

2010 NASA/ESA Conference on Adaptive Hardware and Systems

(AHS 2010)

**Anaheim, California, USA
15 – 18 June 2010**



**IEEE Catalog Number: CFP1063A-PRT
ISBN: 978-1-4244-5887-5**

AHS 2010 - Table of Contents

Preface	vii
Conference Organizers	viii
Program Committee / Reviewers	ix
Keynotes	x

Session A: Adaptive Systems for Space Applications I

Architecture Verification of the SoCWire NoC Approach for Safe Dynamic Partial Reconfiguration in Space Applications.....	1
<i>Björn Osterloh, Harald Michalik, Björn Fiethe and Frank Bubenhausen</i>	
Vision Based Navigation for Autonomous Space Exploration.....	9
<i>G. Flandin, B. Polle, J. Lheritier and P. Vidal</i>	
Design and Implementation of a Radiation Tolerant On-Board Computer for Science Technology Satellite-3... ..	17
<i>Dong-Soo Kang, Kyoung-Son Jhang and Dae-Soo Oh</i>	
On DESTINY Instrument Electrical and Electronics Subsystem Framework.....	24
<i>Semion Kizhner, Dominic J. Benford and Tod R. Lauer</i>	

Session B: Reconfigurable Computing Including Multi Core Architectures

Reconfigurable Machine Vision Systems Using FPGAS.....	31
<i>Carlos Villalpando and Raphael Some</i>	
Adaptive Multicore Scheduling for the LTE Uplink.....	36
<i>Maxime Pelcat, Jean-Francois Nezan and Slaheddine Aridhi</i>	

Session C: Built-in Self-test and Self-repair

Bio-Inspired Bit Slice Processors with Self-Test and Self-Repair Mechanisms.....	44
<i>Andre Stauffer and Joel Rossier</i>	
System Level Self-Healing for Parametric Yield and Reliability Improvement under Power Bound.....	52
<i>S. Narasimhan, S. Paul, R.S. Chakraborty, F. Wolff, C. Papachristou, D. J. Weyer and S. Bhunia</i>	

Low Overhead Soft Error Detection and Correction Scheme for

Reconfigurable Pipelined Data Paths.....59
Sohan Purohit, Sai Rahul Chalamalasetti and Martin Margala

Error-Detecting/Correcting-Code-Based Self-Checked/Corrected/Timed Circuits.....66
Bao Liu

Session D: Special Session on Enabling Advanced Spacecraft Capabilities through Adaptive Hardware Architecture

iBoard: A highly-capable, high-performance, Reconfigurable FPGA-based Building Block for Flight Instrument Digital Electronics73
Yutao He and Mohammad Ashtijou

Wireless Intra-Spacecraft Communication: the Benefits and the Challenges.....75
William Zheng and John Armstrong

Rapid Development of Space Applications with Responsive Digital Electronics Board and LabVIEW FPGA.....79
Brett McMickell, Thom Kreider, PJ Tanzillo and Kosta Ilic

LabVIEW™: A Graphical System Design Environment for Adaptive Hardware/Software Systems.....82
Guoqiang Wang and Hugo Andrade

Session E: Adaptive Systems for Space Applications II

A Formal Approach to Self-configurable Swarm-based Space-exploration Systems.....83
Emil Vassev, Mike Hinchey and Paddy Nixon

Reliability Estimation and Experimental Results of a Self-Healing Asynchronous Circuit: A Case Study.....91
Thomas Panhofer, Werner Friesenbichler and Andreas Steininger

Session F: Hardware for Adaptive Signal Processing

R3TOS: A Reliable Reconfigurable Real-Time Operating System.....99
Xabier Iturbe, Khaled Benkrid, Ahmet T. Erdogan, Tughrul Arslan, Mikel Azkarate, Imanol Martinez and Antonio Perez

An Adaptable Low Density Parity Check (LDPC) Engine for Space Based Communication Systems.....105
Gregory M. Striemer and Ali Akoglu

Performance and Area Efficient Transpose Memory Architecture for High Throughput Adaptive Signal Processing Systems.....113

Mohamed El-Hadedy, Sohan Purohit, Martin Margala and Svein J. Knapkog

A High-Throughput, Adaptive FFT Architecture for FPGA-Based
Space-Borne Data Processors.....121
Kayla Nguyen, Jason Zheng, Yutao He and Biren Shah

Locating Rate Adaptation by Evaluating Movement Specific Parameters.....127
Matthias Brugger and Ferdinand Kemeth

Session G: Special Session on Adaptive, Reconfigurable and Self-aware Computing Architectures

An Emerging Adaptive Architecture and Compilation Techniques.....134
Yong-Kyu Jung

SDVM^R -Managing Heterogeneity in Space and Time on Multicore SoCs.....142
Andreas Hofmann, Klaus Waldschmidt and Jan Haase

Enabling Technologies For Self-Aware Adaptive Systems (Invited).....149
*Marco D. Santambrogio, Henry Hoffmann, Jonathan Eastep
and Anant Agarwal*

Session H: Adaptive Image and Data Compression

HTPCP: GNSS-R multi-channel cross-correlation waveforms post-processing
solution for GOLD-RTR Instrument.....157
Guo Yi, David Atienza, Antonio Rius, Serni Rib' o and Carles Ferrer

Hardware Implementation of the FAPEC Lossless Data Compressor for Space.....164
*Alberto G. Villafranca, Shan Mignot, Jordi Portell
and Enrique Garcia-Berro*

