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PROCEEDINGS

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Material Appearance 2018

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These papers represent the program of Electronic Imaging 2018,
held 28 January – 1 February 2018, at the Hyatt Regency San Francisco Airport in Burlingame, CA.

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Material Appearance 2018

Introduction

The field of material appearance is in constant evolution and appearance continues to be a crucial issue across a range of industrial domains. It is a signature of quality for manufactured and natural products and a criterion of choice for end-customers. Digital processes tend to replace ancient manual manufacturing, thus providing more repeatable aspects for the produced objects, but depriving the manufacturer of traditional, manual means of appearance improvements. In this evolution, digital imaging takes a central place, from its role in online selling; to medical imaging devices assisting physicians in their medical diagnostics by providing many kinds of images from which visual attributes can objectively be evaluated (in the presence or absence of the patient thanks to the spreading of telemedicine); to production or reproduction of objects by 3D printing (an upcoming, massive manufacturing method), to name only a few examples. Many additional examples can be found in human activity today with comparable technical, economical or societal issues.

Assessing and measuring quality is a big challenge for science, because of the subjective part of appearance perception, and also because of the number of disciplines this subject encompasses: material sciences and chemistry, physics and optics for both modelling and measurement, computer science – for simulation, display, or data analyses, digital imaging, sensorial science, and other disciplines usually discarded from "hard sciences" such as design, psychophysics and psychology, sociology. The Material Appearance conference aims at gathering this broad variety of knowledge, and rendering the current pioneering research in both academic and industrial laboratories for understanding appearance.

Papers have been solicited in the following categories:

Physical and visual material characterization: Scattering and absorption properties, layer thicknesses, optical index, surface topology, color, gloss, texture, translucency, Bidirectional Reflectance Distribution Functions (BRDF), Bidirectional Texture Functions (BTF) and Bidirectional Surface Scattering Reflectance Distribution Function (BSSRDF). . .

Measurement techniques: Spectrophotometry, gonio-spectrometry, spectral imaging, angular imaging, 3D imaging, OCT, polarized imaging, glossmeters, non-invasive measurements. . .

Modeling: Light scattering, reflection by multilayers, inverse models,

Reproduction: acquisition of object images (spectral, 3D. . .), soft proofing methods for 2.5D and 3D printing, reproduction quality assessment,

Simulation and display: HDR/spectral display for material appearance, virtual proofing for design, physically-realistic image synthesis

Applications: Art, textile, medical, automotive, object design, manufacturing, lighting. . .

Material Appearance 2018

Monday, January 29, 2018

Keynote: Appearance Issues in Cultural Heritage
Session Chairs: Mathieu Hebert, Université Jean Monnet de Saint Etienne (France) and Ingeborg Tastl, HP Labs, HP Inc. (United States)
10:40 – 11:20 AM
Cypress A

MAAP-122
Material appearance issues: Cultural heritage research, *Holly Rushmeier, Yale University (United States)*
Prof. Holly Rushmeier is a professor in the Yale department of computer science. Her research interests include shape and appearance capture, applications of perception in computer graphics, modeling material appearance and developing computational tools for cultural heritage. Prof. Rushmeier received her BS, MS and PhD in mechanical engineering from Cornell University (1977, 1986 and 1988 respectively). Between receiving the BS and returning to graduate school in 1983 she worked as an engineer at the Boeing Commercial Airplane Company and at Washington Natural Gas Company (now a part of Puget Sound Energy). In 1988 she joined the mechanical engineering faculty at Georgia Tech. At the end of 1991, she joined the computing and mathematics staff of the National Institute of Standards and Technology, focusing on scientific data visualization. From 1996 to early 2004, Dr. Rushmeier was a research staff member at the IBM T.J. Watson Research Center. At IBM she worked on a variety of data visualization problems in applications ranging from engineering to finance. She also worked in the area of acquisition of data required for generating realistic computer graphics models, including a project to create a digital model of Michelangelo's Florence Pieta, and the development of a scanning system to capture shape and appearance data for presenting Egyptian cultural artifacts on the World Wide Web.

