

2010 13th Euromicro Conference on Digital System Design: Architectures, Methods and Tools

(DSD 2010)

Lille, France
1 - 3 September 2010



IEEE Catalog Number: CFP10291-PRT
ISBN: 978-1-4244-7839-2

2010 13th Euromicro Conference on Digital System Design: Architectures, Methods and Tools

DSD 2010

Table of Contents

Message from the General Chairs.....	xv
Message from the Program Chair	xvi
Conference Committees.....	xviii
Keynotes.....	xxii

SCS-1: System and Circuit Synthesis (1)

Optimization of Area and Delay at Gate-Level in Multiple Constant Multiplications	3
<i>Levent Aksoy, Eduardo Costa, Paulo Flores, and José Monteiro</i>	
Visualization of Multi-objective Design Space Exploration for Embedded Systems	11
<i>Toktam Taghavi and Andy D. Pimentel</i>	
Design of Trace-Based Split Array Caches for Embedded Applications	21
<i>Alice M. Tokarnia and Marina Tachibana</i>	
Software Programmable Data Allocation in Multi-bank Memory of SIMD Processors	28
<i>Jian Wang, Joar Sohl, Olof Kraigher, and Dake Liu</i>	

S&N(oc)-1: Systems and Networks on Chip (1)

An Efficient Technique for In-order Packet Delivery with Adaptive Routing Algorithms in Networks on Chip	37
<i>Maurizio Palesi, Rickard Holzmark, Xiaohang Wang, Shashi Kumar, Mei Yang, Yingtao Jiang, and Vincenzo Catania</i>	
Power Distribution in NoCs Through a Fuzzy Based Selection Strategy for Adaptive Routing	45
<i>Nastaran Salehi, Ahmad Khademzadeh, and Arash Dana</i>	

NoC Switch with Credit Based Guaranteed Service Support Qualified for GALS Systems	53
---	----

Tim Kranich and Mladen Berekovic

A Low Cost Single-Cycle Router Based on Virtual Output Queuing for On-chip Networks	60
--	----

Son Truong Nguyen and Shigeru Oyanagi

RC-1: Reconfigurable Computing (1)

Reconfigurable Grid Alu Processor: Optimization and Design Space Exploration	71
---	----

Basher Shehan, Ralf Jahr, Sascha Uhrig, and Theo Ungerer

Creation of Partial FPGA Configurations at Run-Time	80
---	----

Miguel Lino Silva and João Canas Ferreira

A Modular Peripheral to Support Self-Reconfiguration in SoCs	88
--	----

*Andrés Otero, Ángel Morales-Cas, Jorge Portilla, Eduardo de la Torre,
and Teresa Riesgo*

High Level Validation of an Optimization Algorithm for the Implementation of Adaptive Wavelet Transforms in FPGAs	96
--	----

Rubén Salvador, Félix Moreno, Teresa Riesgo, and Lukáš Sekanina

SLEO: System-Level Energy Optimization of HW/SW Embedded Systems

Composable Dynamic Voltage and Frequency Scaling and Power Management for Dataflow Applications	107
--	-----

Kees Goossens, Dongrui She, Aleksandar Milutinovic, and Anca Molnos

A Markov Model for Low-Power High-Fidelity Design-Space Exploration	115
---	-----

Jing Cao and Albert Nymeyer

A Test Bench for Distortion-Energy Optimization of a DSP-Based H.264/SVC Decoder	123
---	-----

F. Pescador, E. Juarez, D. Samper, C. Sanz, and M. Raulet

SCS-2: System and Circuit Synthesis (2)

On Reducing Error Rate of Data Protected Using Systematic Unordered Codes in Asymmetric Channels	133
---	-----

Stanislaw J. Piestrak

QoR Analysis of Automated Clock-Mesh Implementation under OCV Consideration	141
--	-----

Dennis Bode, Mladen Berekovic, Axel Borkowski, and Ludger Büker

A C-to-RTL Flow as an Energy Efficient Alternative to Embedded Processors in Digital Systems	147
---	-----

*Sameer D. Sahasrabuddhe, Sreenivas Subramanian, Kunal P. Ghosh,
Kavi Arya, and Madhav P. Desai*

Area and Speed Oriented Implementations of Asynchronous Logic Operating under Strong Constraints	155
--	-----

Igor Lemberski and Petr Fišer

S&N(oc)-2: Systems and Networks on Chip (2)

