

# IEEE VR 2019 OS KA

the 26<sup>th</sup> IEEE Conference on  
Virtual Reality and 3D User Interfaces



IEEE  
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SOCIETY



IEEE



THE VIRTUAL REALITY SOCIETY OF JAPAN

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# Welcome to IEEE VR 2019!

It is our great pleasure to welcome you to the 26<sup>th</sup> IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR), the premier international conference focused on research in these domains. It is a tremendous honor to host the conference in Osaka, an ancient capital and the largest metropolis in western Japan. This is the first VR conference in Japan since 2001 in Yokohama, and in Asia since 2011 in Singapore.

Reflecting the increasing interest and significance of research in virtual reality and 3D user interfaces, the conference has broken the record numbers in many aspects such as 139 oral presentations, 227 poster presentations, 35 research demonstrations, 18 workshops, 21 exhibitors and 21 sponsors. The oral talks consist of 33 and 95 accepted submissions in the Journal and conference paper tracks, respectively, in addition to 11 additional invited papers that were published in IEEE TVCG during the past year. In particular, we are extremely excited that we will welcome a record number of more than 1,000 individuals at the conference.

We are thrilled to have three keynote talks by Shinya Nishida of NTT Communication Science Laboratories, Yoichi Ochiai of University of Tsukuba / Pixie Dust Technologies, Inc., and Junichiro Koyama and Yukiharu Tamiya of BANDAI NAMCO Amusement Inc., Japan. We are extremely grateful to numerous volunteers and sponsors, including the organizing and program committee members and reviewers, IEEE, the Virtual Reality Society of Japan, and many corporate supporters, who have made this conference possible.

We hope that each of the participants will find VR 2019 to be engaging, insightful, informative, and, last but not least a fun conference for all!

Welcome to Osaka!

Kiyoshi Kiyokawa, *Nara Institute of Science and Technology, Japan*  
Hideyuki Ando, *Osaka University, Japan*  
Betty Mohler, *Amazon Tübingen, Germany*  
[Honorary] Susumu Tachi, *The University of Tokyo, Japan*

## Committee members

### General Chairs

Kiyoshi Kiyokawa, *Nara Institute of Science and Technology, Japan*  
Hideyuki Ando, *Osaka University, Japan*

Betty Mohler, *Max Planck Institutes for Biological Cybernetics and Intelligent Systems, Germany*  
Honorary: Susumu Tachi, *The University of Tokyo, Japan*

### Program Chairs

Bruce Thomas, *University of South Australia, Australia*  
Greg Welch, *University of Central Florida, USA*  
Torsten Kuhlen, *RWTH Aachen University, Germany*  
Kyle Johnsen, *University of Georgia, USA*

### Conference Paper Program Chairs

Rob Teather, *Carleton University, Canada*  
Yuta Itoh, *Tokyo Institute of Technology, Japan*  
Joe Gabbard, *Virginia Tech, USA*  
Ferran Argelaguet, *INRIA, France*  
Anne-Hélène Olivier, *University Rennes 2, France*  
Dan Keefe, *University of Minnesota, USA*

### Finance Chairs

Yuichi Itoh, *Osaka University, Japan*  
Toshiyuki Amano, *Wakayama University, Japan*

### 3DUI Contest Chairs

Rongkai Guo, *Kennesaw State University, USA*  
Benjamin Weyers, *RWTH Aachen University, Germany*  
Kazuki Takashima, *Tohoku University, Japan*  
Pablo Figueroa, *Universidad de los Andes, Colombia*

### Doctoral Consortium Chairs

Jason Orlosky, *Osaka University, Japan*  
Aleshia Hayes, *University of North Texas, USA*  
Tonja Machulla, *Ludwig Maximilians University Munich, Germany*  
Peter Willemsen, *University of Minnesota Duluth, USA*

### Exhibits Chairs

Hisayo Yoshida, *Hexagon Japan, Japan*  
Jerome Perret, *Haption GmbH, Germany*  
Sin-Hwa Kang, *University of Southern California, USA*  
Ichiro Imamura, *Solidray, Japan*

### Local Arrangements Chairs

Goshiro Yamamoto, *Kyoto University, Japan*  
Wataru Hashimoto, *Osaka Institute of Technology, Japan*  
Sei Ikeda, *Ritsumeikan University, Japan*  
Katsuhiko Onishi, *Osaka Electro-Communication University, Japan*

### Panels Chairs

Anatole Lécuyer, *INRIA, France*  
Mary Whitton, *University of North Carolina, USA*  
Takuya Nojima, *University of Electro-Communications, Japan*

### Posters Chairs

Maki Sugimoto, *Keio University, Japan*  
Xubo Yang, *Shanghai Jiao Tong University, China*  
Gabriel Zachmann, *University of Bremen, Germany*

### Publications Chairs

Daisuke Iwai, *Osaka University, Japan*  
Mai Otsuki, *University of Tsukuba, Japan*

### Publicity Chairs

Takuji Narumi, *The University of Tokyo, Japan*  
John Quarles, *University of Texas at San Antonio, USA*

Glyn Lawson, *University of Nottingham, UK*  
Bobby Bodenheimer, *Vanderbilt University, USA*  
Luciana Nedel, *Federal University of Rio Grande do Sul, Brazil*

### Research Demonstrations Chairs

Masahiro Furukawa, *Osaka University, Japan*  
Christoph Borst, *University of Louisiana at Lafayette, USA*  
Jens Grubert, *Coburg University, Germany*  
Honorary: Masahiko Inami, *The University of Tokyo, Japan*

### Student Volunteers Chairs

Photchara Ratsamee, *Osaka University, Japan*  
Johannes Lohmann, *University of Tuebingen, Germany*  
Jerald Thomas, *University of Southern California, USA*  
John Porter III, *Clemson University, USA*

### Tutorials Chairs

Tabitha Peck, *Davidson College, USA*  
Stephan Lukosch, *Delft University of Technology, The Netherlands*  
Masataka Imura, *Kwansei Gakuin University, Japan*

### Videos Chairs

Jian Chen, *The Ohio State University, USA*  
David Krum, *University of Southern California, USA*  
J. Adam Jones, *University of Mississippi, USA*

### Web Chairs

Divine Maloney, *Clemson University, USA*  
Shohei Mori, *Graz University of Technology, Austria*  
Chao Mei, *Kennesaw State University, USA*

### Workshops Chairs

Yasuyuki Yanagida, *Meijo University, Japan*  
Woontack Woo, *KAIST, Korea*  
Alexander Kulik, *Bauhaus-Universität Weimar, Germany*

### Award Chairs

Sabine Coquillart, *INRIA, France*  
J. Edward Swan II, *Mississippi State University, USA*  
Christian Sandor, *Nara Institute of Science and Technology, Japan*

### Social Event Chairs

Yoshifumi Kitamura, *Tohoku University, Japan*  
Robert W. Lindeman, *HITLabNZ, New Zealand*

### Sponsorship Chair

Norihiko Kawai, *SenseTime Japan, Japan*

### Accessibility Chair

Hideyuki Ando, *Osaka University, Japan*

### Liason to APMAR 2019

Nobuchika Sakata, *Nara Institute of Science and Technology, Japan*

### Advisors

Miwako Doi, *NICT, Japan*  
Haruo Takemura, *Osaka University, Japan*  
Masahiko Inami, *The University of Tokyo, Japan*  
Fumio Kishino, *Kwansei Gakuin University, Japan*

# Program at a glance

Saturday, 23 March

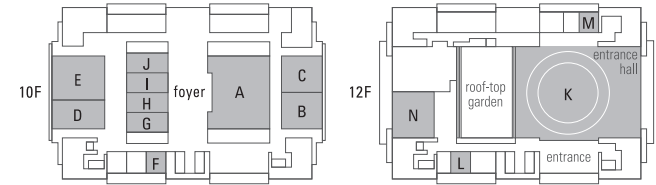
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Rm # (cap.)	#1003 (502)	#1001 (160)	#1002 (160)	#1008 (166)	#1009 (182)	#1010 (34)
08:45 - 10:15	Drink & Snack	W1: KELVAR	W2: PERCAR	T2: Eye-tracking	W4: EVR	Doctoral Consortium
10:15 - 10:30		Break & Coffee				
10:30 - 12:00		W1: KELVAR	W2: PERCAR	T2: Eye-tracking	W4: EVR	Doctoral Consortium
12:00 - 13:30		Lunch (self-organized)				
13:30 - 15:00		W1: KELVAR	T1: AR	W3: NeuroVirt	T3: Deep Learning	Doctoral Consortium
15:00 - 15:15		Break & Coffee				
15:15 - 16:45		W1: KELVAR	T1: AR	W3: NeuroVirt	T3: Deep Learning	Doctoral Consortium

Sunday, 24 March

Room ID	A	B	C	D	E	F
Rm # (cap.)	#1003 (502)	#1001 (160)	#1002 (160)	#1008 (166)	#1009 (182)	#1010 (34)
08:45 - 10:15	W10: HAA	W11: SHS	T4: Statistics	W13: NIDIT	W15: PerGraVAR	W17: FAVR
10:15 - 10:30	Break & Coffee					
10:30 - 12:00	W10: HAA	W11: SHS	T4: Statistics	W13: NIDIT	W15: PerGraVAR	W17: FAVR
12:00 - 13:30	Lunch (self-organized)					
13:30 - 15:00	W10: HAA	W11: SHS	W12: VHCIE	W14: ANIVAE	W16: VisAug	W17: FAVR
15:00 - 15:15	Break & Coffee					
15:15 - 16:45	W10: HAA	W11: SHS	W12: VHCIE	W14: ANIVAE	W16: VisAug	W17: FAVR