Surface Appearance Measurement

Session Chair: Lionel Simonot, Institut Pprime (France)

11:20 am – 12:20 pm
Cypress A

11:20 MAAP-150
Diffraction removal in an image-based BRDF measurement setup, *Antoine Lucat[1,2,3,4], Ramon Hegedus[5], and Romain Pacanowski[1,2,3,4]; [1]University de Bordeaux (France), [2]CNRS (LP2N) (France), [3]Institut d'Optique Graduate School (France), [4]INRIA (France), and [5]Department of Cognitive Science (Germany)*

11:40 MAAP-151 [no paper]
Morphological characterization of rough surfaces, *Colette Turbil, Iryna Gozhyk, and Ingve Simonsen, SVI UMR 125 CNRS/Saint-Gobain Recherche (France)*

12:00 MAAP-152
Three-dimensional hyperspectral imaging: A new method for human face acquisition, *Lou Gevaux[1], Cyprien Adnet[2], Pierre Seroul[2], Raphael Clerc[1], Alain Trémeau[1], Jean-Luc Perrot[3], and Mathieu Hebert[1]; [1]Univ Lyon, UJM-Saint-Etienne, CNRS, Institut d Optique Graduate School, Laboratoire Hubert Curien, [2]Newtone Technologies, and [3]University Hospital of Saint Etienne (France)*

12:20 – 2:00 pm Lunch

Plenary Session

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

Overview of Modern Machine Learning and Deep Neural Networks - Impact on Imaging and the Field of Computer Vision, *Greg Corrado, Google, Inc. (United States)*

Dr. Greg Corrado, co-founder of Google Brain, principal scientist, and director of augmented intelligence research at Google, provides an overview of modern machine learning and deep neural networks, with particular attention to its impact on imaging and the field of computer vision.

Dr. Corrado is a senior research scientist interested in biological neuroscience, artificial intelligence, and scalable machine learning. He has published in fields ranging across behavioral economics, neuromorphic device physics, systems neuroscience, and deep learning. At Google he has worked for some time on brain inspired computing, and most recently has served as one of the founding members and the co-technical lead of Google's large scale deep neural networks project. Prior to joining Google, Dr. Corrado was a staff research scientist at IBM. He received his MS in computer science and PhD in neuroscience from Stanford University.

3:00 – 3:30 pm Coffee Break

Surface Appearance Modeling and Reproduction JOINT SESSION

Session Chairs: Reiner Eschbach, Norwegian University of Science and Technology (Norway) and Monroe Community College (United States) and Mathieu Hebert, Université Jean Monnet de Saint Etienne (France)

3:30 – 4:50 pm
Cypress A

This session is jointly sponsored by: Color Imaging XXIII: Displaying, Processing, Hardcopy, and Applications, and Material Appearance 2018.

3:30 MAAP-165
Color prediction based on individual characterizations of the ink layers and print support, *Théo Phan Van Song[1,2], Christine Andraud[2], Luis Ricardo Sapaico[1], and Maria Ortiz Segovia[1]; [1]Océ Print Logic Technologies — Canon Group and [2]Sorbonnes Universités, Centre de Recherche sur la Conservation des Collections (France)*

3:50 MAAP-166
Light interreflections and shadowing effects in a Lambertian V-cavity under diffuse illumination, *Dorian Saint-Pierre[1], Rada Deeb[1], Damien Muselet[1], Lionel Simonot[1,2], and Mathieu Hebert[1]; [1]Université Jean Monnet de Saint Etienne and [2]Institut Pprime (France)*

4:10 MAAP-167
Interactive RGB transparency: A color rendering tool for superimposed translucent layers in digital images, *Lionel Simonot[1,2] and Mathieu Hebert[3]; [1]Institut Pprime, [2]Futuroscope Chasseneuil, and [3]Université Jean Monnet de Saint Etienne (France)*

4:30 MAAP-168
General method for estimating fluorescent Donaldson matrices, *Shoji Tominaga[1,2], Keita Hirai[1], and Takahiko Horiuchi[1]; [1]Chiba University (Japan) and [2]Norwegian University of Science and Technology (Norway)*

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

Tuesday, January 30, 2018

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

Keynote: Appearance Assessment
Session Chair: Ingeborg Tastl, HP Labs, HP Inc. (United States)
8:50 – 9:30 am
Cypress A

MAAP-184
Digital appearance assessment methods and challenges, *Marc Ellens, X-Rite, Inc. (United States)*
Dr. Marc S. Ellens is a senior research scientist with X-Rite in Grand Rapids, MI. He received his PhD in computer aided geometric design from the University of Utah. Employed at X-Rite for 13 years, he has been involved in research and development efforts toward the capture and reproduction of appearance. Dr. Ellens has presented at numerous conferences including the NVIDIA GPU Technology conference, Autodesk's Automotive Innovation Forums, AATCC LED Lighting Conference, and SPIE Color Image Conference and Materials Conference. He is named in three patents related to material visualization and reproduction and has been a member of ACM SIGGRAPH for more than 15 years.

