

IS&T International Symposium on Electronic Imaging Science and Technology 2018

**Stereoscopic Displays and
Applications XXIX**

**Burlingame, California, USA
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Stereoscopic Displays and Applications XXIX

Monday, January 29, 2018

Stereoscopic Developments

Session Chair: Takashi Kawai, Waseda University (Japan)

8:50 – 10:20 am

Grand Peninsula Ballroom D

8:50 SD&A-109

Use of virtual reality to assess and treat weaknesses in human stereoscopic vision, Benjamin Backus, Brian Dornbos, Tuan Tran, James Blaha, and Manish Gupta, Vivid Vision, Inc. (United States)

9:10 SD&A-110

Emotional effects of car-based motion representations with stereoscopic images, Jo Inami¹, Ryo Kodama², Yusuke Hasegawa¹, Nobushige Fujieda², and Takashi Kawai¹; ¹Waseda University and ²Toyota Central R&D Labs., Inc. (Japan)

9:30 SD&A-111

Mid-air imaging technique for architecture in public space, Ayaka Sano and Naoya Koizumi, The University of Electro-Communications (Japan)

9:50 SD&A-112

A refocus-interface for diminished reality work area visualization, Momoko Maezawa, Shohei Mori, and Hideo Saito, Keio University (Japan)

10:10

SD&A Opening Remarks

10:20 – 10:50 am Coffee Break

Autostereoscopic Displays 1: Light-field

Session Chair: John Stern, Intuitive Surgical, Inc. (United States)

10:50 AM – 12:30 pm

Grand Peninsula Ballroom D

10:50 SD&A-140

Initial work on development of an open Streaming Media Standard for Field of Light Displays (SMFoLD), Jamison Daniel¹, Benjamin Hernandez Arreguin¹, C. E. (Tommy) Thomas², Stephen Kelley², Paul Jones², and Chris Chinnock³; ¹Oak Ridge National Laboratory, ²Third Dimension Technologies, and ³Insight Media (United States)

11:10 SD&A-141

Simulation tools for light-field displays based on a micro-lens array, Weitao Song¹, Dongdong Weng^{2,3}, Yuanjin Zheng¹, Yue Liu^{2,3}, and Yongtian Wang^{2,3}; ¹Nanyang Technological University (Singapore), ²Advanced Innovation Center for Future Visual Entertainment of Beijing Film Academy (China), and ³Beijing Institute of Technology (China)

11:30 SD&A-142

Full-parallax spherical light field display using mirror array, Hiroaki Yano and Tomohiro Yendo, Nagaoka University of Technology (Japan)

11:50 SD&A-250

Fast calculation method for full-color computer-generated hologram with real objects captured by a depth camera, Yu Zhao¹, Shahinur Alam¹, Seok-Hee Jeon², and Nam Kim¹; ¹Chungbuk National University and ²Incheon National University (Republic of Korea)

12:10

SD&A-144

Conversion of sparsely-captured light field into alias-free full-parallax multiview content, Erdem Sahin¹, Suren Vagharshakyan¹, Robert Bregovic¹, Gwangsoon Lee², and Atanas Gotchev¹; ¹Tampere University of Technology (Finland) and ²ETRI (Republic of Korea)

12:30 – 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

SD&A Keynote 1

3:30 – 4:30 pm

Grand Peninsula Ballroom D

It is clear that optic flow is useful to guide an observer's movement and that binocular disparity contributes too. Both cues are important in recovering scene structure. What is less clear is how the information might be useful after a few seconds, when the observer has moved to a new vantage point and the egocentric frame in which the information was gathered is no longer applicable.

SD&A-388 [no paper]

What use is 'time-expired' disparity and optic flow information to a moving observer?, Andrew Glennerster, University of Reading (United Kingdom)

Prof. Andrew Glennerster studied medicine at Cambridge before working briefly with Michael Morgan at UCL then doing a DPhil and an EU-funded postdoc with Brian Rogers on binocular stereopsis (1989 - 1994). He held an MRC Career Development Award (1994 - 1998) with Andrew Parker in Physiology at Oxford including a year with Suzanne McKee in Smith-Kettlewell, San Francisco. He continued work with Andrew Parker on a Royal Society University Research Fellowship (1999 - 2007) which allowed him to set up a virtual reality laboratory to study 3D perception in moving observer, funded for 12 years by the Wellcome Trust. He moved to psychology in Reading in 2005, first as a Reader and now as a professor, where the lab is now funded by EPSRC.