G	H	I	J	K	L	M	N	
#1004 (88)	#1005 (88)	#1006 + #1007 (158)		#conf rm	#1201	#1203	#1202	10F Foyer
W5: AVEH	W6: SEARIS	W8: WEVR		N/A	N/A	N/A	N/A	
W5: AVEH	W6: SEARIS	W8: WEVR						
W5: AVEH	W7: WSWT	W9: WISP						
W5: AVEH	W7: WSWT	W9: WISP						

G	H	I	J	K	L	M	N	
#1004 (88)	#1005 (88)	#1006 + #1007 (158)						10F Foyer
Preparation for Exhibition Booths (9:00 - 13:00)				N/A	N/A	N/A	N/A	Drink & Snack
Preparation for Exhibition (13:00 - 17:00)								
				Preparation for Research Demos (17:00 - 21:00)			Preparation for 3DUI Contest (17:00 - 21:00)	

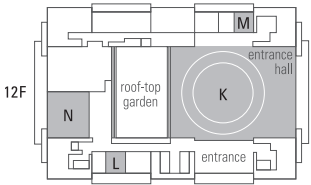
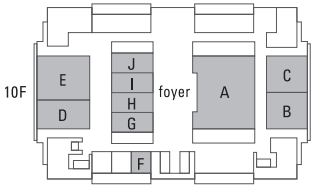


Monday, 25 March

Room ID	A	B	C	D	E	F
Rm # (cap.)	#1003 (502)	#1001 (160)	#1002 (160)	#1008 (166)	#1009 (182)	#1010 (34)
08:30 - 09:00	Opening (*) (broadcasting from Room A)				N/A	Speakers' prep room
09:00 - 10:00	Keynote 1: Hacking Human Visual Perception by Shinya Nishida (broadcasting from Room A)					
10:00 - 10:15	Break & Coffee					
10:15 - 11:30	Session 1: 360 Video 1	Session 2: Haptics and Perception	Session 3: Redirected Walking	Session 4: Rendering		
11:30 - 12:00	Fast forward 1 (broadcasting from Room A)					
12:00 - 14:15	Poster / Demo Core Time (12:00-13:00) & Lunch (self-organized)					
14:15 - 15:30	Session 5: Audio	Session 6: Collaboration	Session 7: Training and Learning	Session 8: Visualization Tools and Applications		
15:30 - 15:45	Break & Coffee					
15:45 - 17:00	Panel 1: Implementing Virtual Reality at Scale in the Field – Challenges of Spaces and Places	Session 9: Perception of Depth and Space	Session 10: Rendering and Simulation	Session 11: Sensing and Capture		
18:00 - 20:00	Conference reception at Rihga Royal Hotel Osaka					

(\*) Greetings (10min), VGTC 2019 Career Award (10min), VGTC 2019 Technical Achievement Award (10min)

G	H	I	J	K	L	M	N	
#1004 (88)	#1005 (88)	#1006 + #1007 (158)		#conf rm	#1201	#1203	#1202	10F Foyer
Preparation for Exhibition (8:30 - 10:30)				Preparation for Research Demos (8:30 - 12:00)		3DUI Contest		Posters
Exhibition (10:30 - 17:00)				Research Demos (12:00 - 15:45)				

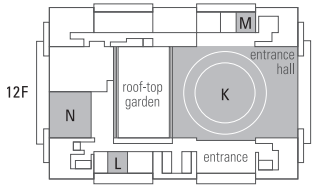
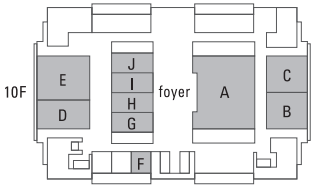


Tuesday, 26 March

Room ID	A	B	C	D	E	F
Rm # (cap.)	#1003 (502)	#1001 (160)	#1002 (160)	#1008 (166)	#1009 (182)	#1010 (34)
08:30 - 09:00	Award ceremony (**) (broadcasting from Room A)					Speakers' prep room
09:00 - 10:00	Keynote 2: Virtual Reality for Enhancing Human Perceptual Diversity Towards an Inclusive Society by Yoichi Ochiai (broadcasting from Room A)					
10:00 - 10:15	Break & Coffee					
10:15 - 11:30	Session 12: Applications	Session 13: Haptics and Vibrotactiles	Session 14: Displays 1	(not assigned)	Session 15: Navigation and Redirection	
11:30 - 12:00	Fast forward 2 (broadcasting from Room A)					
12:00 - 14:15	Poster / Demo Core Time (12:00-13:00)					
	Lunch (self-organized)				Dell & Intel Free Lunch Seminar (ca.100) (13:10-14:00)	
14:15 - 15:30	Session 16: 360 Video 2	Session 17: Audio and Perception	Session 18: Head and Gaze Input	(not assigned)	Session 19: Medical Applications Therapy	
15:30 - 15:45	Break & Coffee					
15:45 - 17:00	Panel 2: The Future of Head Mounted Displays (broadcasting from Room A)					
17:00 - 18:00	(Bus to Kuromon Street)					
18:00 - 20:00	Osaka Gourmet Night					
20:30 - 22:30	Osaka Karaoke Night					

(\*\*) Program stats (5min), Best Paper & Honorable Mention (10min), Best Dissertation Award 2019 (5min), Best Dissertation talk (10min)

G	H	I	J	K	L	M	N	
#1004 (88)	#1005 (88)	#1006 + #1007 (158)		#conf rm	#1201	#1203	#1202	10F Foyer
Exhibition (9:00 - 17:00)				Preparation for Research Demos (8:30 - 12:00)		3DUI Contest		Posters
				Research Demos (12:00 - 15:45)				

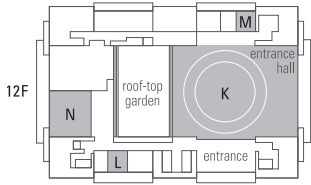
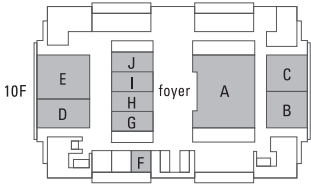


Wednesday, 27 March

Room ID	A	B	C	D	E	F
Rm # (cap.)	#1003 (502)	#1001 (160)	#1002 (160)	#1008 (166)	#1009 (182)	#1010 (34)
08:30 - 09:00	Sponsor talks (***) (broadcasting from Room A)					Speakers' prep room
09:00 - 10:00	Keynote 3: Let's Unleash Entertainment! VR Possibilities Learned through Entertainment Facility "VR Zone" by Junichiro Koyama and Yukiharu Tamiya (broadcasting from Room A)					
10:00 - 10:15	Break & Coffee					
10:15 - 11:30	Session 20: Avatars	Session 21: Displays 2	Session 22: Interaction Techniques	(not assigned)	Session 23: Perception	
11:30 - 12:00	Fast forward 3 (broadcasting from Room A)					
12:00 - 14:15	Poster / Demo Core Time (12:00-13:00)					
	GREE, Inc. Free Lunch Seminar (ca.100) (13:10-14:00)	Lunch (self-organized)				
14:15 - 15:30	Session 24: Medical Applications Training	Session 25: Navigation	Session 26: Social Interactions	(not assigned)	Session 27: Visualization Techniques	
15:30 - 15:45	Break & Coffee					
15:45 - 17:00	Panel 3: Virtual Reality Curriculum	Session 28: Avatar Technologies	Session 29: Cognition and Psychology	(not assigned)	Session 30: Cybersickness	
17:00 - 17:15	Break & Coffee					
17:15 - 17:45	Closing (****) (broadcasting from Room A)					
	KYOHRITSU Tour (18:00-, ticket required) / VR ZONE Osaka (19:00-, ticket required)					

(\*\*\*) All sponsors of bronze or a higher category  
(\*\*\*\*) Best Poster, Best Demo, Best Video, Best 3DUI (15min), Appreciation (5min),  
ISMAR 2019 & VR 2020 Announcement (10min)

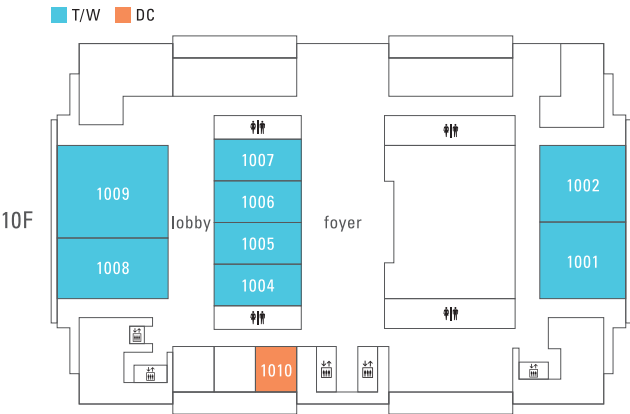
G	H	I	J	K	L	M	N	
#1004 (88)	#1005 (88)	#1006 + #1007 (158)	#conf rm	#1201	#1203	#1202	10F Foyer	
				Preparation for Research Demos (8:30 - 12:00)		N/A	Posters	
Exhibition (9:00 - 15:00)								Research Demos (12:00 - 15:00)
				Exhibit strike (15:00 - 18:00)				Research Demo strike (15:00 - 18:00)





