronze Sponsor).

February 2011

Pedro José Marrón Kamin Whitehouse

Organization

General Chair: Pedro José Marrón, University of Duisburg-Essen and

Fraunhofer IAIS, Germany

Program Co-chairs: Pedro José Marrón, University of Duisburg-Essen and

Fraunhofer IAIS, Germany

Kamin Whitehouse, University of Virginia, USA

Proceedings Chair: Rasit Eskicioglu, University of Manitoba, Canada

Local Organization

Co-chairs: Nils Aschenbruck, University of Bonn, Germany

Peter Martini, University of Bonn, Germany

TPC Members: Tarek Abdelzaher, University of Virginia, USA

Mario Alves, ISEP, Portugal

Philippe Bonnet, Copenhagen University, Denmark Nirupama Bulusu, Portland State University, USA

Alberto Cerpa, UC Merced, USA

Jorge Da Silva, University of Coimbra, Portugal Adam Dunkels, Swedish Institute of Technology,

Sweden

Carlo Fischione, UC Berkeley, USA Jie Gao, Stony Brook University, USA

Alexander Gluhak, University of Surrey, UK

Mike Hazas, University of Lancaster, UK

Wendi Heinzelman, University of Rochester, USA Sanjay Jha, University of New South Wales, Australia

Xiaofan Jiang, UC Berkeley, USA

Holger Karl, University of Padeborn, Germany

Ralph Kling, Xbow, USA Srdjan Krco, Ericsson, USA

Koen Langendoen, TU Delft, Netherlands Akos Ledeczi, Vanderbilt University, USA

Chengyang Lu, Washington University in St. Louis,

USA

Gianfranco Manes, University of Florence, Italy Jose Ramiro Martinez de Dios, AICIA, Spain Amy Murphy, Bruno Kessler Foundation, Italy Gian Pietro Picco, University of Trento, Italy Kay Römer, Universität zu Lübeck, Germany Michele Rossi, University of Padova, Italy Antonio Ruzzelli, UCD Dublin, Ireland Andreas Savvides, Yale University, USA Cormac Sreenan, Cork University, Ireland Nigamanth Sridhar, Cleveland State University, USA

Andreas Terzis, Johns Hopkins University, USA Niwat Thepvilojanapong, Mie University, Japan Thiemo Voigt, Swedish Institute of Technology, Sweden

Andreas Willig, Technical University of Berlin, Germany

Adam Wolisz, Technical University of Berlin, Germany

Poster and Demo Chairs:

Daniel Minder, University of Duisburg-Essen Luca Mottola, Swedish Institute of Computer Science, Sweden

Industrial Demo Committee:

Pedro José Marrón, University of Duisburg-Essen and Fraunhofer IAIS, Germany Herman Tuininga, CEO and owner of SallandElectronics-Zwolle, Netherlands Siebren de Vries, CEO and owner of Chess by-Haarlem, Netherlands

Sponsors:

Networked Embedded Systems Group at the University of Duisburg-Essen (Gold) CONET Network of Excellence (Gold) Boeing (Bronze) Libelium (Bronze)









Table of Contents

Routing and Mobility	
Prediction Accuracy of Link-Quality Estimators	1
The Impact of Network Topology on Collection Performance	17
An Adaptive Algorithm for Compressive Approximation of Trajectory (AACAT) for Delay Tolerant Networks	33
Optimization Techniques	
On the Accuracy of Software-Based Energy Estimation Techniques Philipp Hurni, Benjamin Nyffenegger, Torsten Braun, and Anton Hergenroeder	49
Fast, Accurate Event Classification on Resource-Lean Embedded Sensors	65
A Mobility Management Framework for Optimizing the Trajectory of a Mobile Base-Station	81
MAC Protocols	
Performance Evaluation of Network Coding and Packet Skipping in IEEE 802.15.4-Based Real-Time Wireless Sensor Networks	98
Opportunistic Packet Scheduling in Body Area Networks	114

Algorithms for Wireless Sensor Networks	
Clock Synchronization with Deterministic Accuracy Guarantee Ryo Sugihara and Rajesh K. Gupta	130
An Experimental Evaluation of Position Estimation Methods for Person Localization in Wireless Sensor Networks	147
A Two-Way Time of Flight Ranging Scheme for Wireless Sensor	1.04
Networks	163
Systems and Abstractions	
Efficient Energy Balancing Aware Multiple Base Station Deployment for WSNs	179
Sabbir Mahmud, Hui Wu, and Jingling Xue	
BurstProbe: Debugging Time-Critical Data Delivery in Wireless Sensor Networks	195
The Announcement Layer: Beacon Coordination for the Sensornet Stack	211
Author Index	227