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PROCEEDINGS

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Electronic Imaging

SCIENCE AND TECHNOLOGY

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Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications

Editors: **Reiner Eschbach,** Norwegian University of Science and Technology (Norway) and Monroe Community College (United States),
Gabriel G. Marcu, Apple Inc. (United States), and
Alessandro Rizzi, Università degli Studi di Milano (Italy)

These papers represent the program of Electronic Imaging 2020,
held 26 January — 30 January 2020, at the Hyatt Regency San Francisco Airport in Burlingame, CA.

Society for Imaging Science and Technology
7003 Kilworth Lane • Springfield, VA 22151 USA
703/642-9090; 703/642-9094 fax
info@imaging.org; www.imaging.org

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Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications

Conference overview

Color imaging has historically been treated as a constant phenomenon well described by three independent parameters. Recent advances in computational resources and in the understanding of the human aspects are leading to new approaches that extend the purely metrological view towards a perceptual view of color in documents and displays. Part of this perceptual view is the incorporation of spatial aspects, adaptive color processing based on image content, and the automation of color tasks, to name a few. This dynamic nature applies to all output modalities, e.g., hardcopy devices, but to an even larger extent to soft-copy displays.

Spatially adaptive gamut and tone mapping, dynamic contrast, and color management continue to support the unprecedented development of the display hardware spreading from mobile displays to large size screens and emerging technologies. This conference provides an opportunity for presenting, as well as getting acquainted, with the most recent developments in color imaging researches, technologies, and applications. Focus of the conference is on color basic research and testing, color image input, dynamic color image output and rendering, color image automation, emphasizing color in context and color in images, and reproduction of images across local and remote devices.

In addition, the conference covers software, media, and systems related to color. Special attention is given to applications and requirements created by and for multidisciplinary fields involving color and/or vision.

Paper authors listed as of 1 January 2020;
refer to manuscript for final authors.
Titles that are not listed with the proceedings files were presentation-only.

COLOR IMAGING XXV: DISPLAYING, PROCESSING, HARDCOPY, AND APPLICATIONS

Tuesday, January 28, 2020

7:30 – 8:45 am Women in Electronic Imaging Breakfast; pre-registration required

Skin and Deep Learning — Joint Session

Session Chair: Gabriel Marcu, Apple Inc. (United States)

8:45 – 9:30 am
Regency C
This session is jointly sponsored by: Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications, and Material Appearance 2020.

8:45
Conference Welcome

8:50 MAAP-082
Beyond color correction: Skin color estimation in the wild through deep learning, *Robin Kips, Quoc Tran, Emmanuel Malherbe, and Matthieu Perrot, L'Oréal Research and Innovation (France)*

9:10 COLOR-083
SpectraNet: A deep model for skin oxygenation measurement from multi-spectral data, *Ahmed Mohammed, Mohib Ullah, and Jacob Bauer, Norwegian University of Science and Technology (Norway)*

Spectral Dataset — Joint Session

Session Chair: Ingeborg Tastl, HP Labs, HP Inc. (United States)

9:30 – 10:10 am
Regency C
This session is jointly sponsored by: Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications, and Material Appearance 2020.

9:30 MAAP-106
Visible to near infrared reflectance hyperspectral images dataset for image sensors design, *Axel Clouet[1], Jérôme Vaillant[1], and Célia Viola[2]; [1]CEA-LETI and [2]CEA-LITEN (France)*

9:50 MAAP-107
A multispectral dataset of oil and watercolor paints, *Vahid Babaei[1], Azadeh Asadi Shahmirzadi[2], and Hans-Peter Seidel[1]; [1]Max-Planck-Institut für Informatik and [2]Consultant (Germany)*

10:00 am – 7:30 pm Industry Exhibition - Tuesday

10:10 – 10:40 am Coffee Break

Color and Appearance Reproduction — Joint Session

Session Chair: Mathieu Hebert, Université Jean Monnet de Saint Etienne (France)

10:40 am – 12:30 pm
Regency C
This session is jointly sponsored by: Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications, and Material Appearance 2020.

