

The Engineering Reality of Virtual Reality 2015

Margaret Dolinsky
Ian E. McDowall
Editors

9–10 February 2015
San Francisco, California, United States

Sponsored by
IS&T—The Society for Imaging Science and Technology
SPIE

Published by
SPIE

Volume 9392

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publishers are not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *The Engineering Reality of Virtual Reality 2015*, edited by Margaret Dolinsky, Ian E. McDowall, Proceedings of SPIE-IS&T Electronic Imaging, SPIE Vol. 9392, Article CID Number (2015)

ISSN: 0277-786X

ISBN: 9781628414820

Copublished by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

and

IS&T—The Society for Imaging Science and Technology

7003 Kilworth Lane, Springfield, Virginia, 22151 USA

Telephone +1 703 642 9090 (Eastern Time) · Fax +1 703 642 9094

imaging.org

Copyright © 2015, Society of Photo-Optical Instrumentation Engineers and The Society for Imaging Science and Technology.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by the publishers subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/15/\$18.00.

Printed in the United States of America.

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print. Papers are published as they are submitted and meet publication criteria. A unique citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages.

Contents

v	<i>Authors</i>
vii	<i>Conference Committee</i>

SESSION 1	WORK HARDER AND PLAY HARDER IN AR/VR
9392 02	Game-day football visualization experience on dissimilar virtual reality platforms [9392-1]
9392 03	archAR: an archaeological augmented reality experience [9392-2]
9392 04	Photorealistic 3D omni-directional stereo simulator [9392-3]
9392 05	Composing a model of outer space through virtual experiences [9392-4]
9392 06	How to avoid simulation sickness in virtual environments during user displacement [9392-5]
SESSION 2	BRINGING NEW ENERGY TO AR/VR
9392 07	Development of simulation interfaces for evaluation task with the use of physiological data and virtual reality applied to a vehicle simulator [9392-6]
9392 08	An indoor augmented reality mobile application for simulation of building evacuation [9392-7]
9392 09	Programmable immersive peripheral environmental system (PIPES): a prototype control system for environmental feedback devices [9392-8]
SESSION 3	PUSHING THE BOUNDARIES IN DATA, DIMENSIONS, AND COGNITION
9392 0C	The use of virtual reality to reimagine two-dimensional representations of three-dimensional spaces [9392-11]
9392 0D	Theory review and interaction design space of body image and body schema (BIBS) for embodied cognition in virtual reality [9392-12]
9392 0E	Embodied information behavior, mixed reality, and big data [9392-13]
SESSION 4	BE HERE NOW: ART AND SCIENCE OF BEING IN AR/VR
9392 0G	A method for real-time generation of augmented reality work instructions via expert movements [9392-15]
9392 0I	Marker-less AR system based on line segment feature [9392-17]

9392 0J **On the usefulness of the concept of presence in virtual reality applications** [9392-18]

INTERACTIVE PAPER SESSION

9392 0P **Reduce blurring and distortion in a projection type virtual image display using integrated small optics** [9392-24]

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Aguiar, Carla, 07	Winer, Eliot, 02, 0G
Aguilera, Julieta C., 05	Yamaguchi, Nobuyasu, 0I
Bernardes, Thiago, 07	Yendo, Tomohiro, 0P
Bhattacharya, Bhaskar, 0G	
Boyles, Michael, 09	
Chernoff, Gerrit, 02	
Civitate, Anthony, 02	
Colombet, F., 06	
Costa, Henrik, 07	
Cruz-Neira, Carolina, 04	
Denoual, T., 06	
Diniz, Alberto C. G. C., 07	
Domingues, Diana Maria G., 07	
Fath, Elaine, 0C	
Frend, Chauncey, 09	
Gromala, Diane, 0D	
Hasegawa, Tatsuya, 0P	
Hoover, Melynda, 02	
Hoyle, Janae, 02	
Iscen, Ozgun Eylul, 0D	
Jaycen, Amelia R., 0E	
Jerripathula, Shanmukha, 08	
Kalivarapu, Vijay, 02	
Kemeny, A., 06	
Lueg, Christopher P., 0E	
MacAllister, Anastacia, 02	
Mestre, Daniel R., 0J	
Miosso, Cristiano, 07	
Miranda, Mateus R., 07	
Nakayama, Yusuke, 0I	
Neumann, Carsten, 04	
Oliveira, Alessandro B. S., 07	
Oliveira, Luiz, 07	
Oliver, James, 02	
Parola, Max J., 0E	
Reiners, Dirk, 04	
Saito, Hideo, 0I	
Schlueter, Jonathan, 02	
Schulze, Jürgen P., 03	
Sharma, Sharad, 08	
Shaw, Chris D., 0D	
Shimizu, Masayoshi, 0I	
Smith, Jesse, 02	
Sridhar, Shubang, 02	
Thompkins, Phillip, 02	
Tong, Xin, 0D	
West, Ruth, 0E	
Wiley, Bridgette, 03	
Williamson, Owen, 0D	

Conference Committee

Symposium Chair

Sheila S. Hemami, Northeastern University (United States)

Symposium Co-chair

Choon-Woo Kim, Inha University (Korea, Republic of)

Conference Chairs

Margaret Dolinsky, Indiana University (United States)

Ian E. McDowall, Fakespace Labs, Inc. (United States)

Session Chairs

- 1 Work Harder and Play Harder in AR/VR
Ian E. McDowall, Fakespace Labs, Inc. (United States)
- 2 Bringing New Energy to AR/VR
Margaret Dolinsky, Indiana University (United States)
- 3 Pushing the Boundaries in Data, Dimensions, and Cognition
Ian E. McDowall, Fakespace Labs, Inc. (United States)
- 4 Be Here Now: Art and Science of Being in AR/VR
Margaret Dolinsky, Indiana University (United States)