A Latency-Efficient Router Architecture for CMP Systems	165
<i>Antoni Roca, José Flích, Fedrico Silla, and José Duato</i>	
Trading Hardware Overhead for Communication Performance in Mesh-Type Topologies	173
<i>Claas Cornelius, Philipp Gorski, Stephan Kubisch, and Dirk Timmermann</i>	
Designing Efficient Source Routing for Mesh Topology Network on Chip Platforms	181
<i>Saad Mubeen and Shashi Kumar</i>	

MSDA-1: Multicore Systems: Design and Applications (1)

Evaluating OpenMP Support Costs on MPSoCs	191
<i>Andrea Marongiu, Paolo Burgio, and Luca Benini</i>	
Re-NUCA: Boosting CMP Performance Through Block Replication	199
<i>Pierfrancesco Foglia, Cosimo Antonio Prete, Marco Solinas, and Giovanna Monni</i>	
Filtering Directory Lookups in CMPs	207
<i>Ana Bosque, Víctor Viñals, Pablo Ibáñez, and José M. Llaberia</i>	

FTDSD-1: Fault Tolerance in Digital System Design (1)

Low Latency Recovery from Transient Faults for Pipelined Processor Architectures	219
<i>Marcus Jeitler and Jakob Lechner</i>	
RobuCheck: A Robustness Checker for Digital Circuits	226
<i>Stefan Frehse, Görschwin Fey, André Süelflow, and Rolf Drechsler</i>	
Dynamic Control Flow Checking Technique for Reliable Microprocessors	232
<i>Makoto Sugihara</i>	

Poster Session P-1

Arithmetic Units for RNS Moduli {2n-3} and {2n+3} Operations	243
<i>Pedro Miguel Matutino, Ricardo Chaves, and Leonel Sousa</i>	
Real-Time Testing of True Random Number Generators Through Dynamic Reconfiguration	247
<i>Dan Hotoleanu, Octavian Cret, Alin Suciu, Tamas Gyorfi, and Lucia Vacariu</i>	
Instantiating GENESYS Application Architecture Modeling via UML 2.0 Constructs and MARTE Profile	251
<i>Subayal Khan, Kari Tiensyrjä, and Jari Nurmi</i>	
An Improved Automotive Multiple Target Tracking System Design	255
<i>Tobias Lange, Naim Harb, Haisheng Liu, Smail Niar, and Rabie Ben Atitallah</i>	

Medical Diagnosis Improvement Through Image Quality Enhancement Based on Super-Resolution	259
<i>Lara G. Villanueva, Gustavo M. Callicó, Félix Tobajas, Sebastián López, Valentín De Armas, José F. López, and Roberto Sarmiento</i>	
Generated Cycle-Accurate Profiler for C Language	263
<i>Zdenek Prikryl, Karel Masarík, Tomáš Hruška, and Adam Husár</i>	
Architecture-Level Design Space Exploration of Super Scalar	
Microarchitecture for Network Applications	269
<i>Mostafa E. Salehi, Hamed Dorost, and Sied Mehdi Fakhraie</i>	
SVMT-1: System, Hardware and Embedded-Software Specification, Modeling, Verification and Test (1)	
Simulation of High-Performance Memory Allocators	275
<i>José L. Risco-Martín, J. Manuel Colmenar, David Atienza, and J. Ignacio Hidalgo</i>	
Test Data and Power Reductions for Transition Delay Tests	
for Massive-Parallel Scan Structures	283
<i>Rene Kothe and Heinrich T. Vierhaus</i>	
Exploration of Network Alternatives for Middleware-centric Embedded System	
Design	291
<i>F. Fummi, G. Perbellini, D. Quaglia, and R. Trenti</i>	
FDR: Flexible Digital Radio	
Adaptive Beamforming Using the Reconfigurable MONTIUM TP	301
<i>Marcel D. van de Burgwal, Kenneth C. Rovers, Koen C.H. Blom, André B.J. Kokkeler, and Gerard J.M. Smit</i>	
A Common Operator for FFT and Viterbi Algorithms	309
<i>Malek Naoues, Laurent Alaus, and Dominique Noguet</i>	
ALOE-Based Flexible LDPC Decoder	314
<i>Ismael Gomez, Massimo Camateli, Jordi Bracke, Vuk Marojevic, Antoni Gelonch, Fabrizio Vacca, and Guido Masera</i>	
Physical Layer for Spectrum-Aware Reconfigurable OFDM on an FPGA	321
<i>Adolfo Recio and Peter Athanas</i>	
MSDA-2: Multicore Systems: Design and Applications (2)	
Adaptive Cache Memories for SMT Processors	331
<i>Sonia Lopez, Oscar Garnica, David H. Albonesi, Steven Dropsho, Juan Lanchares, and Jose I. Hidalgo</i>	
Multi-core Technology—Next Evolution Step in Safety Critical Systems	
for Industrial Applications?	339
<i>Frank Reichenbach and Alexander Wold</i>	
A Case for Hardware Task Management Support for the StarSS Programming	
Model	347
<i>Cor Meenderinck and Ben Juurlink</i>	

