

Image Quality and System Performance IV

Luke C. Cui
Yoichi Miyake
Chairs/Editors

30 January–1 February 2007
San Jose, California, USA

Sponsored by
IS&T—The Society for Imaging Science and Technology
SPIE—The International Society for Optical Engineering

SPIE Vol. 6494

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 publishers are 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 Quality and System Performance IV*, edited by Luke C. Cui, Yoichi Miyake, Proceedings of SPIE-IS&T Electronic Imaging, SPIE Vol. 6494, Article CID Number (2007).

ISSN 0277-786X
ISBN 9780819466075

Copublished by

SPIE—The International Society for Optical Engineering

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone 1 360/676-3290 (Pacific Time) · Fax 1 360/647-1445

<http://www.spie.org>

and

IS&T—The Society for Imaging Science and Technology

7003 Kilworth Lane, Springfield, Virginia, 22151 USA

Telephone 1 703/642-9090 (Eastern Time) · Fax 1 703/642-9094

<http://www.imaging.org>

Copyright © 2007, The Society of Photo-Optical Instrumentation Engineers and The Society for Imaging Science and Technology.

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 and IS&T subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$15.00 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 <http://www.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/07/\$15.00.

Printed in the United States of America.

Contents

vii *Conference Committee*

SESSION 1 SYSTEM MEASUREMENT AND MODELING: SUBJECTIVE

- 649402 **Measuring user experience in digital gaming: theoretical and methodological issues** [6494-01]
J. Takatalo, Univ. of Helsinki (Finland); J. Häkkinen, Nokia Research Ctr. (Finland);
J. Kaistinen, G. Nyman, Univ. of Helsinki (Finland)
- 649403 **Audiovisual quality estimation of mobile phone video cameras with interpretation-based quality approach** [6494-02]
J. E. Radun, T. Virtanen, Univ. of Helsinki (Finland); J.-L. Olives, M. Vaahteranoksa, T. Vuori,
Nokia (Finland); G. Nyman, Univ. of Helsinki (Finland)
- 649404 **Image quality difference modelling of a mobile display** [6494-03]
J. J. Yoo, Y.-J. Kim, M. R. Luo, Univ. of Leeds (United Kingdom); W. Choe, S. Lee, S. Lee,
D. S. Park, C. Y. Kim, Samsung Advanced Institute of Technology (South Korea)
- 649405 **Threshold value for acceptable video quality using signal-to-noise ratio** [6494-30]
M. Vaahteranoksa, T. Vuori, Nokia Corp. (Finland)

SESSION 2 SYSTEM MEASUREMENT AND MODELING: WEB-BASED

- 649406 **Color differences without probit analysis** [6494-05]
N. Moroney, Hewlett-Packard Labs. (USA)
- 649407 **Web-based versus controlled environment psychophysics experiments** [6494-06]
S. Zuffi, P. Scala, ITC, CNR (Italy); C. Brambilla, IMATI, CNR (Italy); G. Beretta, Hewlett-
Packard Labs. (USA)

Pagination: 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.

SESSION 3 SYSTEM MEASUREMENT AND MODELING: OBJECTIVE I

- 649408 **Video quality assesment using M-SVD** [6494-07]
P. Tao, Graduate Center, CUNY (USA); A. M. Eskicioglu, Brooklyn College, CUNY (USA)
- 649409 **Method of estimating perceived video quality for mobile multimedia application based on full reference framework** [6494-08]
O. Sugimoto, S. Sakazawa, A. Koike, KDDI R&D Labs. Inc. (Japan)

SESSION 4 SYSTEM MEASUREMENT AND MODELING: OBJECTIVE II

- 64940A **Performance evaluation of digital still camera image processing pipelines** [6494-09]
D. Hertel, E. Chang, L. Shih, Cypress Semiconductor Corp. (USA); J. Sproul, Boston Scientific Corp. (USA)
- 64940B **Image quality and automatic color equalization** [6494-10]
M. Chambah, Univ. de Reims Champagne Ardenne (France); A. Rizzi, Univ. degli Studi di Milano (Italy); C. Saint Jean, Univ. of La Rochelle (France)
- 64940C **A unified framework for physical print quality** [6494-11]
A. Eid, B. Cooper, E. Rippetoe, Lexmark International Inc. (USA)

