

PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 8254

, "Front Matter: Volume 8254," Proc. SPIE 8254, Emerging Digital Micromirror Device Based Systems and Applications IV, 825401 (21 March 2012); doi: 10.1117/12.930988

SPIE.

Event: SPIE MOEMS-MEMS, 2012, San Francisco, California, United States

PROCEEDINGS OF SPIE

Emerging Digital Micromirror Device Based Systems and Applications IV

Michael R. Douglass
Patrick I. Oden
Editors

23–25 January 2012
San Francisco, California, United States

Sponsored by
SPIE

Cosponsored by
DLP Texas Instruments (United States)
Dyoptika (Ireland)
VUZIX Corporation (United States)

Published by
SPIE

Volume 8254

Proceedings of SPIE, 0277-786X, v. 8254

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 *Emerging Digital Micromirror Device Based Systems and Applications IV*, edited by Michael R. Douglass, Patrick I. Oden, Proceedings of SPIE Vol. 8254 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN 0277-786X
ISBN 9780819488978

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 © 2012, 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/12/\$18.00.

Printed in the United States of America.

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

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 as 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*
- ix *Powering the wireless world with MEMS (Plenary Paper) [8248-102]*
S. B. Schaevitz, Lilliputian Systems, Inc. (United States)
- xxv *New optical, acoustic, and electrical diagnostics for the developing world (Plenary Paper) [8251-103]*
S. L. Neale, C. Witte, Y. Bourquin, C. Kremer, A. Menachery, Y. Zhang, R. Wilson, J. Reboud, J. M. Cooper, Univ. of Glasgow (United Kingdom)

PICOPROJECTORS: SYSTEMS AND COMPONENTS: JOINT SESSION WITH CONFERENCE 8252

- 8254 02 **Network-based multisensor optical 3D acquisition of complex structures (Invited Paper)** [8254-01]
G. Frankowski, R. Hainich, GFMesstechnik GmbH (Germany)

BIOMEDICAL IMAGING AND CELL MANIPULATION USING A DIGITAL MICROMIRROR DEVICE II: JOINT SESSION WITH CONFERENCE 8225

- 8254 03 **Hyperspectral imaging in the operating room: what a surgeon wants (Invited Paper)** [8254-02]
S. L. Best, Univ. of Wisconsin School of Medicine and Public Health (United States)
- 8254 04 **Evaluation of a novel laparoscopic camera for characterization of renal ischemia in a porcine model using digital light processing (DLP) hyperspectral imaging (Invited Paper)** [8254-03]
E. O. Olweny, Y. K. Tan, S. Faddegon, N. Jackson, The Univ. of Texas Southwestern Medical Ctr. at Dallas (United States); E. F. Wehner, The Univ. of Texas at Arlington (United States); S. L. Best, S. K. Park, A. Thapa, J. A. Cadeddu, The Univ. of Texas Southwestern Medical Ctr. at Dallas (United States); K. J. Zuzak, The Univ. of Texas Southwestern Medical Ctr. at Dallas (United States), The Univ. of Texas at Arlington (United States), and Digital Light Innovations (United States)
- 8254 05 **Spatial frequency domain imaging (SFDI): a technology overview and validation of an LED-based clinic friendly device** [8254-04]
D. J. Cuccia, Modulated Imaging, Inc. (United States)

BIOMEDICAL IMAGING AND CELL MANIPULATION USING A DIGITAL MICROMIRROR DEVICE III: JOINT SESSION WITH CONFERENCE 8225

- 8254 07 **Digital-micromirror-device-based confocal 4D microscopy (Invited Paper)** [8254-06]
M. Schellenberg, M. Kloster, J. Napier, E. Peev, W. Neu, Univ. of Applied Sciences Emden/Leer (Germany)

