

2018 IEEE International Symposium on Mixed and Augmented Reality (ISMAR 2018)

**Munich, Germany
16-20 October 2018**



**IEEE Catalog Number: CFP18MAR-POD
ISBN: 978-1-5386-7460-4**

**Copyright © 2018 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP18MAR-POD
ISBN (Print-On-Demand):	978-1-5386-7460-4
ISBN (Online):	978-1-5386-7459-8
ISSN:	1554-7868

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

2018 IEEE International Symposium on Mixed and Augmented Reality ISMAR 2018

Table of Contents

Message from the ISMAR 2018 General Chairs	x
Message from the ISMAR 2018 Science and Technology Program Chairs and TVCG Guest Editors ...	xi
Message from the ISMAR 2018 Science and Technology Program Chairs	xiii
Message from the ISMAR 2018 Science and Technology Poster Chairs	xv
Message from the Workshop and Tutorial Chairs	xvi
Message from the Demonstration Chairs	xvii
ISMAR 2018 Conference Committee Members	xviii
ISMAR 2018 Science and Technology Program Committee Members	xix
ISMAR 2018 Steering Committee Members	xx
Reviewers	xxi
Keynotes	xxii
Sponsors and Supporters	xxiv

Science & Technology Papers

Session: Spatial and Handheld Augmented Reality

Seamless Multi-Projection Revisited (TVCG Special Section Paper)	N/A
<i>Petar Pjanic (Disney Research), Simon Willi (Disney Research), Anselm Grundhöfer (Disney Research), and Daisuke Iwai (Osaka University)</i>	
Auto-Calibration for Dynamic Multi-Projection Mapping on Arbitrary Surfaces (TVCG Special Section Paper)	N/A
<i>Philipp Kurth (Friedrich-Alexander University Erlangen-Nuremberg, Computer Graphics Group, Erlangen, Germany), Vanessa Lange (Friedrich-Alexander University Erlangen-Nuremberg, Computer Graphics Group, Erlangen, Germany), Christian Siegl (adidas AG, Herzogenaurach, Germany), Marc Stamminger (Friedrich-Alexander University Erlangen-Nuremberg, Computer Graphics Group, Erlangen, Germany), and Frank Bauer (Friedrich-Alexander University Erlangen-Nuremberg, Computer Graphics Group, Erlangen, Germany)</i>	
A Comparison of Predictive Spatial Augmented Reality Cues for Procedural Tasks (TVCG Special Section Paper)	N/A
<i>Benjamin Volmer (University of South Australia), James Baumeister (University of South Australia), Stewart Von Itzstein (University of South Australia), Ina Bornkessel-Schlesewsky (University of South Australia), Matthias Schlesewsky (University of South Australia), Mark Billingham (University of South Australia), and Bruce.H Thomas (University of South Australia)</i>	
Handheld Guides in Inspection Tasks: Augmented Reality versus Picture (TVCG Conference Partner Presentation (DOI 10.1109/TVCG.2017.2709746))	N/A

