

IS&T International Symposium on
**Electronic
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SCIENCE AND TECHNOLOGY

PROCEEDINGS

13 January 2019 – 17 January 2019 • Burlingame, CA, USA

Material Appearance 2019

Editors: **Mathieu Hebert**, Université Jean Monnet de Saint Etienne (France)
Lionel Simonot, Université de Poitiers (France)
Ingeborg Tastl, HP Labs, HP Inc. (United States)

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Material Appearance 2019

Conference overview

The rapid and continuous development of rendering simulators and devices such as displays and printers offers interesting challenges related to how the appearance of materials is understood. Over the years, researchers from different disciplines, including metrology, optical modeling and digital simulation, have studied the interaction of incident light with the texture and surface geometry of a given object, as well as the optical properties of distinct materials. Thanks to those efforts, we have been able to propose methods for characterizing the optical and visual properties of many materials, propose affordable measurement methods, predict optical properties or appearance attributes, and render 2.5D and 3D objects and scenes with high accuracy.

This conference offers the possibility to share research results and establish new collaborations between academic and industrial researchers from these related fields.

Award

Best Paper Award



Conference Chairs: Mathieu Hebert, Université Jean Monnet de Saint Etienne (France); Lionel Simonot, Université de Poitiers (France); and Ingeborg Tastl, HP Labs, HP Inc. (United States)

Program Committee: Marc Ellens, X-Rite, Inc. (United States); Susan P. Farnand, Rochester Institute of Technology (United States); Roland Fleming, Justus-Liebig-Universität Giessen (Germany); Jon Yngve Hardeberg, Norwegian University of Science and Technology (Norway); Francisco H. Imai, Apple Inc. (United States); Susanne Klein, University of the West of England (United Kingdom); Gael Obein, Conservatoire National des Arts et Metiers (France); Maria Ortiz Segovia, Océ Print Logic Technologies (France); Carinna Parraman, University of the West of England (United Kingdom); Holly Rushmeier, Yale University (United States); Takuroh Sone, Ricoh Japan (Japan); Sabine Süsstrunk, École Polytechnique Fédérale de Lausanne (Switzerland); Shoji Tominaga, Chiba University (Japan); and Philipp Urban, Fraunhofer Institute for Computer Graphics Research IGD (Germany)

Conference Sponsors



MATERIAL APPEARANCE 2019

Monday January 14, 2019

MAAP

Measurement and Evaluation of Appearance I

Session Chair: Mathieu Hebert, Université Jean Monnet de Saint Etienne (France) and Takuroh Sone, Ricoh Company, Ltd. (Japan)

8:50 – 9:30 am

Cypress A

MAAP-475

KEYNOTE: On the acquisition and reproduction of material appearance, Jon Yngve Hardeberg, Norwegian University of Science and Technology (NTNU) (Norway)

Jon Yngve Hardeberg (1971) is a professor in the department of computer science at NTNU in Gjøvik. He has a MSc in signal processing from NTNU, and a PhD in signal and image processing from the Ecole Nationale Supérieure des Télécommunications in Paris, France. Hardeberg is a member of the Norwegian Colour and Visual Computing Laboratory where he teaches, supervises graduate students, manages international study programs and research projects. He has co-authored more than 200 publications. His research interests include multispectral colour imaging, print and image quality, colorimetric device characterization, colour management, cultural heritage imaging, and medical imaging.

Measurement and Evaluation of Appearance II

Session Chair: Takuroh Sone, Ricoh Company, Ltd. (Japan)

9:30 – 10:10 am

Cypress A

9:30

MAAP-476

Evaluation of sparkle impression considering observation distance, Shuhei Watanabe and Takuroh Sone, Ricoh Company, Ltd. (Japan)

9:50

MAAP-477

Comparative analysis of transmittance measurement geometries and apparatus, Marjan Shahpaski¹, Luis Sapaico², and Sabine Süssstrunk¹; ¹Ecole Polytechnique Fédérale de Lausanne (EPFL) (Switzerland) and ²Océ Print Logic Technologies S.A. (France)

