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PROCEEDINGS

IS&T International Symposium on

Electronic Imaging

SCIENCE AND TECHNOLOGY

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

Image Quality and System Performance XIII

Editors: **Robin Jenkin,** ON Semiconductor (United States);
Mohamed-Chaker Larabi, University of Poitiers (France)

These papers represent the program of Electronic Imaging 2016,
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Image Quality and System Performance XIII

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Introduction

We live in a visual world. The perceived quality of images is of crucial importance in industrial, medical, and entertainment environments. Developments in camera sensors, image processing, 3D imaging, display technology, and digital printing are enabling new or enhanced possibilities for creating and conveying visual content that informs or entertains. Wireless networks and mobile devices expand the ways to share imagery. The power of imaging rests directly on the visual quality of the images and the systems that produce them. As images are generally intended to be viewed by humans, consideration of the role of visual perception is intrinsic to the effective assessment of image quality.

IQSP brings together engineers and scientists from industry and academia, who strive to understand what constitutes a high-quality image and how to assess the requirements and performance of modern imaging systems. It focuses on both objective and subjective methods for evaluating the perceptual quality of images, and includes applications throughout the imaging chain from image capture, through processing, to output, printed or displayed, video or still, 2D or 3D.

The thirteenth year of Image Quality and System Performance has brought together a rich program including two keynote speakers: Dr. Andrew B. Watson (NASA Ames Research Center, USA) and Dr. Zhou Wang (Univ. of Waterloo, Canada), five invited papers in addition to two joint sessions with Digital Photography and Mobile Imaging.

Technical sessions focus on topics including image capture, system performance, objective quality assessment, psychophysics, perception and comfort.

Chaker Larabi and Robin Jenkin

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Image Quality and System Performance XIII

Monday, February 15, 2016

Mobile Quality

Session Chair: Jonathan Phillips, Google Inc. (USA)

8:40 – 10:20 am
Golden Gate 5

8:40
IQSP Conference Opening Remarks

8:50 IQSP-201
Development of a perceptually calibrated objective metric for exposure, *Zhen He, Elaine Jin, and Yongshen Ni, Intel Corporation (USA)*

9:10 IQSP-202
A methodology for perceptual image quality assessment of smartphone cameras, *Susan Farnand[1], Young Jang[2], Chuck Han[2], and Hau Hwang[2]; [1]Rochester Institute of Technology and [2]Qualcomm Technologies, Inc. (USA)*

9:30 IQSP-203
Correlation of photo-response blooming metrics with image quality in CMOS image sensors, *Pulla Reddy Ailuri, Orit Skorka, Ning Li, Radu Ispasoiu, and Vladi Koborov, ON Semiconductor (USA)*

9:50 IQSP-204
IEEE standard for mobile device image quality, *Margaret Belska, NVIDIA (USA)*

10:20 – 10:40 am Coffee Break

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, *Boyd Fowler, Vlad Cardei, and Sam Kavusi, 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

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

Keynote: Objective Quality Assessment
Session Chair: Robin Jenkin, ON Semiconductor (USA)
8:50 – 9:40 am
Golden Gate 5

IQSP-205
Objective image quality assessment: Facing the real-world challenges, *Zhou Wang, University of Waterloo (Canada)*

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Objective Quality Assessment

Session Chair: Nicolas Bonnier, Apple Inc. (USA)

9:40 – 10:20 am
Golden Gate 5

9:40 IQSP-206
Applicability of existing objective metrics of perceptual quality for adaptive video streaming, *Jacob Søgaard[1], Lukáš Krasula[2,3], Muhammad Shahid[4], Dogancan Temel[5], Kjell Brunnstrom[6,7], and Manzoor Razaak[8]; [1]Technical University of Denmark (Denmark), [2]Czech Technical University (Czech Republic), [3]Université de Nantes (France), [4]Blekinge Tekniska Högskola (Sweden), [5]Georgia Institute of Technology (USA), [6]Acreo, Swedish ICT (Sweden), [7]Mid Sweden University (Sweden), and [8]Kingston University London (United Kingdom)*

10:00 IQSP-207
Local defect detection and print quality assessment, *Jianyu Wang[1], Terry Nelson[2], Renee Jessome[2], Steve Astling[2], Eric Maggard[2], Mark Shaw[2], and Jan Allebach[1]; [1]Purdue University and [2]Hewlett-Packard Company (USA)*

10:20 – 10:40 am Coffee Break

3D Comfort and Quality

Session Chair: Jukka Häkkinen, University of Helsinki (Finland)

10:40 am – 12:30 pm
Golden Gate 5

10:40 IQSP-208
System performance of light-field 3D displays, *Péter Kovács[1], Robert Bregovic[2], and Atanas Gotchev[2]; [1]Holografika Ltd. (Hungary) and [2]Tampere University of Technology (Finland)*

11:10 IQSP-209
Improving visual discomfort prediction for stereoscopic images via disparity-based contrast (JIST-first), *Werner Zellinger and Bernhard Moser, Software Competence Center Hagenberg (Austria)*

11:30 IQSP-210
The disparity cue and blur on the relative visual comfort of stereoscopic contents (JIST-first), *Yaohua Xie[1], Fang Sun[2], Danli Wang[1], and Heng Qiao[3]; [1]Chinese Academy of Sciences, [2]Liaoning Normal University, and [3]Central University of Finance and Economics (China)*

