

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

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

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Stamatis Vassiliadis Stephan Wong
Timo D. Hämäläinen (Eds.)

Embedded Computer Systems: Architectures, Modeling, and Simulation

6th International Workshop, SAMOS 2006
Samos, Greece, July 17-20, 2006
Proceedings



Springer

Volume Editors

Stamatis Vassiliadis
Stephan Wong
Delft University of Technology
Mekelweg 4, 2628 CD Delft, The Netherlands
E-mail: {s.vassiliadis, j.s.s.m.wong}@ewi.tudelft.nl

Timo D. Hämäläinen
Tampere University of Technology
P.O. Box 553, 33101 Tampere, Finland
E-mail: timo.d.hamalainen@tut.fi

Library of Congress Control Number: 2006928741

CR Subject Classification (1998): C, B

LNCS Sublibrary: SL 1 – Theoretical Computer Science and General Issues

ISSN 0302-9743
ISBN-10 3-540-36410-2 Springer Berlin Heidelberg New York
ISBN-13 978-3-540-36410-8 Springer Berlin Heidelberg New York

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.

Springer is a part of Springer Science+Business Media

springer.com

© Springer-Verlag Berlin Heidelberg 2006
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 11796435 06/3142 5 4 3 2 1 0

Preface

The SAMOS workshop is an international gathering of highly qualified researchers from academia and industry, sharing ideas in a 3-day lively discussion on the quiet and inspiring northern mountainside of the Mediterranean island of Samos. The workshop meeting is one of two colocated events (the other event being the IC-SAMOS). As a tradition, the workshop features presentations in the morning, while after lunch all kinds of informal discussions and nut-cracking gatherings take place. The workshop is unique in the sense that not only solved research problems are presented and discussed but also (partly) unsolved problems and in-depth topical reviews can be unleashed in the scientific arena. Consequently, the workshop provides the participants with an environment where collaboration rather than competition is fostered.

SAMOS VI follows the series of workshops started in 2001 in a new expanded program. This year there were also two parallel sessions for current and foreseen topics. The SAMOS VI workshop and IC-SAMOS attracted a total of 130 papers and 12 invited papers on special topics. We are grateful to all authors who submitted papers. The papers came from 27 countries and regions: Austria(3), Bangladesh(1), Belgium(4), Brazil(4), Canada(4), China(6), Taiwan(1), Czech Republic(6), Finland(17), France(3), Germany(14), Greece(8), Hong Kong(1), India(6), Iran(3), Italy(4), Japan(1), Mexico(1), Republic of Korea(13), Republic of Singapore(1), Romania(1), Spain(11), Sweden(1), The Netherlands(15), Tunisia(1), UK(3), and USA(9).

The papers went through a rigorous reviewing process and each paper received at least three individual reviews, with an average of four reviews. Due to time constraints in the workshop program and the high quality of the submitted papers, the selection process was very competitive and many qualified papers could not be accepted. The program also included two keynote speeches by Jinsung Choi from LG Electronics and by Panagiotis Tsarchopoulos from the European Commission.

A workshop like this cannot be organized without the help of many other people. Therefore, we thank the members of the Steering and Program Committees and the external referees for their dedication and diligence in selecting the technical presentations. The investment of their time and insight is very much appreciated. We would like to express our sincere gratitude to Carlo Galuzzi for maintaining the website and paper submission system and preparing the workshop proceedings. We thank Lidwina Tromp for her support in organizing the workshop.

We hope that the attendees enjoyed the SAMOS VI workshop in all its aspects, including many informal discussions and gatherings.

June 2006

Stamatis Vassiliadis
Stephan Wong
Timo D. Hämäläinen

Organization

The SAMOS VI workshop took place during July 17 – 20, 2006 at the Research and Teaching Institute of East Aegean (INEAG) in Agios Konstantinos on the island of Samos, Greece.

Workshop Chairs

Stamatis Vassiliadis	Delft University of Technology, The Netherlands
Stephan Wong	Delft University of Technology, The Netherlands

Program Chair

Timo D. Hämäläinen	Tampere University of Technology, Finland
--------------------	---

Proceedings Chair

Carlo Galuzzi	Delft University of Technology, The Netherlands
---------------	---

Publicity and Financial Chair

Stephan Wong	Delft University of Technology, The Netherlands
--------------	---

Steering Committee

Shuvra Bhattacharyya	University of Maryland, USA
Ed Deprettere	Leiden University, The Netherlands
Andy Pimentel	University of Amsterdam, The Netherlands
Patrice Quinton	IRISA, France
Jarmo Takala	Tampere University of Technology, Finland
Jürgen Teich	University of Erlangen-Nuremberg, Germany
Stamatis Vassiliadis	Delft University of Technology, The Netherlands

