

Editorial Board

Simone Diniz Junqueira Barbosa

*Pontifical Catholic University of Rio de Janeiro (PUC-Rio),
Rio de Janeiro, Brazil*

Phoebe Chen

La Trobe University, Melbourne, Australia

Alfredo Cuzzocrea

ICAR-CNR and University of Calabria, Italy

Xiaoyong Du

Renmin University of China, Beijing, China

Joaquim Filipe

Polytechnic Institute of Setúbal, Portugal

Orhun Kara

TÜBİTAK BİLGEM and Middle East Technical University, Turkey

Tai-hoon Kim

Konkuk University, Chung-ju, Chungbuk, Korea

Igor Kotenko

*St. Petersburg Institute for Informatics and Automation
of the Russian Academy of Sciences, Russia*

Dominik Ślęzak

University of Warsaw and Infobright, Poland

Xiaokang Yang

Shanghai Jiao Tong University, China

Weixia Xu Liquan Xiao Pingjing Lu
Jinwen Li Chengyi Zhang (Eds.)

Computer Engineering and Technology

16th National Conference, NCCET 2012
Shanghai, China, August 17-19, 2012
Revised Selected Papers



Springer

Volume Editors

Weixia Xu
Liquan Xiao
Pingjing Lu
Jinwen Li
Chengyi Zhang

National University of Defense Technology
School of Computer Science
Changsha, Hunan, P.R. China, 410073

weixia_xu@263.net
marshall.xiao@gmail.com
pingjinglu@gmail.com
lijinwen@sina.com
chengyizhang@nudt.edu.cn

ISSN 1865-0929 e-ISSN 1865-0937
ISBN 978-3-642-35897-5 e-ISBN 978-3-642-35898-2
DOI 10.1007/978-3-642-35898-2
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2012954675

CR Subject Classification (1998): C.1.2, C.1.4, B.7.1, B.4.3, B.3.2, B.2.4, B.8.2

© Springer-Verlag Berlin Heidelberg 2013

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

We are pleased to present the proceedings of the 16th Annual Conference on Computer Engineering and Technology (NCCET 2012). Over its short sixteen-year history, NCCET has established itself as one of the major national conferences dedicated to the important and emerging challenges in the field of computer engineering and technology. Following the previous successful events, NCCET 2012 provided a forum to bring together researchers and practitioners from academia and industry to discuss cutting-edge research on computer engineering and technology.

We are delighted that the conference continues to attract high-quality submissions from a diverse and national group of researchers. This year, we received 108 paper submissions, among which 27 papers were accepted. Each paper received three or four peer reviews from our Technical Program Committee (TPC) comprised of a total of 55 TPC members from academia, government, and industry.

The pages of this volume represent only the end result of an enormous endeavor involving hundreds of people. Almost all this work is voluntary, with some individuals contributing hundreds of hours of their time to the effort. Together, the 55 members of the TPC, the 12 members of the External Review Committee (ERC), and the 10 other individual reviewers consulted for their expertise wrote nearly 400 reviews.

Every paper received at least three reviews and many had four or more. With the exception of submissions by the TPC, each paper had at least three reviews from the TPC and at least one review from an outside expert. For the second year running most of the outside reviews were done by the ERC, which was selected in advance, and additional outside reviews beyond the ERC were requested whenever appropriate or necessary. Reviewing was “first read double-blind”, meaning that author identities were withheld from reviewers until they submitted a review. Revealing author names once initial reviews had been written, allowed reviewers to find related and previous material by the same authors, which helped greatly in many cases in understanding the context of the work, and also ensured that the author feedback and discussions at the PC meeting could be frank and direct. For the first time in many years, we allowed PC members to submit papers to the conference. Submissions co-authored by a TPC member were reviewed exclusively by the ERC and other external reviewers, and these same reviewers decided whether to accept the PC papers; no PC member reviewed a TPC paper, and no TPC papers were discussed at the TPC meeting.

After the reviewing was complete, the Program Committee met at the National University of Defense Technology, Changsha, on June 15th and 18th, to select the program. Separately, the ERC decided on the PC papers in email and

phone discussions. In the end, 27 of the 108 submissions (25%) were accepted for the conference.

First of all, we would like to thank all researchers who submitted manuscripts. Without these submissions, it would be impossible to provide such an interesting technical program. We thank all PC members for helping to organize the conference program. We thank all TPC members for their tremendous time and efforts during the paper review and selection process. The efforts of these individuals were crucial in constructing our successful technical program. Last but not least, we would like to thank the organizations and sponsors that supported NCCET 2012. Finally, we thank all the participants of the conference and hope that you have a truly memorable NCCET 2012 in Shanghai, China.