Stereoscopic Displays and Applications XXIX

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

SD&A Conference 3D Theatre

6:00 – 7:30 pm

Grand Peninsula Ballroom D

This ever-popular session of each year's Stereoscopic Displays and Applications Conference showcases the wide variety of 3D content that is being produced and exhibited around the world. All 3D footage screened in the 3D Theater Session is shown in high-quality polarized 3D on a large screen. The final program will be announced at the conference and 3D glasses will be provided.

SD&A Conference Annual Dinner

7:50 – 10:00 pm

Offsite - details provided with registration

The annual informal dinner for SD&A attendees. An opportunity to meet with colleagues and discuss the latest advances. There is no host for the dinner. Information on venue and cost will be provided on the day at the conference.

Tuesday, January 30, 2018

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

Stereoscopic Applications: VR to Immersive Analytics in

Bioinformatics 1 JOINT SESSION

Session Chair: Björn Sommer, University of Konstanz (Germany)

8:50 – 10:10 am

Grand Peninsula Ballroom D

This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2018, and Stereoscopic Displays and Applications XXIX.

8:50 SD&A-189 [ref. to Intro]

Mesoscopic rigid body modeling of the ExtraCellular Matrix's self assembly, Hua Wong, Nicolas Bellay, and Manuel Dauchez, University of Reims Champagne-Ardenne (France)

9:10 SD&A-190 [ref. to Intro]

Semantics for an integrative and immersive pipeline combining visualisation and analysis of molecular data, Mikael Trellet¹, Nicolas Ferey¹, Patrick Bourdoi¹, and Marc Baaden²; ¹LUMSI and ²IBPC (France)

9:30 SD&A-191 [ref. to Intro]

3D-stereoscopic modeling and visualization of a Chlamydomonas reinhardtii cell, Niklas Biere¹, Mehmood Ghaffar¹, Daniel Jäger¹, Anja Doebbe¹, Nils Rothe¹, Karsten Klein^{2,3}, Ralf Hofestädt¹, Falk Schreiber^{2,3}, Olaf Kruse¹, and Björn Sommer^{2,3}; ¹Bielefeld University (Germany), ²University of Konstanz (Germany), and ³Monash University (Australia)

9:50 SD&A-192 [ref. to Intro]

Immersive analysis and visualization of redox signaling pathways integrating experiments and computational modelling, Alexandre Maes¹, Karen Druart², Sean Guégan², Xavier Martinez^{2,3}, Christophe Marchand¹, Stéphane Lemaire¹, and Marc Baaden²; ¹Institut de Biologie Physico-Chimique, UMR8226, CNRS, Sorbonne Universités, UPMC Université Paris 06, ²Laboratoire de Biochimie Théorique, CNRS, UPR9080, Univ Paris Diderot, Sorbonne Paris Cité, PSL Research University, and ³CNRS-LUMSI, VENISE team, Univ Paris-Sud (France)

10:00 am – 7:30 pm Industry Exhibition

10:10 – 10:50 am Coffee Break

Autostereoscopic Displays 2: Volumetric, Integral, Stackable, and Holographic

Session Chair: Gregg Favalora, Draper (United States)

10:50 am – 12:30 pm

Grand Peninsula Ballroom D

10:50 SD&A-246 [no paper]

Recent progress in volumetric 3D digital light photoactivatable dye displays, Shreya Patel, Jian Cao, Anthony Spearman, Cecilia O'Brien, and Alexander Lippert, Southern Methodist University (United States)

11:10 SD&A-247

Integral imaging system using locally controllable point light source array, Hayato Watanabe, Masahiro Kawakita, Naoto Okaichi, Hisayuki Sasaki, and Tomoyuki Mishina, Science and Technology Research Laboratories, NHK (Japan)

11:30 SD&A-248

Mobile integral imaging display using three-dimensional scanning, Munkh-Uchral Erdenebat¹, Ki-Chul Kwon¹, Erkhembaatar Dashdavaa¹, Jong-Rae Jeong², and Nam Kim¹; ¹Chungbuk National University and ²Suwon Science College (Republic of Korea)

11:50 SD&A-249 [no paper]

Constructing stackable multiscopic display panels using microlenses and optical waveguides, Hironobu Gotoda, National Institute of Informatics (Japan)

12:10 SD&A-143 [no paper]

Angular and spatial sampling requirements in 3D light field displays, Hong Hua, The University of Arizona (United States)

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, Avidah Zakhor, University of California, Berkeley (United States)

Professor Avidah Zakhor 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 cofounded 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.