Session: Capture and Reconstruction

Towards Fully Mobile 3D Face, Body, and Environment Capture Using Only Head-Worn Cameras (TVCG Special Section Paper)	N/A
<i>Young-Woon Cha (University of North Carolina at Chapel Hill), True Price (University of North Carolina at Chapel Hill), Zhen Wei (University of North Carolina at Chapel Hill), Xinran Lu (University of North Carolina at Chapel Hill), Nicholas Rewkowski (University of North Carolina at Chapel Hill), Rohan Chabra (University of North Carolina at Chapel Hill), Zihe Qin (University of North Carolina at Chapel Hill), Hyoungun Kim (University of North Carolina at Chapel Hill), Zhaoqi Su (Tsinghua University), Yebin Liu (Tsinghua University), Adrian Ilie (University of North Carolina at Chapel Hill), Andrei State (University of North Carolina at Chapel Hill and InnerOptic Technology Inc.), Zhenlin Xu (University of North Carolina at Chapel Hill), Jan-Michael Frahm (University of North Carolina at Chapel Hill), and Henry Fuchs (University of North Carolina at Chapel Hill)</i>	
Collaborative Large-Scale Dense 3D Reconstruction with Online Inter-Agent Pose Optimisation (TVCG Special Section Paper)	N/A
<i>Stuart Golodetz (University of Oxford), Tommaso Cavallari (University of Oxford), Nicholas A. Lord (University of Oxford), Victor A. Prisacariu (University of Oxford), David W. Murray (University of Oxford), and Philip H. S. Torr (University of Oxford)</i>	
Efficient Point Cloud Rasterization for Real Time Volumetric Integration in Mixed Reality Applications	1
<i>Christian Kunert (Technische Universität Ilmenau), Tobias Schwandt (Technische Universität Ilmenau), and Wolfgang Broll (Technische Universität Ilmenau)</i>	
MaskFusion: Real-Time Recognition, Tracking and Reconstruction of Multiple Moving Objects	10
<i>Martin Runz (University College London) and Lourdes Agapito (University College London)</i>	

Session: Tracking and Calibration

Impact of Alignment Point Distance and Posture on SPAAM Calibration of Optical See-Through Head-Mounted Displays	21
<i>Kenneth R. Moser (Marxent Labs LLC), Mohammed Safayet Arefin (Mississippi State University), and J. Edward Swan II (Mississippi State University)</i>	
Efficient Pose Selection for Interactive Camera Calibration	31
<i>Pavel Rojtberg (Fraunhofer IGD) and Arjan Kuijper (Fraunhofer IGD)</i>	
Visual-Inertial SLAM Initialization: A General Linear Formulation and a Gravity-Observing Non-Linear Optimization	37
<i>Javier Domínguez-Conti (Universidad de Zaragoza), Jianfeng Yin (Geomagical Labs, Inc.), Yacine Alami (Geomagical Labs, Inc.), and Javier Civera (Universidad de Zaragoza)</i>	
On Exploiting Per-Pixel Motion Conflicts to Extract Secondary Motions	46
<i>Benzun Pious Wisely Babu (Bosch Research and Technology Center North America), Zhixin Yan (Bosch Research and Technology Center North America), Mao Ye (Bosch Research and Technology Center North America), and Liu Ren (Bosch Research and Technology Center North America)</i>	

Hybrid 3D Hand Articulations Tracking Guided by Classification and Search Space Adaptation	57
<i>Gabyong Park (KAIST) and Woontack Woo (KAIST)</i>	

Session: Situation and Spatial Awareness

Towards Efficient Visual Guidance in Limited Field-of-View Head-Mounted Displays (TVCG Special Section Paper)	N/A
<i>Felix Bork (Technical University of Munich), Christian Schnelzer (Technical University of Munich), Ulrich Eck (Technical University of Munich), and Nassir Navab (Technical University of Munich)</i>	
Restoring the Awareness in the Occluded Visual Field for Optical See-Through Head-Mounted Displays (TVCG Special Section Paper)	N/A
<i>Long Qian (Johns Hopkins University), Alexander Plopski (Nara Institute of Science and Technology), Nassir Navab (Technical University of Munich), and Peter Kazanzides (Johns Hopkins University)</i>	
Ensuring Safety in Augmented Reality from Trade-off Between Immersion and Situation Awareness	70
<i>Jinki Jung (Korea Research Institute of Ships and Ocean Engineering), Hyeopwoo Lee (KAIST), Jeehye Choi (KAIST), Abhilasha Nanda (KAIST), Uwe Gruenefeld (University of Oldenburg), Tim Stratmann (University of Oldenburg), and Wilko Heuten (OFFIS - Institute for IT)</i>	
Obstacle Avoidance Method in Real Space for Virtual Reality Immersion	80
<i>Kohei Kanamori (Osaka University), Nobuchika Sakata (Nara Institute of Science and Technology), Tomu Tominaga (Osaka University), Yoshinori Hijikata (Kwansei Gakuin University), Kensuke Harada (Osaka University), and Kiyoshi Kiyokawa (Nara Institute of Science and Technology)</i>	
The Impact of an Accurate Vertical Localization with HRTFs on Short Explorations of Immersive Virtual Reality Scenarios	90
<i>Michele Geronazzo (Aalborg University), Erik Sikström (Virsi ApS), Jari Kleimola (Hefio Ltd), Federico Avanzini (University of Milano), Amalia de Götzen (Aalborg University), and Stefania Serafin (Aalborg University)</i>	