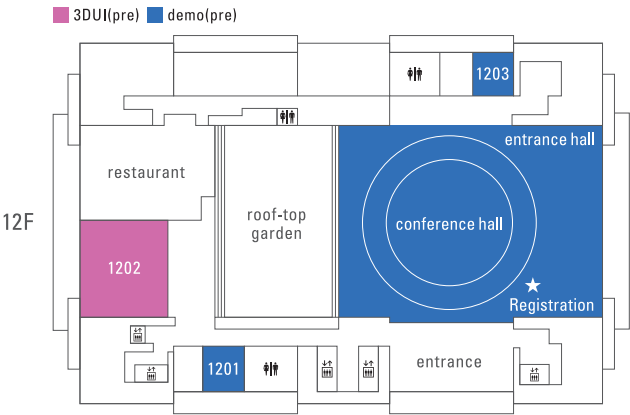
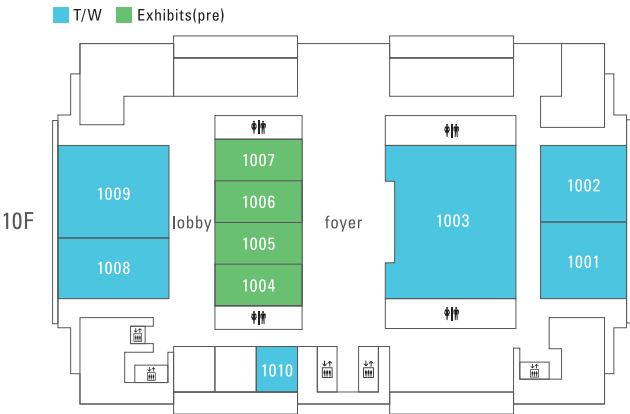
# Venue map