3:00 – 3:30 pm Coffee Break

Discussion: 360° Imaging Should Be 3D – But Why

And How? **JOINT SESSION**

3:30 – 4:30 pm

Grand Peninsula Ballroom D

This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2018, and Stereoscopic Displays and Applications XXIX.

NOTE: Full list of panelists to be announced.

Stereoscopic Applications: VR to Immersive Analytics in Bioinformatics 2

JOINT SESSION

Session Chair: Marc Baaden, IBPC (France)

4:30 – 5:10 pm

Grand Peninsula Ballroom D

This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2018, and Stereoscopic Displays and Applications XXIX.

4:30 SD&A-288 [ref. to Intro]

Interactive molecular graphics for augmented reality using HoloLens,
Christoph Müller, Michael Krone, Markus Huber, Verena Biener, Guido Reina, Daniel Weiskopf, and Thomas Ertl, University of Stuttgart (Germany)

4:50 SD&A-289 [ref. to Intro]

Molecular Dynamics Visualization (MDV): Stereoscopic 3D display of biomolecular structure and interactions using the Unity game engine,
Michael Wiebrands, Chris Malajczuk, Andrew Woods, Andrew Rohl, and Ricardo Mancera, Curtin University (Australia)

Symposium Demonstration Session

5:30 – 7:30 pm

Grand Peninsula Ballroom E

Wednesday, January 31, 2018

Stereoscopic History

Session Chair: Nicolas Holliman, University of Newcastle (United Kingdom)

8:50 – 9:10 am

Grand Peninsula Ballroom D

8:50 SD&A-290

The history of stereoscopic video games for the consumer electronic market, Illicia Benoit¹ and Eric Kurland²; ¹Independent and ²3-D SPACE (United States)

SD&A Keynote 2

Session Chair: Nicolas Holliman, University of Newcastle (United Kingdom)

9:10 – 10:10 am

Grand Peninsula Ballroom D

SD&A-474 [no paper]

Over fifty years of working with stereoscopic 3D systems – Anecdotes, insights, and advice illustrated by many examples of stereoscopic imagery, both good and bad, John Merritt, The Merritt Group (United States)

Senior Consulting Scientist John O. Merritt is an internationally recognized expert in the operational use of stereoscopic 3D displays and the application of research and development in sensory and perceptual science to remote-presence systems. He brings over 30 years of experience and extensive practical and theoretical knowledge of spatial perception and stereoscopic video applications to every project. Merritt's early work in overhead reconnaissance as a Naval Air Intelligence Officer, combined with his years of experience as a 3D-display design consultant, make him uniquely qualified to assess the strengths and weaknesses of advanced 3D imaging systems. Merritt has extensive experience comparing task performance in 3D vs. 2D evaluation studies. Since completing his graduate work in sensory and perceptual psychology at Harvard University, he has provided vision research and human factors engineering consulting services to a broad range of industrial and government clients. As a senior research scientist at Perceptronics in Woodland Hills, CA, he headed a number of R&D projects related to vision and visual-simulator displays.

10:00 AM – 4:00 pm Industry Exhibition

10:10 – 10:40 am Coffee Break

Keynote: Immersive Imaging **JOINT SESSION**

Session Chair: Gordon Wetzstein, Stanford Univ. (United States)

10:40 – 11:20 am

Grand Peninsula Ballroom D

This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2018, Photography, Mobile, and Immersive Imaging 2018, and Stereoscopic Displays and Applications XXIX.

PMII-320

Real-time capture of people and environments for immersive computing, Shahram Izadi, perceptivelO, Inc. (United States)

Dr. Shahram Izadi is co-founder and CTO of perceptivelO, a new Bay Area startup working on bleeding-edge research and products at the intersection of real-time computer vision, applied machine learning, novel displays, sensing, and human-computer interaction. Prior to perceptivelO, Dr. Izadis was a research manager at Microsoft, managing a team of researchers and engineers, called Interactive 3D Technologies, working on moonshot projects in the area of augmented and virtual reality and natural user interfaces.

Immersive Imaging **JOINT SESSION**

Session Chair: Gordon Wetzstein, Stanford Univ. (United States)

11:20 am – 12:40 pm

Grand Peninsula Ballroom D

This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2018, Photography, Mobile, and Immersive Imaging 2018, and Stereoscopic Displays and Applications XXIX.