10:10 – 10:50 am Coffee Break

Appearance Design and 3D Printing I

Session Chair: Jon Yngve Hardeberg, Norwegian University of Science and Technology (NTNU) (Norway)

10:50 – 11:30 am

Cypress A

MAAP-478

KEYNOTE: Beyond printing: How to expand 3D applications through postprocessing, Isabel Sanz, HP Inc. (Spain)

Isabel Sanz received an MSc in mechanical engineering from the Technical University of Valencia (Spain) and from RWTH Aachen (Germany). Her current position is 3D Printing Advanced Technical Consultant at HP Inc. She complemented her studies with a master in project management from La Salle, in Barcelona (Spain). Her career at HP started as R&D mechanical engineer in the HP Large Format Printing business. After that experience, she moved into the 3D Printing business. There, Sanz started the benchmark printing process for Multi Jet Fusion customers. Nowadays, she is technically developing new applications and helping customers to introduce and grow the 3D printing opportunities in their products and processes. She holds 9 patents and 1 publication and she keeps looking for new and innovative ways of doing things, evangelizing the movement to additive manufacturing.

Appearance Design and 3D Printing II

Session Chair: Jon Yngve Hardeberg, Norwegian University of Science and Technology (NTNU) (Norway)

11:30 am – 12:30 pm

Cypress A

11:30

MAAP-479

A soft-proofing workflow for color 3D printing - Addressing needs for the future, Ingeborg Tastl¹, Miguel A. Lopez-Alvarez², Alexandra Ju², Morgan Schramm², Jordi Roca², and Matthew Shepherd²; ¹HP Labs, HP Inc. and ²HP Inc. (United States)

11:50

MAAP-480

Improving aesthetics through post-processing for 3D printed parts, Alexandra Ju, Andrew Fitzhugh, Jiwon Jun, and Mary Baker, HP Inc. (United States)

12:10

MAAP-481

Refractive index of inks and colored gloss (Invited), Lionel Simonot¹, Oussama Sari², and Mathieu Hebert²; ¹Université de Poitiers and ²Université Jean Monnet de Saint Etienne (France)

12:30 – 2:00 pm Lunch

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)*

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 Kirchner¹, Ivo Lans¹, Pim Koeckhoven¹, Khalil Huraibat², Francisco Martinez-Verdu², Esther Perales², Alejandro Ferrero³, and Joaquin Campos³; ¹AkzoNobel (the Netherlands), ²University of Alicante (Spain), and ³CSIC (Spain)*

4:30

COLOR-077

Recreating Van Gogh’s original colors on museum displays, *Eric Kirchner¹, Muriel Geldof², Ella Hendriks³, Art Ness Proano Gaibar², Koen Janssens⁴, John Delaney⁵, Ivo Lans¹, Frank Ligterink², Luc Megens², Teio Meedendorp⁶, and Kathrin Pilz⁶; ¹AkzoNobel (the Netherlands), ²RCE (the Netherlands), ³University of Amsterdam (the Netherlands), ⁴University of Antwerp (Belgium), ⁵National Gallery (United States), and ⁶Van Gogh Museum (the Netherlands)*

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

Tuesday January 15, 2019

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

Material Appearance Perception

JOINT SESSION

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

9:10 – 10:10 am

Grand Peninsula Ballroom D

This session is jointly sponsored by: Human Vision and Electronic Imaging 2019, and Material Appearance 2019.

9:10 MAAP-202

Material appearance: Ordering and clustering, Davit Gigilashvili, Jean-Baptiste Thomas, Marius Pedersen, and Jon Yngve Hardeberg, Norwegian University of Science and Technology (NTNU) (Norway)

9:30 MAAP-203

A novel translucency classification for computer graphics, Morgane Gerardin¹, Lionel Simonot², Jean-Philippe Farrugia³, Jean-Claude Leh³, Thierry Fournel⁴, and Mathieu Hebert⁴; ¹Institut d'Optique Graduate School, ²Université de Poitiers, ³IRIS, and ⁴Université Jean Monnet de Saint Etienne (France)

