

# **IS&T International Symposium on Electronic Imaging Science and Technology 2020**

The Engineering Reality of Virtual Reality  
2020

Burlingame, California, USA  
26 - 30 January 2020

**Editors:**

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Ian E. McDowall**

ISBN: 978-1-7138-3815-9

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



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# THE ENGINEERING REALITY OF VIRTUAL REALITY 2020

Wednesday, January 29, 2020

12:40 – 2:00 pm Lunch

## 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)...N/A

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

IMAWM-220

**Augmented reality assistants for enterprise**, Matthew Shreve and Shiwali Mohan, Palo Alto Research Center (United States)...N/A

11:00

IMAWM-221

**Extra FAT: A photorealistic dataset for 6D object pose estimation**, Jianhang Chen<sup>1</sup>, Daniel Mas Montserrat<sup>1</sup>, Qian Lin<sup>2</sup>, Edward Delp<sup>1</sup>, and Jan Allebach<sup>1</sup>; <sup>1</sup>Purdue University and <sup>2</sup>HP Labs, HP Inc. (United States)...N/A

11:20

IMAWM-222

**Space and media: Augmented reality in urban environments**, Luisa Caldas, University of California, Berkeley (United States)...N/A

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)...1

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)...7

## 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)...N/A

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 Toirisi, Royal College of Art (United Kingdom)...N/A

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)...N/A

## 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, Euclidean Holographics (Australia)...N/A

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)...N/A

9:10

ERVR-338

**Head-up LiDAR imaging with sensor fusion**, Yang Cai, CMU (United States)...13

9:30

ERVR-339

**Enhancing lifeguard training through virtual reality**, Lucas Wright<sup>1</sup>, Lara Chunka<sup>2</sup>, Kelsey Benjamin<sup>3</sup>, Emmanuelle Hernandez-Morales<sup>4</sup>, Jack Miller<sup>5</sup>, Melynda Hoover<sup>6</sup>, and Eliot Wine<sup>5</sup>; <sup>1</sup>Hamilton College, <sup>2</sup>University of Colorado, <sup>3</sup>Prairie View A&M University, <sup>4</sup>University of Puerto Rico, and <sup>5</sup>Iowa State University (United States)...19

9:50

ERVR-340

**Transparent type virtual image display using small mirror array**, Akane Temochi and Tomohiro Yendo, Nagaoka University of Technology (Japan)...24

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<sup>1</sup>, Eitan Mendelowitz<sup>2</sup>, Zach Thomas<sup>1</sup>, Christopher Poovey<sup>1</sup>, and Luke Hillard<sup>1</sup>; <sup>1</sup>University of North Texas and <sup>2</sup>Mount Holyoke College (United States)...29

11:10

ERVR-361

**Leaving the windows open: Indeterminate situations through composite 360-degree photography**, Peter Williams<sup>1</sup> and Sala Wong<sup>2</sup>; <sup>1</sup>California State University, Sacramento and <sup>2</sup>Indiana State University (United States)...N/A

11:30

ERVR-362

**User experience evaluation in virtual reality based on subjective feelings and physiological signals (JIST-first)**, YunFang Niu<sup>1</sup>, Danli Wang<sup>1</sup>, ZiWei Wang<sup>1</sup>, Fang Sun<sup>2</sup>, Kang Yue<sup>1</sup>, and Nan Zheng<sup>1</sup>; <sup>1</sup>Institute of Automation, Chinese Academy of Sciences and <sup>2</sup>Liaoning Normal University (China)...69

11:50

ERVR-363

**Interactive multi-user 3D visual analytics in augmented reality**, Wanze Xie<sup>1</sup>, Yining Liang<sup>1</sup>, Janet Johnson<sup>1</sup>, Andrea Mower<sup>2</sup>, Samuel Burns<sup>2</sup>, Colleen Chelini<sup>2</sup>, Paul D'Alessandro<sup>2</sup>, Nadir Weibel<sup>1</sup>, and Jürgen Schulze<sup>1</sup>; <sup>1</sup>University of California, San Diego and <sup>2</sup>PwC (United States)...37

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)...42

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<sup>1</sup>, Xingguo Zhang<sup>2</sup>, Xun Shen<sup>2</sup>, Pongsathorn Raksincharoensak<sup>2</sup>, and Norimichi Tsumura<sup>1</sup>; <sup>1</sup>Chiba University and <sup>2</sup>Tokyo University of Agriculture and Technology (Japan)...48

2:20

ERVR-381

**WARHOL: Wearable holographic object labeler**, Matthew Shreve, Bob Price, Les Nelson, Raja Bala, Jin Sun, and Sririchan Kumar, Palo Alto Research Center (United States)...53

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)...61