Stereoscopic Displays and Applications XXIX

11:20 PMII-350

SpinVR: Towards live-streaming 3D virtual reality video, Donald Dansereau, Robert Konrad, Aniq Masood, and Gordon Wetzstein, Stanford University (United States)

11:40 PMII-351

Towards a full parallax cinematic VR system, Haricharan Lakshman, Dolby Labs (United States)

12:00 PMII-352

Perceptual evaluation of six degrees of freedom virtual reality rendering from stacked omnistereo representation, Jayant Thatte and Bernd Girod, Stanford University (United States)

12:20 PMII-353

Image systems simulation for 360° camera rigs, Trisha Lian, Joyce Farrell, and Brian Wandell, Stanford University (United States)

12:40 – 2:00 pm Lunch

Plenary Session

2:00 – 3:00 pm

Grand Peninsula Ballroom D

Ubiquitous, Consumer AR Systems to Supplant Smartphones, Ronald T. Azuma, Intel, Corp. (United States)

Dr. Ronald T. Azuma, researcher and augmented reality pioneer, shares his vision for achieving ubiquitous, consumer AR systems. Recent large investments in augmented reality reflect the commercial interest in its inherent potential to replace current smartphone technology, but much remains to be done. In his talk, Dr. Azuma gives a vision for achieving this goal, which requires not just solving numerous technical challenges but also determining new, compelling AR experiences that will establish AR as a new platform and novel form of media.

Dr. Azuma leads a team in Intel Labs that designs and prototypes novel experiences and key enabling technologies to enable new forms of media. These technology areas include computational imaging and photography, computational displays, and head-worn displays. Dr. Azuma is recognized as a pioneer and innovator in augmented reality, and has held prominent leadership roles in that research area, including leading and implementing research projects and demonstrations in areas such as AR, visualization, and mobile applications. Dr. Azuma received his BSc (1988) in electrical engineering from University of California, Berkeley, and MS (1990) and PhD (1995) in computer science from University of North Carolina, Chapel Hill. Prior to joining Intel, he was a research leader at Nokia Research Center Hollywood, and a senior researcher at Hughes Research Laboratories.

3:00 – 3:30 pm Coffee Break

Visualization Facilities JOINT SESSION

Session Chairs: Margaret Dolinsky, Indiana University (United States) and Andrew Woods, Curtin University (Australia)

3:30 – 5:30 pm

Grand Peninsula Ballroom D

This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2018, and Stereoscopic Displays and Applications XXIX.

3:30 ERVR-392

xREZ Art + Science Lab - facilities presentation, Ruth West, University of North Texas (United States)

3:50 SD&A-393 [no paper]

CADwalk: Life-size MR-AR-VR design experience – Optimising and validating mission critical work environments, Gerhard Kimenkowski, CADwalk Global Pty Ltd. (Australia)

4:10 ERVR-394

When one is not enough: Cross-platform and collaborative developments at the Emerging Analytics Center, Dirk Reiners, Carolina Cruz-Neira, and Carsten Neumann, University of Arkansas at Little Rock (United States)

4:30 SD&A-395 [no paper]

Multiplatform VR case study – Beacon Virtua, Andrew Woods¹, Nick Oliver¹, and Paul Bourke²; ¹Curtin University and ²University of Western Australia (Australia)

4:50 SD&A-396 [no paper]

What will we see next? Current visualization facilities trends and future considerations, Kurt Hoffmeister, Mechdyne Corp. (United States)

5:10

SD&A Closing Remarks

Stereoscopic Displays and Applications XXIX Interactive (Poster)

Papers Session

5:30 – 7:00 pm

The Grove

The following works will be presented at the EI 2018 Symposium Interactive Papers Session.

SD&A-410

Computer-generated holography method based on orthographic projection using depth camera, Yan-Ling Piao¹, Seo-Yeon Park¹, Hui-Ying Wu¹, Sang-Keun Gil², and Nam Kim¹; ¹Chungbuk National University and ²Suwon University (Republic of Korea)

SD&A-411

Full-parallax and high-quality multiview 3D image acquisition method using camera slider, Byeong-Jun Kim, Ki-Chul Kwon, Jae-Min Lee, Young-Tae Lim, and Nam Kim, Chungbuk National University (Republic of Korea)

SD&A-412

Projection type light field display using undulating screen, Masahiro Kajimoto and Tomohiro Yendo, Nagaoka University of Technology (Japan)

SD&A-413

Study of eye tracking type super multi-view display using time division multiplexing, Yuta Takahashi and Tomohiro Yendo, Nagaoka University of Technology (Japan)

Meet the Future: A Showcase of Student and Young Professionals Research

5:30 – 7:30 pm

The Grove