

Proceedings

18th IEEE Symposium on Computer Arithmetic

Montpellier, France

June 25-27, 2007



Los Alamitos, California
Washington • Tokyo



Table of Contents

18th IEEE Symposium on Computer Arithmetic (ARITH-18 2007)

Foreword	ix
Program Committee	x
Steering Committee / Symposium Committee	xi
Reviewers	xii

Session 1: Keynote Talk

Chair: Graham Jullien

The Return of Silicon Efficiency	3
<i>Simon Knowles</i>	

Session 2: Basic Arithmetic Operations I

Chair: Luigi Dadda

Serial Parallel Multiplier Design in Quantum-dot Cellular Automata.....	7
<i>Heumpil Cho and Earl Swartzlander</i>	
Robust Energy-Efficient Adder Topologies	16
<i>Dinesh Patil, Omid Azizi, Ron Ho, Mark Horowitz, and Rajesh Ananthraman</i>	

Session 3: Decimal Floating Point

Chair: Neil Burgess

A Software Implementation of the IEEE 754R Decimal Floating-Point Arithmetic Using the Binary Encoding Format	29
<i>Marius Cornea, Cristina Anderson, John Harrison, Ping Tak Peter Tang, Eric Schneider, and Charles Tsen</i>	
Solving Constraints on the Intermediate Result of Decimal Floating-Point Operations	38
<i>Merav Aharoni, Ron Maharik, and Abraham Ziv</i>	
Decimal Floating-Point Multiplication via Carry-Save Addition.....	46
<i>Mark Erle, Mike Schulte, and Brian Hickman</i>	
Decimal Floating-Point Adder and Multifunction Unit with Injection-Based Rounding	56
<i>Liang-Kai Wang and Mike Schulte</i>	

Session 4: Floating Point Implementation

Chair: John Harrison

A New Architecture for Multiple-precision Floating-point Multiply-add Fused Unit Design	69
<i>Libo Huang, Li Shen, Kui Dai, and Zhiyang Wang</i>	
P6 Binary Floating-Point Unit.....	77
<i>Eric Schwarz, Son Dao Trong, Martin Schmookler, and Michael Kroener</i>	
Design of the ARM VFP11 Divide and Square Root Synthesisable Macrocell	87
<i>Neil Burgess and Christopher Hinds</i>	

Session 5: Crypto Algorithms

Chair: Jean-Claude Bajard

An Algorithm for the η_T Pairing Calculation in Characteristic Three and its Hardware Implementation	97
<i>Jean-Luc Beuchat, Masaaki Shirase, Tsuyoshi Takagi, and Eiji Okamoto</i>	
An Algorithm for Inversion in $GF(2^m)$ Suitable for Implementation Using a Polynomial Multiply Instruction on $GF(2)$	105
<i>Katsuki Kobayashi, Naofumi Takagi, and Kazuyoshi Takagi</i>	
Asymmetric Squaring Formulae	113
<i>Jaewook Chung and M. Anwar Hasan</i>	
Spectral Modular Exponentiation	123
<i>Gökay Saldamlı and Çetin Koç</i>	

Session 6: Various Topics

Chair: Israel Koren

Worst Cases of a Periodic Function with Large Arguments	133
<i>Guillaume Hanrot, Vincent Lefèvre, Damien Stehlé, and Paul Zimmermann</i>	
How to Ensure a Faithful Polynomial Evaluation with the Compensated Horner Algorithm	141
<i>Philippe Langlois and Nicolas Louvet</i>	
Accurate Multiple-Precision Gauss-Legendre Quadrature	150
<i>Laurent Fousse</i>	

Session 7: Elementary Functions

Chair: Elisardo Antelo

Return of the Hardware Floating-Point Elementary Function	161
<i>Jérémie Detrey, Florent de Dinechin, and Xavier Pujol</i>	
Efficient Polynomial L^∞ -Approximations	169
<i>Nicolas Brisebarre and Sylvain Chevillard</i>	
Floating-Point L^2 -Approximations to Functions	177
<i>Nicolas Brisebarre and Guillaume Hanrot</i>	

Session 8: Floating Point Issues and Operations

Chair: Eric Schwarz

Formal Verification of Floating-Point Programs	187
<i>Jean-Christophe Filliâtre and Sylvie Boldo</i>	
A New Family of High-Performance Parallel Decimal Multipliers	195
<i>Alvaro Vázquez, Elisardo Antelo, and Paolo Montuschi</i>	
Optimistic Parallelization of Floating-Point Accumulation	205
<i>Nachiket Kapre and André DeHon</i>	

Session 9: Modular Operations

Chair: Naofumi Takagi

Modular Multiplication Using Redundant Digit Division	217
<i>Ping Tak Peter Tang</i>	
Fast Modular Reduction	225
<i>William Hasenplaugh, Vinodh Gopal, and Gunnar Gaubatz</i>	
Montgomery Reduction Algorithm for Modular Multiplication Using Low-Weight Polynomial Form Integers	230
<i>Jaewook Chung and M. Anwar Hasan</i>	
Efficient Method for Magnitude Comparison in RNS Based on Two Pairs of Conjugate Moduli.....	240
<i>Leonel Sousa</i>	

Session 10: Basic Arithmetic Operations II

Chair: Tomas Lang

Performing Advanced Bit Manipulations Efficiently in General-Purpose Processors	251
<i>Yedidya Hilewitz and Ruby B. Lee</i>	
Multiplication by a Constant is Sublinear.....	261
<i>Vassil Dimitrov, Laurent Imbert, and Andrew Zakaluzny</i>	

Author Index	269
---------------------------	------------