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

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Editors:

Reiner Eschbach
Gabriel G. Marcu
Alessandro Rizzi

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

Monday January 14, 2019

Monday Plenary

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

Autonomous Driving Technology and the OrCam MyEye, *Amnon Shashua, President and CEO, Mobileye, an Intel Company, and senior vice president, Intel Corporation (United States)*

The field of transportation is undergoing a seismic change with the coming introduction of autonomous driving. The technologies required to enable computer driven cars involves the latest cutting edge artificial intelligence algorithms along three major thrusts: Sensing, Planning and Mapping. Shashua will describe the challenges and the kind of computer vision and machine learning algorithms involved, but will do that through the perspective of Mobileye's activity in this domain. He will then describe how OrCam leverages computer vision, situation awareness and language processing to enable blind and visually impaired to interact with the world through a miniature wearable device.

Prof. Amnon Shashua holds the Sachs chair in computer science at the Hebrew University of Jerusalem. His field of expertise is computer vision and machine learning. Shashua has founded three startups in the computer vision and machine learning fields. In 1995 he founded CogniTens that specializes in the area of industrial metrology and is today a division of the Swedish Corporation Hexagon. In 1999 he cofounded Mobileye with his partner Ziv Aviram. Mobileye develops system-on-chips and computer vision algorithms for driving assistance systems and is developing a platform for autonomous driving to be launched in 2021. Today, approximately 32 million cars rely on Mobileye technology to make their vehicles safer to drive. In August 2014, Mobileye claimed the title for largest Israeli IPO ever, by raising $1B at a market cap of $5.3B. In August 2017, Mobileye became an Intel company in the largest Israeli acquisition deal ever of $15.3B. Today, Shashua is the president and CEO of Mobileye and a senior vice president of Intel Corporation. In 2010 Shashua co-founded OrCam which harnesses computer vision and artificial intelligence to assist people who are visually impaired or blind.

3:00 – 3:30 pm Coffee Break

Color Rendering of Materials I · JOINT SESSION

Session Chair: Lionel Simonot, Université de Poitiers (France)

3:30 – 4:10 pm
Cypress A

This session is jointly sponsored by: Color Imaging XXIV: Displaying, Processing, Hardcopy, and Applications, and Material Appearance 2019.

MAAP-075

KEYNOTE: Capturing appearance in text: The Material Definition Language (MDL), *Andy Kopra, NVIDIA Advanced Rendering Center (Germany) ...N/A*

Andy Kopra is a technical writer at the NVIDIA Advanced Rendering Center in Berlin, Germany. With more than 35 years of professional computer graphics experience, he writes and edits documentation for NVIDIA customers on a wide variety of topics. He also designs, programs, and maintains the software systems used in the production of the documentation websites and printed materials.

Color Rendering of Materials II · JOINT SESSION

Session Chair: Lionel Simonot, Université de Poitiers (France)

4:10 – 4:50 pm
Cypress A

This session is jointly sponsored by: Color Imaging XXIV: Displaying, Processing, Hardcopy, and Applications, and Material Appearance 2019.

4:10 COLOR-076

Real-time accurate rendering of color and texture of car coatings, *Eric Kirchner[1], Ivo Lans[1], Pim Koeckhoven[1], Khalil Huraibat[2], Francisco Martinez-Verdu[2], Esther Perales[2], Alejandro Ferrero[3], and Joaquin Campos[3]; [1]AkzoNobel (the Netherlands), [2]University of Alicante (Spain), and [3]CSIC (Spain) ...pg. 1*

4:30 COLOR-077

Recreating Van Gogh's original colors on museum displays, *Eric Kirchner[1], Muriel Geldof[2], Ella Hendriks[3], Art Ness Proano Gaibor[2], Koen Janssens[4], John Delaney[5], Ivo Lans[1], Frank Ligterink[2], Luc Megens[2], Teio Meedendorp[6], and Kathrin Pilz[6]; [1]AkzoNobel (the Netherlands), [2]RCE (the Netherlands), [3]University of Amsterdam (the Netherlands), [4]University of Antwerp (Belgium), [5]National Gallery (United States), and [6]Van Gogh Museum (the Netherlands) ...pg. 6*

5:00 – 6:00 pm All-Conference Welcome Reception

COLOR

Paper titles and authors as of 1 Jan 2019; final proceedings manuscript may vary.