## 3/23 Tutorials/Workshops

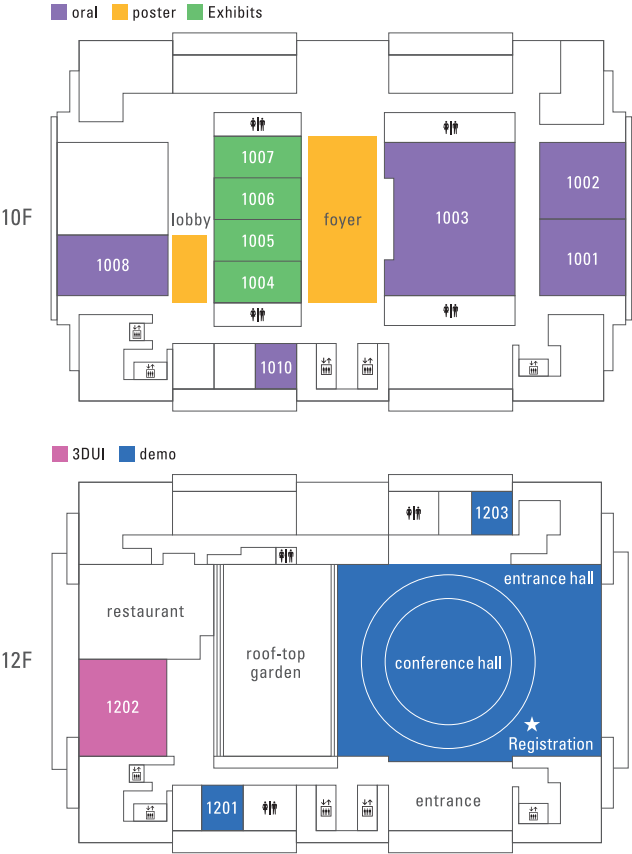


Elevators Bathrooms

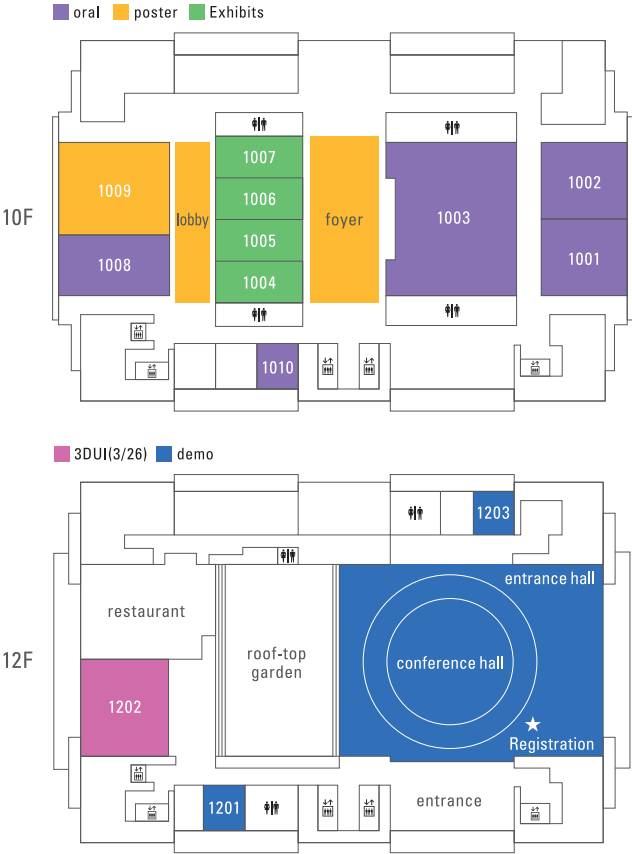
## 3/24 Tutorials/Workshops



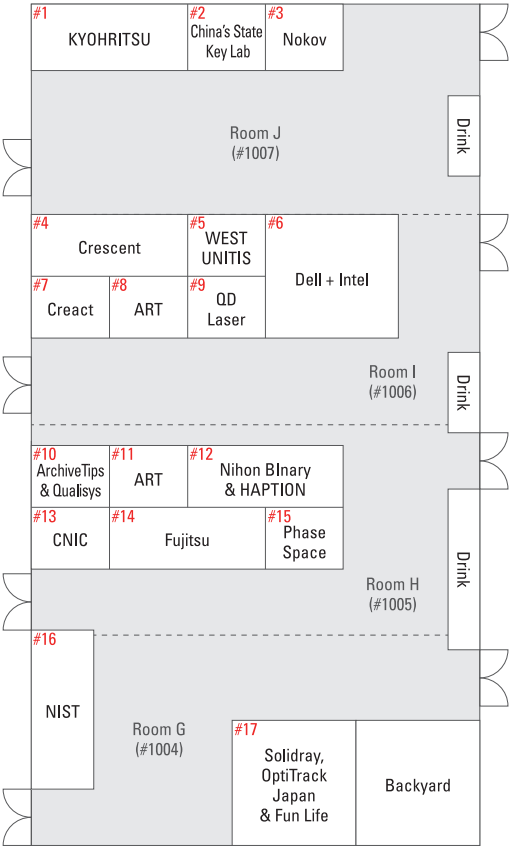
3/25 Oral/3DUI/Poster/Demo



3/26-27 Oral/3DUI/Poster/Demo

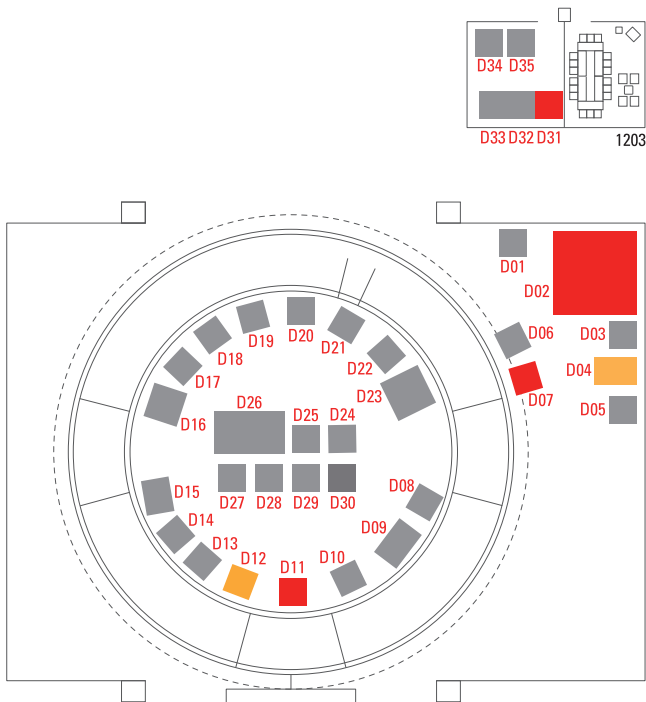


# Exhibition map



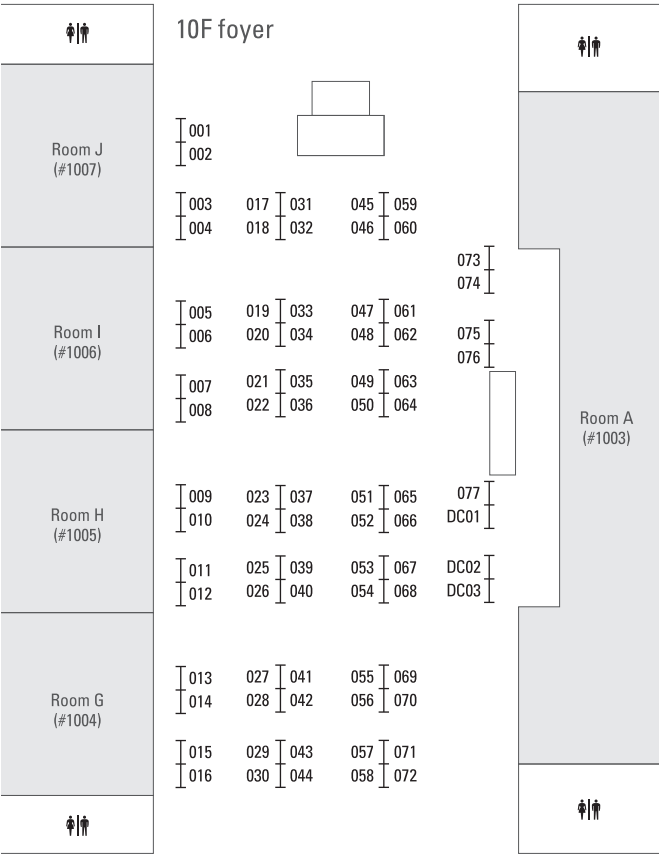
- #1 KYOHRITSU ELECTRONIC INDUSTRY Co.,Ltd.
- #2 China's State Key Laboratory of Virtual Reality Technology and Systems
- #3 Beijing Nokov Science & Technology Co., Ltd.
- #4 Crescent
- #5 WESTUNITIS Co., Ltd.
- #6 DELL + Intel Japan
- #7 Creact
- #8 Advanced Realtime Tracking (ART)
- #9 QD Laser, Inc.
- #10 Archivetips & Qualisys
- #11 Advanced Realtime Tracking (ART)
- #12 Nihon Binary Co., Ltd & Haption
- #13 Computer Network Information Center, Chinese Academy of Sciences
- #14 Fujitsu
- #15 PhaseSpace
- #16 NIST - Public Safety Communications Research
- #17 Solidray Co.,Ltd., Optitrack Japan, Ltd. & Fun Life Inc.

# Research demos map

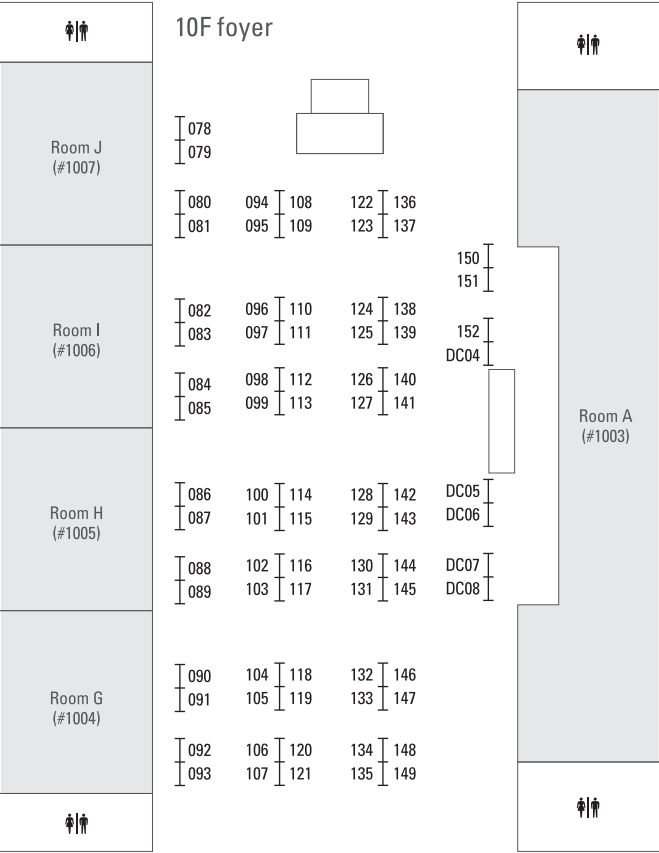


# Poster map

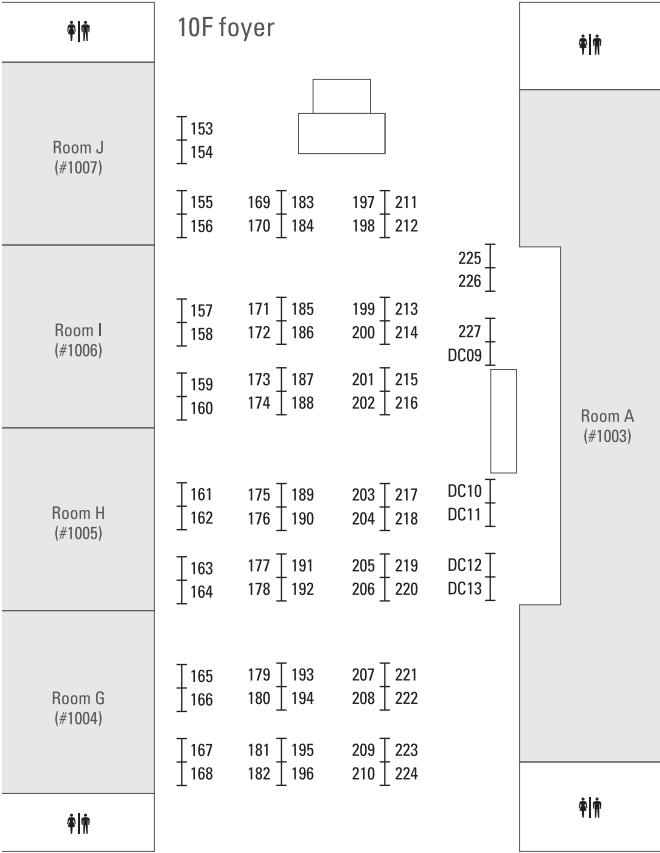
Monday, 25 March



Tuesday, 26 March



Wednesday, 27 March



# Program details

## Saturday, 23 March

### WORKSHOPS

8:45 - 16:45 @ Room B

**[W1] KELVAR: The Fourth IEEE VR Workshop on K-12+ Embodied Learning through Virtual & Augmented Reality**

**Organizers:** Iulian Radu, Erica Southgate, Francisco R. Ortega, Jerry Alan Fails, Steven Cutchin

8:45 - 12:00 @ Room C

**[W2] PERCAR: The Fifth IEEE VR Workshop on Perceptual and Cognitive Issues in AR**

**Organizers:** Joe Gabbard, Richard Skarbez, Ernst Kruijff

13:30 - 16:45 @ Room D

**[W3] NeuroVirt: The Second IEEE VR Workshop on Neuroscience and Virtuality**

**Organizers:** Irini Giannopulu, Tomoko Yonezawa

8:45 - 12:00 @ Room E

**[W4] EVR: The First IEEE VR Workshop on Ethics in VR**

**Organizers:** Ana-Despina Tudor

8:45 - 16:45 @ Room G

**[W5] AVEH: The First IEEE VR Workshop on Applied VR for Enhanced Healthcare**

**Organizers:** Christian Geiger, Nikolaos Katzakis, Fariba Mostajeran, Charles Nduka, Sebastian Rings, Wendy Powell, Vaughan Powell, Frank Steinicke, Marcel Tiator

