

PROCEEDINGS OF SPIE

Optical Pattern Recognition XIX

David P. Casasent
Tien-Hsin Chao
Editors

17–18 March 2008
Orlando, Florida, USA

Sponsored and Published by
SPIE

Volume 6977

Proceedings of SPIE, 0277-786X, v. 6977

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 *Optical Pattern Recognition XIX*, edited by David P. Casasent, Tien-Hsin Chao, Proceedings of SPIE Vol. 6977 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X
ISBN 9780819471680

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 INVITED PAPERS I

- 6977 02 **Optical ID tags for automatic vehicle identification and authentication (Keynote Paper)** [6977-01]
B. Javidi, Univ. of Connecticut (USA); E. Pérez-Cabré, M. S. Millán, Univ. Politècnica de Catalunya (Spain)
- 6977 03 **Distortion-invariant kernel filters for general pattern recognition (Invited Paper)** [6977-02]
R. Patnaik, D. Casasent, Carnegie Mellon Univ. (USA)
- 6977 04 **Grayscale optical correlator for CAD/CAC applications (Invited Paper)** [6977-03]
T.-H. Chao, T. Lu, Jet Propulsion Lab. (USA)

SESSION 2 INVITED PAPERS II

- 6977 05 **Multiple target detection in video using quadratic multi-frame correlation filtering (Invited Paper)** [6977-04]
R. A. Kerekes, Oak Ridge National Lab. (USA); B. V. K. Vijaya Kumar, Carnegie Mellon Univ. (USA)
- 6977 06 **Dynamic range compression deconvolution for enhancement of automatic target recognition system performance (Invited Paper)** [6977-05]
B. Hajj-saeed, Solid State Scientific Corp. (USA); J. Khouri, Air Force Research Lab. (USA); W. D. Goodhue, Univ. of Massachusetts, Lowell (USA); C. L. Woods, Air Force Research Lab. (USA); J. Kierstead, Solid State Scientific Corp. (USA)
- 6977 07 **Mine detection in multispectral imagery data using constrained energy minimization (Invited Paper)** [6977-06]
M. I. Elbakary, M. S. Alam, Univ. of South Alabama (USA)

SESSION 3 PATTERN RECOGNITION CORRELATORS

- 6977 08 **M-ary pseudorandom phase masks for spatially efficient phase encoded reference JTC** [6977-07]
A. Alsamman, Univ. of New Orleans (USA)
- 6977 09 **Probability density function-based Fisher ratio applied to polarization-enhanced patterns** [6977-08]
A. El-Saba, M. S. Alam, H. Nalluri, Univ. of South Alabama (USA)

- 6977 0A **Pattern recognition using Gaussian-filtered, shifted phase-encoded fringe-adjusted joint transform correlation** [6977-09]
M. N. Islam, Old Dominion Univ. Research Foundation (USA); M. S. Alam, Univ. of South Alabama (USA); K. V. Asari, M. A. Karim, Old Dominion Univ. (USA)
- 6977 0C **LPCC invariant correlation filters: realization in 4-f holographic correlator** [6977-11]
N. N. Evtikhiev, S. N. Starikov, S. A. Sirotkin, R. S. Starikov, E. Yu. Zlokazov, Moscow Engineering Physics Institute (Russia)

SESSION 4 PATTERN RECOGNITION FILTERS AND APPLICATIONS

- 6977 0E **Space vehicle pose estimation via optical correlation and nonlinear estimation** [6977-13]
J. M. Rakoczy, K. A. Herren, NASA Marshall Space Flight Ctr. (USA)
- 6977 0F **Improved training for target detection using Fukunaga-Koontz transform and distance classifier correlation filter** [6977-14]
M. I. Elbakary, M. S. Alam, M. S. Aslan, Univ. of South Alabama (USA)
- 6977 0G **Multiscale beamlet transform application to airfield runway detection** [6977-15]
S. Sahli, Y. Sheng, Laval Univ. (Canada)
- 6977 0H **Land cover mapping after the tsunami event over Nanggroe Aceh Darussalam (NAD) province, Indonesia** [6977-16]
H. S. Lim, M. Z. MatJafri, K. Abdullah, A. N. Alias, N. Mohd. Saleh, C. J. Wong, Univ. Sains Malaysia (Malaysia); M. S. Surbakti, Syiah Kuala Univ. (Indonesia)

