## **PROCEEDINGS OF SPIE**

# Image Reconstruction from Incomplete Data V

Philip J. Bones Michael A. Fiddy Rick P. Millane Editors

11–12 August 2008 San Diego, California, USA

Sponsored and Published by SPIE

Volume 7076

Proceedings of SPIE, 0277-786X, v. 7076

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

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 *Image Reconstruction from Incomplete Data V*, edited by Philip J. Bones, Michael A. Fiddy, Rick P. Millane, Proceedings of SPIE Vol. 7076 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X ISBN 9780819472960

Published 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

Copyright © 2008, 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/08/\$18.00.

Printed in the United States of America.

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



SPIEDigitalLibrary.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 SAMPLING AND APERTURE CODING

- 7076 02 Spectral image estimation for coded aperture snapshot spectral imagers (Invited Paper) [7076-11]
   A. A. Wagadarikar, Duke Univ. (United States); N. P. Pitsianis, Duke Univ. (United States) and Aristotle Univ. (Greece); X. Sun, D. J. Brady, Duke Univ. (United States)
- 7076 03 **Exploiting image sparsity in parallel magnetic resonance imaging (pMRI)** [7076-20] B. Wu, R. P. Millane, R. Watts, P. J. Bones, Univ. of Canterbury (New Zealand)
- 7076 04 Spatio-temporal sampling for video [7076-12]
   M. Shankar, Duke Univ. (United States); N. P. Pitsianis, Duke Univ. (United States) and Aristotle Univ. (Greece); D. Brady, Duke Univ. (United States)

#### SESSION 2 TOMOGRAPHY AND INVERSE SCATTERING

- 7076 05 Multi-spectral intensity diffraction tomography [7076-10]
   M. A. Anastasio, Q. Xu, Illinois Institute of Technology (United States); D. Shi, Toshiba Medical Research Institute USA, Inc. (United States)
- 7076 06 Inversion of strongly scattered data: shape and permittivity recovery [7076-15] U. Shahid, M. A. Fiddy, Univ. of North Carolina, Charlotte (United States); M. E. Testorf, Dartmouth College (United States)
- Fvaluation of surrogate data quality in sinogram-based CT metal-artifact reduction
   [7076-04]
   M. Oehler, B. Kratz, T. Knopp, J. Müller, T. M. Buzug, Univ. of Luebeck (Germany)
- 7076 08 An EM-like optimization scheme for diffuse optical tomography [7076-05] C. Wang, M. Jiang, Peking Univ. (China)

#### SESSION 3 PHASE RETRIEVAL

- Advances in ptychographical coherent diffractive imaging [7076-06]
   A. Menzel, P. Thibault, Paul Scherrer Institut (Switzerland); M. Dierolf, Paul Scherrer Institut (Switzerland) and Ecole Polytechnique Fédérale de Lausanne (Switzerland); C. M. Kewish, O. Bunk, C. David, Paul Scherrer Institut (Switzerland); W. Leitenberger, Univ. Potsdam (Germany); F. Pfeiffer, Paul Scherrer Institut (Switzerland) and Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- 7076 0A Image reconstruction by phase retrieval with transverse translation diversity [7076-02] M. Guizar-Sicairos, J. R. Fienup, Institute of Optics, Univ. of Rochester (United States)

- 7076 OB Iterative projection algorithms for reconstructing compact binary images [7076-03] V. L. Lo, R. P. Millane, Univ. of Canterbury (New Zealand)
- 7076 OC **Experimental approaches to x-ray phase-retrieval for nano-resolution diffraction imaging** [7076-14] A. Y. Nikulin, Monash Univ. (Australia)

#### SESSION 4 IMAGING THROUGH TURBULENCE

- 7076 0D **Turbulence profiling for long range surveillance imaging** [7076-16] A. Lambert, D. Fraser, D. Bowman, S. Brandon, J. Davies, Univ. of New South Wales, Australian Defence Force Academy (Australia)
- 7076 OE **Superresolution in dewarped anisoplanatic images** [7076-01] M. Charnotskii, Zel Technologies, LLC (United States) and NOAA (United States)
- 7076 OF Self-tuning Kalman filter estimation of atmospheric warp [7076-13]
   M. Tahtali, A. Lambert, D. Fraser, Univ. of New South Wales, Australian Defence Force Academy (Australia)