10:40 MAAP-396
From color and spectral reproduction to appearance, BRDF, and beyond, *Jon Yngve Hardeberg, Norwegian University of Science and Technology (NTNU) (Norway)*

11:10 MAAP-120
HP 3D color gamut – A reference system for HP's Jet Fusion 580 color 3D printers, *Ingeborg Tastl[1] and Alexandra Ju[2]; [1]HP Labs, HP Inc. and [2]HP Inc. (United States)*

11:30 COLOR-121
Spectral reproduction: Drivers, use cases, and workflow, *Tanzima Habib, Phil Green, and Peter Nussbaum, Norwegian University of Science and Technology (Norway)*

11:50 COLOR-122
Parameter estimation of PuRet algorithm for managing appearance of material objects on display devices (JIST-first), *Midori Tanaka, Ryusuke Arai, and Takahiko Horiuchi, Chiba University (Japan)*

12:10 COLOR-123
Colorimetrical performance estimation of a reference hyperspectral microscope for color tissue slides assessment, *Paul Lemaillet and Wei-Chung Cheng, US Food and Drug Administration (United States)*

12:30 – 2:00 pm Lunch

PLENARY: Automotive Imaging

Session Chairs: Radka Tezaur, Intel Corporation (United States), and Jonathan Phillips, Google Inc. (United States)

2:00 – 3:10 pm
Grand Peninsula Ballroom D

Imaging in the Autonomous Vehicle Revolution, *Gary Hicok, senior vice president, hardware development, NVIDIA Corporation (United States)*

For abstract and speaker biography, see page 7

3:10 – 3:30 pm Coffee Break

Color Understanding

Session Chair: Alessandro Rizzi, Università degli Studi di Milano (Italy)

3:30 – 5:10 pm
Regency C

3:30 COLOR-161
Automated multicolored fabric image segmentation and associated psychophysical evaluation, *Nian Xiong, North Carolina State University (United States)*

3:50 COLOR-162
Comparing a spatial extension of ICtCp color representation with S-CIELAB and other recent color metrics for HDR and WCG quality assessment, *Anustup Choudhury and Scott Daly, Dolby Laboratories, Inc. (United States)*

4:10 COLOR-163
An improved optimisation method for finding a color filter to make a camera more colorimetric, *Graham Finlayson and Yuteng Zhu, University of East Anglia (United Kingdom)*

4:30 COLOR-164
Random Spray Retinex extensions considering region of interest and eye movements (JIST-first), *Midori Tanaka[1], Matteo Lanaro[2], Takahiko Horiuchi[1], and Alessandro Rizzi[2]; [1]Chiba University (Japan) and [2]Università degli Studi di Milano (Italy)*

4:50 COLOR-165
Teaching color and color science: The experience of an international Master course, *Maurizio Rossi[1], Alice Plutino[2], Andrea Siniscalco[1], and Alessandro Rizzi[2]; [1]Politecnico di Milano and [2]Università degli Studi di Milano (Italy)*

5:30 – 7:30 pm Symposium Demonstration Session

Wednesday, January 29, 2020

Color Halftoning

Session Chair: Alessandro Rizzi, Università degli Studi di Milano (Italy)

8:50 – 10:10 am
Regency C

8:50 COLOR-195
New results for aperiodic, clustered-dot halftoning, *Jiayin Liu[1], Altyngul Jumabayeva[1], Yujian Xu[1], Yin Wang[1], Tal Frank[2], Shani Gat[2], Orel Bat Mor[2], Ben-Shoshan Yotam[2], Robert Ulichney[3], and Jan Allebach[1]; [1]Purdue University (United States), [2]HP Indigo (Israel), and [3]HP Labs, HP Inc. (United States)*

9:10 COLOR-196
Data-bearing halftone image alignment and assessment on 3D surface, *Ziyi Zhao[1], Yujian Xu[1], Robert Ulichney[2], Matthew Gaubatz[2], Stephen Pollard[3], and Jan Allebach[1]; [1]Purdue University (United States), [2]HP Labs, HP Inc. (United States), and [3]HP Inc. UK Ltd. (United Kingdom)*

9:30 COLOR-197
Using watermark visibility measurements to select an optimized pair of spot colors for use in a binary watermark, *Alastair Reed[1], Vlado Kitanovski[2], Kristyn Falkenstern[1], and Marius Pedersen[2]; [1]Digimarc Corporation (United States) and [2]Norwegian University of Science and Technology (Norway)*