Program Committee

Piergiovanni Bazzana	ATMEL, Italy
Koen Bertels	Delft University of Technology, The Netherlands
Holger Blume	RWTH Aachen University, Germany

VIII Organization

Geoffrey Brown	Indiana University, USA
João M. P. Cardoso	University of Algarve, Portugal
Luigi Carro	Universidade Federal do Rio Grande do Sul, Brazil
Vassilios V. Dimakopoulos	University of Ioannina, Greece
Nikitas Dimopoulos	University of Victoria, Canada
Pedro Diniz	University of Southern California, USA
Nikil Dutt	University of California Irvine, USA
Paraskevas Evripidou	University of Cyprus, Cyprus
Fabrizio Ferrandi	Politecnico di Milano, Italy
Gerhard Fettweis	Technische Universität Dresden, Germany
Manfred Glesner	Technische Universität Darmstadt, Germany
David Guevorkian	Nokia Research Center, Finland
Timo D. Hämäläinen	Tampere University of Technology, Finland
Fadi J. Kurdahi	University of California Irvine, USA
Johan Lilius	Ado Akademi University, Finland
Wayne Luk	Imperial College London, UK
Walid Najjar	University of California Riverside, USA
Sule Ozev	Duke University, USA
Dionisios N. Pnevmatikatos	Technical University of Crete, Greece
Bernard Pottier	Université de Bretagne Occidentale, France
Tanguy Risset	IRISA/INRIA, France
Suleyman Sair	North Carolina State University, USA
Michael Schulte	University of Wisconsin-Madison, USA
Olli Silven	University of Oulu, Finland
Leonel Sousa	TU Lisbon, Portugal
Dirk Stroobandt	Ghent University, Belgium
Sriram Sundararajan	Moxair, USA
Won Yong Sung	Seoul National University, Korea
Serge Vernalde	IMEC, Belgium
Jens Peter Wittenburg	Thomson Corporate Research, Germany

Local Organizers

Lidwina Tromp	Delft University of Technology, The Netherlands
Karin Vassiliadis	Delft University of Technology, The Netherlands
Yiasmin Kioulafa	Research and Training Institute of East Aegean, Greece

Referees

- Aho, E.
Al-Ars, Z.
Bazzana, P.
Bertels, K.
Betul Buyukkurt, A.
Blume, H.
Brown, A.
Brown, G.
Calderon, H.
Cardoso, J.
Carro, L.
Chang, Z.
Chaves, R.
Christiaens, M.
Cope, B.
de Andrés, D.
de Langen, P.
Deprettere, E.
Devos, H.
D'Haene, M.
Dias, T.
Dimakopoulos, V.
Dimopoulos, N.
Diniz, P.
Duarte, F.
Dutt, N.
Eeckhout, L.
Erbas, C.
Evripidou, P.
Faes, P.
Falk, J.
Ferrandi, F.
Fettweis, G.
Flich, J.
Gädke, K.
Galuzzi, C.
Gaydadjiev, G
Germano, J.
Glesner, M.
Glossner, J.
Gordon-Ross, A.
Guevorkian, D.
Guntoro, A.
Guo, Z.
Hamalainen, T.
Haubelt, C.
Heikkinen, J.
Heirman, W.
Hinkelmann, H.
Hounta, A. E.
Jääskeläinen, P.
Jachalsky, J.
Janes, D.
Jenkins, C.
Kachris, C.
Kangas, T.
Kaxiras, S.
Keinert, J.
Koch, D.
Kohvakka, M.
Kropp, H.
Kulmala, A.
Kuorilehto, M.
Kurdahi, F.
Kuzmanov, G.
Kyriacou, C.
Lafond, S.
Lahtinen, V.
Langerwerf, J. M.
Lappalainen, V.
Lilius, J.
Lopez, P.
Lotfi Mhamdi
Luk, W.
Majer, M.
Mak, T.
Mäkelä, R.
Manzoni, P.
Matus, E.
Meenderinck, C.
Mladen, B.
Momcilovic, S.
Morel, L.
Moscu Panainte, E.
Najjar, W.
Oliver, J.
Orsila, H.
Ozev, S.
Palermo, G.
Papaefstathiou, I.
Paya Vaya, G.
Petit, S.
Petoumenos, P.
Pieper, S.
Pimentel, A.
Pitkänen, T.
Plosila, J.
Pnevmatikatos, D.
Polstra, S.
Porres, I.
Pottier, B.
Pourebrahimi, B.
Quinton, P.
Risset, T.
Rodas, A.
Sahuquillo, J.
Sair, S.
Salminen, E.
Snchez, M.
Santambrogio, M. D.
Santonja, V.
Schlichter, T.
Sculte, M.
Sedcole, P.
Shahbahrami, A
Silla, F.
Silven, O.
Smailbegovic, F.
Soares Indrusiak, I.
Soffke, O.
Sourdis, I.
Sousa, L.
Stitt, G.
Stoyanova, T.
Streichert, T.
Streubhr, M.
Stroobandt, D.
Strydis, C.
Sundararajan, S.