8:45 - 12:00 @ Room H

**[W6] SEARIS: The Twelfth IEEE VR Workshop on Software Engineering and Architectures for Realtime Interactive Systems**

**Organizers:** Marc Erich Latoschik, Jean Luc Lugin, Dirk Reiners, Wesley Griffin, Pablo Figueroa

13:30 - 16:45 @ Room H

**[W7] WSWT: The First IEEE VR Workshop on Smart Work Technologies**

**Organizers:** Takashi Okuma, Ryosuke Ichikari, Mai Otsuki

8:45 - 12:00 @ Room I + J

**[W8] WEVR: The Fifth IEEE VR Workshop on Everyday Virtual Reality**

**Organizers:** Adalberto L. Simeone, Benjamin Weyers, Christoph W. Borst, Mark Billinghurst

13:30 - 16:45 @ Room I + J

**[W9] WISP: The First IEEE VR Workshop on Immersive Sickness Prevention**

**Organizers:** Evan Suma Rosenberg, Victoria Interrante

### TUTORIALS

13:30 - 16:45 @ Room C

**[T1] (AR) Hack Our Material Perception in Spatial Augmented Reality**

**Organizers:** Toshiyuki Amano, Daisuke Iwai, Keita Hirai, Takahiro Kawabe, Katsunori Okajima, Yoshihiro Watanabe

8:45 - 12:00 @ Room D

**[T2] (EYETRACKING) Eye-tracking in 360: Methods, Challenges, and Opportunities**

**Organizers:** Olivier Le Meur, Eakta Jain

13:30 - 16:45 @ Room E

**[T3] (DL) Introduction to Deep Learning**

**Organizers:** Nikolaos Katzakis

## DOCTORAL CONSORTIUM

8:45 - 16:45 @ Room F

**Chairs:** Aleshia Hayes, Jason Orlosky, Pete Willemsen, Tonja Machulla

## Sunday, 24 March

### WORKSHOPS

8:45 - 16:45 @ Room A

**[W10] HAA: The First IEEE VR Workshop on Human Augmentation and its Applications**

**Organizers:** Hideki Koike, Jun Rekimoto, Junichi Ushiba, Shinichi Furuya, Asa Ito

8:45 - 16:45 @ Room B

**[W11] SHS: The First IEEE VR Workshop on Superhuman Sports**

**Organizers:** Kai Kunze, Stephan Lukosch, Kouta Minamizawa, Takuya Nojima, Yuichi Kurita, Bing-Yu Chen

13:30 - 16:45 @ Room C

**[W12] VHCIE: The Fourth IEEE VR Workshop on Virtual Humans and Crowds in Immersive Environments**

**Organizers:** Ming Lin, Anne-Hélène Olivier, Julien Pettré

8:45 - 12:00 @ Room D

**[W13] NIDIT: The First IEEE VR Workshop on Novel Input Devices and Interaction Techniques**

**Organizers:** Robert J. Teather, Adalberto Simeone, Francisco R. Ortega

13:30 - 16:45 @ Room D

**[W14] ANIVAE: The Second IEEE VR Workshop on Animation in Virtual and Augmented Environments**

**Organizers:** Franziska Bruckner, Thomas Moser

8:45 - 12:00 @ Room E

**[W15] PerGraVAR: The First IEEE VR Workshop on Perception-driven Graphics and Displays for VR and AR**

**Organizers:** Martin Weier, Kaan Aksit, Jason Orlosky, Yuta Itoh, Praneeth Chakravarthy, Chang Liu

13:30 - 16:45 @ Room E

**[W16] VisAug: The First IEEE VR Workshop on Eye Tracking and Vision Augmentation**

**Organizers:** Jason Orlosky, Yuta Itoh, Praneeth Chakravarthy, Chang Liu

8:45 - 16:45 @ Room F

**[W17] FAVR: The First IEEE VR Workshop on the Future of Audio in VR**

**Organizers:** Anil Çamcı, Rob Hamilton

### TUTORIALS

8:45 - 12:00 @ Room C

**[T4] (STATISTICS) The Replication Crisis in Empirical Science: Implications for Human Subject Research in Mixed Reality**

**Organizer:** J. Edward Swan II

## Monday, 25 March

8:30-9:00

**Opening @ Room A, and Room B~D (broadcasting)**

9:00-10:00

**Keynote 1: Hacking Human Visual Perception @ Room A, and Room B~D (broadcasting)**

**Speaker:** Shinya Nishida, NTT Communication Science Laboratories

**Chair:** Anatole Lécuyer



10:15-11:30

**Paper Session 1: 360 Video 1 @ Room A**

**Chair:** Stephen DiVerdi

[TVCG] Motion parallax for 360 RGBD video

Ana Serrano, Incheol Kim, Zhili Chen, Stephen DiVerdi, Diego Gutierrez, Aaron Hertzmann, Belen Masia

[TVCG] MegaParallax: Casual 360° Panoramas with Motion Parallax

Tobias Bertel, Neill DF Campbell, Christian Richardt

[Conference] Deep Learning-Based Approach For Automatic VR Image Upright Adjustment

Raehyuk Jung, Aiden Seung Joon Lee, Amirsaman Ashtari, Jean-Charles Bazin

[Conference] Dense 3D Scene Reconstruction from Multiple Spherical Images for 3-DoF+ VR Applications

Thiago Lopes Trugillo da Silveira, Claudio R Jung

**Paper Session 2: Haptics and Perception @ Room B**

**Chair:** Ann McNamara

[Conference] Remapped Physical-Virtual Interfaces with Bimanual Haptic Retargeting

Brandon J Matthews, Bruce H Thomas, G Stewart Von Itzstein, Ross Smith

[TVCG-Invited] FleXeen: Visually Manipulating Perceived Fabric Bending Stiffness in Spatial Augmented Reality

Parinya Punpongsanon, Daisuke Iwai, Kosuke Sato

[Conference] Effects of Stereoscopic Viewing and Haptic Feedback, Sensory-Motor Congruence and Calibration on Near-Field Fine Motor Perception-Action Coordination in Virtual Reality

David Brickler, Jeffrey W. Bertrand, Sabarish V. Babu

[Conference] Visual Manipulation for Underwater Drag Force Perception in Immersive Virtual Environments

HyeongYeop Kang, Geonsun Lee, JungHyun Han

[Conference] Estimating Detection Thresholds for Desktop-Scale Hand Redirection in Virtual Reality

André Zenner, Antonio Krüger

**Paper Session 3: Redirected Walking @ Room C**

**Chair:** Evan Suma Rosenberg

[Conference] A General Reactive Algorithm for Redirected Walking using Artificial Potential Functions

Jerald Thomas, Evan Suma Rosenberg

[Conference] Real-time Optimal Planning for Redirected Walking Using Deep Q-Learning

Dong-Yong Lee, Yong-Hun Cho, In-Kwon Lee

[Conference] Effects of Tracking Area Shape and Size on Artificial Potential Field Redirected Walking

Justin Messinger, Eric Hodgson, Eric R Bachmann

[TVCG] Multi-User Redirected Walking and Resetting Using Artificial Potential Fields

Eric R Bachmann, Eric Hodgson, Cole Hoffbauer, Justin Messinger

[TVCG] Shrinking Circles: Adaptation to Increased Curvature Gain in Redirected Walking

Luke Bölling, Niklas Stein, Frank Steinicke, Markus Lappe



#### **Paper Session 4: Rendering @ Room D**

**Chair:** Mark Billinghurst

[TVCG-Invited] Tile Pair-based Adaptive Multi-Rate Stereo Shading  
Yazhen Yuan, Rui Wang, Hujun Bao

[Conference] Real-Time Rendering of Stereo-Consistent Contours  
Dejing He, Rui Wang, Hujun Bao

[Conference] Hybrid Mono-Stereo Rendering in Virtual Reality  
Laura Fink, Nora Hensel, Daniela Markov-Vetter, Christoph Weber, Oliver Stadl, Marc Stamminger

[Conference] Optimised Molecular Graphics on the HoloLens  
Christoph Müller, Matthias Braun, Thomas Ertl

[Conference] Real-Time Continuous Level of Detail Rendering of Point Clouds  
Markus Schütz, Katharina Krösl, Michael Wimmer

11:30-12:00

#### **Fast forward 1 @ Room A, and Room B~D (broadcasting)**

12:00-13:00

#### **Poster / Demo Core Time**

14:15-15:30

#### **Paper Session 5: Audio @ Room A**

**Chair:** Tabitha Peck

[Conference] Haptic Force Guided Sound Synthesis in Multimodal Virtual Reality (VR) Simulation for Rigid-Fluid Interaction  
Haonan Cheng, Shiguang Liu

[TVCG] Adaptive Sampling for Sound Propagation  
Chakravarty Reddy Alla Chaitanya, John Snyder, Keith Godin, Derek Nowrouzezahrai, Nikunj Raghuvanshi

[TVCG] Audio-Material Reconstruction for Virtualized Reality Using a Probabilistic Damping Model  
Auston Baker Sterling, Nicholas Rewkowski, Roberta L. Klatzky, Ming C Lin

[Conference] Immersive Spatial Audio Reproduction for VR/AR Using Room Acoustic Modelling from 360 Images  
Hansung Kim, Luca Remaggi, Philip J.B. Jackson, Adrian Hilton

#### **Paper Session 6: Collaboration @ Room B**

**Chair:** Steven Feiner

[Conference] Characterizing Asymmetric Collaborative Interactions in Virtual and Augmented Realities  
Jerônimo Gustavo Grandi, Henrique Galvan Debarba, Anderson Maciel

[TVCG] Immersive Telepresence and Remote Collaboration using Mobile and Wearable Devices  
Jacob Young, Tobias Langlotz, Matthew Cook, Steven Mills, Holger Regenbrecht

[Conference] Multi-Ray Jumping: Comprehensible Group Navigation for Collocated Users in Immersive Virtual Reality  
Tim Weissker, Alexander Kulik, Bernd Froehlich

[Conference] Dataspace: A Reconfigurable Hybrid Reality Environment for Collaborative Information Analysis  
Marco Cavallo, Mishal Dolakia, Matous Havlena, Ken Ocheltree, Mark Podlasek

### **Paper Session 7: Training and Learning @ Room C**

**Chair:** Gudrun Klinker

[Conference] Scale - Unexplored Opportunities for Immersive Technologies in Place-based Learning

Jiayan Zhao, Alexander Klippel

[Conference] Virtual Classmates: Embodying Historical Learners Messages as Learning Companions in a VR Classroom through Comment Mapping  
Meng-Yun Liao, Ching Ying Sung, Hao-Chuan Wang, Wen-Chieh Lin

[Conference] iVRNote: Design, Creation and Evaluation of an Interactive Note-Taking Interface for Study and Reflection in VR Learning Environments  
Yi-Ting Chen, Chi-Hsuan Hsu, Chih-Han Chung, Yu-Shuen Wang, Sabarish V. Babu

[Conference] Creating a Stressful Decision Making Environment for Aerial Fire-fighter Training in Virtual Reality  
Rory Michael Scott Clifford, Simon Hoermann, Sungchul Jung, Mark Billinghurst, Robert W. Lindeman

[Conference] Ad-hoc study on soldiers calibration procedures in Virtual Reality  
Jean-Daniel Taupiac, Nancy Rodriguez, Olivier Strauss, Martin Rabier

### **Paper Session 8: Visualization Tools and Applications @ Room D**

**Chair:** Michele Fiorentino

[Conference] Kati: An Immersive Analytics Toolkit  
Maxime Cordeil, Andrew Cunningham, Benjamin Bach, Christophe Hurter, Bruce H Thomas, Kim Marriott, Tim Dwyer

[Conference] GeoGate: Correlating Geo-Temporal Datasets Using an Augmented Reality Space-Time Cube and Tangible Interactions  
Seung Youb Ssin, James A Walsh, Ross Smith, Andrew Cunningham, Bruce H Thomas