11:50 IQSP-211
Using binocular and monocular properties for the construction of a quality assessment metric for stereoscopic images, *Iana Iatsun, Chaker Larabi, and Christine Fernandez Maloigne, Université de Poitiers (France)*

12:10 IQSP-212
An adaptive contrast enhancement method for stereo endoscopic images combining binocular just noticeable difference model and depth information, *Bilel Sdiri[1,2], Azeddine Beghdadi[1], Faouzi Alaya Cheikh[2], and Ole Jakob Elle[3]; [1]Université Paris 13 (France), [2]Gjøvik University College, and [3]Oslo University Hospital (Norway)*

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

Image Capture II

Session Chair: Frans Gaykema, Océ Technologies (Netherlands)

3:30 – 4:40 pm
Golden Gate 5

3:30 IQSP-213
Imaging applications of noise equivalent quanta, *Brian Keelan, ON Semiconductor (USA)*

4:00 IQSP-214
Effects on Fourier peaks used for periodic pattern detection, *Chun-Jung Tai[1], Robert Ulichney[2], and Jan Allebach[1]; [1]Purdue University and [2]HP Lab (USA)*

4:20 IQSP-215
Mixing and matching sensor format with lens coverage, *Henry Dietz, University of Kentucky (USA)*

Panel on Image Quality and System Performance
Panel Moderators: Robin Jenkin, ON Semiconductor (USA); Chaker Larabi, Université de Poitiers (France); and Sophie Triantaphillidou, University of Westminster (United Kingdom)
4:40 – 5:30 pm
Golden Gate 5

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

Wednesday, February 17, 2016

IQSP/HVEI: Keynote: Perception and Quality Joint Session

Session Chair: Chaker Larabi, Université de Poitiers (France)

8:50 – 9:40 am
Continental Ballroom 4

This session is jointly sponsored by: Image Quality and System Performance XIII, and Human Vision and Electronic Imaging (HVEI) 2016.

8:50 IQSP-029
Up Periscope! Designing a new perceptual metric for imaging system performance, *Andrew Watson, NASA Ames Research Center (USA)*

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Perception and Quality

Session Chair: Göte Nyman, University of Helsinki (Finland)

9:40 – 10:30 am
Golden Gate 5

9:40 IQSP-216
How saccadic models help predict where we look during a visual task? Application to visual quality assessment, *Olivier Le Meur[1] and Antoine Coutrot[2]; [1]University of Rennes 1 (France) and [2]University College London (United Kingdom)*

10:10 IQSP-217
An audiovisual saliency model for conferencing and conversation videos, *Naty Sidaty, Chaker Larabi, and Abdelhakim Saadane, Université de Poitiers (France)*

10:30 – 10:50 am Coffee Break

Image Capture III

Session Chair: Luke Cui, Microsoft Co. (USA)

10:50 – 11:30 am
Golden Gate 5

10:50 IQSP-218
Color correction meets blind validation for image capture: Are we teaching to the test?, *Don Williams[1] and Peter Burns[2]; [1]Image Science Associates and [2]Burns Digital Imaging (USA)*

11:10 IQSP-219
Effect of capture illumination on preferred white point for camera automatic white balance, *Ben Bodner, Yixuan Wang, and Susan Farnand, Rochester Institute of Technology (USA)*

11:30 – 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

Psychophysics, Quality, and Perception

Session Chair: Peter Burns, Burns Digital Imaging (USA)

3:30 – 5:20 pm
Golden Gate 5

3:30 IQSP-220
The influence of lightness, and the 'crispening' effect on the perceived contrast of textured images, *David Kane and Marcelo Bertalmio, Universitat Pompeu Fabra (Spain)*

3:50 IQSP-221
Study on perceptible and acceptable ranges for color gamut of transparent displays, *Suhyun Kwon, Sunhee Park, and Jaehong Kim, LG Display Co., Ltd. (South Korea)*

4:10 IQSP-222
Statistical study on perceived JPEG image quality via MCL-JCI dataset construction and analysis, *Haiqiang Wang, University of Southern California (USA)*

4:30 IQSP-223
Perceptual picture quality analysis of UHD signals in terms of spatial information and noises, *Chulhee Lee, Sangwook Baek, Sungwook Youn, Seongyoun Woo, and Jeongyeol Baek, Yonsei University (South Korea)*

4:50 IQSP-224
Visual assessment of HDR video, *Vittorio Baroncini[1], Massimiliano Agostinelli[2], Federica Mangiatordi[1], and Emiliano Pallotti[1]; [1]Fondazione Ugo Bordoni and [2]Tretag s.r.l. (Italy)*

5:10
IQSP Conference Closing Remarks

Image Quality and System Performance XIII Interactive Papers Session

5:30 – 7:00 pm
Continental Ballroom 6

The following works will be presented at the EI 2016 Symposium Interactive Papers Session.

IQSP-225
Noise-free rule-based fuzzy image enhancement, *Mehdi Roopaei, Sos Agaian, Mehdi Shadaram, and Morad Khosravi Eghbal, University of Texas at San Antonio (USA)*

IQSP-226
Large-scale image processing using Amazon EC2 spot instances, *Youngsol Koh and Yung-Hsiang Lu, Purdue University (USA)*

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