- 8254 08 **A pico projector source for confocal fluorescence and ophthalmic imaging (Invited Paper)** [8254-07]
M. S. Muller, Aeon Imaging, LLC (United States)
- 8254 09 **Medical devices in dermatology using DLP technology from Texas Instruments** [8254-08]
M. Kock, F. Lüllau, Lüllau Engineering GmbH (Germany)
- 8254 0A **Implementation of an LED-based clinical spatial frequency domain imaging system** [8254-09]
A. Mazhar, S. A. Sharif, Beckman Laser Institute (United States); S. Saggese, Modulated Imaging, Inc. (United States); B. Choi, Beckman Laser Institute (United States); D. J. Cuccia, Modulated Imaging, Inc. (United States); A. J. Durkin, Beckman Laser Institute (United States)

HOLOGRAPHIC IMPLEMENTATION

- 8254 0B **Real time 3D holographic display** [8254-10]
L. Loreti, R. Ceccarelli, Opto-electronics s.r.l. (Italy); A. Loreti, A. Borro, RESI Group s.r.l. (Italy)
- 8254 0C **Suppression of the zero-order diffraction beam from computer-generated holograms produced by a DLP spatial light modulator** [8254-11]
S.-Y. Wu, J. Liang, M. F. Becker, The Univ. of Texas at Austin (United States)

RAPID PROTOTYPING

- 8254 0E **DLP-based light engines for additive manufacturing of ceramic parts** [8254-13]
M. Hatzenbichler, Technische Univ. Wien (Austria); M. Geppert, FOTEC Research and Technology Transfer GmbH (Austria); S. Gruber, Technische Univ. Wien (Austria); E. Ipp, IN-VISION Digital Imaging Optics GmbH (Austria); R. Almedal, Visitech AS (Norway); J. Stampfl, Technische Univ. Wien (Austria)

3D MEASUREMENT SYSTEMS USING STRUCTURED LIGHT

- 8254 0F **Measurement of human subjects using structured light** [8254-27]
M. W. Bellis, Seikowave (United States); D. L. Lau, Univ. of Kentucky (United States)
- 8254 0G **Face recognition via a projective compressive sensing system** [8254-15]
B. M. Kaylor, C. J. Keith, P. A. Roos, R. R. Reibel, Bridger Photonics, Inc. (United States)
- 8254 0H **High-speed 3D measurement system using DMD-based projector for industrial applications** [8254-16]
Y. Mori, K. Saito, K. Homma, Y. Ohnishi, D. Mitsumoto, M. Suwa, OMRON Corp. (Japan)
- 8254 0I **Volumetric 3D display using a DLP projection engine** [8254-17]
J. Geng, IEEE Intelligent Transportation Systems Society (United States)

ADVANCED DISPLAY

- 8254 0J **Considerations for DMDs operating in the infrared** [8254-18]
J. Rentz Dupuis, D. J. Mansur, OPTRA, Inc. (United States)
- 8254 0K **Full color high contrast front projection on black emissive display** [8254-19]
T. Sun, Sun Innovations Inc. (United States); G. Pettitt, N. T. Ho, K. Eckles, Texas Instruments Inc. (United States); B. Clifton, Planar Systems, Inc. (United States); B. Cheng, Sun Innovations Inc. (United States)

LASER BEAM SHAPING

- 8254 0L **Multimode fiber-based high-power laser distribution using DLP technology** [8254-20]
A. Morisset, E. Durbize, B. Chassagne, C. Pierre, A. Zoubir, S. Ermeneux, ALPhANOV (France)
- 8254 0M **Bandwidth-limited laser image projection using a DMD-based beam shaper** [8254-21]
J. Liang, S.-Y. Wu, R. N. Kohn, Jr., M. F. Becker, D. J. Heinzen, The Univ. of Texas at Austin (United States)
- 8254 0N **Application of DMD: laser speckle control for rough surface photofabrication** [8254-22]
V. Brissonneau, Thales Optronique S.A. (France) and Institut Matériaux Microélectronique Nanosciences de Provence, Aix Marseille Univ. (France); L. Escoubas, Institut Matériaux Microélectronique Nanosciences de Provence, Aix Marseille Univ. (France); F. Flory, Institut Matériaux Microélectronique Nanosciences de Provence, Ecole Centrale Marseille (France); G. Berginc, Thales Optronique S.A. (France)