[TVCG] Developing Virtual Reality Visualizations for Unsteady Flow Analysis of Dinosaur Track Formation using Scientific Sketching  
Johannes Novotny, Joshua Tveite, Morgan Turner, Stephen Gatesy, Peter L Falkingham, David H. Laidlaw

[TVCG-Invited] Non-Contact Thermo-Visual Augmentation by IR-RGB Projection  
Daisuke Iwai, Mei Aoki, Kosuke Sato

[Conference] Exploration of an EEG-Based Cognitively Adaptive Training System in Virtual Reality

Arindam Dey, Alex Chatburn, Mark Billinghurst

**15:45-17:00**

### **Panel 1: Implementing Virtual Reality at Scale in the Field – Challenges of Spaces and Places @ Room A**

**Moderator:** Sun Joo (Grace) Ahn, Kyle Johnsen

**Panelists:** Christoph Borst, Erica Southgate, Sabarish Babu, Maki Sugimoto

### **Paper Session 9: Perception of Depth and Space @ Room B**

**Chair:** Bret Jackson

[TVCG] An Evaluation of Depth and Size Perception on Spherical Fish Tank Virtual Reality Display  
Qian Zhou, Georg Hagemann, Dylan Brodie Fafard, Ian Stavness, Sidney S Fels



[Conference] Virtual Objects Look Farther on the Sides: The Anisotropy of Distance Perception in Virtual Reality  
Etienne Peillard, Thomas Thebaud, Jean-Marie Normand, Ferran Argelaguet Sanz, Guillaume Moreau, Anatole Lécuyer

[Conference] Distance Judgments to On- and Off-Ground Objects in Augmented Reality  
Carlos Salas, Grant D. Pointon, Haley Alexander Adams, Jeanine Stefanucci, Sarah Creem-Regehr, William B Thompson, Bobby Bodenheimer

[Conference] Mitigating Incorrect Perception of Distance in Virtual Reality through Personalized Rendering Manipulation

Alex Peer, Kevin Ponto

[TVCG] Orientation Perception in Real and Virtual Environments

Adam Jones, Jonathan E Hopper, Mark Bolas, David M. Krum

### **Paper Session 10: Rendering and Simulation @ Room C**

**Chair:** Benjamin Weyers



[TVCG] Temporal Resolution Multiplexing: Exploiting the limitations of spatio-temporal vision for more efficient VR rendering

Gyorgy Denes, Kuba Maruszczyk, George Ash, Rafal K. Mantiuk

[TVCG] Intuitive VR Exploration Assistance through Automatic Occlusion Removal

Lili Wang, Jian Wu, Xuefeng Yang, Voicu Popescu

[Conference] Material Surface Reproduction and Perceptual Deformation with Projection Mapping for Car Interior Design

Takuro Takezawa, Daisuke Iwai, Kosuke Sato, Toshihiro Hara, Yusaku Takeda, Kenji Murase

[TVCG-Invited] A Deep Learning-based Framework for Intersectional Traffic Simulation and Editing

Huikun Bi, Tianlu Mao, Zhaoqi Wang, Zhigang Deng

[Conference] Simulating Water Resistance for Virtual Underwater Experience Using Visual Delay Effect

Eun-Cheol Lee, Yong-Hun Cho, In-Kwon Lee

### **Paper Session 11: Sensing and Capture @ Room D**

**Chair:** David Krum



[TVCG] Mo2Cap2: Real-time Mobile 3D Motion Capture with a Cap-mounted Fisheye Camera

Weipeng Xu, Avishek Chatterjee, Michael Zollhoefer, Helge Rhodin, Pascal Fua, Hans-Peter Seidel, Christian Theobalt

[TVCG] SLAMCast: Large-Scale, Real-Time 3D Reconstruction and Streaming for Immersive Multi-Client Live Telepresence

Patrick Stotko, Stefan Krumpen, Matthias Hullin, Michael Weinmann, Reinhard Klein

[TVCG-Invited] Temporal Upsampling of Depth Maps Using a Hybrid Camera

Ming-Ze Yuan, Lin Gao, Hongbo Fu, Shihong Xia

[TVCG-Invited] Realistic Procedural Plant Modeling from Multiple View Images  
Jianwei Guo, Shibiao Xu, Dong-Ming Yan, Zhanglin Cheng, Marc Jaeger, Xiaopeng Zhang

[Conference] Mask-off: Synthesizing Face Images in the Presence of Head-mounted Displays

Yajie Zhao, Qingguo Xu, Weikai Chen, Jun Xing, Chao Du, Xinyu Huang, Ruigang Yang

**18:00-20:00**

**Conference reception at Rihga Royal Hotel Osaka**

## Tuesday, 26 March

8:30-9:00

**Award ceremony @ Room A, and Room B~E (broadcasting)**

9:00-10:00

**Keynote 2: Virtual Reality for Enhancing Human Perceptual Diversity Towards an Inclusive Society @ Room A, and Room B~E (broadcasting)**

**Speaker:** Yoichi Ochiai, University of Tsukuba / Pixie Dust Technologies, Inc.

**Chair:** Gordon Wetzstein



10:15-11:30

**Paper Session 12: Applications @ Room A**

**Chair:** Amela Sadagic

[Conference] Investigating the Third Dimension for Authentication in Immersive Virtual Reality and in the Real World  
Ceenu George, Daniel Buschek, Mohamed Khamis, Heinrich Hussmann

[Conference] The Effects of Stereopsis and Immersion on Bimanual Assembly Task in a Virtual Reality System  
Douglas Yamashita de Moura, Amela Sadagic

[Conference] Empowering Young Job Seekers with Virtual Reality  
Ekaterina Prasolova-Førland, Mikhail Fominykh, Oscar Ihlen Ekelund

[TVCG] Functional Workspace Optimization via Learning Personal Preferences from Virtual Experiences  
Wei Liang, Jingjing Liu, Yining Lang, Bing Ning, Lap-Fai (Craig) Yu

[Conference] VR as a Content Creation Tool for Film Previsualisation  
Quentin Galvane, I-Sheng Lin, Ferran Argelaguet Sanz, Tsai-Yen Li, Marc Christie

**Paper Session 13: Haptics and Vibrotactiles @ Room B**

**Chair:** Maud Marchal

[TVCG] Modulating Fine Roughness Perception of Vibrotactile Textured Surface using Pseudo-haptic Effect  
Yusuke Ujitoko, Yuki Ban, Koichi Hirota

[Conference] TacTiles: Dual-mode Low-power Electromagnetic Actuators for Rendering Continuous Contact and Spatial Haptic Patterns in VR  
Velko Vechev, Juan Zarate, David Lindlbauer, Ronan J Hinchet, Herbert Shea, Otmar Hilliges

[Conference] Toward Universal Tangible Objects: a Novel Approach to Optimize Haptic Sensations in 3D Interaction  
Xavier de Tinguay, Claudio Pacchierotti, Maud Marchal, Anatole Lécuyer

[Conference] HapticSphere: Physical Support To Enable Precision Touch Interaction in Mobile Mixed-Reality  
Chiu-Hsuan Wang, Chen-Yuan Hsieh, Neng-Hao Yu, Andrea Bianchi, Liwei Chan

[Conference] Vibro-tactile Feedback for Real-world Awareness in Immersive Virtual Environments  
Dimitar Valkov, Lars Linsen

**Paper Session 14: Displays 1 @ Room C**

**Chair:** J. Edward Swan II

[TVCG] Manufacturing Application-Driven Foveated Near-Eye Displays  
KAAN AKSIT, Praneeth Chakravarthula, Kishore Rathinavel, Youngmo Jeong, Rachel Albert, Henry Fuchs, David Luebke

[TVCG] A perception-driven hybrid decomposition for multi-layer accommodative displays

Hyeonseung Yu, Mojtaba Bemana, Marek Wernikowski, Michal Chwesiuk, Okan Tarhan Tursun, Gurprit Singh, Karol Myszkowski, Radoslaw Mantiuk, Hans-Peter Seidel, Piotr Didyk

[TVCG] Light Attenuation Display: Subtractive See-Through Near-Eye Display via Spatial Color Filtering

Yuta Itoh, Tobias Langlotz, Daisuke Iwai, Toshiyuki Amano, Kiyoshi Kiyokawa

[TVCG] Varifocal Occlusion for Optical See-Through Head-Mounted Displays using a Slide Occlusion Mask

Takumi Hamasaki, Yuta Itoh

[Conference] MDI: A Multi-channel Dynamic Immersion Headset for Seamless Switching between Virtual and Real World Activities

Kien T. P. Tran, Sungchul Jung, Simon Hoermann, Robert W. Lindeman

### **Paper Session 15: Navigation and Redirection @ Room E**

**Chair:** Victoria Interrante

[Conference] VRoamer: Generating On-The-Fly VR Experiences While Walking inside Large, Unknown Real-World Building Environments

Lung-Pan Cheng, Eyal Ofek, Christian Holz, Andrew D Wilson

[Conference] Improving Walking in Place Methods with Individualization and Deep Networks

Sara Hanson, Richard Paris, Haley Alexander Adams, Bobby Bodenheimer

[Conference] Redirecting View Rotation in Immersive Movies with Washout Filters

Travis Stebbins, Eric Ragan

[Conference] Redirected Jumping: Imperceptibly Manipulating Jump Motions in Virtual Reality