On Scaling Speedup with Coarse-Grain Coprocessor Accelerators on Reconfigurable Platforms	355
<i>George Kornaros and Antonios Motakis</i>	

FTDSD-2: Fault Tolerance in Digital System Design (2)

Fault Tolerant Structure for SRAM-Based FPGA via Partial Dynamic Reconfiguration	365
<i>Martin Straka, Jan Kastil, and Zdenek Kotasek</i>	
System Level Hardening by Computing with Matrices	373
<i>Ronaldo Rodrigues Ferreira, Álvaro Freitas Moreira, and Luigi Carro</i>	
Faults Coverage Improvement Based on Fault Simulation and Partial Duplication	380
<i>Jaroslav Borecký, Martin Kohlík, Hana Kubátová, and Pavel Kubalík</i>	

Poster Session P-2

A Class of Recursive Networks on a Chip for Enhancing Intercluster Parallelism	389
<i>Masaru Takesue</i>	
A Programming Model and a NoC-Based Architecture for Streaming Applications	393
<i>Yun Jie Wu, Dominique Houzet, and Sylvain Huet</i>	
Scalable Architecture for Wavelength-Switched Optical NoC with Multicasting Capability	398
<i>Somayyeh Koohi, Alireza Shafaei, and Shaahin Hessabi</i>	
Performance Analysis of 90nm Look Up Table (LUT) for Low Power Application	404
<i>Deepak Kumar, Pankaj Kumar, and Manisha Pattanaik</i>	
Area-Efficient Multi-moduli Squarers for RNS	408
<i>D. Bakalis and H.T. Vergos</i>	
A Load-Forwarding Mechanism for the Vector Architecture in Multimedia Applications	412
<i>Ye Gao, Ryusuke Egawa, Hiroyuki Takizawa, and Hiroaki Kobayashi</i>	
Low Power FPGA Implementations of 256-bit Luffa Hash Function	416
<i>Paris Kitsos, Nicolas Sklavos, and Athanassios N. Skodras</i>	
On the Numbers of Variables to Represent Multi-valued Incompletely Specified Functions	420
<i>Tsutomu Sasao</i>	

SCS-3: System and Circuit Synthesis (3)

Unified Digit Serial Systolic Montgomery Multiplication Architecture for Special Classes of Polynomials over GF(2 ^m)	427
<i>Somsubhra Talapatra, Hafizur Rahaman, and Samir K. Saha</i>	
An Improved Hardware Implementation of the Grain Stream Cipher	433
<i>Shohreh Sharif Mansouri and Elena Dubrova</i>	
Description-Level Optimisation of Synthesisable Asynchronous Circuits	441
<i>Luis A. Tarazona, Doug A. Edwards, Andrew Bardsley, and Luis A. Plana</i>	
A Parallel for Loop Memory Template for a High Level Synthesis Compiler	449
<i>Craig Moore, Wim Meeus, Harald Devos, and Dirk Stroobandt</i>	

S&N(oc)-3: Systems and Networks on Chip (3)

In-channel Flow Control Scheme for Network-on-Chip	459
<i>Vrishali Vijay Nimbalkar and Kuruvilla Varghese</i>	
An Efficient Method to Reliable Data Transmission in Network-on-Chips	467
<i>Ahmad Patooghy, Hamed Tabkhi, and Seyed Ghassem Miremadi</i>	
Network-on-Multi-Chip (NoMC) for Multi-FPGA Multimedia Systems	475
<i>Marta Stepniewska, Adam Luczak, and Jakub Siast</i>	
Persistence Management Model for Dynamically Reconfigurable Hardware	482
<i>Julio Dondo, Fernando Rincón, Jesús Barba, Francisco Moya, Francisco Sanchez, and Juan Carlos López</i>	

WSN: Wireless Sensor Networks

System Level Synthesis for Ultra Low-Power Wireless Sensor Nodes	493
<i>Muhammad Adeel Pasha, Steven Derrien, and Olivier Sentieys</i>	
A Traffic Differentiation Add-On to the IEEE 802.15.4 Protocol: Implementation and Experimental Validation over a Real-Time Operating system	501
<i>Ricardo Severino, Manish Batsa, Mário Alves, and Anis Koubâa</i>	
Evaluating a Transmission Power Self-Optimization Technique for WSN in EMI Environments	509
<i>F. Lavratti, A.R. Pinto, L. Bolzani, F. Vargas, C. Montez, F. Hernandez, E. Gatti, and C. Silva</i>	

