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PROCEEDINGS

IS&T International Symposium on

Electronic Imaging

SCIENCE AND TECHNOLOGY

14–18 February 2016 • San Francisco, CA, USA

Digital Photography and Mobile Imaging XII

Editors: **Jackson Roland,** Imatest LLC (USA); **Radka Tezaur,** Nikon Research Corp. of America (USA); and **Dietmar Wueller,** Image Engineering GmbH & Co. KG (Germany)

These papers represent the program of Electronic Imaging 2016,
held February 14-18, 2016, at the Hilton San Francisco, Union Square in San Francisco, CA.

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Digital Photography and Mobile Imaging XII

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Nitin Sampat, Rochester Institute of Technology (USA)

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Digital Photography and Mobile Imaging XII

Conference Chairs
Jackson Roland, Imatest LLC (USA)
Radka Tezaur, Intel Corporation (USA)
Dietmar Wueller, Image Engineering GmbH & Co. KG (Germany)

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Michael Wang, Intel Corporation (USA)
Zhan Yu, University of Delaware (USA)

Monday, February 15, 2016

DPMI/IQSP: Mobile and Digital Camera Image Quality Evaluation

Joint Session

Session Chairs: Joyce Farrell, Stanford University (USA) and Elaine Jin, Intel Corporation (USA)

10:40 am – 12:30 pm
Golden Gate 6/7

This session is jointly sponsored by: Digital Photography and Mobile Imaging XII and Image Quality and System Performance XIII.

10:40
Conference Opening Remarks

10:50 DPMI-004
Image stabilization performance – existing standards and the challenges for mobile imaging, *Uwe Artmann and Philipp Feldker, Image Engineering GmbH & Co. KG (Germany)*

11:10 DPMI-005
Image flare measurement according to ISO 18844, *Dietmar Wueller, Image Engineering GmbH & Co. KG (Germany)*

11:30 DPMI-006
MTF measurements of wide field of view cameras, *Vlad Cardei, Boyd Fowler, Sam Kavusi, and Jonathan Phillips, Google Inc. (USA)*

11:50 DPMI-007
Method for quantifying image sensor susceptibility to chromatic flare artifacts, *Orit Skorka, Dave Jasinski, Radu Ispasoiu, and Vladi Koborov, ON Semiconductor (USA)*

12:10 DPMI-008
Which factor is more important in obtaining good capture characterization, and, consequently, render higher color accuracy: The characterization of the camera's sensor, or the characterization of illuminant?, *Nitin Sampat and Stephen Viggiano, Rochester Institute of Technology (USA)*

12:30 – 2:00 pm Lunch Break

EI 2016 Opening Plenary and Symposium Awards
Session Chair: Choon-Woo Kim (Inha University)
2:00 – 3:00 PM
Continental Ballroom 5

Illuminating a bright future for medicine, *Audrey K. Bowden, Stanford University (USA)*

3:00 – 3:30 pm Coffee Break

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DPMI/IQSP: Image Capture I Joint Session

Session Chairs: Susan Farnand, Rochester Institute of Technology (USA) and Dietmar Wueller, Image Engineering GmbH & Co. KG (Germany)

3:30 – 5:00 pm
Golden Gate 6/7

This session is jointly sponsored by: Digital Photography and Mobile Imaging XII and Image Quality and System Performance XIII.

3:30 IQSP-009
Adaptive geometric calibration correction for camera array, *Florian Ciurea, Dan Lelescu, and Priyam Chatterjee, Pelican Imaging (USA)*

4:00 IQSP-010
A filter design approach for consistent image quality, *Ahmed Eid, Michael Phelps, and Brian Cooper, Lexmark International (USA)*

4:20 IQSP-011
Linearization and normalization in spatial frequency response measurement, *Uwe Artmann, Image Engineering GmbH & Co. KG (Germany)*

4:40 IQSP-012
Optimized tone curve for in-camera image processing, *Praveen Cyriac, David Kane, and Marcelo Bertalmio, Universitat Pompeu Fabra (Spain)*

5:00 – 6:00 pm EI 2016 Symposium Reception

Tuesday, February 16, 2016

DPMI/IPAS: Image Filtering and Denoising Joint Session

Session Chairs: Karen Egiazarian, Tampere University of Technology (Finland) and Zhen He, Intel Corporation (USA)

8:50 – 10:10 am
Golden Gate 6/7

This session is jointly sponsored by: Digital Photography and Mobile Imaging XII and Image Processing: Algorithms and Systems XIV.

