

Proceedings

14th IEEE Symposium on Computer Arithmetic

April 14 – 16, 1999

Adelaide, Australia

Edited by

Israel Koren and Peter Kornerup

Sponsored by

IEEE Computer Society Technical Committee on VLSI



Los Alamitos, California

Washington



Brussels



Tokyo

Copyright © 1999 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries may photocopy beyond the limits of US copyright law, for private use of patrons, those articles in this volume that carry a code at the bottom of the first page, provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

Other copying, reprint, or republication requests should be addressed to: IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, P.O. Box 133, Piscataway, NJ 08855-1331.

The papers in this book comprise the proceedings of the meeting mentioned on the cover and title page. They reflect the authors' opinions and, in the interests of timely dissemination, are published as presented and without change. Their inclusion in this publication does not necessarily constitute endorsement by the editors, the IEEE Computer Society, or the Institute of Electrical and Electronics Engineers, Inc.

IEEE Computer Society Order Number PR00116
ISBN 0-7695-0116-8
ISBN 0-7695-0118-4 (microfiche)
IEEE Order Plan Catalog Number 99CB36336
ISSN 1063-6889

Additional copies may be ordered from:

IEEE Computer Society
Customer Service Center
10662 Los Vaqueros Circle
P.O. Box 3014
Los Alamitos, CA 90720-1314
Tel: + 1-714-821-8380
Fax: + 1-714-821-4641
E-mail: cs.books@computer.org

IEEE Service Center
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
Tel: + 1-732-981-1393
Fax: + 1-732-981-9667
mis.custserv@computer.org

IEEE Computer Society
Ooshima Building
1-4-2 Minami-Aoyama
Minato-ku, Tokyo 107-0062
JAPAN
Tel: + 81-3-3408-3118
Fax: + 81-3-3408-3553
Tokyo.ofc@computer.org

Editorial production by Regina Spencer Sipple and Frances M. Titsworth

Cover art design by Joseph Daigle/Studio Productions

Printed in the United States of America by The Printing House



Symposium Committee

General Chair

Jean-Michel Muller

*Ecole Normale **Supérieure de Lyon***

Program Chairs

Israel Koren

University of Massachusetts at Amherst

Peter Kornerup

Odense University

Finance Chair

Neil Burgess

Adelaide University

Local Arrangements

Neil Burgess

Adelaide University

Web Applications Design

Steven R. Morin

University of Massachusetts at Amherst

Program Committee

Jean-Claude Bajard, *LIM Marseilles*
Neil Burgess, **University of Adelaide**
Joseph Cavallaro, **Rice University**
Luigi Ciminiera, **Politecnico di Torino**
Luigi Dadda, **Politecnico di Milano**
Debjit DasSarma, **Cyrix**
Guy Even, Tel Aviv University
Milos Ercegovac, **University of California at Los Angeles**
Michael J. Flynn, **Stanford University**
Roger A. Golliver, **Intel**
David Hough, **Sun Microsystems**
Atsuki Inoue, **Fujitsu Laboratories**
Mary Jane Irwin, **Pennsylvania State University**
Graham Jullien, **University of Windsor**
Simon Knowles, **Element 14**
Israel Koren, **University of Massachusetts, Amherst**
Peter Kornerup, **Odense University**
Tomas Lang, **University of California at Irvine**
Jeong-A Lee, **Chosun University**
David Matula, **Southern Methodist University**
William H. McAllister, **Hewlett-Packard Labs**
Jean-Michel Muller, **LIP-ENS Lyon**
Paolo Montuschi, **Politecnico di Torino**
Stuart Oberman, **AMD**
Vojin G. Oklobdzija, **University of California at Davis**
Dhananjay S. Phatak, **SUNY Binghamton**
Sri Samudrala, **Digital**
Eric Schwarz, **IBM**
Michael Schulte, **Lehigh University**
Renato Stefanelli, **Politecnico di Milano**
Earl Swartzlander, **University of Texas at Austin**
Naofumi Takagi, **Nagoya University**
George Taylor, **S3, Inc.**
Peter Turner, **US Naval Academy**
Colin Walter, **Manchester University**
Belle W. Y. Wei, **San Jose State University**
Dan Zuras, **Hewlett-Packard Labs**

List of Reviewers

Cesare Alippi	Ching-Yu Hung	Gianluca Piccinini
Elisardo Antelo	Laurent Imbert	Vincenzo Piuri
David H. Bailey	Atsuki Inoue	Doug Priest
Jean-Claude Bajard	Cristina Iordache	David M. Russinoff
Andrew Beaumont-Smith	Mary Jane Irwin	John Sacha
Gary Bewick	Norbert Juffa	Sridhar Samudrala
Neil Burgess	Graham Jullien	Michael Schulte
Dave Carlson	Simon Knowles	Eric Schwarz
Joseph Cavallaro	Israel Koren	Peter-Michael Seidel
Jae-hun Choi	Peter Kornerup	Marjan Shahkarami
Jun Rim Choi	Hajime Kubosawa	Hosahalli R. Srinivas
Benny Chor	Tomas Lang	Renato Stefanelli
Luigi Ciminiera	Jeong-A. Lee	James E. Stine
Gianluca Cornetta	Andrew P. Lentvorski Jr.	Earl E. Swartzlander
Sorin Cotofana	Yutai Ma	Naofumi Takagi
Henry M. Darley	Enrico Macii	Hiromasa Takahashi
Debjit DasSarma	Mark Matson	George Taylor
Marc Daumas	David W. Matula	Alexandre F. Tenca
V. Dimitrov	Willy McAllister	Okan Tepencelik
Milos D. Ercegovac	Lee McFearin	Peter Turner
Guy Even	Oskar Mencer	Colin Walter
Charles A. Fabian	John Meyer	Belle Wei
Warren Ferguson	Paolo Montuschi	Guoheng Wei
John Gill	M. Morf	Larry Widigen
Tom Goff	Jean-Michel Muller	Derek Wong
Roger Golliver	Stuart Oberman	Wu Ye
Shai Halevi	Vojin G. Oklobdzija	Sungwook Yu
David Hough	Holger Orup	Andrew Zimmerman
Chris Howland	Dhananjay Phatak	Dan Zuras