DYNAMIC SPECTRAL IMAGING AND ATTENUATION

- 8254 0O **Study of an NIR digital micromirror device-based snapshot spectral imaging system** [8254-23]
Y. Wu, I. O. Mirza, G. R. Arce, D. W. Prather, Univ. of Delaware (United States)
- 8254 0P **Flat spectral response all-digital broadband variable fiber optic attenuator** [8254-24]
M. Sheikh, Lahore Univ. of Management Sciences (Pakistan)
- 8254 0Q **Demonstrator of a multi-object spectrograph based on the 2048x1080 DMD** [8254-25]
F. Zamkotsian, Lab. d'Astrophysique de Marseille, CNRS, Observatoire Astronomique de Marseille-Provence (France); P. Spano, INAF - Osservatorio Astronomico di Brera (Italy); W. Bon, P. Lanzoni, Lab. d'Astrophysique de Marseille, CNRS, Observatoire Astronomique de Marseille-Provence (France)
- 8254 0R **Hyperspectral image projector applications** [8254-26]
J. P. Rice, S. W. Brown, D. W. Allen, H. W. Yoon, M. Litorja, J. C. Hwang, National Institute of Standards and Technology (United States)

Author Index

Conference Committee

Symposium Chair

Harald Schenk, Fraunhofer Institute for Photonic Microsystems
(Germany)

Symposium Cochair

David L. Dickensheets, Montana State University (United States)

Conference Chairs

Michael R. Douglass, Texas Instruments Inc. (United States)
Patrick I. Oden, Texas Instruments Inc. (United States)

Program Committee

Michael F. Becker, The University of Texas at Austin (United States)
Jonathan T. Fong, Texas Instruments Inc. (United States)
Roland Höfling, ViALUX GmbH (Germany)
Alfred Jacobsen, Visitech AS (Germany)
Paul Rancuret, Texas Instruments Inc. (United States)
Joseph P. Rice, National Institute of Standards and Technology (United States)
Karel J. Zuzak, Digital Light Innovations (United States)

Session Chairs

- 1 Biomedical Imaging and Cell Manipulation Using a Digital Micromirror Device I: Joint Session with Conference 8225
Calum E. MacAulay, The BC Cancer Agency Research Centre (Canada)
Michael R. Douglass, Texas Instruments Inc. (United States)
- 2 Picoprojectors: Systems and Components: Joint Session with Conference 8252
Paul Rancuret, Texas Instruments Inc. (United States)
Yong-Hwa Park, Samsung Advanced Institute of Technology (Korea, Republic of)
- 3 Biomedical Imaging and Cell Manipulation Using a Digital Micromirror Device II: Joint Session with Conference 8225
Karel J. Zuzak, Digital Light Innovations (United States)
James F. Leary, Purdue University (United States)

- 4 Biomedical Imaging and Cell Manipulation Using a Digital Micromirror Device III: Joint Session with Conference 8225
Michael R. Douglass, Texas Instruments Inc. (United States)
James F. Leary, Purdue University (United States)
- 5 Holographic Implementation
Patrick I. Oden, Texas Instruments Inc. (United States)
Alfred Jacobsen, Visitech AS (Germany)
- 6 Rapid Prototyping
Patrick I. Oden, Texas Instruments Inc. (United States)
Alfred Jacobsen, Visitech AS (Germany)
- 7 3D Measurement Systems Using Structured Light
Paul Rancuret, Texas Instruments Inc. (United States)
Joseph P. Rice, National Institute of Standards and Technology (United States)
- 8 Advanced Display
Roland Höfling, ViALUX GmbH (Germany)
Michael F. Becker, The University of Texas at Austin (United States)
- 9 Laser Beam Shaping
Michael F. Becker, The University of Texas at Austin (United States)
Roland Höfling, ViALUX GmbH (Germany)
- 10 Dynamic Spectral Imaging and Attenuation
Karel J. Zuzak, Digital Light Innovations (United States)
Joseph P. Rice, National Institute of Standards and Technology (United States)