SESSION 5 SYSTEM MEASUREMENT AND MODELING: NEWER TECHNOLOGIES

- 64940D **Measurement-based objective metric for printer resolution** [6494-33]
J. Hasegawa, T.-Y. Hwang, H.-C. Kim, D.-W. Kim, M.-H. Choi, Samsung Electronics Co., Ltd. (South Korea)
- 64940E **Information distance-based selective feature clarity measure for iris recognition** [6494-13]
C. Belcher, Y. Du, Indiana Univ.-Purdue Univ. Indianapolis (USA)

SESSION 6 IMAGE QUALITY STANDARDS I

- 64940F **Driving color management into the office** [6494-14]
T. Newman, CIE Division 8, Image Technology (USA)
- 64940G **Appearance can be deceiving: using appearance models in color imaging** [6494-15]
G. M. Johnson, Apple Computer, Inc. (USA)
- 64940H **Applying and extending ISO/TC42 digital camera resolution standards to mobile imaging products** [6494-16]
D. Williams, P. D. Burns, Eastman Kodak Co. (USA)
- 64940I **Differential gloss quality scale experiment update: an appearance-based image quality standard initiative (INCITS W1.1)** [6494-17]
Y. S. Ng, C. Kuo, Eastman Kodak Co. (USA); E. Maggard, Hewlett Packard Co. (USA); D. Mashtare, Xerox Corp. (USA); P. Morris, Hewlett Packard Co. (USA); S. Farnand, Rochester Institute of Technology (USA)

SESSION 7 IMAGE QUALITY STANDARDS II

- 64940K **Recent progress in the development of INCITS W1.1: appearance-based image quality standards for printers** [6494-19]
T. Bouk, Eastman Kodak Co. (USA); E. N. Dalal, Xerox Corp. (USA); K. D. Donohue, Univ. of Kentucky (USA); S. Farnand, Rochester Institute of Technology (USA); F. Gaykema, Océ-Technologies B.V. (Netherlands); D. Gusev, Eastman Kodak Co. (USA); A. Haley, Monotype Imaging (USA); P. L. Jeran, Hewlett Packard Co. (USA); D. Kozak, Lexmark International, Inc. (USA); W. C. Kress, Toshiba America DSE (USA); Ó. Martinez, Hewlett-Packard Co. (Spain); D. Mashtare, Xerox Corp. (USA); A. McCarthy, Lexmark Corp. (USA); Y. S. Ng, Eastman Kodak Co. (USA); D. R. Rasmussen, Xerox Corp. (USA); M. Robb, Lexmark International, Inc. (USA); H. Shin, Xerox Corp. (USA); M. Quiroga Slickers, Hewlett-Packard Española S.L. (Spain); E. H. Barney Smith, Boise State Univ. (USA); M.-K. Tse, Quality Engineering Assoc., Inc. (USA); D. Williams, Eastman Kodak Co. (USA); E. Zeise, Eastman Kodak Co. (USA); S. Zoltner, Xerox Corp. (USA)
- 64940L **Scanners for analytic print measurement: the devil in the details** [6494-20]
E. K. Zeise, D. Williams, P. D. Burns, Eastman Kodak Co. (USA); W. C. Kress, Toshiba America Business Solutions (USA)