DTDS-1: Dependability and Testing of Digital Systems (1)

Path-Delay Fault Testing in Embedded Content Addressable Memories	519
<i>P. Manikandan, Bjørn B. Larsen, and Einar J. Aas</i>	
Application Dependent FPGA Testing Method	525
<i>Martin Rozkovec, Jirí Jenícek, and Ondrej Novák</i>	
On-chip Scan-Based Test Strategy for a Dependable Many-Core Processor Using a NoC as a Test Access Mechanism	531
<i>Xiao Zhang, Hans G. Kerkhoff, and Bart Vermeulen</i>	

SCS-4: System and Circuit Synthesis (4)

Behavioural Modelling of DLLs for Fast Simulation and Optimisation of Jitter and Power Consumption	541
<i>Enrique Barajas, Diego Mateo, and José Luis González</i>	
A Predictable Multiprocessor Design Flow for Streaming Applications with Dynamic Behaviour	548
<i>Sander Stuijk, Marc Geilen, and Twan Basten</i>	
A Design Process for Hardware/Software System Co-design and its Application to Designing a Reconfigurable FPGA	556
<i>Félix Moreno, Ignacio López, and Ricardo Sanz</i>	
Optimising Self-Timed FPGA Circuits	563
<i>Phillip David Ferguson, Aristides Efthymiou, Tughrul Arslan, and Danny Hume</i>	

S&N(oc)-4: Systems and Networks on Chip (4)

A New High-Level Methodology for Programming FPGA-Based Smart Camera	573
<i>Nicolas Roudel, François Berry, Jocelyn Sérot, and Laurent Eck</i>	
Power Consumption Modeling for DVFS Exploitation	579
<i>Andrea Castagnetti, Cécile Belleudy, Sébastien Bilavarn, and Michel Auguin</i>	
Automated Power Characterization for Run-Time Power Emulation of SoC Designs	587
<i>Christian Bachmann, Andreas Genser, Christian Steger, Reinhold Weiss, and Josef Haid</i>	
Customizable Composition and Parameterization of Hardware Design Transformations	595
<i>Tim Todman, Qiang Liu, Wayne Luk, and George Constantinides</i>	

ET: Emerging Technologies

Architectural Vulnerability Factor Estimation with Backwards Analysis	605
<i>Robert Hartl, Andreas J. Rohatschek, Walter Stechele, and Andreas Herkersdorf</i>	
Design of Testable Universal Logic Gate Targeting Minimum Wire-Crossings in QCA Logic Circuit	613
<i>Bibhash Sen, Anik Sengupta, Mamata Dalui, and Biplab K. Sikdar</i>	
Evaluation of RTD-CMOS Logic Gates	621
<i>Juan Núñez, María J. Avedillo, and José M. Quintana</i>	
On CMOS Memory Design in Low Supply Voltage for Integrated Biosensor Applications	628
<i>Allen Chen, Ryan Hoppal, and Tom Chen</i>	

DTDS-2: Dependability and Testing of Digital Systems (2)

A Formal Condition to Stop an Incremental Automatic Functional Diagnosis	637
<i>Luca Amati, Cristiana Bolchini, Fabio Salice, and Federico Franzoso</i>	
The Use of Genetic Algorithm to Derive Correlation Between Test Vector and Scan Register Sequences and Reduce Power Consumption	644
<i>Zdenek Kotásek, Jaroslav Škarvada, and Josef Strnadel</i>	
Multiple Bit Error Detection and Correction in Memory	652
<i>J.F. Tarillo, N. Mavrogiannakis, C.A. Lisboa, C. Argyrides, and L. Carro</i>	
Structurally Synthesized Multiple Input BDDs for Speeding Up Logic-Level Simulation of Digital Circuits	658
<i>Dmitri Mironov, Raimund Ubar, Sergei Devadze, Jaan Raik, and Artur Jutman</i>	

SCS-5: System and Circuit Synthesis (5)

