

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

PROCEEDINGS

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

Photography, Mobile, and Immersive Imaging 2019

Editors: **Jon S. McElvain**, Dolby Labs., Inc. (United States)
Nitin Sampat, Rochester Institute of Technology (United States)

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Photography, Mobile, and Immersive Imaging 2019

Conference overview

Photography, Mobile, and Immersive Imaging, previously *Digital Photography and Mobile Imaging*, conference expands its scope in 2019 to cover the areas of automotive and medical imaging, machine vision/learning, and topics pertaining to virtual reality, augmented reality and mixed reality. It serves to bring together researchers, scientists, and engineers working in the fields of mobile, automotive imaging, medical imaging, computational photography and VR/AR/MR to discuss recent progress and advances in these fields. The technical scope includes novel Input hardware and system architecture designs, high dynamic range imaging, sensor architectures, image / video artifact corrections, enhancement, rendering, and imaging pipelines. This conference includes paper presentations, presentation-only talks as well as joint sessions with other Electronic Imaging conferences with overlapping interests. In Electronic Imaging 2020, PMII will merge with the IMSE conference.

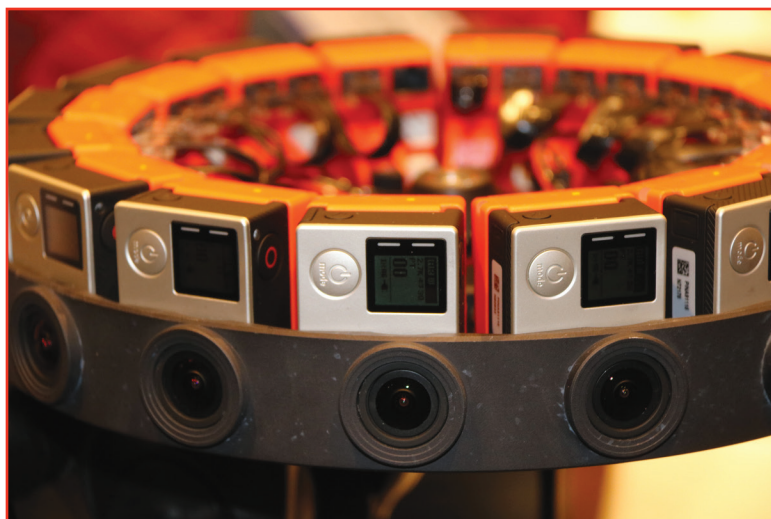
Award (jointly with the IMSE conference)

Arnaud Darmont Memorial Best Paper Award

Conference Chairs: Jon S. McElvain, Dolby Labs, Inc. (United States); and Nitin Sampat, Edmund Optics, Inc. (United States)

Program Committee: Ajit Bopardikar, Samsung R&D Institute India Bangalore Pvt. Ltd. (India); Peter Catrysse, Stanford University (United States); Henry Dietz, University of Kentucky (United States); Joyce E. Farrell, Stanford University (United States); Boyd Fowler, OmniVision Technologies, Inc. (United States); Orazio Gallo, NVIDIA Research (United States); Sergio Goma, Qualcomm Technologies, Inc. (United States); Zhen He, Intuitive Surgical, Inc. (United States); Francisco Imai, Apple Inc. (United States); Michael Kriss, MAK Consultants (United States); Jiangtao (Willy) Kuang, Facebook, Inc. (United States); Feng Li, Intuitive Surgical, Inc. (United States); Kevin Matherson, Microsoft Corporation (United States); David Morgan-Mar, Canon Information Systems Research Australia Pty Ltd (CISRA) (Australia); Bo Mu, Quanergy Inc. (United States); Oscar Nestares, Intel Corporation (United States); Jackson Roland, Apple Inc. (United States); Radka Tezaur, Intel Corporation (United States); Gordon Weitzstein, Stanford University (United States); and Dietmar Wueller, Image Engineering GmbH & Co. KG (Germany)

Conference Sponsor



PHOTOGRAPHY, MOBILE, AND IMMERSIVE IMAGING 2019

Monday January 14, 2019

Machine Learning Applications in Imaging

Session Chairs: Jon McElvain, Dolby Laboratories (United States) and Radka Tezaur, Intel Corporation (United States)