SESSION 8 IMAGE QUALITY ATTRIBUTES: MEASUREMENT AND MODELING

- 64940M **Paper roughness and the color gamut of color laser images** [6494-21]
J. S. Arney, M. Spampata, S. Farnand, Rochester Institute of Technology (USA); T. Oswald, J. Chauvin, Hewlett-Packard Corp. (USA)
- 64940N **Investigation of two methods to quantify noise in digital images based on the perception of the human eye** [6494-22]
J. Kleinmann, Univ. of Applied Sciences of Cologne (Germany); D. Wueller, Image Engineering (Germany)
- 64940O **Effective pictorial information capacity as an image quality metric** [6494-23]
R. B. Jenkin, Cranfield Univ. (United Kingdom); S. Triantaphillidou, Univ. of Westminster (United Kingdom); M. A. Richardson, Cranfield Univ. (United Kingdom)
- 64940P **Objective video quality assessment method for evaluating effects of freeze distortion in arbitrary video scenes** [6494-24]
K. Watanabe, J. Okamoto, T. Kurita, NTT Service Integration Labs. (Japan)

SESSION 9 IMAGE QUALITY ATTRIBUTES: UNIQUE DEFECTS

- 64940Q **Comparison of vision-based algorithms for hiding defective subpixels** [6494-26]
J. Stellbrink, Hewlett-Packard Co. (USA)
- 64940R **Scanner motion error detection and correction** [6494-27]
C. Cui, Lexmark International Inc. (USA)

POSTER SESSION

- 64940S **Accurate and cost-effective MTF measurement system for lens modules of digital cameras**
[6494-28]
G.-W. Chang, C.-C. Liao, Z.-M. Yeh, National Taiwan Normal Univ. (Taiwan)
- 64940T **Quality improvement by selective regional slice coding implementation in H.264/AVC**
[6494-29]
H. Ryu, Univ. of Science and Technology (South Korea); W.-S. Cheong, Univ. of Science and Technology (South Korea) and Electronics and Telecommunications Research Institute (South Korea); S. Jeong, K. A. Moon, Electronics and Telecommunications Research Institute (South Korea)
- 64940U **Quality evaluation of the halftone by halftoning algorithm-based methods and adaptive method** [6494-32]
X. Wan, D. Xie, J. Xu, Wuhan Univ. (USA)

Author Index

Conference Committee

Symposium Chairs

Michael A. Kriss, Consultant (USA)
Robert A. Sprague, Consultant (USA)

Conference Chairs

Luke C. Cui, Lexmark International, Inc. (USA)
Yoichi Miyake, Chiba University (Japan)

Program Committee

Peter D. Burns, Eastman Kodak Company (USA)
Mark D. Fairchild, Rochester Institute of Technology (USA)
Susan P. Farnand, Eastman Kodak Company (USA)
Frans Gaykema, Océ-Technologies BV (Netherlands)
Dirk W. Hertel, Cypress Semiconductor Corporation (USA)
Robin B. Jenkin, Cranfield University (United Kingdom)
Lindsay W. MacDonald, London College of Communication (United Kingdom)
Nathan Moroney, Hewlett-Packard Laboratories (USA)
D. René Rasmussen, Xerox Corporation (USA)
Eric K. Zeise, Xerox Corporation (USA)

Session Chairs

- 1 System Measurement and Modeling: Subjective
Nathan Moroney, Hewlett-Packard Laboratories (USA)
- 2 System Measurement and Modeling: Web-based
Peter D. Burns, Eastman Kodak Company (USA)
- 3 System Measurement and Modeling: Objective I
Peter D. Burns, Eastman Kodak Company (USA)
- 4 System Measurement and Modeling: Objective II
Robin B. Jenkin, Cranfield University (United Kingdom)
- 5 System Measurement and Modeling: Newer Technologies
Robin B. Jenkin, Cranfield University (United Kingdom)
- 6 Image Quality Standards I
Eric K. Zeise, Xerox Corporation (USA)

- 7 Image Quality Standards II
Dirk W. Hertel, Cypress Semiconductor Corporation (USA)
- 8 Image Quality Attributes: Measurement and Modeling
D. René Rasmussen, Xerox Corporation (USA)
- 9 Image Quality Attributes: Unique Defects
Susan P. Farnand, Eastman Kodak Company (USA)