Design Methodology for a High Performance Robust DVB-S2 Decoder Implementation	667
<i>Florent Berthelot, François Charot, Charles Wagner, and Christophe Wolinski</i>	
Cyclic Redundancy Checking (CRC) Accelerator for the FlexCore Processor	675
<i>Muhammad Waqar Azhar, Tung Thanh Hoang, and Per Larsson-Edefors</i>	
A Memetic Approach for Nanoscale Hybrid Circuit Cell Mapping	681
<i>Zhufei Chu, Yinshui Xia, William N.N. Hung, Lunyao Wang, and Xiaoyu Song</i>	
Static Average Case Power Estimation Technique for Block Ciphers	689
<i>Tingcong Ye, Dilip Vasudevan, Jiaoyan Chen, Emanuel Popovici, and Michel Schellekens</i>	

SVMT-2: System, Hardware and Embedded-Software Specification, Modeling, Verification and Test (2)

An Approximate Maximum Common Subgraph Algorithm for Large Digital Circuits	699
<i>Jochem H. Rutgers, Pascal T. Wolkotte, Philip K.F. Hölzespies, Jan Kuper, and Gerard J.M. Smit</i>	
Modeling Reconfigurable Systems-on-Chips with UML MARTE Profile: An Exploratory Analysis	706
<i>Sana Cherif, Imran Rafiq Quadri, Samy Meftali, and Jean-Luc Dekeyser</i>	
ClaSH: Structural Descriptions of Synchronous Hardware Using Haskell	714
<i>Christiaan Baaij, Matthijs Kooijman, Jan Kuper, Arjan Boeijink, and Marco Gerards</i>	
Storage-Aware Value Prediction	722
<i>Mohammad Salehi and Amirali Baniasadi</i>	

APP: Applications of (Embedded) Digital Systems

Computation Reduction Techniques for Vector Median Filtering and their Hardware Implementation	731
<i>Ozgur Tasdizen and İlker Hamzaoglu</i>	
A Novel VLSI Architecture of Fixed-Complexity Sphere Decoder	737
<i>Bin Wu and Guido Masera</i>	
A Packet Classifier Using a Parallel Branching Program Machine	745
<i>Hiroki Nakahara, Tsutomu Sasao, and Munehiro Matsuura</i>	
A Computation and Power Reduction Technique for H.264 Intra Prediction	753
<i>Yusuf Adibelli, Mustafa Parlak, and İlker Hamzaoglu</i>	

RC-2: Reconfigurable Computing (2)

Hardware-Based Speed Up of Face Recognition Towards Real-Time Performance	763
<i>I. Sajid, Sotirios G. Ziavras, and M.M. Ahmed</i>	
An FPGA-Based Accelerator for Analog VLSI Artificial Neural Network Emulation	771
<i>Barend van Liempd, Daniel Herrera, and Miguel Figueroa</i>	
A Multicore Embedded Processor for Fingerprint Recognition	779
<i>G. Danese, M. Giachero, F. Leporati, and N. Nazzicari</i>	
H.264 Color Components Video Decoding Parallelization on Multi-core Processors	785
<i>Elias Baaklini, Hassan Sbeity, Smail Niar, and Nouhad Amaneddine</i>	

Poster Session P-3

New Digital Control Technique for Improving Transient Response in DC–DC Converters	793
<i>Majd Ghazi Batarseh, Ehab Shobaki, Xiang Fang, Haibing Hu, and Issa Batarseh</i>	
A Fast Analytical Approach to Multi-cycle Soft Error Rate Estimation of Sequential Circuits	797
<i>Mahdi Fazeli, Seyed Ghassem Miremadi, Hossein Asadi, and Mehdi Baradaran Tahoori</i>	
A Multicore SDR Architecture for Reconfigurable WiMAX Downlink	801
<i>Pedro Suárez-Casal, Ángel Carro-Lagoa, José A. García-Naya, and Luis Castedo</i>	
Test Patterns Compression Technique Based on a Dedicated SAT-Based ATPG	805
<i>Jirí Balcarék, Petr Fišer, and Jan Schmidt</i>	
Gracefully Degrading Circuit Controllers Based on Polytronics	809
<i>Richard Ruzicka</i>	
LEON3 ViP: A Virtual Platform with Fault Injection Capabilities	813
<i>Antonio da Silva and Sebastián Sánchez</i>	

Reconfigurable Fault-Tolerant System Synchronization	817
<i>Jan Balach and Ondrej Novák</i>	

36th EUROMICRO Conference on Software Engineering and Advanced Applications

Software Managed Instruction Scratchpad Memory Optimization in Stream Architecture Based on Hot Code Analysis of Kernels	823
<i>He Yi, Ren Ju, Wen Mei, Yang Qianming, Wu Nan, and Zhang Chunyuan</i>	
Author Index	831