10:30 am – 12:00 pm

Regency AB

10:30 PMII-575
Expanding the impact of deep learning (Invited), Ray Ptucha, Rochester Institute of Technology (United States)

11:00 PMII-576
Towards combining domain knowledge and deep learning for computational imaging (Invited), Orazio Gallo, NVIDIA Research (United States)

11:20 PMII-577
Autofocus by deep reinforcement learning of phase data, Chin-Cheng Chan and Homer Chen, National Taiwan University (Taiwan)

11:40 PMII-578
Face skin tone adaptive automatic exposure control, Noha El-Yamany, Jarno Nikkanen, and Jihyeon Yi, Intel Corporation (Finland)

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 cofounded OrCam which harnesses computer vision and artificial intelligence to assist people who are visually impaired or blind.

3:00 – 3:30 pm Coffee Break

PMII

Panel: Sensing and Perceiving for Autonomous Driving JOINT SESSION

3:30 – 5:30 pm
Grand Peninsula Ballroom D

This session is jointly sponsored by the EI Steering Committee

Moderator: Dr. Wende Zhang, technical fellow, General Motors
Panelists:
 Dr. Amnon Shashua, professor of computer science, Hebrew University; president and CEO, Mobileye, an Intel Company, and senior vice president, Intel Corporation
 Dr. Boyd Fowler, CTO, OmniVision Technologies
 Dr. Christoph Schroeder, head of autonomous driving N.A., Mercedes-Benz R&D Development North America, Inc.
 Dr. Jun Pei, CEO and co-founder, Cepton Technologies Inc.

Driver assistance and autonomous driving rely on perceptual systems that combine data from many different sensors, including camera, ultrasound, radar and lidar. The panelists will discuss the strengths and limitations of different types of sensors and how the data from these sensors can be effectively combined to enable autonomous driving.

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

Tuesday January 15, 2019

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

High Dynamic Range Imaging I

Session Chairs: Michael Kriss, MAK Consultants (United States) and Jackson Roland, Apple Inc. (United States)

8:50 – 9:30 am
Regency AB

PMII-579

KEYNOTE: High dynamic range imaging: History, challenges, and opportunities, Greg Ward, Dolby Laboratories, Inc. (United States)

Greg Ward is a pioneer in the HDR space, having developed the first widely-used high dynamic range image file format in 1986 as part of the RADIANCE lighting simulation system. Since then, he has developed the LogLuv TIFF HDR and the JPEG-HDR image formats, and created Photosphere, an HDR image builder and browser. He has been involved with BrightSide Technology and Dolby's HDR display developments. He is currently a senior member of technical staff for research at Dolby Laboratories. He also consults for the Lawrence Berkeley National Lab on RADIANCE development, and for IRYStec, Inc. on OS-level mobile display software.

High Dynamic Range Imaging II

Session Chairs: Michael Kriss, MAK Consultants (United States) and Jackson Roland, Apple Inc. (United States)

9:30 – 10:10 am
Regency AB

9:30 PMII-580
High dynamic range imaging for high performance applications (Invited), Boyd Fowler, OmniVision Technologies (United States)

9:50 PMII-581
Improved image selection for stack-based HDR imaging, Peter van Beek, University of Waterloo (Canada)

10:00 am – 7:00 pm Industry Exhibition

10:10 – 10:40 am Coffee Break

Camera Pipelines and Processing I

Session Chairs: Boyd Fowler, OmniVision Technologies (United States) and Francisco Imai, Apple Inc. (United States)

10:40 – 11:20 am
Regency AB

PMII-582

KEYNOTE: Unifying principles of camera processing pipeline in the rapidly changing imaging landscape, Keigo Hirakawa, University of Dayton (United States)

Keigo Hirakawa is an associate professor at the University of Dayton. Prior to UD, he was with Harvard University as a research associate of the department of statistics. He simultaneously earned his PhD in electrical and computer engineering from Cornell University and his MM in jazz performance from New England Conservatory of Music. Hirakawa received his MS in electrical and computer engineering from Cornell University and BS in electrical engineering from Princeton University. He is an associate editor for IEEE Transactions on Image Processing and for SPIE/IS&T Journal of Electronic Imaging, and served on the technical committee of IEEE SPS IVMSP as well as the organization committees of IEEE ICIP 2012 and IEEE ICASSP 2017. He has received a number of recognitions, including a paper award at IEEE ICIP 2007 and keynote speeches at IS&T CGIV, PCSJ-IMPS, CSAJ, and IAPR CCIW.

