PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 7872

, "Front Matter: Volume 7872," Proc. SPIE 7872, Parallel Processing for Imaging Applications, 787201 (25 January 2011); doi: 10.1117/12.888484

SPIE.

Event: IS&T/SPIE Electronic Imaging, 2011, San Francisco Airport, California, United States

Parallel Processing for Imaging Applications

**John D. Owens
I-Jong Lin
Yu-Jin Zhang
Giordano B. Beretta**
Editors

**24–25 January 2011
San Francisco, California, United States**

Sponsored and Published by
IS&T—The Society for Imaging Science and Technology
SPIE

Volume 7872

Proceedings of SPIE, 0277-786X, v. 7874

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Parallel Processing for Imaging Applications*, edited by John D. Owens, I-Jong Lin, Yu-Jin Zhang, Giordano B. Beretta, SPIE-IS&T Electronic Imaging, Vol. 7872 (SPIE, Bellingham, WA, 2011) Article CID Number.

ISSN 0277-786X

ISBN 9780819484093

Copublished by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

and

IS&T—The Society for Imaging Science and Technology

7003 Kilworth Lane, Springfield, Virginia, 22151 USA

Telephone +1 703 642 9090 (Eastern Time) · Fax +1 703 642 9094

imaging.org

Copyright © 2011, Society of Photo-Optical Instrumentation Engineers

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/11/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

vii *Conference Committee*

SESSION 1 PARALLEL IMAGING SYSTEMS

- 7872 02 **Using a commercial graphical processing unit and the CUDA programming language to accelerate scientific image processing applications** [7872-01]
R. P. Broussard, R. W. Ives, U.S. Naval Academy (United States)
- 7872 03 **Automatic distribution of vision-tasks on computing clusters** [7872-02]
T. Müller, B. A. Tran, A. Knoll, Technische Univ. München (Germany)
- 7872 04 **Highly scalable digital front end architectures for digital printing** [7872-03]
D. Staas, Hewlett-Packard Co. (United States)
- 7872 05 **Parallel training and testing methods for complex image processing algorithms on distributed, heterogeneous, unreliable, and non-dedicated resources** [7872-04]
R. Usamentiaga, D. F. García, J. Molleda, I. Sainz, F. G. Bulnes, Univ. de Oviedo (Spain)
- 7872 06 **Integrated parallel printing systems with hypermodular architecture (Invited Paper)** [7872-05]
D. Biegelsen, L. Crawford, M. Do, D. Duff, C. Eldershaw, M. Fromherz, H. Hindi, Palo Alto Research Ctr., Inc. (United States); G. Kott, Xerox Corp. (United States); D. Lerner, Palo Alto Research Ctr., Inc. (United States); B. Mandel, S. Moore, Xerox Corp. (United States); B. Preas, W. Ruml, G. Schmitz, L. Swartz, R. Zhou, Palo Alto Research Ctr., Inc. (United States)

SESSION 2 FROM IMAGE TO STRUCTURE I

- 7872 07 **Parallel processing considerations for image recognition tasks (Invited Paper)** [7872-06]
S. J. Simske, Hewlett-Packard Labs. (United States)
- 7872 08 **GPGPU real-time texture analysis framework** [7872-07]
M. A. Akhloufi, F. Gariepy, G. Champagne, Ctr. de Robotique et de Vision Industrielles (Canada)
- 7872 09 **A parallel implementation of 3D Zernike moment analysis** [7872-08]
D. Berjón, S. Arnaldo, F. Morán, Univ. Politécnica de Madrid (Spain)
- 7872 0A **A novel parallel algorithm for airport runway segmentation in satellite images using priority directional region growing strategy based on ensemble learning** [7872-09]
F. Duan, Y.-J. Zhang, Tsinghua Univ. (China)
- 7872 0B **Visualization assisted by parallel processing** [7872-10]
B. Lange, Lab. d'Informatique de Robotique et de Microelectronique de Montpellier (France); H. Rey, X. Vasques, IBM (France); W. Puech, N. Rodriguez, Lab. d'Informatique de Robotique et de Microelectronique de Montpellier (France)

SESSION 3 FROM IMAGE TO STRUCTURE II

- 7872 0C **A parallel impulse-noise detection algorithm based on ensemble learning for switching median filters** [7872-11]
F. Duan, Y.-J. Zhang, Tsinghua Univ. (China)

SESSION 4 FROM STRUCTURE TO IMAGE I

- 7872 0D **GPU color space conversion** [7872-12]
P. Chase, G. Vondran, Hewlett-Packard Co. (United States)
- 7872 0E **Acceleration of the Retinex algorithm for image restoration by GPGPU/CUDA** [7872-13]
Y.-K. Wang, W.-B. Huang, Fu Jen Catholic Univ. (Taiwan)
- 7872 0F **Performance evaluation of Canny edge detection on a tiled multicore architecture** [7872-14]
A. Z. Brethorst, N. Desai, D. P. Enright, R. Scrofano, The Aerospace Corp. (United States)

SESSION 5 FROM STRUCTURE TO IMAGE II

- 7872 0G **Video transcoding using GPU accelerated decoder** [7872-15]
W.-L. Hsu, Advanced Micro Devices, Inc. (United States)
- 7872 0H **Real-time image deconvolution on the GPU** [7872-16]
J. T. Klosowski, S. Krishnan, AT&T Labs. Research (United States)
- 7872 0I **Stitching giga pixel images using parallel computing** [7872-17]
R. Kooper, P. Bajcsy, Univ. of Illinois at Urbana-Champaign (United States); N. M. Hernández, Univ. of La Laguna (Spain)