Tuesday January 15, 2019

7:15 – 8:45 am Women in Electronic Imaging Breakfast

Gamut Mapping

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

8:50 – 10:10 am
Cypress B

8:50   COLOR-078
Development of a color appearance model with embedded uniform color space, *Muhammad Safdar, Norwegian University of Science and Technology (NTNU) (Norway) ...N/A*

9:10   COLOR-079
Colour gamut mapping using vividness scale, *Baiyue Zhao[1], Lihao Xu[1], and Ming Ronnier Luo[1,2]; [1]Zhejiang University (China) and [2]University of Leeds (United Kingdom) ...pg. 11*

9:30   COLOR-080
A computationally-efficient gamut mapping solution for color image processing pipelines in digital camera systems, *Noha El-Yamany, Intel Corporation (Finland) ...N/A*

9:50   COLOR-081
A simple approach for gamut boundary description using radial basis function network, *In-ho Park, Hyunsoo Oh, and Ki-Min Kang, HP Printing Korea (HPPK) (Republic of Korea) ...pg. 17*

10:00 am – 7:00 pm Industry Exhibition

10:10 – 10:40 am Coffee Break

Display & Color Constancy

Session Chair: Reiner Eschbach, Norwegian University of Science and Technology (Norway) and Monroe Community College (United States)

10:40 am – 12:20 pm
Cypress B

10:40   COLOR-083
Viewing angle characterization of HDR/WCG displays using color volumes and new color spaces, *Pierre Boher[1], Thierry Leroux[1], and Pierre Blanc[2]; [1]ELDIM and [2]Laboratoires d'Essai de la FNAC (France) ...pg. 32*

11:00   COLOR-082
Beyond limits of current high dynamic range displays: Ultra-high dynamic range display, *Jae Sung Park, Sungwon Seo, Dukjin Kang, James Langehennig, and Byungseok Min, Samsung Electronics (Republic of Korea) ...pg. 23*

11:20   COLOR-084
About glare and luminance measurements, *Simone Liberini[1], Maurizio Rossi[2], Matteo Lanaro[1], and Alessandro Rizzi[1]; [1]Università degli Studi di Milano and [2]Politecnico di Milano (Italy)...pg. 38*

11:40   COLOR-085
Limits of color constancy: Comparison of the signatures of chromatic adaptation and spatial comparisons (Invited), *John McCann, McCann Imaging (United States) ...pg. 43*

12:30 – 2:00 pm Lunch

Tuesday Plenary

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

The Quest for Vision Comfort: Head-Mounted Light Field Displays for Virtual and Augmented Reality, *Hong Hua, professor of optical sciences, University of Arizona (United States)*

Hong Hua will discuss the high promises and the tremendous progress made recently toward the development of head-mounted displays (HMD) for both virtual and augmented reality displays, developing HMDs that offer uncompromised optical pathways to both digital and physical worlds without encumbrance and discomfort confronts many grand challenges, both from technological perspectives and human factors. She will particularly focus on the recent progress, challenges and opportunities for developing head-mounted light field displays (LF-HMD), which are capable of rendering true 3D synthetic scenes with proper focus cues to stimulate natural eye accommodation responses and address the well-known vergence-accommodation conflict in conventional stereoscopic displays.

Dr. Hong Hua is a professor of optical sciences at the University of Arizona. With more than 25 years of experience, Hua is widely recognized through academia and industry as an expert in wearable display technologies and optical imaging and engineering in general. Hua's current research focuses on optical technologies enabling advanced 3D displays, especially head-mounted display technologies for virtual reality and augmented reality applications, and microscopic and endoscopic imaging systems for medicine. Hua has published more than 200 technical papers and filed a total of 23 patent applications in her specialty fields, and delivered numerous keynote addresses and invited talks at major conferences and events worldwide. She is an SPIE Fellow and OSA senior member. She was a recipient of NSF Career Award in 2006 and honored as UA Researchers @ Lead Edge in 2010. Hua and her students shared a total of 8 "Best Paper" awards in various IEEE, SPIE and SID conferences. Hua received her PhD in optical engineering from the Beijing Institute of Technology in China (1999). Prior to joining the UA faculty in 2003, Hua was an assistant professor with the University of Hawaii at Manoa in 2003, was a Beckman Research Fellow at the Beckman Institute of University of Illinois at Urbana-Champaign between 1999 and 2002, and was a post-doc at the University of Central Florida in 1999.