Camera Pipelines and Processing II

Session Chairs: Boyd Fowler, OmniVision Technologies (United States) and Francisco Imai, Apple Inc. (United States)

11:20 am – 12:40 pm
Regency AB

11:20 PMII-583
Rearchitecting and tuning ISP pipelines (Invited), Kari Pulli, stealth startup (United States)

11:40 PMII-584
Image sensor oversampling (Invited), Scott Campbell, Area4 Professional Design Services (United States)

12:00 PMII-585
Credible repair of Sony main-sensor PDAF striping artifacts, Henry Dietz, University of Kentucky (United States)

12:20

PMII-586

Issues reproducing handshake on mobile phone cameras, Francois-Xavier Bucher, Jae Young Park, Ari Partinen, and Paul Hubel, Apple Inc. (United States)

12:40 – 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

Computational Models for Human Optics

JOINT SESSION

Session Chair: Session Chair: Jennifer Gille, Oculus VR (United States)

3:30 – 5:30 pm

Grand Peninsula Ballroom D

This session is jointly sponsored by the EI Steering Committee.

3:30

EISS-704

Eye model implementation (Invited), Andrew Watson, Apple Inc. (United States)

Dr. Andrew Watson is the chief vision scientist at Apple Inc., where he specializes in vision science, psychophysics display human factors, visual human factors, computation modeling of vision, and image and video compression. For thirty-four years prior to joining Apple, Dr. Watson was the senior scientist for vision research at NASA. Watson received his PhD in psychology from the University of Pennsylvania (1977) and followed that with post doc work in vision at the University of Cambridge.

3:50

EISS-700

Wide field-of-view optical model of the human eye (Invited), James Polans, Verily Life Sciences (United States)

Dr. James Polans is an engineer who works on surgical robotics at Verily Life Sciences in South San Francisco. Polans received his PhD in biomedical engineering from Duke University under the mentorship of Joseph Izatt. His doctoral work explored the design and development of wide field-of-view optical coherence tomography systems for retinal imaging. He also has a MS in electrical engineering from the University of Illinois at Urbana-Champaign.

4:10

EISS-702

Evolution of the Arizona Eye Model (Invited), Jim Schwiegerling, University of Arizona (United States)

Prof. Jim Schwiegerling is a Professor in the College of Optical Sciences at the University of Arizona. His research interests include the design of ophthalmic systems such as corneal topographers, ocular wavefront sensors and retinal imaging systems. In addition to these systems, Schwiegerling has designed a variety of multifocal intraocular and contact lenses and has expertise in diffractive and extended depth of focus systems.

4:30

EISS-705

Berkeley Eye Model (Invited), Brian Barsky, University of California, Berkeley (United States)

Prof. Brian Barsky is professor of computer science and affiliate professor of optometry and vision science at UC Berkeley. He attended McGill University, Montréal, received a DCS in engineering and a BSc in mathematics and computer science. He studied computer graphics and computer science at Cornell University, Ithaca, where he earned an MS. His PhD is in computer science from the University of Utah, Salt Lake City. He is a fellow of the American Academy of Optometry. His research interests include computer aided geometric design and modeling, interactive three-dimensional computer graphics, visualization in scientific computing, computer aided cornea modeling and visualization, medical imaging, and virtual environments for surgical simulation.

4:50 EISS-701
Modeling retinal image formation for light field displays (Invited),
 Hekun Huang, Mohan Xu, and Hong Hua, University of Arizona
 (United States)

Prof. 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.

5:10 EISS-703
Ray-tracing 3D spectral scenes through human optics (Invited),
 Trisha Lian, Kevin MacKenzie, and Brian Wandell, Stanford University (United States)

Trisha Lian is an electrical engineering PhD student at Stanford University. Before Stanford, she received her bachelor's in biomedical engineering from Duke University. She is currently advised by Professor Brian Wandell and works on interdisciplinary topics that involve image systems simulations. These range from novel camera designs to simulations of the human visual system.