SESSION 6 SPEED VS. ACCURACY TRADE-OFF I

- 7872 0J **GPU-completeness: theory and implications** [7872-18]
I.-J. Lin, Hewlett-Packard Labs. (United States)
- 7872 0K **A parallel error diffusion implementation on a GPU** [7872-20]
Y. Zhang, Univ. of California, Davis (United States); J. L. Recker, Hewlett-Packard Labs. (United States); R. Ulichney, Hewlett-Packard Co. (United States); G. B. Beretta, I. Tasti, I.-J. Lin, Hewlett-Packard Labs. (United States); J. D. Owens, Univ. of California, Davis (United States)
- 7872 0L **Experience with imaging algorithms on multiple core CPUs** [7872-21]
R. Moore, 3M Co. (United States)

SESSION 7 SPEED VS. ACCURACY TRADE-OFF II

7872 0M **Evaluation of CPU and GPU architectures for spectral image analysis algorithms** [7872-22]
V. Fresse, Univ. de Lyon (France), CNRS, Lab. Hubert Curien (France), and Univ. de Saint-Etienne, Jean-Monnet (France); D. Houzet, GIPSA Lab. (France); C. Gravier, Univ. de Lyon (France), Univ. de Saint-Etienne, Jean-Monnet (France), and TELECOM Saint-Etienne (France)

7872 0N **Computational scalability of large size image dissemination** [7872-23]
R. Kooper, P. Bajcsy, Univ. of Illinois at Urbana-Champaign (United States)

SESSION 8 IMAGING APPLICATIONS

7872 0P **Real-time 3D flash lidar imaging through GPU data processing** [7872-25]
C. M. Wong, C. Bracikowski, B. K. Baldauf, S. A. Havstad, Northrop Grumman Aerospace Systems (United States)

7872 0Q **Advanced MRI reconstruction toolbox with accelerating on GPU** [7872-26]
X.-L. Wu, Y. Zhuo, Univ. of Illinois at Urbana-Champaign (United States); J. Gai, Beckman Institute, Univ. of Illinois at Urbana-Champaign (United States); F. Lam, M. Fu, J. P. Haldar, W.-M. Hwu, Z.-P. Liang, B. P. Sutton, Univ. of Illinois at Urbana-Champaign (United States)

7872 0R **Accelerating image recognition on mobile devices using GPGPU** [7872-27]
M. Bordallo López, Univ. of Oulu (Finland); H. Nykänen, Visidon Ltd. (Finland); J. Hannuksela, O. Silvén, Univ. of Oulu (Finland); M. Vehviläinen, Nokia Research Ctr. (Finland)

7872 0S **Multi-view stereo reconstruction via voxel clustering and optimization of parallel volumetric graph cuts** [7872-28]
Y.-F. Zhu, Y.-J. Zhang, Tsinghua Univ. (China)

7872 0T **A GPU accelerated PDF transparency engine** [7872-29]
J. Recker, I.-J. Lin, I. Tastl, Hewlett-Packard Labs. (United States)

INTERACTIVE PAPER SESSION

7872 0U **Infrared small target tracking based on SOPC** [7872-30]
T. Hu, Hefei Electronic Engineering Institute (China); X. Fan, Hefei Electronic Engineering Institute (China) and Science and Technology Univ. of China (China); Y.-J. Zhang, Tsinghua Univ. (China); Z. Cheng, B. Zhu, Hefei Electronic Engineering Institute (China)

Author Index

Conference Committee

Symposium Chair

Sabine E. Süsstrunk, École Polytechnique Fédérale de Lausanne
(Switzerland)

Symposium Cochair

Majid Rabbani, Eastman Kodak Company (United States)

Conference Chairs

John D. Owens, University of California, Davis (United States)
I-Jong Lin, Hewlett-Packard Laboratories (United States)
Yu-Jin Zhang, Tsinghua University (China)

Editor

Giordano B. Beretta, Hewlett-Packard Laboratories (United States)

Program Committee

Yen-Kuang Chen, Intel Corporation (United States)
Ngai-Man Cheung, Stanford University (United States)
Ajay Divakaran, Sarnoff Corporation (United States)
Mei Han, Google Inc. (United States)
Michael Houston, Advanced Micro Devices, Inc. (United States)
Wen-Mei Hwu, University of Illinois at Urbana-Champaign (United States)
Christopher R. Johnson, The University of Utah (United States)
Kurt W. Keutzer, University of California, Berkeley (United States)
Ron Kimmel, Technion-Israel Institute of Technology (Israel)
David P. Luebke, NVIDIA Corporation (United States)
Thomas Malzbender, Hewlett-Packard Laboratories (United States)
Marilyn C. Wolf, Georgia Institute of Technology (United States)
Robert A. Ulichney, Hewlett-Packard Laboratories (United States)

Session Chairs

- 1 **Parallel Imaging Systems**
Erwin Oertli, NVIDIA Corporation (United States)

- 2 From Image to Structure I
Robert A. Ulichney, Hewlett-Packard Laboratories (United States)
- 3 From Image to Structure II
Robert A. Ulichney, Hewlett-Packard Laboratories (United States)
- 4 From Structure to Image I
Yu-Jin Zhang, Tsinghua University (China)
- 5 From Structure to Image II
Ngai-Man Cheung, Stanford University (United States)
- 6 Speed vs. Accuracy Trade-off I
Bill Buzbee, Google Inc. (United States)
- 7 Speed vs. Accuracy Trade-off II
Bill Buzbee, Google Inc. (United States)
- 8 Imaging Applications
Mei Han, Google Inc. (United States)