9:50 COLOR-198
Hiding data in the blue channel, *Robert Ulichney and Matthew Gaubatz, HP Labs, HP Inc. (United States)*

10:00 am – 3:30 pm Industry Exhibition - Wednesday

10:10 – 10:50 am Coffee Break

Color and Human Vision

Session Chair: Gabriel Marcu, Apple Inc. (United States)

10:50 am – 12:10 pm
Regency C

10:50 COLOR-235
Individual differences in feelings about the color red, *Yasuyo Ichihara, Kogakuin University (Japan)*

11:10 COLOR-236
Colors before and after cataract surgery: A study of color constancy and discrimination, *John McCann, McCann Imaging (United States)*

11:30 COLOR-237
Daltonization by spectral filtering, *Phil Green and Peter Nussbaum, Norwegian University of Science and Technology (Norway)*

11:50 WITHDRAWN COLOR-238
Psychophysical evaluation of grey scale functions performance, *Kwame Baah, University of the Arts London (United Kingdom)*

Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications Interactive Papers Oral Previews

Session Chair: Gabriel Marcu, Apple Inc. (United States)

12:10 – 12:30 pm
Regency C

In this session interactive poster authors will each provide a brief oral overview of their poster presentation, which will be presented in the Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications 2020 Interactive Papers Session at 5:30 pm on Wednesday.

12:10 COLOR-259
Visual fidelity improvement in virtual reality through spectral textures applied to lighting simulations, *Francisco Díaz-Barrancas, Halina Cwierz, Pedro José Pardo, Ángel Luis Pérez, and María Isabel Suero, University of Extremadura (Spain)*

12:20 COLOR-260
Application of spectral computing technics for color vision testing using virtual reality devices, *Halina Cwierz, Francisco Díaz-Barrancas, Pedro José Pardo, Ángel Luis Pérez, and María Isabel Suero, University of Extremadura (Spain)*

12:30 – 2:00 pm Lunch

PLENARY: VR/AR Future Technology

Session Chairs: Radka Tezaur, Intel Corporation (United States), and Jonathan Phillips, Google Inc. (United States)

2:00 – 3:10 pm
Grand Peninsula Ballroom D

Quality Screen Time: Leveraging Computational Displays for Spatial Computing, *Douglas Lanman, director, Display Systems Research, Facebook Reality Labs (United States)*

For abstract and speaker biography, see page 7

3:10 – 3:30 pm Coffee Break

Dark Side of Color

Session Chair: Alessandro Rizzi, Università degli Studi di Milano (Italy)

3:30 – 5:10 pm
Regency C

3:30 COLOR-279
Increases in scattered light causes increased darkness, *John McCann, McCann Imaging (United States)*

3:50 COLOR-280
Do you see what I see?, *Phil Green, Norwegian University of Science and Technology (Norway)*

4:10 COLOR-281
Replacing test charts with pictures, *Sophie Triantaphillidou, Edward Fry, and Oliver van Zwanenberg, University of Westminster (United Kingdom)*

4:30 COLOR-282
Colors challanges in navigating autonomous vehicles, *Dietmar Wueller, Image Engineering GmbH & Co. KG (Germany)*

4:50 COLOR-283
Does computer vision need color science?, *Jan Allebach, Purdue University (United States)*

Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications Interactive Posters Session

5:30 – 7:00 pm
Sequoia

The Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications Conference works to be presented at the EI 2020 Symposium Interactive Posters Session are listed in the Color Imaging XXV: Displaying, Processing, Hardcopy, and Applications Interactive Papers Oral Previews session just before Wednesday lunch.