3:00 – 3:30 pm Coffee Break

Color Processing

Session Chairs: Phil Green, Norwegian University of Science and Technology (Norway) and Alessandro Rizzi, Università degli Studi di Milano (Italy)

3:30 – 5:10 pm
Cypress B

3:30   COLOR-086
Evaluation of naturalness and readability of whiteboard image enhancements, *Mekides Abebe and Jon Yngve Hardeberg, Norwegian University of Science and Technology (NTNU) (Norway)...pg. 49*

3:50   COLOR-087

Automatic detection of scanned page orientation, *Zhenhua Hu[1], Peter Bauer[2], and Todd Harris[2]; [1]Purdue University and [2]Hewlett-Packard (United States) ...pg. 57*

4:10   COLOR-088

Automatic image enhancement for under-exposed, over-exposed, or backlit images, *Jaemin Shin, Hyunsoo Oh, Kyeongman Kim, Ki-Min Kang, and In-ho Park, HP Printing Korea (Republic of Korea) ...pg. 63*

4:30   COLOR-089

Relationship between faithfulness and preference of stars in a planetarium (JPI-pending), *Midori Tanaka[1], Takahiko Horiuchi[1], and Kenichi Otani[2]; [1]Chiba University and [2]Konica Minolta Planetarium Co., Ltd. (Japan) ...N/A*

4:50   COLOR-090

A CNN adapted to time series for the classification of supernovae, *Anthony Brunel[1], Johanna Pasquet[2], Jérôme Pasquet[3], Nancy Rodriguez[1], Frédéric Comby[1], Dominique Fouchez[2], and Marc Chaumont[1]; [1]LIRMM Montpellier, [2]CPPM Marseille, and [3]LIS Marseille (France) ...pg. 68*

5:30 – 7:00 pm Symposium Demonstration Session

Wednesday January 16, 2019

Color Vision & Illuminants

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

8:50 – 10:10 am
Cypress B

8:50   COLOR-091

How is colour harmony perceived by colour vision deficient observers?, *Susann Lundekvam and Phil Green, Norwegian University of Science and Technology (Norway) ...pg. 76*

9:10   COLOR-092

Impression evaluation between color vision types, *Yasuyo Ichihara, Kogakuin University (Japan) ...pg. 81*

9:30   COLOR-093

Analysis of illumination correction error in camera color space, *Minji Lee and Byung-Uk Lee, Ewha Womans University (Republic of Korea) ...pg. 87*

9:50   COLOR-094

Multiple illuminants' color estimation using layered gray-world assumption, *Harumi Kawamura, Salesian Polytechnic University (Japan) ...pg. 91*

10:00 am – 3:30 pm Industry Exhibition

10:10 – 10:40 am Coffee Break

Observers & Appearance

Session Chairs: Reiner Eschbach, Norwegian University of Science and Technology (Norway) and Monroe Community College (United States) and John McCann, McCann Imaging (United States)

10:40 am – 12:20 pm
Cypress B

10:40   COLOR-095

Consistency of color appearance based on image color difference, *Muhammad Safdar, Phil Green, and Peter Nussbaum, Norwegian University of Science and Technology (NTNU) (Norway) ...N/A*

11:00   COLOR-096

Determination of individual-observer color matching functions for use in color management systems, *Eric Walowit, Consultant (United States)...pg. 96*

11:20   COLOR-097

Refining ACES best practice, *Eberhard Hasche, Oliver Karaschewski, and Reiner Creutzburg, Technische Hochschule Brandenburg (Germany) ...pg. 100*

11:40   COLOR-098

EMVA1288 compliant image interpolation creating homogeneous pixel size and gain, *Jörg Kunze, Basler AG (Germany) ...N/A*

12:00   COLOR-099

A data-driven approach for garment color classification in on-line fashion images, *Zhi Li[1], Gautam Golwala[2], Sathya Sundaram[2], and Jan Allebach[1]; [1]Purdue University and [2]Poshmark Inc. (United States) ...pg. 120*