5:30 – 7:00 pm Symposium Demonstration Session

Wednesday January 16, 2019

Medical Imaging - Camera Systems

JOINT SESSION

Session Chairs: Jon McElvain, Dolby Laboratories (United States) and Ralf Widenhorn, Portland State University (United States)

8:50 – 10:30 am
 Grand Peninsula Ballroom D

This medical imaging session is jointly sponsored by: Image Sensors and Imaging Systems 2019, and Photography, Mobile, and Immersive Imaging 2019.

8:50 PMII-350
Plenoptic medical cameras (Invited), Liang Gao, University of Illinois Urbana-Champaign (United States)

9:10 PMII-351
Simulating a multispectral imaging system for oral cancer screening (Invited), Joyce Farrell, Stanford University (United States)

9:30 PMII-352
Imaging the body with miniature cameras, towards portable healthcare (Invited), Ofer Levi, University of Toronto (Canada)

9:50 PMII-353
Self-calibrated surface acquisition for integrated positioning verification in medical applications, Sven Jörissen¹, Michael Bleier², and Andreas Nüchter¹; ¹University of Wuerzburg and ²Zentrum für Telematik e.V. (Germany)

10:10 IMSE-354
Measurement and suppression of multipath effect in time-of-flight depth imaging for endoscopic applications, Ryota Miyagi¹, Yuta Murakami¹, Keiichiro Kagawa¹, Hajime Ngahara², Kenji Kawashima³, Keita Yasutomi¹, and Shoji Kawahito¹; ¹Shizuoka University, ²Osaka University, and ³Tokyo Medical and Dental University (Japan)

10:00 am – 3:30 pm Industry Exhibition

10:10 – 10:50 am Coffee Break

Automotive Image Sensing I**JOINT SESSION**

Session Chairs: Kevin Matherson, Microsoft Corporation (United States); Arnaud Peizerat, CEA (France); and Peter van Beek, Intel Corporation (United States)

10:50 am – 12:10 pm

Grand Peninsula Ballroom D

This session is jointly sponsored by: *Autonomous Vehicles and Machines 2019*, *Image Sensors and Imaging Systems 2019*, and *Photography, Mobile, and Immersive Imaging 2019*.

10:50

IMSE-050

KEYNOTE: Recent trends in the image sensing technologies, Vladimir Koifman, Analog Value Ltd. (Israel)

Vladimir Koifman is a founder and CTO of Analog Value Ltd. Prior to that, he was co-founder of Advasense Inc., acquired by Pixim/Sony Image Sensor Division. Prior to co-founding Advasense, Koifman co-established the AMCC analog design center in Israel and led the analog design group for three years. Before AMCC, Koifman worked for 10 years in Motorola Semiconductor Israel (Freescale) managing an analog design group. He has more than 20 years of experience in VLSI industry and has technical leadership in analog chip design, mixed signal chip/system architecture and electro-optic device development. Koifman has more than 80 granted patents and several papers. Koifman also maintains Image Sensors World blog.

11:30

AVM-051

KEYNOTE: Solid-state LiDAR sensors: The future of autonomous vehicles, Louay Eldada, Quanergy Systems, Inc. (United States)

Louay Eldada is CEO and co-founder of Quanergy Systems, Inc. Eldada is a serial entrepreneur, having founded and sold three businesses to Fortune 100 companies. Quanergy is his fourth startup. Eldada is a technical business leader with a proven track record at both small and large companies and with 71 patents, is a recognized expert in quantum optics, nanotechnology, photonic integrated circuits, advanced optoelectronics, sensors and robotics. Prior to Quanergy, he was CSO of SunEdison, after serving as CTO of HeliVolt, which was acquired by SK Energy. Eldada was earlier CTO of DuPont Photonic Technologies, formed by the acquisition of Telephotonics where he was founding CTO. His first job was at Honeywell, where he started the Telecom Photonics business and sold it to Corning. He studied business administration at Harvard, MIT and Stanford, and holds a PhD in optical engineering from Columbia University.

Automotive Image Sensing II**JOINT SESSION**

Session Chairs: Kevin Matherson, Microsoft Corporation (United States); Arnaud Peizerat, CEA (France); and Peter van Beek, Intel Corporation (United States)

12:10 – 12:50 pm

Grand Peninsula Ballroom D

This session is jointly sponsored by: *Autonomous Vehicles and Machines 2019*, *Image Sensors and Imaging Systems 2019*, and *Photography, Mobile, and Immersive Imaging 2019*.

