

Computational Imaging VII

Charles A. Bouman
Eric L. Miller
Ilya Pollak
Editors

19–20 January 2009
San Jose, California, USA

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

Volume 7246

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 publishers are 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 *Computational Imaging VII*, edited by Charles A. Bouman, Eric L. Miller, Ilya Pollak, Proceedings of SPIE-IS&T Electronic Imaging, SPIE Vol. 7246, Article CID Number (2009).

ISSN 0277-786X

ISBN 9780819474964

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 © 2009, Society of Photo-Optical Instrumentation Engineers and The Society for Imaging Science and Technology.

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 the publishers 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/09/\$18.00.

Printed in the United States of America.

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 MICROSCOPY

- 7246 04 **Quantitative phase and amplitude imaging using Differential-Interference Contrast (DIC) microscopy** [7246-53]
C. Preza, The Univ. of Memphis (United States); J. A. O'Sullivan, Washington Univ. (United States)

SESSION 2 MEDICAL IMAGING

- 7246 07 **Smoothing fields of frames using conjugate norms on reproducing kernel Hilbert spaces** [7246-41]
H.-F. Chou, L. Younes, Johns Hopkins Univ. (United States)
- 7246 08 **A new method for FMRI activation detection** [7246-47]
J. Wei, T. M. Talavage, I. Pollak, Purdue Univ. (United States)
- 7246 0A **Bayesian multiresolution method for local X-ray tomography in dental radiology** [7246-40]
K. Niinimäki, Univ. of Kuopio (Finland); S. Siltanen, Tampere Univ. of Technology (Finland); V. Kolehmainen, Univ. of Kuopio (Finland)

SESSION 3 INVERSE METHODS

- 7246 0B **Fast space-varying convolution and its application in stray light reduction** [7246-31]
J. Wei, G. Cao, C. A. Bouman, J. Allebach, Purdue Univ. (United States)
- 7246 0C **Joint deconvolution and imaging** [7246-45]
H. S. Anderson, M. R. Gupta, Univ. of Washington (United States)

SESSION 4 SPARSE AND ADAPTIVE SIGNAL PROCESSING

- 7246 0D **Dictionaries for sparse representation and recovery of reflectances** [7246-35]
S. Linsel, M. Parmar, B. A. Wandell, Stanford Univ. (United States)
- 7246 0E **Dantzig selector homotopy with dynamic measurements** [7246-30]
M. S. Asif, J. Romberg, Georgia Institute of Technology (United States)
- 7246 0F **Sparsity regularization for image reconstruction with Poisson data** [7246-50]
D. J. Lingenfelter, J. A. Fessler, Z. He, Univ. of Michigan, Ann Arbor (United States)
- 7246 0G **Compressive coded aperture imaging** [7246-01]
R. F. Marcia, Z. T. Harmany, R. M. Willett, Duke Univ. (United States)

- 7246 OH **Multi-object segmentation using coupled nonparametric shape and relative pose priors** [7246-39]
M. G. Uzunbaş, O. Soldea, M. Çetin, G. Ünal, A. Erçil, Sabanci Univ. (Turkey); D. Unay, A. Ekin, Philips Research Europe (Netherlands); Z. Firat, Yeditepe Univ. Hospital (Turkey)

SESSION 5 SEGMENTATION

- 7246 OI **Sobolev gradients and joint variational image segmentation, denoising, and deblurring** [7246-16]
M. Jung, Univ. of California, Los Angeles (United States); G. Chung, Yale Univ. (United States); G. Sundaramoorthi, L. A. Vese, A. L. Yuille, Univ. of California, Los Angeles (United States)
- 7246 OJ **Resolving occlusion and segmentation errors in multiple video object tracking** [7246-37]
H.-Y. Cheng, National Central Univ. (Taiwan); J.-N. Hwang, Univ. of Washington (United States)

SESSION 6 INTERPOLATION AND INPAINTING

- 7246 OL **Iterative demosaicking accelerated: theory and fast noniterative implementations** [7246-03]
Y. M. Lu, M. Karzand, M. Vetterli, Swiss Federal Institute of Technology Lausanne, (Switzerland)
- 7246 OM **Resolution and interpolation of multichannel long wave infrared camera data** [7246-22]
A. D. Portnoy, D. J. Brady, Duke Univ. (United States)
- 7246 ON **Video inpainting algorithm using spatio-temporal consistency** [7246-11]
S.-H. Lee, S.-Y. Lee, J.-H. Heu, Seoul National Univ. (Korea, Republic of); C.-S. Kim, Korea Univ. (Korea, Republic of); S.-U. Lee, Seoul National Univ. (Korea, Republic of)

SESSION 7 MATHEMATICAL IMAGING

- 7246 OO **Effective curve registration using a novel solution method for overdetermined systems of polynomial equations** [7246-49]
J. Zhang, S. Huang, M. Boutin, Purdue Univ. (United States)
- 7246 OP **Image zooming with contour stencils** [7246-12]
P. Getreuer, Univ. of California, Los Angeles (United States)
- 7246 OQ **Aspects of 3D shape reconstruction** [7246-21]
P. F. Stiller, Texas A&M Univ. (United States); G. Arnold, M. Ferrara, Air Force Research Lab. (United States)