9:50 MAAP-204

Constructing glossiness perception model of computer graphics with sounds, Takumi Nakamura, Keita Hirai, and Takahiko Horiuchi, Chiba University (Japan)

10:00 am – 7:00 pm Industry Exhibition

10:10 – 10:50 am Coffee Break

Appearance Design and Computation

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

10:50 am – 12:30 pm

Cypress A

10:50 MAAP-482

Image-based BRDF design, Ezra Davis¹, Weiqi Shi¹, Hongzhi Wu², Julie Dorsey¹, and Holly Rushmeier¹; ¹Yale University (United States) and ²Zhejiang University (China)

11:10 MAAP-483

Hair tone estimation at roots via imaging device with embedded deep learning, Panagiotis-Alexandros Bokaris, Emmanuel Malherbe, Thierry Wasserman, Michaël Haddad, and Matthieu Perrot, L'Oreal Research & Innovation (France)

11:30 MAAP-484

CNN based parameter optimization for texture synthesis, Jiangpeng He¹, Kyle Ziga¹, Judy Bagchi², and Fengqing Zhu¹; ¹Purdue University and ²Dzine Steps (United States)

11:50 MAAP-485

Appearance reconstruction of mutual illumination effect between plane and curved fluorescent objects, Shoji Tominaga^{1,2}, Keita Hirai³, and Takahiko Horiuchi³; ¹Norwegian University of Science and Technology (NTNU) (Norway), ²Nagano University (Japan), and ³Chiba University (Japan)

12:10 MAAP-486

Accurate physico-realistic ray tracing simulation of displays, Pierre Boher¹, Thierry Leroux¹, Thomas Muller², and Philippe Porral²; ¹ELDIM and ²United Visual Researchers (France)

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

Describing Material Appearance

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

3:30 – 4:00 pm

Cypress A

Enough (data) already!, Marc Ellens, X-Rite, Inc. (United States)

MAAP-487

Discussion: Rarely Asked Questions on Material Appearance

4:00 – 4:20 pm

Cypress A

Moderators: Mathieu Hebert, Université Jean Monnet de Saint Etienne (France); Lionel Simonot, Université de Poitiers (France); and Ingeborg Tastl, HP Labs, HP Inc. (United States)

MAAP-478

Can perception models for gloss and color be combined to assess the appearance of metallic objects or lusterware? Can translucency be assessed by simple optical measurement? Do commercially available color measurement devices determine the degree of light scattering that occurs in translucent materials and do the numbers correspond with the visual perception? Appearance is an area where questions are much more numerous than answers and where questions expressed today can become guidelines for scientific research in the future. Everyone is welcome to share their own questions arising from their own professional experience! This is meant to be a truly interactive session.

Demo Session on Material Appearance

4:20 – 5:20 pm

Cypress A

Talking about material appearance is good. Looking at materials and speaking about them is even better! Every innovative or traditional object, material, image or simulation is welcome to be presented in the final session of the MAAP conference. Collectively they will serve as an inspiration for future innovative objects, materials, images or simulations.

5:30 – 7:00 pm Symposium Demonstration Session

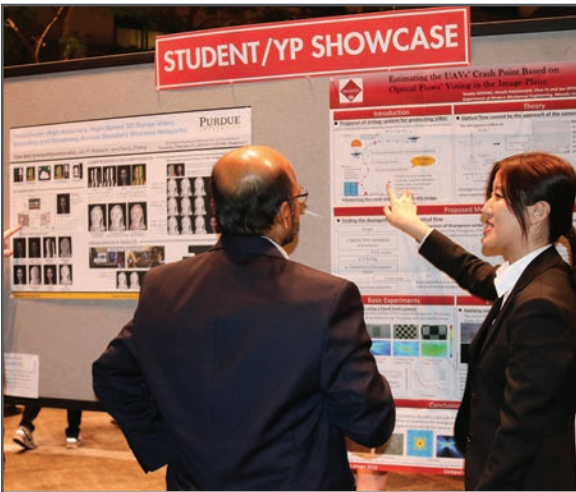
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