12:10

PMII-052

Driving, the future – The automotive imaging revolution (Invited), Patrick Denny, Valeo (Ireland)

12:30

AVM-053

A system for generating complex physically accurate sensor images for automotive applications, Zhenyi Liu^{1,2}, Minghao Shen¹, Jiaqi Zhang³, Shuangting Liu³, Henryk Blasinski², Trisha Lian², and Brian Wandell²; ¹Jilin University (China), ²Stanford University (United States), and ³Beihang University (China)

12:50 – 2:00 pm Lunch

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

Light Field Imaging and Display**JOINT SESSION**

Session Chair: Gordon Wetzstein, Stanford University (United States)

3:30 – 5:30 pm

Grand Peninsula Ballroom D

This session is jointly sponsored by the EI Steering Committee.

3:30 EISS-706
Light fields - From shape recovery to sparse reconstruction (Invited),
 Ravi Ramamoorthi, University of California, San Diego (United States)

Prof. Ravi Ramamoorthi is the Ronald L. Graham Professor of Computer Science, and Director of the Center for Visual Computing, at the University of California, Berkeley. Ramamoorthi received his PhD in computer science (2002) from Stanford University. Prior to joining UC San Diego, Ramamoorthi was associate professor of EECS at the University of California, Berkeley, where he developed the complete graphics curricula. His research centers on the theoretical foundations, mathematical representations, and computational algorithms for understanding and rendering the visual appearance of objects, exploring topics in frequency analysis and sparse sampling and reconstruction of visual appearance datasets a digital data-driven visual appearance pipeline; lightfield cameras and 3D photography; and physics-based computer vision. Ramamoorthi is an ACM Fellow for contributions to computer graphics rendering and physics-based computer vision, awarded Dec. 2017, and an IEEE Fellow for contributions to foundations of computer graphics and computer vision, awarded Jan. 2017.

4:10 EISS-707
The beauty of light fields (Invited), David Fattal, LEIA Inc. (United States)

Dr. David Fattal is co-founder and CEO at LEIA Inc., where he is in charge of bringing their mobile holographic display technology to market. Fattal received his PhD in physics from Stanford University (2005). Prior to founding LEIA Inc., Fattal was a research scientist with HP Labs, HP Inc. At LEIA Inc., the focus is on immersive mobile, with screens that come alive in richer, deeper, more beautiful ways. Flipping seamlessly between 2D and lightfields, mobile experiences become truly immersive: no glasses, no tracking, no fuss. Alongside new display technology LEIA Inc. is developing Leia Loft™ — a whole new canvas.

4:30 EISS-708
Light field insights from my time at Lytro (Invited), Kurt Akeley, Google Inc. (United States)

Dr. Kurt Akeley is a distinguished engineer at Google Inc. Akeley received his PhD in stereoscopic display technology from Stanford University (2004), where he implemented and evaluated a stereoscopic display that passively (e.g., without eye tracking) produces nearly correct focus cues. After Stanford, Akeley worked with OpenGL at NVIDIA Incorporated, was a principal researcher at Microsoft Corporation, and a consulting professor at Stanford University. In 2010, he joined Lytro Inc. as CTO. During his seven-year tenure as Lytro's CTO, he guided and directly contributed to the development of two consumer lightfield cameras and their related display systems, and also to a cinematic capture and processing service that supported immersive, six-degree-of-freedom virtual reality playback.

4:50 EISS-709
Quest for immersion (Invited), Kari Pulli, Stealth Startup (United States)

Dr. Kari Pulli has spent two decades in computer imaging and AR at companies such as Intel, NVIDIA and Nokia. Before joining a stealth startup, he was the CTO of Meta, an augmented reality company in San Mateo, heading up computer vision, software, displays, and hardware, as well as the overall architecture of the system. Before joining Meta, he worked as the CTO of the Imaging and Camera Technologies Group at Intel, influencing the architecture of future IPU's in hardware and software. Prior, he was vice president of computational imaging at Light, where he developed algorithms for combining images from a heterogeneous camera array into a single high-quality image. He previously led research teams as a senior director at NVIDIA Research and as a Nokia fellow at Nokia Research, where he focused on computational photography, computer vision, and AR. Pulli holds computer science degrees from the University of Minnesota (BSc), University of Oulu (MSc, Lic. Tech), and University of Washington (PhD), as well as an MBA from the University of Oulu. He has taught and worked as a researcher at Stanford, University of Oulu, and MIT.

