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PROCEEDINGS

IS&T International Symposium on

Electronic Imaging

SCIENCE AND TECHNOLOGY

26 January 2020 — 30 January 2020 • Burlingame, CA, USA

The Engineering Reality of Virtual Reality 2020

Editors: **Margaret Dolinsky,** Indiana University (United States),
Ian E. McDowall, Fakespace Labs, Inc. (United States)

These papers represent the program of Electronic Imaging 2020,
held 26 January — 30 January 2020, at the Hyatt Regency San Francisco Airport in Burlingame, CA.

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The Engineering Reality of Virtual Reality 2020

Conference overview

Virtual and augmented reality systems are evolving. In addition to research, the trend toward content building continues and practitioners find that technologies and disciplines must be tailored and integrated for specific visualization and interactive applications. This conference serves as a forum where advances and practical advice toward both creative activity and scientific investigation are presented and discussed. Research results can be presented and applications can be demonstrated.

Highlights

Early Wednesday morning ERVR will join in the Imaging Sensors and Systems Conference keynote, "Mixed-reality guided neuronavigation for non-invasive brain simulation treatment." Mid-morning on Wednesday, ERVR is co-hosting a Joint Session on urban and enterprise applications of augmented reality with the Imaging and Multimedia Analytics in a Web and Mobile World 2020 Conference. Wednesday afternoon, ERVR is co-hosting the "Visualization Facilities" Joint Session with Stereoscopic Displays and Applications XXXI Conference.

On Thursday, the core ERVR conference sessions kick off with sessions exploring applications of augmented reality, immersive and virtual reality environments, and LiDAR sensor fusion.

Conference Chairs: **Margaret Dolinsky**, Indiana University (United States), and **Ian E. McDowall,** Intuitive Surgical / Fakespace Labs (United States)

Program Committee: **Dirk Reiners,** University of Arkansas at Little Rock (United States); **Jürgen Schulze,** University of California, San Diego (United States); and **Andrew Woods,** Curtin University (Australia)

Paper authors listed as of 1 January 2020;
refer to manuscript for final authors.
Titles that are not listed with the proceedings files were presentation-only.

THE ENGINEERING REALITY OF VIRTUAL REALITY 2020

Wednesday, January 29, 2020

KEYNOTE: Imaging Systems and Processing — Joint Session

Session Chairs: Kevin Matherson, Microsoft Corporation (United States) and Dietmar Wueller, Image Engineering GmbH & Co. KG (Germany)

8:50 – 9:30 am
Regency A
This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2020, Imaging Sensors and Systems 2020, and Stereoscopic Displays and Applications XXXI.

ISS-189
Mixed reality guided neuronavigation for non-invasive brain stimulation treatment, *Christoph Leuze, research scientist in the Incubator for Medical Mixed and Extended Reality, Stanford University (United States)*

Biographies and/or abstracts for all keynotes are found on pages 9–14

10:00 am – 3:30 pm Industry Exhibition - Wednesday

10:10 – 10:30 am Coffee Break

Augmented Reality in Built Environments — Joint Session

Session Chairs: Raja Bala, PARC (United States) and Matthew Shreve, Palo Alto Research Center (United States)

10:30 am – 12:40 pm
Cypress B
This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2020, and Imaging and Multimedia Analytics in a Web and Mobile World 2020.

10:30 IMAVVM-220
Augmented reality assistants for enterprise, *Matthew Shreve and Shiwali Mohan, Palo Alto Research Center (United States)*

11:00 IMAVVM-221
Extra FAT: A photorealistic dataset for 6D object pose estimation, *Jianhang Chen[1], Daniel Mas Montserrat[1], Qian Lin[2], Edward Delp[1], and Jan Allebach[1]; [1]Purdue University and [2]HP Labs, HP Inc. (United States)*

11:20 IMAVVM-222
Space and media: Augmented reality in urban environments, *Luisa Caldas, University of California, Berkeley (United States)*

12:00 ERVR-223
Active shooter response training environment for a building evacuation in a collaborative virtual environment, *Sharad Sharma and Sri Teja Bodempudi, Bowie State University (United States)*