5:30 – 7:00 pm EI 2020 Symposium Interactive Posters Session

5:30 – 7:00 pm Meet the Future: A Showcase of Student and Young Professionals Research

Thursday, January 30, 2020

Inkjet Printer Development and Diagnostic

Session Chair: Sophie Triantaphillidou, University of Westminster (United Kingdom)

8:50 – 10:30 am
Regency C

8:50 COLOR-350
Developing an inkjet printer I: RGB image to CMY ink amounts -- Image processing and color management, *Yin Wang[1], Baekdu Choi[1], Daulet Kenzhebalin[1], Sige Hu[1], George Chiu[1], Zillion Lin[2], Davi He[2], and Jan Allebach[1]; [1]Purdue University (United States) and [2]Sunvalleytek International Inc. (China)*

9:10 COLOR-351
Developing an inkjet printer II: CMY ink amounts to multibit CMY halftones, *Baekdu Choi[1], Daulet Kenzhebalin[1], Sige Hu[1], George Chiu[1], Davi He[2], Zillion Lin[2], and Jan Allebach[1]; [1]Purdue University and [2]Sunvalleytek International Inc. (United States)*

9:30 COLOR-352
Developing an inkjet printer III: Multibit CMY halftones to hardware-ready bits, *Sige Hu[1], Daulet Kenzhebalin[1], George Chiu[1], Zillion Lin[2], Davi He[2], and Jan Allebach[1]; [1]Purdue University (United States) and [2]Sunvalleytek International Inc. (China)*

9:50 COLOR-349
Developing an inkjet printer IV: Printer mechanism control for best print quality, *Daulet Kenzhebalin[1], Baekdu Choi[1], Sige Hu[1], George Chiu[1], Zillion Lin[2], Davi He[2], and Jan Allebach[1]; [1]Purdue University (United States) and [2]Sunvalley Group (China)*

10:10 COLOR-353
Using acoustic information to diagnose the health of a printer, *Chin-Ning Chen[1], Katy Ferguson[2], Anton Wiranata[2], Mark Shaw[2], Wan-Eih Huang[1], George Chiu[1], Patricia Davis[1], and Jan Allebach[1]; [1]Purdue University and [2]HP Inc. (United States)*

10:30 – 11:00 am Coffee Break

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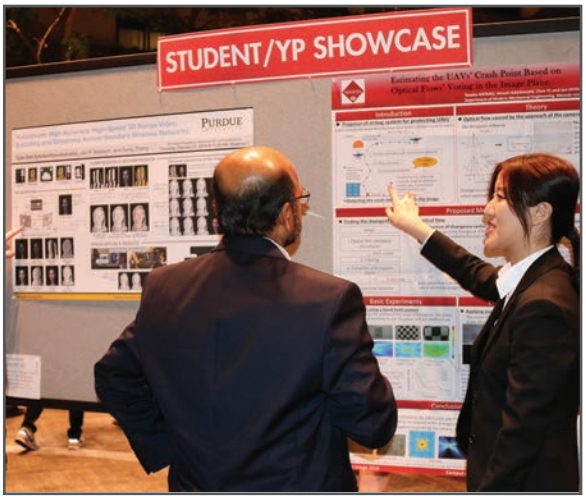

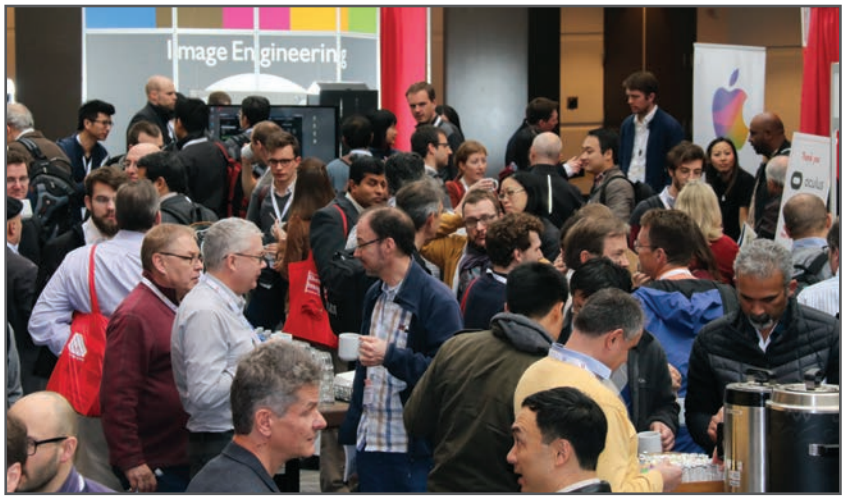

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