Evolutionary design and optimization of Wavelet Transforms for image
compression in embedded systems.....171
Ruben Salvador, Felix Moreno, Teresa Riesgo and Lukas Sekanina

Session I: Evolvable Hardware

Use of a Multi-Objective Fitness Function to Improve Cartesian
Genetic Programming Circuits.....179
James Hilder, James A. Walker and Andy Tyrrell

Automated synthesis of 8-Output Voltage Distributor using Incremental Evolution.....186
Yerbol Sapargaliyev and Tatana G. Kalganova

Adaptive and Evolvable Hardware Security Architectures.....194

Session J: Adaptive Antennas

Adaptive Phase Synchronization in Distributed Digital Arrays.....	199
<i>D. C. Jenn, Tsai Yen-Chang, Ji Heon Ryu and R. Broadston</i>	

An Adaptive SIW Filter using Vertically-Orientated Fluidic Material Perturbations.....	205
<i>Joel D. Barrera and Gregory H. Huff</i>	

Adaptive Radiation Pattern Optimization for Antenna Arrays by Phase Perturbations using Particle Swarm Optimization.....	209
<i>Virgilio Zuniga, Ahmet T. Erdogan and Tughrul Arslan</i>	

Session K: Special Session on Adaptive Techniques for Security and Trust in Hardware Design

Process Reliability Based Trojans through NBTI and HCI effects.....	215
<i>Y. Shiyanovskii, F. Wolff, A. Rajendran, C. Papachristou, D. Weyer and W. Clay</i>	

Embedded System Protection from Software Corruption.....	223
<i>Francis Wolff, Chris Papachristou, Daniel Weyer and William Clay</i>	

Ultimate Design Security in Self-Reconfiguring Non-Volatile Environments.....	230
<i>Wael Adi and Khaled Benkrid</i>	

POSTERS

Recovery method for a turn-off failure mode of a laser array on an ORGA.....	235
<i>Daisaku Seto and Minoru Watanabe</i>	

A Formal Model for Specification and Optimization of Flexible Communication Systems.....	241
<i>Jiong Ou, Farooq Muhammad, Jan Haase and Christoph Grimm</i>	

An Adaptive Algorithm for Reconfigurable Analog-to-Digital Converters.....	250
<i>Zulhakimi Razak, Ahmet Erdogan and Tughrul Arslan</i>	

Balancing Exploration and Exploitation in an Adaptive Three-Dimensional Cellular Genetic Algorithm via a Probabilistic Selection Operator.....	258
<i>Asma Al-Naqi, Ahmet Erdogan and Tughrul Arslan</i>	

Thermal-aware Fault-Tolerant System Design with Coarse-Grained Reconfigurable	
---	--

Array Architecture.....	265
<i>Ganghee Lee and Kiyoungh Choi</i>	
Calibrating a predictive cache emulator for SoC design.....	273
<i>Stéphane Mancini, Lionel Pierrefeu, Zahir Larabi and Yves Mathieu</i>	
Formal modelling of a robust Wireless Sensor Network routing protocol.....	281
<i>Kashif Saghar, William Henderson, David Kendall and Ahmed Bouridane</i>	
Environment-Based Measurement Planning For Autonomous RTLS Configuration.....	289
<i>Thorsten Edelhäuser, Mateusz Janiak and Gabriella Kókai</i>	
A Fault-Tolerant System-on-Programmable-Chip Based on Domain-Partition and Blind Reconfiguration.....	297
<i>Li Hong Shang, Mi Zhou and Yu Hu</i>	
Acceleration method of optical reconfigurations using analog configuration contexts.....	304
<i>Yuji Aoyama and Minoru Watanabe</i>	
Auto-Reconfiguration on Self-organized Intelligent Platform.....	309
<i>Kevin Cheng, Ali Akbar Zarezadeh, Felix Muhlbauer, Camel Tanougast and Christophe Bobda'</i>	
An Adaptive Communications Module for On-board Computers of Satellites.....	317
<i>Eduardo Bezerra, Gabriel Almeida, Luciano Azevedo and Cristiano Ferreira</i>	
Bio-Inspired Self-Test Technique for Evolvable Fault Tolerant Hardware Systems.....	325
<i>Mohammad Samie, Gabriel Dragffy and Tony Pipe</i>	
A Fuzzy Logic Based Dynamic Reconfiguration Scheme for Optimal Energy and Throughput in Symmetric Chip Multiprocessors.....	333
<i>Muhammad Yasir Qadri and Klaus D. McDonald-Maier</i>	
FPGA Implementation of an Efficient High-Throughput Sphere Decoder for MIMO Systems Based on the Smallest Singular Value Threshold.....	340
<i>Xiang Wu and John S. Thompson</i>	
Efficient Analog Architectures for DCT Processing.....	346
<i>Surya Prakash Noolu, Maryam Shojaei Baghini and Rajbabu Velmurugan</i>	
Similarity Transformation-based Method for Cross-Coupling Effects of Parameters.....	354
<i>H.J. Kadim</i>	
Design of analog field programmable RC oscillator using a floating-gate PFET.....	358
<i>Garima Kapur and C.M. Markan</i>	

A Very High Resolution DAC at 1kHz for Space Applications.....	364
<i>George Tsiligiannis, Kostas Makris, Tasos Lambaounas, Dimosthenis Fragopoulos, Panagiotis Anagnostopoulos, Constantin Papadas and Jean-Pierre Schoellkopf</i>	
Author Index	371