8:50 IPAS-013
Intelligent image filtering using multilayer neural network with multi-valued neurons, *Igor Aizenberg, Texas A&M University-Texarkana (USA)*

9:10 IPAS-014
Robust extensions to guided image filtering, *Oleg Michailovich, University of Waterloo (Canada)*

9:30 DPMI-015
Local denoising applied to RAW images may outperform non-local patch-based methods applied to the camera output, *Gabriela Ghimpeteanu[1], Thomas Batard[1], Tamara Seybold[2], and Marcelo Bertalmio[1]; [1]University Pompeu Fabra (Spain) and [2]ARRI Arnold & Richter Cine Technik GmbH & Co. Betriebs KG (Germany)*

9:50 DPMI-016
Use of flawed and ideal image pairs to drive filter creation by genetic programming, *Subash Sridhar, Henry Dietz, and Paul Eberhart, University of Kentucky (USA)*

10:10 – 10:50 am Coffee Break

DPMI/IPAS: Color Filter Array Interpolation and Superresolution Joint Session

Session Chairs: Ajit Bopardikar, Samsung R&D Institute India - Bangalore (India) and Atanas Gotchev, Tampere University of Technology (Finland)

10:50 am – 12:30 pm
Golden Gate 6/7

This session is jointly sponsored by: Digital Photography and Mobile Imaging XII and Image Processing: Algorithms and Systems XIV.

10:50 IPAS-024
Optimal transparent wavelength and arrangement for multispectral filter array, *Yudai Yanagi[1], Kazuma Shinoda[1], Madoka Hasegawa[1], Shigeo Kato[1], Masahiro Ishikawa[2], Hideki Komagata[2], and Naoki Kobayashi[2]; [1]Utsunomiya University and [2]Saitama Medical University (Japan)*

11:10 DPMI-025
Multi-spectrum to RGB with direct structure-tensor reconstruction, *Takashi Shibata[1,2], Masayuki Tanaka[1], and Masatoshi Okutomi[1]; [1]Tokyo Institute of Technology and [2]NEC Corporation (Japan)*

11:30 IPAS-026
Edge-directional interpolation algorithm using structure tensor, *Andrey Nasonov[1], Andrey Krylov[1], Xenya Petrova[2], and Michael Rychagov[2]; [1]Lomonosov Moscow State University and [2]Samsung R&D Institute Rus (Russian Federation)*

11:50 IPAS-027
Fast edge-directed single-image super-resolution, *Mushfiqur Rouf[1], Dikpal Reddy[2], Kari Pulli[2], and Rabab Ward[3]; [1]University of British Columbia (Canada) and [2]Light Co (USA)*

12:10 DPMI-028
Light-weight single image super-resolution via pattern-wise regression function, *Kohei Kurihara[1], Yoshitaka Toyoda[1], Shotaro Moriya[2], Daisuke Suzuki[1], Takeo Fujita[1], Narihiro Matoba[1], Jay Thornton[3], and Fatih Porikli[4]; [1]Mitsubishi Electric Corporation, Advanced Technology R&D Center, (Japan), [2]Mitsubishi Electric Corporation, Kamakura Factory (Japan), [3]Mitsubishi Electric Research Laboratories (MERL) (USA), and [4]Australian National University (Australia)*

12:30 – 2:00 pm Lunch Break

EI 2016 Tuesday Plenary and Symposium Awards
Session Chair: Nitin Sampat (Rochester Institute of Technology)
2:00 – 3:00 PM
Continental Ballroom 5

Pushing computational photography deeper into imaging system design, *Ren Ng, University of California, Berkeley (USA)*

3:00 – 3:30 pm Coffee Break

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High Dynamic Range Imaging

Session Chair: Thomas Vogelsang, Rambus Inc. (USA)

3:30 – 4:30 pm
Golden Gate 6/7

3:30 DPMI-245
High quality video in high dynamic range scenes from interlaced dual-ISO footage, *Raquel Gil Rodríguez and Marcelo Bertalmio, Universitat Pompeu Fabra (Spain)*

3:50 DPMI-246
FPGA-based implementation of estimating saturated pixel values in RAW image, *Jun Fu, Yungang Wu, Xuanqin Mou, Wenbo Ji, and Ping Wang, Xi'an Jiaotong University (China)*

4:10 DPMI-247
Novel approach to detect HDR scenes and determine suitable frames for image fusion, *Sphurti Bhoskar, Nanyang Technological University (Singapore) and Ramakrishna Kakarala, Picartio, Inc. (USA)*

Image Signal Processing Pipeline

Session Chair: Jon McElvain, Dolby Laboratories (USA)

4:30 – 5:10 pm
Golden Gate 6/7

4:30 DPMI-248
Local linear approximation for camera image processing pipelines, *Haomiao Jiang, Qiyuan Tian, Joyce Farrell, and Brian Wandell, Stanford University (USA)*

4:50 DPMI-249
A novel adaptive shading correction algorithm for camera systems, *Varuna De Silva, Viacheslav Chesnokov, and Daniel Larkin, Apical Ltd (United Kingdom)*