Session: Human Vision

An Extended Depth-of-Field Volumetric Near-Eye Augmented Reality Display (TVCG Special Section Paper)	N/A
<i>Kishore Rathinavel (UNC Chapel Hill), Hanpeng Wang (UNC Chapel Hill), Alex Blate (UNC Chapel Hill), and Henry Fuchs (UNC Chapel Hill)</i>	
FocusAR: Auto-Focus Augmented Reality Eyeglasses for Both Real and Virtual Imagery (TVCG Special Section Paper)	N/A
<i>Praneeth Chakravarthula (UNC Chapel Hill), David Dunn (UNC Chapel Hill), Kaan Aksit (NVIDIA Research), and Henry Fuchs (UNC Chapel Hill)</i>	
IntelliPupil: Pupillometric Light Modulation for Optical See-Through Head-Mounted Displays	98
<i>Chang Liu (Osaka University), Alexander Plopski (Nara Institute of Science and Technology), Kiyoshi Kiyokawa (Nara Institute of Science and Technology), Photchara Ratsamee (Osaka University), and Jason Orlosky (Osaka University)</i>	
Effects of AR Display Context Switching and Focal Distance Switching on Human Performance (TVCG Conference Partner Presentation (DOI 10.1109/TVCG.2018.2832633))	N/A

Session: Perception and Interaction

Does a Digital Assistant Need a Body? The Influence of Visual Embodiment and Social Behavior on the Perception of Intelligent Virtual Agents in AR	105
<i>Kangsoo Kim (University of Central Florida), Luke Boelling (University of Münster), Steffen Haesler (University of Würzburg), Jeremy Bailenson (Stanford University), Gerd Bruder (University of Central Florida), and Greg F. Welch (University of Central Florida)</i>	
Superman vs Giant: A Study on Spatial Perception for a Multi-Scale Mixed Reality Flying Telepresence Interface (TVCG Special Section Paper)	N/A
<i>Thammathip Piumsomboon (University of South Australia), Gun A. Lee (University of South Australia), Barrett H. Ens (University of South Australia, Monash University), Bruce Thomas (University of South Australia), and Mark Billingham (University of South Australia)</i>	
Rethinking Redirected Walking: On the Use of Curvature Gains Beyond Perceptual Limitations and Revisiting Bending Gains	115
<i>Michael Rietzler (Ulm University), Jan Gugenheimer (Ulm University), Teresa Hirzle (Ulm University), Martin Deubzer (Ulm University), Eike Langbehn (Hamburg University), and Enrico Rukzio (Ulm University)</i>	
PizzaText: Text Entry for Virtual Reality Systems Using Dual Thumbsticks (TVCG Special Section Paper)	N/A
<i>Difeng Yu (Xi'an Jiaotong-Liverpool University, China), Kaixuan Fan (Xi'an Jiaotong-Liverpool University, China), Heng Zhang (Xi'an Jiaotong-Liverpool University, China), Diego Monteiro (Xi'an Jiaotong-Liverpool University, China), Wenge Xu (Xi'an Jiaotong-Liverpool University, China), and Hai-Ning Liang (Xi'an Jiaotong-Liverpool University, China)</i>	
Enlarging a Smartphone with AR to Create a Handheld VESAD (Virtually Extended Screen-Aligned Display)	123
<i>Erwan Normand (École de technologie supérieure) and Michael J. McGuffin (École de technologie supérieure)</i>	