12:20 ERVR-224
Identifying anomalous behavior in a building using HoloLens for emergency response, *Sharad Sharma and Sri Teja Bodempudi, Bowie State University (United States)*

12:40 – 2:00 pm Lunch

PLENARY: VR/AR Future Technology

Session Chairs: Radka Tezaur, Intel Corporation (United States), and Jonathan Phillips, Google Inc. (United States)

2:00 – 3:10 pm
Grand Peninsula Ballroom D

Quality Screen Time: Leveraging Computational Displays for Spatial Computing, *Douglas Lanman, director, Display Systems Research, Facebook Reality Labs (United States)*

For abstract and speaker biography, see page 7

3:10 – 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 – 4:10 pm
Grand Peninsula D
This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2020, and Stereoscopic Displays and Applications XXXI.

3:30 SD&A-265
Immersive design engineering, *Bjorn Sommer, Chang Lee, and Savina Toirrisi, Royal College of Art (United Kingdom)*

3:50 SD&A-266
Using a random dot stereogram as a test image for 3D demonstrations, *Andrew Woods, Wesley Lamont, and Joshua Hollick, Curtin University (Australia)*

KEYNOTE: Visualization Facilities — Joint Session

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

4:10 – 5:10 pm
Grand Peninsula D
This session is jointly sponsored by: The Engineering Reality of Virtual Reality 2020, and Stereoscopic Displays and Applications XXXI.

ERVR-295
Social holographics: Addressing the forgotten human factor, *Derek Van Tonder, business development manager, and Andy McCutcheon, global sales manager for Aerospace & Defence, Euclideon Holographics (Australia)*

Biographies and/or abstracts for all keynotes are found on pages 9–14

5:30 – 7:00 pm EI 2020 Symposium Interactive Posters Session

5:30 – 7:00 pm Meet the Future: A Showcase of Student and Young Professionals Research

Thursday, January 30, 2020

Flourishing Virtual & Augmented Worlds

Session Chairs: Margaret Dolinsky, Indiana University (United States) and Ian McDowall, Intuitive Surgical / Fakespace Labs (United States)

8:45 – 10:10 am
Regency A

8:45
Conference Welcome

8:50 ERVR-337
Using virtual reality for spinal cord injury rehabilitation, *Marina Ciccarelli, Susan Morris, Michael Wiebrands, and Andrew Woods, Curtin University (Australia)*

9:10 ERVR-338
Heads-up LiDAR imaging with sensor fusion, *Yang Cai, CMU (United States)*

9:30 ERVR-339
Enhancing lifeguard training through virtual reality, *Lucas Wright[1], Lara Chunko[2], Kelsey Benjamin[3], Emmanuelle Hernandez-Morales[4], Jack Miller[5], Melynda Hoover[5], and Eliot Winer[5]; [1]Hamilton College, [2]University of Colorado, [3]Prairie View A&M University, [4]University of Puerto Rico, and [5]Iowa State University (United States)*

9:50 ERVR-340
Transparent type virtual image display using small mirror array, *Akane Temochi and Tomohiro Yendo, Nagaoka University of Technology (Japan)*

10:10 – 10:50 am Coffee Break

Experiencing Virtual Reality

Session Chairs: Margaret Dolinsky, Indiana University (United States) and Ian McDowall, Intuitive Surgical / Fakespace Labs (United States)

10:50 am – 12:30 pm
Regency A

10:50 ERVR-360
Designing a VR arena: Integrating virtual environments and physical spaces for social sensorial data-driven virtual experiences, *Ruth West[1], Eitan Mendelowitz[2], Zach Thomas[1], Christopher Poovey[1], and Luke Hillard[1]; [1]University of North Texas and [2]Mount Holyoke College (United States)*

11:10 ERVR-361
Leaving the windows open: Indeterminate situations through composite 360-degree photography, *Peter Williams[1] and Sala Wong[2]; [1]California State University, Sacramento and [2]Indiana State University (United States)*

11:30 ERVR-362
User experience evaluation in virtual reality based on subjective feelings and physiological signals (JIST-first), *YunFang Niu[1], Danli Wang[1], ZiWei Wang[1], Fang Sun[2], Kang Yue[1], and Nan Zheng[1]; [1]Institute of Automation, Chinese Academy of Sciences and [2]Liaoning Normal University (China)*