12:30 – 2:00 pm Lunch

COLOR

Wednesday Plenary

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

Light Fields and Light Stages for Photoreal Movies, Games, and Virtual Reality, *Paul Debevec, senior scientist, Google (United States)*

Paul Debevec will discuss the technology and production processes behind "Welcome to Light Fields", the first downloadable virtual reality experience based on light field capture techniques which allow the visual appearance of an explorable volume of space to be recorded and reprojected photorealistically in VR enabling full 6DOF head movement. The lightfields technique differs from conventional approaches such as 3D modelling and photogrammetry. Debevec will discuss the theory and application of the technique. Debevec will also discuss the Light Stage computational illumination and facial scanning systems which use geodesic spheres of inward-pointing LED lights as have been used to create digital actor effects in movies such as Avatar, Benjamin Button, and Gravity, and have recently been used to create photoreal digital actors based on real people in movies such as Furious 7, Blade Runner: 2049, and Ready Player One. The lighting reproduction process of light stages allows omnidirectional lighting environments captured from the real world to be accurately reproduced in a studio, and has recently be extended with multispectral capabilities to enable LED lighting to accurately mimic the color rendition properties of daylight, incandescent, and mixed lighting environments. They have also recently used their full-body light stage in conjunction with natural language processing and automultiscopic video projection to record and project interactive conversations with survivors of the World War II Holocaust.

Paul Debevec is a senior scientist at Google VR, a member of Google VR's Daydream team, and adjunct research professor of computer science in the Viterbi School of Engineering at the University of Southern California, working within the Vision and Graphics Laboratory at the USC Institute for Creative Technologies. Debevec's computer graphics research has been recognized with ACM SIGGRAPH's first Significant New Researcher Award (2001) for "Creative and Innovative Work in the Field of Image-Based Modeling and Rendering", a Scientific and Engineering Academy Award (2010) for "the design and engineering of the Light Stage capture devices and the image-based facial rendering system developed for character relighting in motion pictures" with Tim Hawkins, John Monos, and Mark Sagar, and the SMPTE Progress Medal (2017) in recognition of his achievements and ongoing work in pioneering techniques for illuminating computer-generated objects based on measurement of real-world illumination and their effective commercial application in numerous Hollywood films. In 2014, he was profiled in The New Yorker *magazine's "Pixel Perfect: The Scientist Behind the Digital Cloning of Actors" article by Margaret Talbot.*

3:00 – 3:30 pm Coffee Break

Halftoning & Image Representation

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

3:30 – 5:10 pm
Cypress B

3:30 COLOR-100

Creating a simulation option for the reconstruction of ancient documents, *Reiner Eschbach[1,2], Roger Easton[3], Sony George[1], and Jon Yngve Hardeberg[1]; [1]Norwegian University of Science and Technology (NTNU) (Norway), [2]Monroe Community College (United States), and [3]Rochester Institute of Technology (United States) ...pg. 124*

3:50 COLOR-101

3D Tone-Dependent Fast Error Diffusion (TDFED), *Adam Michals, Altyngul Jumabayeva, and Jan Allebach, Purdue University (United States) ...pg. 128*

4:10 COLOR-102

NPAC FM color halftoning for the Indigo press: Challenges and solutions, *Jiayin Liu[1], Tal Frank[2], Ben-Shoshan Yotam[2], Robert Ulichney[3], and Jan Allebach[1]; [1]Purdue University (United States), [2]HP Inc. (Israel), and [3]HP Labs, HP Inc. (United States) ... pg. 135*

4:30 COLOR-103

Vector tone-dependent fast error diffusion in the YyCxCz color space, *Chin-Ning Chen, Zhen Luan, and Jan Allebach, Purdue University (United States) ...pg. 142*

4:50 COLOR-104

Appearance-preserving error diffusion algorithm using texture information, *Takuma Kiyotomo, Midori Tanaka, and Takahiko Horiuchi, Chiba University (Japan) ...pg. 147*

5:30 – 7:00 pm Symposium Interactive Papers (Poster) Session

Additional Paper

Relationship between Faithfulness and Preference of Stars in a Planetarium, *Ken'Ichi Otani, Midori Tanaka, and Takahiko Horiuchi, Chiba University (Japan) ...pg. 151*

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