October 2012

Xu Weixia
Fu Yuzhuo
Zhang Minxuan
Xiao Liqun

Organization

Organizing Committee

General Co-chairs

Xu Weixia	National University of Defense Technology, China
Fu Yuzhuo	Shanghai Jiao Tong University, China
Zhang Minxuan	National University of Defense Technology, China

Program Chair

Xiao Liquan	National University of Defense Technology, China
-------------	---

Publicity Co-chairs

Lu Pingjing	National University of Defense Technology, China
Zhang Chengyi	National University of Defense Technology, China

Local Arrangement Co-chairs

Jiang Jiang	Shanghai Jiao Tong University, China
Li Jinwen	National University of Defense Technology, China
Huang Yan	Shanghai Jiao Tong University, China

Registration and Finance Co-chairs

Yu Meijuan	Shanghai Jiao Tong University, China
Zhang Junying	National University of Defense Technology, China

Program Committee

Han Wei	Xi'an Aeronautics Computing Technique Research Institute, China
Jin Lifeng	Jiangnan Institute of Computing Technology, China
Xiong Tinggang	Wuhan Digital Engineering Institute of China Shipbuilding Industry, China
Zhao Xiaofang	Institute of Computing Technology Chinese Academy of Sciences, China
Yang Yintang	Xi Dian University, China
Li Jinwen	National University of Defense Technology, China
Jiang Jiang	Shanghai Jiao Tong University, China

Technical Program Committee

Chen Shuming	National University of Defense Technology, China
Chen Yueyue, Chen Zheng	Hunan Changsha DIGIT Company, China Xi'an Aeronautics Computing Technique Research Institute, China
Du Huimin	Xi'an University of Posts and Telecommunications, China
Fan Dongrui	Institute of Computing Technology Chinese Academy of Sciences, China
Fan Xiaoya	Northwestern Polytechnical University, China
Fang Xing	Jiangnan Institute of Computing Technology, China
Gu Tianlong	Guilin University of Electronic Technology, China
Guo Donghui	Xiamen University, China
Hou Jianru	Institute of Computing Technology Chinese Academy of Sciences, China
Huang Jin	Xi Dian University, China
Ji Liqiang	Cesller Company, China
Jin Jie	Hunan Changsha Fusion Company, China
Li Ping	University of Electronic Science and Technology of China, China
Li Qiong	Inspur Information Technology Co. Ltd., China
Li Yuanshan	Inspur Information Technology Co. Ltd., China
Li Yun	Yangzhou University, China
Lin Kaizhi	Inspur Information Technology Co. Ltd., China
Lin Zhenghao	Tongji University, China
Lv Chunyang,	Jiangnan Institute of Computing Technology, China

Sun Haibo	Inspur Information Technology Co. Ltd., China
Sun Yongjie	Hunan Changsha DIGIT Company, China
Wang Dong	National University of Defense Technology, China
Wang Yaonan	Hunan University, China
Wang Yiwen,	University of Electronic Science and Technology of China, China
Xing Zuocheng	Hunan Changsha DIGIT Company, China
Xue Chengqi	Southeast University, China
Yang Peihe	Jiangnan Institute of Computing Technology, China
Yang Xiaojun	Institute of Computing Technology Chinese Academy of Sciences, China
Yin Luosheng	Synopsys Company, China
Yu Mingyan	Harbin Institute of Technology, China
Yu Zongguang	China Electronics Technology Group Corporation NO.58 Research Institute, China
Zeng Tian	Wuhan Digital Engineering Institute of China Shipbuilding Industry, China
Zeng Xifang	Hunan Great Wall Information Technology Co. Ltd., China
Zeng Yu	Sugon Company, China
Zeng Yun	Hunan University, China
Zhang Jianyun	Hefei Electronic Engineering Institute, China
Zhang Shengbing	Northwestern Polytechnical University, China
Zhang Shujie	Huawei Company, China
Zhang Xu	Jiangnan Institute of Computing Technology, China
Zhang Yiwei	Wuhan Digital Engineering Institute of China Shipbuilding Industry, China
Zhao Yuelong	South China University of Technology, China
Zhou Ya	Guilin University of Electronic Technology, China

