

# **2011 Symposium on Application Accelerators in High-Performance Computing**

**(SAAHPC 2011)**

**Knoxville, Tennessee, USA  
19 – 21 July 2011**



**IEEE Catalog Number: CFP1125P-PRT  
ISBN: 978-1-4577-0635-6**

# 2011 Symposium on Application Accelerators in High-Performance Computing

## SAAHPC 2011

### Table of Contents

Foreword.....	vi
Conference Committees.....	vii
Conference Sponsors.....	ix

---

#### Reconfigurable Computing

Real-Time Object Tracking System on FPGAs .....	1
<i>Su Liu, Alexandros Papakonstantinou, Hongjun Wang, and Deming Chen</i>	
Iterative Refinement on FPGAs .....	8
<i>Jun Kyu Lee and Gregory D. Peterson</i>	
GPU-Accelerated Wire-Length Estimation for FPGA Placement .....	14
<i>Christian Fobel, Gary Gréwal, and Deborah Stacey</i>	

#### Weather and Climate Modeling

Accelerating a Climate Physics Model with OpenCL .....	24
<i>Fahad Zafar, Dibyajyoti Ghosh, Lawrence Sebald, and Shujia Zhou</i>	
Experience Applying Fortran GPU Compilers to Numerical Weather Prediction .....	34
<i>T. Henderson, J. Middlecoff, J. Rosinski, M. Govett, and P. Madden</i>	
A Study of the Performance of Multifluid PPM Gas Dynamics on CPUs and GPUs .....	42
<i>Pei-Hung Lin, Jagan Jayaraj, and Paul R. Woodward</i>	

#### Poster Session

Non-serial Polyadic Dynamic Programming on a Data-Parallel Many-core Architecture .....	52
<i>Maryam Moazeni, Majid Sarrafzadeh, and Alex A.T. Bui</i>	
Design and Simulation of a Rectangular Meshotron Unit Prototype .....	56
<i>Carlos Romeiro, Guilherme Campos, and Arnaldo Oliveira</i>	

Transformation of Scientific Algorithms to Parallel Computing Code: Single GPU and MPI Multi GPU Backends with Subdomain Support .....	60
<i>Björn Meyer, Christian Plessl, and Jens Förstner</i>	
A First Analysis of a Dynamic Memory Allocation Controller (DMAC) Core .....	64
<i>Yamuna Rajasekhar and Ron Sass</i>	
Application of Graphics Processing Units (GPUs) to the Study of Non-linear Dynamics of the Exciton Bose-Einstein Condensate in a Semiconductor Quantum Well .....	68
<i>Akila Gothandaraman, Seyedhamidreza Sadatian, Michal Faryniarz, Oleg L. Berman, and German V. Kolmakov</i>	
Porting Optimized GPU Kernels to a Multi-core CPU: Computational Quantum Chemistry Application Example .....	72
<i>Dong Ye, Alexey Titov, Volodymyr Kindratenko, Ivan Ufimtsev, and Todd Martinez</i>	
G-NetMon: A GPU-accelerated Network Performance Monitoring System .....	76
<i>Wenji Wu, Phil DeMar, Don Holmgren, and Amitoj Singh</i>	
Implications of Memory-Efficiency on Sparse Matrix-Vector Multiplication .....	80
<i>Shweta Jain, Robin Pottathuparambil, and Ron Sass</i>	

## GPU Applications I

GPU Performance Comparison for Accelerated Radar Data Processing .....	84
<i>C.T. Fallen, B.V.C. Bellamy, G.B. Newby, and B.J. Watkins</i>	
Evaluation of GPU Architectures Using Spiking Neural Networks .....	93
<i>Vivek K. Pallipuram, Mohammad A. Bhuiyan, and Melissa C. Smith</i>	
Adaptable Two-Dimension Sliding Windows on NVIDIA GPUs with Runtime Compilation .....	103
<i>Nicholas Moore, Miriam Leeser, and Laurie Smith King</i>	

## Computational Physics and Chemistry

QUonG: A GPU-based HPC System Dedicated to LQCD Computing .....	113
<i>Roberto Ammendola, Andrea Biagioni, Ottorino Frezza, Francesca Lo Cicero, Alessandro Lonardo, Pier Stanislao Paolucci, Davide Rossetti, Francesco Simula, Laura Tosoratto, and Piero Vicini</i>	
Efficient Implementation of the Overlap Operator on Multi-GPUs .....	123
<i>Andrei Alexandru, Michael Lujan, Craig Pelissier, Ben Gamari, and Frank Lee</i>	
Quantum Chemical Many-Body Theory on Heterogeneous Nodes .....	131
<i>A. Eugene DePrince III and Jeff R. Hammond</i>	

## **GPU Applications II**

On the Efficacy of a Fused CPU+GPU Processor (or APU) for Parallel Computing .....	141
<i>Mayank Daga, Ashwin M. Aji, and Wu-chun Feng</i>	
A Class of Hybrid LAPACK Algorithms for Multicore and GPU Architectures .....	150
<i>Mitch Horton, Stanimire Tomov, and Jack Dongarra</i>	
Python for Development of OpenMP and CUDA Kernels for Multidimensional Data .....	159
<i>Bogdan Vacaliuc, Dilip R. Patlolla, Ed. D’Azevedo, Greg G. Davidson, John K. Munro Jr, Thomas M. Evans, Wayne Joubert, and Zane W. Bell</i>	
<b>Author Index</b> .....	168