Daigo Hayashi, Kazuyuki Fujita, Kazuki Takashima, Robert W. Lindeman, Yoshifumi Kitamura

[Conference] Evaluating the Effectiveness of Redirected Walking with Auditory Distractors for Navigation in Virtual Environments

Nicholas Rewkowski, Atul Rungta, Mary C. Whitton, Ming C Lin

**11:30-12:00**

**Fast forward 2 @ Room A, and Room B~E (broadcasting)**

**12:00-13:00**

**Poster / Demo Core Time**

**13:10-14:00**

**(Free Lunch Seminar) Dell + Intel: VR technology to improve productivity in Japan @ Room E**

**14:15-15:30**

**Paper Session 16: 360 Video 2 @ Room A**

**Chair:** Hideo Saito

[Conference] Real-time panoramic depth maps from omni-directional stereo images for 6 DoF videos in virtual reality

Po Kong Lai, Shuang Xie, Jochen Lang, Robert Laganière

[Conference] Exploration of Large Omnidirectional Images in Immersive Environments

Seyedkoosha Mirhosseini, Parmida Ghahremani, Sushant Ojal, Joseph Marino, Arie Kaufman

[Conference] The Effect of Camera Height, Actor Behavior, and Viewer Position on the User Experience of 360° Videos

Tuuli Keskinen, Ville Mäkelä, Pekka Kallioniemi, Jaakko Hakulinen, Jussi Karhu, Kimmo Ronkainen, John Mäkelä, Markku Turunen

[Conference] Live Stereoscopic 3D Image With Constant Capture Direction of 360 Cameras for High-Quality Visual Telepresence

Yasushi Ikei, Vibol Yem, Kento Tashiro, Toi Fujie, Tomohiro Amemiya, Michiteru Kitazaki

[Conference] Efficient Hybrid Projection For Encoding 360 VR Videos  
Jingtao Tang, Xinyu Zhang

#### **Paper Session 17: Audio and Perception @ Room B**

**Chair:** Ernst Kruijff

[Conference] Perceptual Study of Near-Field Binaural Audio Rendering in Six-Degrees-of-Freedom Virtual Reality

Olli Rummukainen, Sebastian J. Schlecht, Thomas Robotham, Axel Plinge, Emanuel A. P. Habets

[Conference] Perceptual Characterization of Early and Late Reflections for Auditory Displays

Atul Rungta, Nicholas Rewkowski, Roberta L. Klatzky, Dinesh Manocha

[TVCG] Audio-Visual-Olfactory Resource Allocation for Tri-modal Virtual Environments

Efstathios Doukakis, Kurt Debattista, Thomas Bashford-Rogers, Amar Dhokia, Ali Asadipour, Alan Chalmers, Carlo Harvey

[TVCG] Auditory Feedback for Navigation with Echoes in Virtual Environments: Training Procedure and Orientation Strategies

Anastasia Andreassen, Michele Geronazzo, Niels Christian Nilsson, Jelizaveta Zovnercuka, Kristian Konovalov, Stefania Serafin

#### **Paper Session 18: Head and Gaze Input @ Room C**

**Chair:** Henry Fuchs

[TVCG] RingText: Dwell-free and hands-free Text Entry for Mobile Head-Mounted Displays using Head Motions

Wenge Xu, Hai-Ning Liang, Yuxuan Zhao, Tianyu Zhang, Difeng Yu, Diego Vilela Monteiro, Yong Yue

[Conference] Optimizing Visual Element Placement in Virtual Environments via Visual Attention Analysis

Rawan Alghofaili, Michael S Solah, Haikun Huang, Yasuhito Sawahata, Marc Pomplun, Lap-Fai (Craig) Yu

[TVCG] SGaze: A Data-Driven Eye-Head Coordination Model for Realtime Gaze Prediction

Zhiming Hu, Congyi Zhang, Sheng Li, Guoping Wang, Dinesh Manocha

[Conference] EyeSeeThrough: Unifying Tool Selection and Application in Virtual Environments

Diako Mardanbegi, Ken Pfeuffer, Alexander Perzl, Benedikt Mayer, Shahram Jalaliniya, Hans Gellersen

#### **Paper Session 19: Medical Applications Therapy @ Room E**

**Chair:** Benjamin Lok

[Conference] Visual stimulus disrupts the location of tactile perception in virtual reality

Dion Willis, Wendy Powell, Vaughan Powell, Brett Stevens

[Conference] Virtual Reality Video Game Paired with Physical Monocular Blurring as Accessible Therapy for Amblyopia

Ocean Hurd, Sri Kurniawan, Mircea Teodorescu

[Conference] Using Virtual Reality and Gamification Within Procedural Generated Environments to Increase Motivation During Gait Rehabilitation  
Florian Kern, Carla Winter, Dominik Gall, Ivo Käthner, Paul Pauli, Marc Erich Latoschik

15:45-17:00

**Panel 2: Special Panel on the Future of Head Mounted Displays @ Room A, and Room B~E (broadcasting)**

**Moderator:** Henry Fuchs

**Panelists:** Hong Hua, Bernard Kress, Andrew Maimone, Gordon Wetzstein

18:00-20:00

**Osaka Gourmet Night**

20:30-22:30

**Osaka Karaoke Night**

## Wednesday, 27 March

8:30-9:00

**Sponsor talks @ Room A, and Room B~E (broadcasting)**

9:00-10:00

**Keynote 3: Let's Unleash Entertainment! VR Possibilities Learned through Entertainment Facility "VR Zone" @ Room A, and Room B~E (broadcasting)**

**Speakers:** Junichiro Koyama and Yukiharu Tamiya, BANDAI NAMCO Amusement Inc.

**Chair:** Marc Erick Latoschik



10:15-11:30

**Paper Session 20: Avatars @ Room A**

**Chair:** Amy Ulinski Banic

[Conference] The Effect of Hand Size and Interaction Modality on the Virtual Hand Illusion

Lorraine Lin, Aline Normoyle, Alexandra Adkins, Yu Sun, Andrew Robb, Yuting Ye, Massimiliano Di Luca, Sophie Joerg

[Conference] Virtual Hand Realism Affects Object Size Perception in Body-Based Scaling

Nami Ogawa, Takuji Narumi, Michitaka Hirose

[Conference] Reconciling Being in-Control vs Being Helped for the Execution of Complex Movements in VR

Thibault Porssut, Bruno Herbelin, Ronan Bouluc

[Conference] The Influence of Size in Augmented Reality Telepresence Avatars

Michael Walker, Daniel Szafir, Irene Rae

[Conference] The Effect of Avatar Appearance on Social Presence in an Augmented Reality Remote Collaboration

Boram Yoon, Hyung-il Kim, Gun Lee, Mark Billinghurst, Woontack Woo

**Paper Session 21: Displays 2 @ Room B**

**Chair:** Daisuke Iwai

[Conference] Large-Scale Projection-Based Immersive Display: The Design and Implementation of LargeSpace

Hikaru Takatori, Masashi Hiraiwa, Hiroaki Yano, Hiroo Iwata

[TVCG-Invited] The Effect of Focal Distance, Age, and Brightness on Near-Field Augmented Reality Depth Matching

Gurjot Singh, Stephen R. Ellis, J. Edward Swan II

[Conference] Towards Eye-Friendly VR: How Bright Should It Be?

Khrystyna Vasylevska, Hyunjin Yoo, Tara Akhavan, Hannes Kaufmann

[Conference] The Effect of Narrow Field of View and Information Density on Visual Search Performance in Augmented Reality  
Christina Trepkowski, Tom David Eibich, Jens Maiero, Alexander Marquardt, Ernst Kruijff, Steven Feiner

[TVCG] Implementation and Evaluation of a 50KHz, 28 $\mu$ s Motion-to-Pose Latency Head Tracking Instrument  
Alex Blate, Mary C. Whitton, Andrei State, Montek Singh, Gregory F. Welch, Turner Whitted, Henry Fuchs

#### **Paper Session 22: Interaction Techniques @ Room C**

**Chair:** Doug Bowman

[TVCG-Invited] Towards Brain-Computer Interfaces for Augmented Reality: Feasibility, Design and Evaluation  
Hakim Si-Mohammed, Jimmy Petit, Camille Jeunet, Ferran Argelaguet, Fabien Spindler, Andréol Évain, Nicolas Roussel, Géry Casiez, Anatole Lécuyer

[Conference] Do Head-Mounted Display Stereo Deficiencies Affect 3D Pointing Tasks in AR and VR?  
Anil Ufuk Batmaz, Mayra Donaji Barrera Machuca, Duc-Minh Pham, Wolfgang Stuerzlinger

[Conference] Augmented Reality Map Navigation with Freehand Gestures  
Kadek Ananta Satriadi, Barrett Ens, Maxime Cordeil, Tobias Czauderna, Wesley Willett, Bernhard Jenny

[Conference] Get a Grip! Introducing Variable Grip for Controller-Based VR Systems  
Michael Bonfert, Robert Porzel, Rainer Malaka

[Conference] The effect of elastic feedback on the perceived user experience and presence of travel methods in immersive environments.  
Tobias Günther, Lars Engeln, Sally Julie Busch, Rainer Groh

#### **Paper Session 23: Perception @ Room E**

**Chair:** Guillaume Moreau

[Conference] Enactive approach to assess perceived speed error during walking and running in virtual reality  
Théo Perrin, Hugo A. Kerhervé, Charles Faure, Anthony Sorel, Benoit Bideau, Richard Kulpa