Session: Applications and Reviews

Revisiting Trends in Augmented Reality Research: A Review of the 2nd Decade of ISMAR (2008–2017) (TVCG Special Section Paper)	N/A
<i>Kangsoo Kim (University of Central Florida), Mark Billingham (University of South Australia), Gerd Bruder (University of Central Florida), Henry Been-Lin Duh (La Trobe University), and Gregory F. Welch (University of Central Florida)</i>	
Augmented Reality Interface Design Approaches for Goal-Directed and Stimulus-Driven Driving Tasks (TVCG Special Section Paper)	N/A
<i>Coleman Merenda (Virginia Tech), Hyungil Kim (Virginia Tech), Kyle Tanous (Virginia Tech), Joseph Gabbard (Virginia Tech), Blake Feichtl (Virginia Tech), Chihiro Suga (Honda Research Institute), and Teruhisa Misu (Honda Research Institute)</i>	
Comparing HMD-Based and Paper-Based Training	134
<i>Stefan Werrlich (BMW Group), Austino Daniel (BMW Group), Alexandra Ginger (BMW Group), Phuc-Anh Nguyen (BMW Group), and Gunther Notni (Technical University of Ilmenau)</i>	

Narrative and Spatial Memory for Jury Viewings in a Reconstructed Virtual Environment (TVCG Special Section Paper)	N/A
<i>Carolyn Reichherzer (University of South Australia), Andrew Cunningham (University of South Australia), James Walsh (University of South Australia), Mark Kohler (University of South Australia), Mark Billingham (University of South Australia), and Bruce H. Thomas (University of South Australia)</i>	

ARbis Pictus: A Study of Vocabulary Learning with Augmented Reality (TVCG Special Section Paper)	N/A
<i>Adam Ibrahim (University of California, Santa Barbara), Brandon Huynh (University of California, Santa Barbara), Jonathan Downey (University of California, Santa Barbara), Tobias Hollerer (University of California, Santa Barbara), Dorothy Chun (University of California, Santa Barbara), and John O'Donovan (University of California, Santa Barbara)</i>	

Session: VR/MR Experiences

A Context-Aware Method for Authentically Simulating Outdoors Shadows for Mobile Augmented Reality (TVCG Conference Partner Presentation (DOI 10.1109/TVCG.2017.2676777))	N/A
--	-----

Evaluating Engagement Level and Analytical Support of Interactive Visualizations in Virtual Reality Environments	143
<i>Feiyu Lu (Xi'an Jiaotong-Liverpool University), Difeng Yu (Xi'an Jiaotong-Liverpool University), Hai-Ning Liang (Xi'an Jiaotong-Liverpool University), Wenjun Chen (Xi'an Jiaotong-Liverpool University), Konstantinos Papangelis (Xi'an Jiaotong-Liverpool University), and Nazlena Mohamad Ali (University Kebangsaan Malaysia)</i>	

A User Study on MR Remote Collaboration Using Live 360 Video	153
<i>Gun A. Lee (University of South Australia), Theophilus Teo (University of South Australia), Seungwon Kim (University of South Australia), and Mark Billingham (University of South Australia)</i>	

Effects of Sharing Real-Time Multi-Sensory Heart Rate Feedback in Different Immersive Collaborative Virtual Environments	165
<i>Arindam Dey (University of South Australia, Australia), Hao Chen (University of Canterbury, New Zealand), Chang Zhuang (Northwestern Polytechnical University, China P.R.), Mark Billingham, and Robert W. Lindeman (University of Canterbury, New Zealand)</i>	

Compressed Animated Light Fields with Real-time View-dependent Reconstruction (TVCG Conference Partner Presentation (DOI 10.1109/TVCG.2018.2818156))	N/A
--	-----

Author Index	175
---------------------------	------------