Table of Contents

Session 1: Microprocessor and Implementation

A Method of Balancing the Global Multi-mode Clock Network in Ultra-large Scale CPU	1
<i>Zhuo Ma, Zhenyu Zhao, Yang Guo, Lunguo Xie, and Jinshan Yu</i>	
Hardware Architecture for the Parallel Generation of Long-Period Random Numbers Using MT Method	8
<i>Shengfei Wu, Jiang Jiang, and Yuzhuo Fu</i>	
MGTE: A Multi-level Hybrid Verification Platform for a 16-Core Processor	16
<i>Xiaobo Yan, Rangyu Deng, Caixia Sun, and Qiang Dou</i>	
An Efficient Parallel SURF Algorithm for Multi-core Processor	27
<i>Zhong Liu, Binchao Xing, and Yueyue Chen</i>	
A Study of Cache Design in Stream Processor	38
<i>Chiyuan Ma and Zhenyu Zhao</i>	
Design and Implementation of Dynamically Reconfigurable Token Coherence Protocol for Many-Core Processor	49
<i>Chuan Zhou, Yuzhuo Fu, Jiang Jiang, Xing Han, and Kaikai Yang</i>	
Dynamic and Online Task Scheduling Algorithm Based on Virtual Compute Group in Many-Core Architecture	57
<i>Ziyang Liu, Yuzhuo Fu, Jiang Jiang, and Xing Han</i>	
ADL and High Performance Processor Design	67
<i>Liu Yang, Xiaoqiang Ni, Yusong Tan, and Hengzhu Liu</i>	

Session 2: Design of Integration Circuit

The Design of the ROHC Header Compression Accelerator	75
<i>Mengmeng Yan and Shengbing Zhang</i>	
A Hardware Implementation of Nussinov RNA Folding Algorithm	84
<i>Qilong Su, Jiang Jiang, and Yuzhuo Fu</i>	
A Configurable Architecture for 1-D Discrete Wavelet Transform	92
<i>Qing Sun, Jiang Jiang, and Yuzhuo Fu</i>	
A Comparison of Folded Architectures for the Discrete Wavelet Transform	102
<i>Jia Zhou and Jiang Jiang</i>	

A High Performance DSP System with Fault Tolerant for Space Missions 111
Kang Xia, Ao Shen, Yuzhuo Fu, Ting Liu, and Jiang Jiang

The Design and Realization of Campus Information Release Platform Based on Android Framework 121
Jie Wang, Xue Yu, Yu Zeng, and Dongri Yang

A Word-Length Optimized Hardware Gaussian Random Number Generator Based on the Box-Muller Method 129
Yuan Li, Jiang Jiang, Minxuan Zhang, and Shaojun Wei

Session 3: I/O Interconnect

DAMQ Sharing Scheme for Two Physical Channels in High Performance Router 138
Yongqing Wang and Minxuan Zhang

Design and Implementation of Dynamic Reliable Virtual Channel for Network-on-Chip 148
Peng Wu, Yuzhuo Fu, and Jiang Jiang

HCCM: A Hierarchical Cross-Connected Mesh for Network on Chip 155
Liguo Zhang, Huimin Du, and Jianyuan Liu

Efficient Broadcast Scheme Based on Sub-network Partition for Many-Core CMPs on Gem5 Simulator 163
Kaikai Yang, Yuzhuo Fu, Xing Han, and Jiang Jiang

A Quick Method for Mapping Cores Onto 2D-Mesh Based Networks on Chip 173
Zhenlong Song, Yong Dou, Mingling Zheng, and Weixia Xu

Session 4: Measurement, Verification, and Others

A Combined Hardware/Software Measurement for ARM Program Execution Time 185
Liangliang Kong and Jianhui Jiang

A Low-Complexity Parallel Two-Sided Jacobi Complex SVD Algorithm and Architecture for MIMO Beamforming Systems 202
Weihua Ding, Jiangpeng Li, Guanghui He, and Jun Ma

A Thermal-Aware Task Mapping Algorithm for Coarse Grain Reconfigurable Computing System 211
Shizhuo Tang, Naifeng Jing, Weiguang Sheng, Weifeng He, and Zhigang Mao

DC Offset Mismatch Calibration for Time-Interleaved ADCs in High-Speed OFDM Receivers	221
<i>Yulong Zheng, Zhiting Yan, Jun Ma, and Guanghui He</i>	
A Novel Graph Model for Loop Mapping on Coarse-Grained Reconfigurable Architectures	231
<i>Ziyu Yang, Ming Yan, Dawei Wang, and Sikun Li</i>	
Memristor Working Condition Analysis Based on SPICE Model	242
<i>Zhuo Bi, Ying Zhang, and Yunchuan Xu</i>	
On Stepsize of Fast Subspace Tracking Methods	253
<i>Zhu Cheng, Zhan Wang, Haitao Liu, and Majid Ahmadi</i>	
Author Index	263