SESSION 8 STATISTICAL IMAGING

- 7246 OR **Wavelet-based Poisson rate estimation using the Skellam distribution** [7246-43]
K. Hirakawa, Harvard Univ. (United States); F. Baqai, Sony Electronics, Inc. (United States);
P. J. Wolfe, Harvard Univ. (United States)
- 7246 OS **Dictionary-based probability density function estimation for high-resolution SAR data**
[7246-44]
V. Krylov, Lomonosov Moscow State Univ. (Russian Federation) and EPI Ariana, INRIA Sophia
Antipolis Méditerranée (France); G. Moser, S. B. Serpico, Univ. of Genoa (Italy); J. Zerubia, EPI
Ariana, INRIA Sophia Antipolis Méditerranée (France)
- 7246 OT **Uncorrelated versus independent elliptically-contoured distributions for anomalous change
detection in hyperspectral imagery** [7246-36]
J. Theiler, C. Scovel, Los Alamos National Lab. (United States)
- 7246 OU **Photometry in UV astronomical images of extended sources in crowded field using
deblended images in optical visible bands as Bayesian priors** [7246-25]
D. Vibert, Lab. d'Astrophysique de Marseille, OAMP, Univ. Aix-Marseille, CNRS (France);
M. Zamojski, California Institute of Technology (United States); S. Conseil, A. Llebaria, Lab.
d'Astrophysique de Marseille, OAMP, Univ. Aix-Marseille, CNRS (France); S. Arnouts, Canada
France Hawaii Telescope (United States); B. Milliard, Lab. d'Astrophysique de Marseille,
OAMP, Univ. Aix-Marseille, CNRS (France); M. Guillaume, Institut Fresnel, Univ. Aix Marseille III
(France)
- 7246 OV **Image denoising using locally learned dictionaries** [7246-27]
P. Chatterjee, P. Milanfar, Univ. of California, Santa Cruz (United States)

SESSION 9 REGISTRATION

- 7246 OW **Image registration for multi-exposed HDR1 and motion deblurring** [7246-09]
S. Lee, H.-C. Wey, S.-D. Lee, Samsung Advanced Institute of Technology (Korea, Republic of)
- 7246 OX **Comparison of subpixel image registration algorithms** [7246-26]
R. R. Boye, C. L. Nelson, Sandia National Labs. (United States)

SESSION 10 IMAGE PROCESSING APPLICATIONS

- 7246 OY **Three-dimensional electronic unpacking of packed bags using 3-D CT images** [7246-19]
S. M. Song, TeleSecurity Sciences (United States); C. R. Crawford, Csuptwo, LLC (United
States); D. P. Boyd, TeleSecurity Sciences (United States)
- 7246 OZ **Personal dietary assessment using mobile devices** [7246-33]
A. Mariappan, M. Bosch, F. Zhu, C. J. Boushey, Purdue Univ. (United States); D. A. Kerr, Curtin
Institute of Technology (Australia); D. S. Ebert, E. J. Delp, Purdue Univ. (United States)

INTERACTIVE PAPER SESSION

- 7246 10 **Separation of limb and terminator on apparent contours of solar system small bodies** [7246-02]
A. Llebaria, L. Jorda, O. Groussin, LAM-OAMP, CNRS (France); G. Gesquiere, LSIS, CNRS (France); P. Lamy, LAM-OAMP, CNRS (France)
- 7246 12 **Automated image processing and fusion for remote sensing applications** [7246-17]
S. Zabuawala, H. Wei, C. Raju, UtopiaCompression Corp. (United States); N. Ray, Univ. of Alberta (Canada); J. Yadegar, UtopiaCompression Corp. (United States)
- 7246 13 **Support vector machine for automatic pain recognition** [7246-20]
M. M. Monwar, Univ. of Calgary (Canada); S. Rezaei, Univ. of Northern British Columbia (Canada)

Author Index

Conference Committee

Symposium Chair

Nitin Sampat, Rochester Institute of Technology (United States)

Symposium Cochair

Jan P. Allebach, Purdue University (United States)

Conference Chairs

Charles A. Bouman, Purdue University (United States)

Eric L. Miller, Tufts University (United States)

Ilya Pollak, Purdue University (United States)

Program Committee

Samit Basu, GE Global Research (United States)

Thomas S. Denney, Jr., Auburn University (United States)

Peter C. Doerschuk, Cornell University (United States)

Peyman Milanfar, University of California/Santa Cruz (United States)

Joseph A. O'Sullivan, Washington University in St. Louis (United States)

Zygmunt Pizlo, Purdue University (United States)

Stanley J. Reeves, Auburn University (United States)

Yongyi Yang, Illinois Institute of Technology (United States)

Session Chairs

- 1 Microscopy
 Eric L. Miller, Tufts University (United States)
- 2 Medical Imaging
 Jinyi Qi, University of California, Davis (United States)
- 3 Inverse methods
 Ilya Pollak, Purdue University (United States)
- 4 Sparse and Adaptive Signal Processing
 Justin K. Romberg, Georgia Institute of Technology (United States)
- 5 Segmentation
 Jeffrey P. Simmons, Air Force Research Laboratory (United States)

- 6 Interpolation and Inpainting
Patrick J. Wolfe, Harvard University (United States)
- 7 Mathematical Imaging
James Theiler, Los Alamos National Laboratory (United States)
- 8 Statistical Imaging
James Theiler, Los Alamos National Laboratory (United States)
- 9 Registration
Peyman Milanfar, University of California, Santa Cruz (United States)
- 10 Image Processing Applications
Mireille Boutin, Purdue University (United States)