X Organization

Sung, W.	Uola, J.	Xekalakis, P.
Tarala, J.	Uusikartano, R.	Yan, L.
Tavares, M. B. S.	Vainio, O.	Yankova, Y.
Teich, J.	Vanne, J.	Young Hur, J.
Thompson, M.	Villareal, J.	Ziener, D.
Trancoso, P.	Wang, L.-K.	Zipf, P.
Tsen, C.	Whattacharyya, S.	
Tumeo, A.	Wittenburg, J.	

Table of Contents

Keynotes

- Reconfigurable Platform for Digital Convergence Terminals
Jinsung Choi 1

- European Research in Embedded Systems
Panagiotis Tsarchopoulos 2

System Design and Modeling

- Interface Overheads in Embedded Multimedia Software
Tero Rintaluoma, Olli Silven, Juuso Raekallio 5

- A UML Profile for Asynchronous Hardware Design
Kim Sandström, Ian Oliver 15

- Automated Distribution of UML 2.0 Designed Applications
to a Configurable Multiprocessor Platform
*Mikko Setälä, Petri Kukkala, Tero Arpinen, Marko Hännikäinen,
Timo D. Hämäläinen* 27

- Towards a Transformation Chain Modeling Language
*Bert Vanhooff, Stefan Van Baelen, Aram Hovsepyan, Wouter Joosen,
Yolande Berbers* 39

- Key Research Challenges for Successfully Applying MDD Within
Real-Time Embedded Software Development
*Aram Hovsepyan, Stefan Van Baelen, Bert Vanhooff, Wouter Joosen,
Yolande Berbers* 49

- Domain-Specific Modeling of Power Aware Distributed Real-Time
Embedded Systems
Gabor Madl, Nikil Dutt 59

- Mining Dynamic Document Spaces with Massively Parallel Embedded
Processors
Jan W.M. Jacobs, Rui Dai, Gerard J.M. Smit 69

- Efficient Automated Clock Gating Using CoDeL
Nainesh Agarwal, Nikitas J. Dimopoulos 79

An Optimization Methodology for Memory Allocation and Task Scheduling in SoCs Via Linear Programming <i>Bastian Ristau, Gerhard Fettweis</i>	89
Wireless Sensor Networks	
Designing Wireless Sensor Nodes <i>Marcos A.M. Vieira, Adriano B. da Cunha, Diógenes C. da Silva Jr.</i>	99
Design, Implementation, and Experiments on Outdoor Deployment of Wireless Sensor Network for Environmental Monitoring <i>Jukka Suhonen, Mikko Kohvakka, Marko Hännikäinen, Timo D. Hämäläinen</i>	109
LATONA: An Advanced Server Architecture for Ubiquitous Sensor Network <i>Chi-Hoon Shin, Soo-Cheol Oh, Dae-Won Kim, Sun-Wook Kim, Kyoung Park, Sung-Woon Kim</i>	122
An Approach for the Reduction of Power Consumption in Sensor Nodes of Wireless Sensor Networks: Case Analysis of Mica2 <i>Adriano B. da Cunha, Diógenes C. da Silva Jr.</i>	132
Energy-Driven Partitioning of Signal Processing Algorithms in Sensor Networks <i>Dong-Ik Ko, Chung-Ching Shen, Shuvra S. Bhattacharyya, Neil Goldsman</i>	142
Preamble Sense Multiple Access (PSMA) for Impulse Radio Ultra Wideband Sensor Networks <i>Jussi Haapola, Leonardo Goratti, Isameldin Suliman, Alberto Rabbachin</i>	155
Security in Wireless Sensor Networks: Considerations and Experiments <i>Panu Hämäläinen, Mauri Kuorilehto, Timo Alho, Marko Hännikäinen, Timo D. Hämäläinen</i>	167
On Security of PAN Wireless Systems <i>Ondrej Hyncica, Peter Kacz, Petr Fiedler, Zdenek Bradac, Pavel Kucera, Radimir Vrba</i>	178