5:10 EISS-710
Industrial scale light field printing (Invited), Matthew Hirsch, Lumii Inc. (United States)

Dr. Matthew Hirsch is a co-founder and chief technical officer of Lumii. He worked with Henry Holtzman's Information Ecology Group and Ramesh Raskar's Camera Culture Group at the MIT Media Lab, making the next generation of interactive and glasses-free 3D displays. Hirsch received his bachelors from Tufts University in computer engineering, and his Masters and Doctorate from the MIT Media Lab. Between degrees, he worked at Analogic Corp. as an imaging engineer, where he advanced algorithms for image reconstruction and understanding in volumetric x-ray scanners. His work has been funded by the NSF and the Media Lab consortia, and has appeared in SIGGRAPH, CHI, and ICCP. Hirsch has also taught courses at SIGGRAPH on a range of subjects in computational imaging and display, with a focus on DIY.

Photography, Mobile, and Immersive Imaging 2019 Interactive Posters Session

5:30 – 7:00 pm

The Grove

The following works will be presented at the EI 2019 Symposium Interactive Papers Session.

A new methodology in optimizing the auto-flash quality of mobile cameras, Abtin Ghelmsaraei, Quarry Lane High School (United States) PMII-587

Deep video super-resolution network for flickering artifact reduction, Il Jun Ahn, Jae-yeon Park, Yongsup Park, and Tammy Lee, Samsung Electronics (Republic of Korea) PMII-588

Fast restoring of high dynamic range image appearance for multi-partial reset sensor, Ziad Youssfi and Firas Hassan, Ohio Northern University (United States) PMII-589

Shuttering methods and the artifacts they produce, Henry Dietz and Paul Eberhart, University of Kentucky (United States) PMII-590

Thursday January 17, 2019

Imaging Systems

JOINT SESSION

Session Chairs: Atanas Gotchev, Tampere University of Technology (Finland) and Michael Kriss, MAK Consultants (United States)

8:50 – 10:10 am

Regency B

This session is jointly sponsored by: Image Processing: Algorithms and Systems XVII, and Photography, Mobile, and Immersive Imaging 2019.

8:50 PMII-278

EDICT: Embedded and distributed intelligent capture technology (Invited), Scott Campbell, Timothy Macmillan, and Katsuri Rangam, Area4 Professional Design Services (United States)

9:10 IPAS-279

Modeling lens optics and rendering virtual views from fisheye imagery, Filipe Gama, Mihail Georgiev, and Atanas Gotchev, Tampere University of Technology (Finland)

9:30 PMII-280

Digital distortion correction to measure spatial resolution from cameras with wide-angle lenses, Brian Rodricks¹ and Yi Zhang²; ¹SensorSpace, LLC and ²Facebook Inc. (United States)

9:50 IPAS-281

LiDAR assisted large-scale privacy protection in street view cycloramas, Clint Sebastian¹, Bas Boom², Egor Bondarev¹, and Peter De With¹; ¹Eindhoven University of Technology and ²CycloMedia Technology B.V. (the Netherlands)

10:10 – 11:00 am Coffee Break

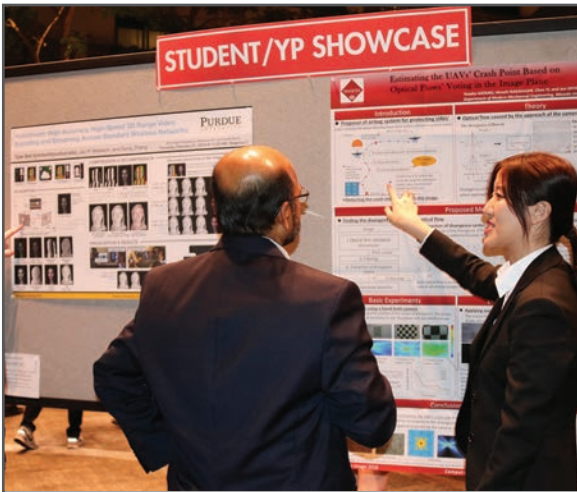
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