#### SESSION 5 INVITED PRESENTATION

7076 0G Image reconstruction in electron microscopy (Invited Paper) [7076-21]
 Y. Zheng, S. Lee, Purdue Univ. (United States); P. C. Doerschuk, Cornell Univ. (United States) and Purdue Univ. (United States)

#### SESSION 6 MOTION COMPENSATION IN MRI

- 7076 OH Robust statistical extension to TRELLIS motion correction in MRI (Invited Paper) [7076-19] P. J. Bones, Univ. of Canterbury (New Zealand); J. R. Maclaren, Univ. Hospital Freiburg (Germany)
- 7076 0I Radial k-t FOCUSS using motion estimation and compensation [7076-17]
   H. Jung, Korea Advanced Institute of Science and Technology (South Korea); J. Yoo, Medison Co. (South Korea); J. C. Ye, Korea Advanced Institute of Science and Technology (South Korea)

#### SESSION 7 DECONVOLUTION AND SUPERRESOLUTION

- 7076 0J Wiener filtering of aliased imagery [7076-09] S. T. Thurman, J. R. Fienup, Institute of Optics, Univ. of Rochester (United States)
- 7076 OK Superresolution capabilities of 3D optical filters [7076-18] M. A. Fiddy, Univ. of North Carolina, Charlotte (United States); M. E. Testorf, Dartmouth College (United States)

- 7076 OL **Processing of the astronomical image data obtained from UWFC optical systems** [7076-08] M. Řeřábek, P. Páta, Czech Technical Univ. in Prague (Czech Republic); P. Koten, Astronomical Institute (Czech Republic)
- 7076 0MThe iterative detection network based suppression of the thermal noise and blurring due to<br/>object moving in black and white pictures shot by a camera with CCD/CMOS sensor<br/>[7076-07]<br/>D. Kekrt, M. Klíma, K. Fliegel, Czech Technical Univ. in Prague (Czech Republic)

Author Index

### **Conference Committee**

#### Program Track Chair

Khan M. Iftekharuddin, The University of Memphis (United States)

**Conference** Chairs

Philip J. Bones, University of Canterbury (New Zealand)
Michael A. Fiddy, The University of North Carolina at Charlotte (United States)
Rick P. Millane, University of Canterbury (New Zealand)

#### Program Committee

Mark A. Anastasio, Illinois Institute of Technology (United States)
David J. Brady, Duke University (United States)
Julian C. Christou, University of California, Santa Cruz (United States)
Peter C. Doerschuk, Cornell University (United States)
James R. Fienup, University of Rochester (United States)
Andrew J. Lambert, University of New South Wales/Australian Defence Force Academy (Australia)
Richard G. Lane, ARANZ Ltd. (New Zealand)
Marc Saillard, Université de Toulon et du Var (France)
Markus E. Testorf, Dartmouth College (United States)
Kevin J. Webb, Purdue University (United States)
Jong-Chul Ye, Korea Advanced Institute of Science and Technology (South Korea)

#### Session Chairs

- Sampling and Aperture Coding Michael A. Fiddy, The University of North Carolina at Charlotte (United States)
- 2 Tomography and Inverse Scattering Andrew J. Lambert, University of New South Wales/Australian Defence Force Academy (Australia)
- 3 Phase Retrieval **Peter C. Doerschuk**, Cornell University (United States)
- Imaging through Turbulence
   Mark A. Anastasio, Illinois Institute of Technology (United States)

- 5 Invited Presentation Rick P. Millane, University of Canterbury (New Zealand)
- 6 Motion Compensation in MRI **Rick P. Millane**, University of Canterbury (New Zealand)
- 7 Deconvolution and Superresolution **Philip J. Bones**, University of Canterbury (New Zealand)