11:50 ERVR-363
Interactive multi-user 3D visual analytics in augmented reality, *Wanze Xie[1], Yining Liang[1], Janet Johnson[1], Andrea Mower[2], Samuel Burns[2], Colleen Chelini[2], Paul D'Alessandro[2], Nadir Weibel[1], and Jürgen Schulze[1]; [1]University of California, San Diego and [2]PwC (United States)*

12:10 ERVR-364
CalAR: A C++ engine for augmented reality applications on Android mobile devices, *Menghe Zhang, Karen Lucknavalai, Weichen Liu, and Jürgen Schulze, University of California, San Diego (United States)*

12:30 – 2:00 pm Lunch

Developing Virtual Reality

Session Chairs: Margaret Dolinsky, Indiana University (United States) and Ian McDowall, Intuitive Surgical / Fakespace Labs (United States)

2:00 – 3:00 pm
Regency A

2:00 ERVR-380
Development and evaluation of immersive educational system to improve driver's risk prediction ability in traffic accident situation, *Hiroto Suto[1], Xingguo Zhang[2], Xun Shen[2], Pongsathorn Raksincharoensak[2], and Norimichi Tsumura[1]; [1]Chiba University and [2]Tokyo University of Agriculture and Technology (Japan)*

2:20 ERVR-381
WARHOL: Wearable holographic object labeler, *Matthew Shreve, Bob Price, Les Nelson, Raja Bala, Jin Sun, and Srichiran Kumar, Palo Alto Research Center (United States)*

2:40 ERVR-382
RaViS: Real-time accelerated view synthesizer for immersive video 6DoF VR, *Daniele Bonatto, Sarah Fachada, and Gauthier Lafruit, Université Libre de Bruxelles (Belgium)*

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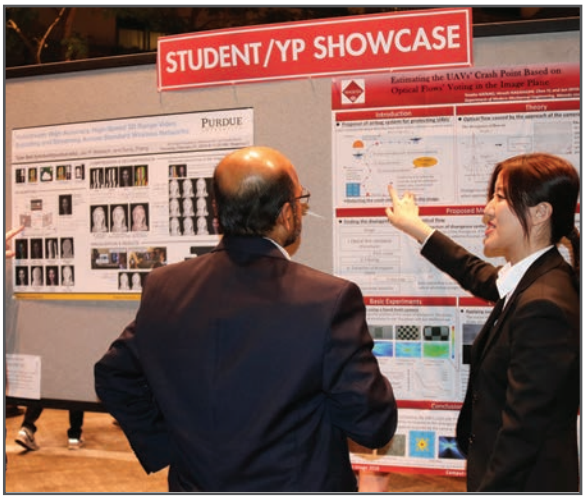

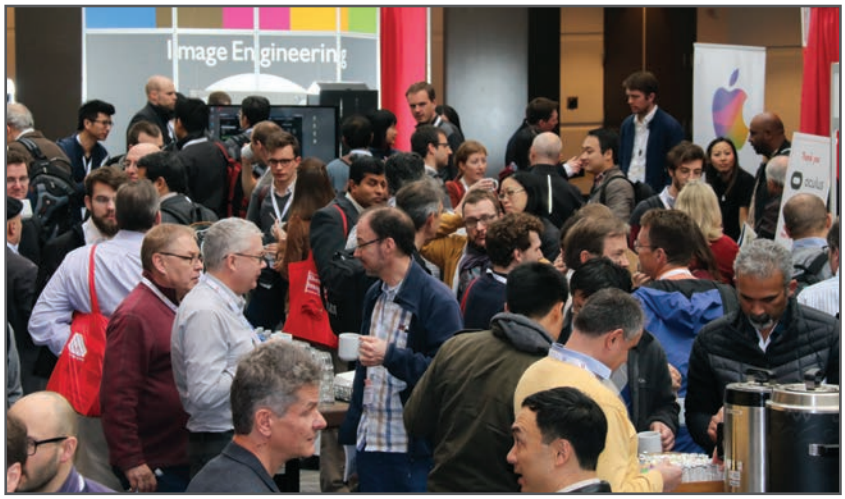

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