Processor Design

Code Size Reduction by Compiler Tuning <i>Masayo Haneda, Peter M.W. Knijnenburg, Harry A.G. Wijshoff</i>	186
Energy Optimization of a Multi-bank Main Memory <i>Hanene Ben Fradj, Sébastien Icart, Cécile Belleudy, Michel Auguin</i>	196
Probabilistic Modelling and Evaluation of Soft Real-Time Embedded Systems <i>Oana Florescu, Menno de Hoon, Jeroen Voeten, Henk Corporaal</i>	206
Hybrid Functional and Instruction Level Power Modeling for Embedded Processors <i>Holger Blume, Daniel Becker, Martin Botteck, Jörg Brakensiek, Tobias G. Noll</i>	216
Low-Power, High-Performance TTA Processor for 1024-Point Fast Fourier Transform <i>Teemu Pitkänen, Risto Mäkinen, Jari Heikkinen, Tero Partanen, Jarmo Takala</i>	227
Software Pipelining Support for Transport Triggered Architecture Processors <i>Perttu Salmela, Pekka Jääskeläinen, Tuomas Järvinen, Jarmo Takala</i>	237
SAD Prefetching for MPEG4 Using Flux Caches <i>Georgi N. Gaydadjiev, Stamatis Vassiliadis</i>	248
Effects of Program Compression <i>Jari Heikkinen, Jarmo Takala</i>	259
Integrated Instruction Scheduling and Fine-Grain Register Allocation for Embedded Processors <i>Dae-Hwan Kim, Hyuk-Jae Lee</i>	269
Compilation and Simulation Tool Chain for Memory Aware Energy Optimizations <i>Manish Verma, Lars Wehmeyer, Robert Pyka, Peter Marwedel, Luca Benini</i>	279

A Scalable, Multi-thread, Multi-issue Array Processor Architecture for DSP Applications Based on Extended Tomasulo Scheme <i>Mladen Bereković, Tim Niggemeier</i>	289
Reducing Execution Unit Leakage Power in Embedded Processors <i>Houman Homayoun, Amirali Baniasadi</i>	299
Memory Architecture Evaluation for Video Encoding on Enhanced Embedded Processors <i>Ali Iranpour, Krzysztof Kuchcinski</i>	309
Advantages of Java Processors in Cache Performance and Power for Embedded Applications <i>Antonio Carlos S. Beck, Mateus B. Rutzig, Luigi Carro</i>	321

Dependable Computing

CARROT – A Tool for Fast and Accurate Soft Error Rate Estimation <i>Dimitrios Bountas, Georgios I. Stamoulis</i>	331
A Scheduling Strategy for a Real-Time Dependable Organic Middleware <i>Uwe Brinkschulte, Alexander von Renteln, Mathias Pacher</i>	339
Autonomous Construction Technology of Community for Achieving High Assurance Service <i>Kotaro Hama, Yuji Horikoshi, Yosuke Sugiyama, Kinji Mori</i>	349

Architectures and Implementations

A Method for Router Table Compression for Application Specific Routing in Mesh Topology NoC Architectures <i>Maurizio Palesi, Shashi Kumar, Rickard Holsmark</i>	373
Real-Time Embedded System for Rear-View Mirror Overtaking Car Monitoring <i>Javier Díaz, Eduardo Ros, Sonia Mota, Rodrigo Agis</i>	385
Design of Asynchronous Embedded Processor with New Ternary Data Encoding Scheme <i>Je-Hoon Lee, Eun-Ju Choi, Kyoung-Rok Cho</i>	395

Hardware-Based IP Lookup Using n -Way Set Associative Memory and LPM Comparator <i>SangKyun Yun</i>	406
A Flash File System to Support Fast Mounting for NAND Flash Memory Based Embedded Systems <i>Song-Hwa Park, Tae-Hoon Lee, Ki-Dong Chung</i>	415
Rescheduling for Optimized SHA-1 Calculation <i>Ricardo Chaves, Georgi Kuzmanov, Leonel Sousa, Stamatis Vassiliadis</i>	425
Software Implementation of WiMAX on the Sandbridge SandBlaster Platform <i>Daniel Iancu, Hua Ye, Emanoil Surducan, Murugappan Senthilvelan, John Glossner, Vasile Surducan, Vladimir Kotlyar, Andrei Iancu, Gary Nacer, Jarmo Takala</i>	435
High-Radix Addition and Multiplication in the Electron Counting Paradigm Using Single Electron Tunneling Technology <i>Cor Meenderinck, Sorin Cotofana</i>	447
Area, Delay, and Power Characteristics of Standard-Cell Implementations of the AES S-Box <i>Stefan Tillich, Martin Feldhofer, Johann Großschädl</i>	457
Embedded Sensor Systems	
Integrated Microsystems in Industrial Applications <i>Paddy J. French</i>	467
A Solid-State 2-D Wind Sensor <i>Kofi A.A. Makinwa, Johan H. Huijsing, Arend Hagedoorn</i>	477
Fault-Tolerant Bus System for Airbag Sensors and Actuators <i>Klaas-Jan de Langen</i>	485
Author Index	491