Appearance Assessment

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

9:30 – 10:10 am
Cypress A

9:30 MAAP-209
Perceptual appearance uniformity in 3D printing, *Michael Ludwig[1], Nathan Moroney[2], Ingeborg Tastl[2], Melanie Gottwals[2], and Gary Meyer[1]; [1]University of Minnesota and [2]HP Labs, HP Inc. (United States)*

9:50 MAAP-210
A model of visual opacity for translucent colorants, *Helene Midtfjord, Phil Green, and Peter Nussbaum, Norwegian University of Science and Technology (Norway)*

10:10 – 10:50 am Coffee Break

10:00 am – 7:30 pm Industry Exhibition

Keynote: Appearance Rendering
Session Chair: Lionel Simonot, Institut Pprime (France)
10:50 – 11:30 am
Cypress A

MAAP-226
Simulating the appearance of materials, *Henrik Jensen, University of California, San Diego (United States)*
Prof. Henrik Wann Jensen is a professor at the University of California at San Diego, where he works in the computer graphics lab. His research is focused on realistic image synthesis, global illumination, rendering of natural phenomena, and appearance modeling. His contributions to computer graphics include the photon mapping algorithm for global illumination, and the first technique for efficiently simulating subsurface scattering in translucent materials. He is the author of "Realistic Image Synthesis using Photon Mapping," AK Peters 2001. He has rendered images that have appeared on the front covers of the National Geographic Magazine and the SIGGRAPH proceedings. He previously worked at Stanford University, Massachusetts Institute of Technology (MIT), Weta, Pixar, and at mental images. He received his MSc and PhD in computer science from the Technical University of Denmark. He is the recipient of an Academy Award (Technical Achievement Award) from the Academy of Motion Picture Arts and Sciences for pioneering research in rendering translucent materials. He also received a Sloan Fellowship, and was selected as one of the top 10 scientists by Popular Science magazine.

Discussion: Interfaces for Material Appearance Design
Session Chairs: Mathieu Hebert, Université Jean Monnet de Saint Etienne (France) and Ingeborg Tastl, HP Labs, HP Inc. (United States)
11:30 am – 12:30 pm
Cypress A

MAAP-255
Interfaces for material appearance design, *Holly Rushmeier, Yale University (United States)*
Computer graphics systems have elaborate systems of menus for specifying reflectance, transmittance and texture for objects. These menus are generally based on the computational structures that will be used (e.g. Specifying parameters like a "Phong exponent"), rather than on how people view or think about material appearance. Further, the systems apply to virtual materials only — not necessarily materials that will be physically produced. Only a few projects have explored other paradigms for specification — such as virtually painting test objects, rather than tweaking parameters. Little work has been done on the display requirements in terms of resolution, color reproduction and dynamic range required. The constraints of real material manufacture have not been incorporated. The role of VR and AR in material design has not be explored. This discussion will ask the audience to contribute their experiences with using and developing interfaces, and ideas for new research directions in this area.

12:30 – 2:00 pm Lunch

Plenary Session

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

Fast, Automated 3D Modeling of Buildings and Other GPS Denied Environments, *Avideh Zakhor, University of California, Berkeley (United States)*

Professor Avideh Zahkor discusses fast, automated 3D modeling of buildings and other GPS denied environments with examples from her work in 3D reality capture, and visual and metric documentation of building interiors. Dr. Zakhor is a serial entrepreneur with startups in outdoor mapping, indoor mapping, and micro-lithography, currently CEO and founder of Indoor Reality, a Silicon Valley startup with products in 3D reality capture, and visual and metric documentation of building interiors.

Dr. Zakhor has been faculty member at University of California, Berkeley since 1994 where she holds the Qualcomm Chair in the electrical engineering and computer science department. She co-founded OPC technology in 1996, which was acquired by Mentor Graphics in 1998, and UrbanScan Inc. in 2005, acquired by Google in 2007. UrbanScan created the first fully automated 3D outdoor mapping system for 3D exterior models of buildings in urban environments. She has received a number of best paper awards in 3D computer vision, image processing, signal processing, is an IEEE fellow, and received the presidential young investigator award in 1992. Dr. Zakhor received her BSc in electrical engineering, from the California Institute of Technology (1983), and her MS (1985) and PhD (1987) in electrical engineering and computer science from MIT.

Symposium Demonstration Session

5:30 – 7:30 pm
Grand Peninsula Ballroom E