SESSION 5 IMAGE PROCESSING

- 6977 0I **Multifractal and directional wavelet analysis for accurate detection of precipitation events in weather radar images** [6977-17]
A. Alsamman, R. Dahale, D. Charalampidis, Univ. of New Orleans (USA)
- 6977 0J **Noise elimination methods in topological pattern recognition** [6977-18]
C. J. Hu, Univ. of Colorado at Boulder (USA)
- 6977 0L **Image watermarking extraction using Fourier domain Wiener filter** [6977-20]
P. Birch, M. Pavlidis, A. Panwar, O. Nnamadim, I. Kypraios, B. Mitra, R. Young, C. Chatwin, Univ. of Sussex (United Kingdom)
- 6977 0M **Computational sensing algorithms for image reconstruction and the detection of moving objects in multiplexed imaging systems** [6977-21]
R. Muise, A. Mahalanobis, Lockheed Martin Missiles and Fire Control (USA)

SESSION 6 TRACKING AND APPLICATIONS

- 6977 0N **Near real-time extraction of planar features from 3D flash-ladar video frames** [6977-22]
D. Venable, M. Uijt de Haag, Ohio Univ. Avionics Engineering Ctr. (USA)

- 6977 0P **Compact liquid crystal waveguide based Fourier transform spectrometer for in-situ and remote gas and chemical sensing** [6977-24]
T.-H. Chao, T. T. Lu, Jet Propulsion Lab. (USA); S. R. Davis, S. D. Rommel, G. Farca, B. Luey, A. Martin, M. H. Anderson, Vescnet Photonics, Inc. (USA)
- 6977 0Q **Predictive control and resource management of a distributed coastal monitoring sensor network** [6977-25]
A. Talukder, Jet Propulsion Lab./NASA (USA); A. Panangadan, CHLA/USC (USA)

POSTER SESSION: PATTERN RECOGNITION FILTERS AND APPLICATIONS

- 6977 0R **Using commercial photo camera's RAW-based images in optical-digital correlator for pattern recognition** [6977-26]
S. N. Starikov, M. V. Konnik, Moscow Engineering Physics Institute (Russia)

POSTER SESSION: IMAGE PROCESSING

- 6977 0S **High-spatial resolution land cover mapping using remotely sensed image** [6977-28]
H. S. Lim, Univ. Sains Malaysia (Malaysia); S. AlSultan, Qassim Univ. College of Agriculture (Saudi Arabia); M. Z. MatJafri, K. Abdullah, A. N. Alias, C. J. Wong, N. Mohd. Saleh, Univ. Sains Malaysia (Malaysia)
- 6977 0T **The cognitive structural approach for image restoration** [6977-29]
I. Mardare, V. Perju, Technical Univ. of Moldova (Moldova); D. Casasent, Carnegie Mellon Univ. (USA)
- 6977 0U **Face recognition on the basis of moment invariants, principal component analysis, and correlation** [6977-30]
V. Perju, Technical Univ. of Moldova (Moldova) and Free International Univ. of Moldova (Moldova); D. Casasent, Carnegie Mellon Univ. (USA); I. Mardare, A. Crivat, Technical Univ. of Moldova (Moldova)

Author Index

Conference Committee

Symposium Chair

Larry B. Stotts, Defense Advanced Research Projects Agency (USA)

Symposium Cochair

Ray O. Johnson, Lockheed Martin Corporation (USA)

Program Track Chair

Andrew R. Pirich, Air Force Research Laboratory (USA)

Conference Chairs

David P. Casasent, Carnegie Mellon University (USA)
Tien-Hsin Chao, Jet Propulsion Laboratory (USA)

Program Committee

Mohammad S. Alam, University of South Alabama (USA)
Don A. Gregory, The University of Alabama in Huntsville (USA)
Bahram Javidi, University of Connecticut (USA)
Richard D. Juday, NASA Johnson Space Center (USA)
Dennis R. Pape, AlphaLaunch (USA)
Yunlong Sheng, Laval University (Canada)
Joseph L. Stufflebeam, NewTec (USA)
Ashit Talukder, University of Southern California (USA)
B. V. K. Vijaya Kumar, Carnegie Mellon University (USA)
Rupert C. D. Young, University of Sussex (United Kingdom)

Session Chairs

- 1 Invited Papers I
David P. Casasent, Carnegie Mellon University (USA)
- 2 Invited Papers II
David P. Casasent, Carnegie Mellon University (USA)
- 3 Pattern Recognition Correlators
Tien-Hsin Chao, Jet Propulsion Laboratory (USA)

- 4 Pattern Recognition Filters and Applications
Mohammad S. Alam, University of South Alabama (USA)
- 5 Image Processing
Rupert C. D. Young, University of Sussex at Brighton (United Kingdom)
- 6 Tracking and Applications
Tien-Hsin Chao, Jet Propulsion Laboratory (USA)