EI 2016 Symposium Demonstration Session and Exhibit Hall Happy Hour
5:30 – 7:00 PM
Continental Ballroom Foyer

Wednesday, February 17, 2016

DPMI XII Keynote
Session Chair: Francisco Imai, Canon U.S.A. Inc. (USA)
9:30 – 10:10 am
Golden Gate 6/7

DPMI-250
Photo editing on mobile devices, *Sylvain Paris, Adobe (USA)*

10:10 – 10:50 am Coffee Break

DPMI/IPAS/VIPC: Blur Removal and Synthesis Joint Session

Session Chair: Radka Tezaur, Nikon Research Corp. of America (USA)

10:50 am – 12:10 pm
Golden Gate 6/7

This session is jointly sponsored by: Digital Photography and Mobile Imaging XII, Image Processing: Algorithms and Systems XIV, and Visual Information Processing and Communication VII.

10:50 DPMI-030
Multi-image sparse motion-invariant photography, *Bart Kofoed[1,2], Peter de With[1], and Eric Janssen[2]; [1]Eindhoven University of Technology and [2]Prodrive Technologies (Netherlands)*

11:10 DPMI-031
Virtual DSLR: High quality dynamic depth-of-field synthesis on mobile platforms, *Yang Yang[1], Haiting Lin[1], Zhan Yu[2], Sylvain Paris[2], and Jingyi Yu[1]; [1]University of Delaware and [2]Adobe (USA)*

11:50 VIPC-033
Motion deblurring for depth-varying scenes, *Ruiwen Zhen and Robert Stevenson, University of Notre Dame (USA)*

12:10 – 2:00 pm Lunch Break

EI 2016 Wednesday Plenary and Symposium Awards
Session Chair: Choon-Woo Kim (Inha University)
2:00 – 3:00 PM
Continental Ballroom 5

Intel® RealSense Technology: Adding human-like sensing and interactions to computing devices, *Achin Bhowmik, Intel Corporation (USA)*

3:00 – 3:30 pm Coffee Break

Optics and Optical Modeling

Session Chair: Michael Kriss, MAK Consultants (USA)

3:30 – 4:10 pm
Golden Gate 6/7

3:30 DPMI-251
Gapless dual-layered diffractive optical element and optical design of imaging lens that incorporates it, *Hiroto Yasui, Canon Inc. (Japan)*

3:50 DPMI-252
A three parameter underwater image formation model, *Henryk Blasinski and Joyce Farrell, Stanford University (USA)*

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Digital Photography and Mobile Imaging XII Interactive Papers Oral Previews

Session Chair: Kevin Matherson, Microsoft Corporation (USA)

4:10 – 4:50 pm
Golden Gate 6/7

In this session interactive poster authors will each provide a brief oral preview of their poster presentation, which will be presented fully in the Digital Photography and Mobile Imaging XII Interactive Papers Session at 5:30 pm on Wednesday.

4:10 DPMI-253
Focus assist for 4K camera, *Seiichi Gohshi, Kogakuin University (Japan)*

4:15 DPMI-254
Using disparity information for stereo autofocus in 3-D photography, *Shao-Kang Huang, Cheng-Chieh Yang, Kuang-Tsu Shih, and Homer H. Chen, National Taiwan University (Taiwan)*

4:20 DPMI-255
Fast JPEG rate control, *Sergey Zavalishin, Valery Anisimovskiy, and Ilya Kurilin, Samsung R&D Institute Russia (Russian Federation)*

4:25 DPMI-256
Single-sensor RGB and NIR image acquisition: Toward optimal performance by taking account of CFA pattern, demosaicking, and color correction, *Hayato Teranaka, Yusuke Monno, Masayuki Tanaka, and Masatoshi Okutomi, Tokyo Institute of Technology (Japan)*

4:30 DPMI-257
A reduced-reference image quality assessment model based on joint-distribution of neighboring LOG signals, *Congmin Chen and Xuanqin Mou, Institute of Image Processing & Pattern Recognition (China)*

4:35 DPMI-258
Several parameters that affect the spatial frequency response of camera phones to the dead leaves target, *Nitin Suresh[1,2] and Quanzeng Wang[1]; [1]US FDA and [2]University of Maryland (USA)*

4:40 DPMI-259
Scene appearance change as framerate approaches infinity, *Henry Dietz, Zachary Snyder, John Fike, and Pablo Quevedo, University of Kentucky (USA)*

4:45
DPMI Conference Closing Remarks

EI 2016 Symposium Interactive Papers Session
5:30 – 7:00 PM
Continental Ballroom 6

Digital Photography and Mobile Imaging XII Interactive Papers Session

5:30 – 7:00 pm
Continental Ballroom 6

The DPMI interactive papers will be presented in the EI 2016 Symposium Interactive Papers Session.