[TVCG] Perceptually Based Adaptive Motion Retargeting to Animate Real Objects by Light Projection  
Taiki Fukiage, Takahiro Kawabe, Shinya Nishida

[Conference] PeriText: Utilizing Peripheral Vision for Reading Text on Augmented Reality Smart Glasses  
Pin Sung Ku, Yi-Hao Peng, Yu-Chih Lin, Mike Y. Chen

[Conference] Text Presentation for Augmented Reality Applications in Dual Task Situations  
Elisa Maria Klose, Nils Adrian Mack, Jens Hegenberg, Ludger Schmidt

[Conference] Perception of Volumetric Characters' Eye-Gaze Direction in Head-Mounted Displays  
Andrew MacQuarrie, Anthony Steed

**11:30-12:00**

**Fast forward 3 @ Room A, and Room B-E (broadcasting)**

**12:00-13:00**

**Poster / Demo Core Time**

**13:10-14:00**

**(Free Lunch Seminar) GREE VR Studio Lab - R&D for Virtual human beings and live entertainment which drives ecosystem in VR4.0 era**



14:15-15:30

### **Paper Session 24: Medical Applications Training @ Room A**

**Chair:** Rick Skarbez

[TVCG] Immersive Virtual Colonoscopy

Seyedkoosha Mirhosseini, Ievgenia Gutenko, Sushant Ojal, Joseph Marino, Arie Kaufman

[Conference] ICthroughVR: Illuminating Cataracts through Virtual Reality

Katharina Krösl, Carmine Elvezio, Matthias Hürbe, Sonja Karst, Michael Wimner, Steven Feiner

[Conference] Efficacy Study on Interactive Mixed Reality (IMR) Software with Sepsis Prevention Medical Education

Naveen Kumar Sankaran, Harris J Nisar, Ji Zhang, Kyle Formella, Jennifer Amos, Lisa T. Barker, John Vozenilek, Steven M. LaValle, Thenkurussi Kesavadas

[Conference] Toward Virtual Stress Inoculation Training of Prehospital Healthcare Personnel: A Stress-Inducing Environment Design and Investigation of an Emotional Connection Factor

Mores Prachyabrued, Disathon Wattanadhirach, Richard Bartley Dudrow, Nat Krairojananan, Pusit Fuengfoo

### **Paper Session 25: Navigation @ Room B**

**Chair:** Regis Kopper

[Conference] Virtual vs. Physical Navigation in VR: Study of Gaze and Body Segments Temporal Reorientation Behaviour

Hugo Brument, Iana Podkosova, Hannes Kaufmann, Anne-Hélène Olivier, Ferran Argelaguet Sanz

[Conference] User-Centered Extension of Locomotion Typology: Body-Based Sensorial Cues of Different Locomotion Modes to predict Spatial Learning

Carolin Wienrich, Nina Döllinger, Simon Kock, Klaus Gramann

[Conference] Jumping Further: Forward Jumps in a Gravity-reduced Immersive Virtual Environment

HyeongYeop Kang, Geonsun Lee, Dae Seok Kang, Ohung Kwon, Jun Yeup Cho, Ho-Jung Choi, JungHyun Han

[Conference] Occlusion Management in VR: A Comparative Study

Lili Wang, Han Zhao, Zesheng Wang, Jian Wu, Bingqiang Li, Zhiming He, Voicu Popescu

### **Paper Session 26: Social Interactions @ Room C**

**Chair:** Robert W. Lindeman

[TVCG] Inferring User Intent using Bayesian Theory of Mind in Shared Avatar-Agent Virtual Environments

Sahil Narang, Andrew Best, Dinesh Manocha

[TVCG] Interpersonal Affordances and Social Dynamics in Collaborative Immersive Virtual Environments: Passing Together Through Apertures

Lauren Buck, John Rieser, Gayathri Narasimham, Bobby Bodenheimer

[TVCG] Not Alone Here?! Scalability and User Experience of Embodied Ambient Crowds in Distributed Social Virtual Reality

Marc Erich Latoschik, Florian Kern, Jan-Philipp Stauffert, Andrea Bartl, Mario Botsch, Jean-Luc Lugin

[Conference] Studying Gaze Behaviour During Interactions With a Virtual Walker: Influence of the Virtual Reality Setup

Florian Berton, Anne-Hélène Olivier, Julien Bruneau, Ludovic Hoyet, Julien Pettré

[Conference] Effects of Self-Avatar and Gaze on Avoidance Movement Behavior

Christos Mousas, Alexandros Fabio Koiliias, Dimitris Anastasiou, Banafsheh Rekabdar, Christos-Nikolaos Anagnostopoulos

### **Paper Session 27: Visualization Techniques @ Room E**

**Chair:** Antonello Uva

[Conference] Visualization Techniques for Precise Alignment in VR. A Comparative Study

Alejandro Martin-Gomez, Ulrich Eck, Nassir Navab

[TVCG-Invited] The Influence of Label Design on Search Performance and Noticeability in Wide Field of View Augmented Reality Displays

Ernst Kruijff, Jason Orlosky, Naohiro Kishishita, Christina Trepkowski, Kiyoshi Kiyokawa

[Conference] Comparing Techniques for Visualizing Moving Out-of-View Objects in Head-mounted Virtual Reality

Uwe Gruenefeld, Ilja Koethe, Daniel Lange, Sebastian Weiß, Wilko Heuten

[Conference] Worlds-in-Wedges: Combining WIMs and Portals to Support Comparative Immersive Visualization of Forestry Data

Jung Who Nam, Krista McCullough, Joshua Tveite, Maria Molina Espinosa, Charles Hobie Perry, Barry Ty Wilson, Daniel F. Keefe

15:45-17:00

### **Panel 3: Virtual Reality Curriculum @ Room A**

**Moderator:** Tabitha Peck

**Panelists:** Bobby Bodenheimer, Doug A. Bowman, Gerard Jounghyun Kim, Benjamin Lok, Luciana Nedel, Anthony Steed

### **Paper Session 28: Avatar Technologies @ Room B**

**Chair:** Gerd Bruder

[Conference] The Impact of Avatar Tracking Errors on User Experience in VR

Nicholas Toothman, Michael Neff

[TVCG] The Virtual Caliper: Rapid Creation of Metrically Accurate Avatars from 3D Measurements

Sergi Pujades, Betty Mohler, Anne Thaler, Joachim Tesch, Naureen Mahmood, Nikolas Hesse, Heinrich H. Bühlhoff, Michael J. Black

[Conference] Virtual Agent Positioning Driven by Scene Semantics in Mixed Reality

Yining Lang, Wei Liang, Lap-Fai (Craig) Yu

[Conference] EEG can be used to measure embodiment when controlling a walking self-avatar

Bilal Alchalabi, Jocelyn Faubert, David Labbe

[Conference] Automatic Generation and Stylization of High Quality Real-Time Avatars

Fabien Danieau, Ilja Gubins, Nicolas Olivier, Olivier Dumas, Bernard Denis, Thomas Lopez, Nicolas Mollet, Brian Frager, Quentin Avril

### **Paper Session 29: Cognition and Psychology @ Room C**

**Chair:** Jason Orlosky

[Conference] The Effects of Presence on Harm-inducing Factors in Virtual Slot Machines

David Heidrich, Sebastian Oberdörfer, Marc Erich Latoschik

[Conference] Entropy of Controller Movements Detects Mental Workload in Virtual Reality

Daniel Reinhardt, Steffen Haesler, Jörn Hurtienne, Carolin Wienrich

[Conference] Studying the Mental Effort in Virtual Versus Real Environments

Tiffany Luong, Nicolas Martin, Ferran Argelaguet Sanz, Anatole Lécuyer

[TVCG] You or me? Personality traits predict sacrificial decisions in a VR-simulated accident situation

Uijong Ju, June Kang, Christian Wallraven

**Paper Session 30: Cybersickness @ Room E**

**Chair:** Blair MacIntyre

[Conference] PhantomLegs: Reducing Virtual Reality Sickness using Head-Worn Haptic Devices  
Shi-Hong Liu, Neng-Hao Yu, Liwei Chan, Yi-Hao Peng, Wei-Zen Sun, Mike Y. Chen

[TVCG] Motion Sickness Prediction in Stereoscopic Videos Using 3D Convolutional Neural Networks  
Tae Min Lee, Jong-Chul Yoon, In-Kwon Lee

[TVCG-Invited] Analysis on Mitigation of Visually Induced Motion Sickness by Applying Dynamical Blurring on a User's Retina  
Guang-Yu Nie, Henry Been-Lirn Duh, Yue Liu, Yongtian Wang

[TVCG-Invited] Scene Transitions and Teleportation in Virtual Reality and the Implications for Spatial Awareness and Sickness  
Kasra Rahimi Moghadam, Colin Banigan, Eric D. Ragan

[Conference] Cybersickness Analysis with EEG using Deep Learning Algorithms  
Dae kyo Jeong, Sangbong Yoo, Yun Jang

17:15-17:45

**Closing @ Room A, and Room B~E (broadcasting)**

Posters



Research  
Demos



Doctoral  
Consortium



Videos



3DUI  
Contest



# Featured events

Tuesday, 26 March

## Osaka Gourmet Night

Time: 18:00 - 20:00

Place: Kuromon Ichiba Market / 黒門市場

Meeting place: Ground floor of the conference venue

Meeting time: 17:10

more detailed info



## Osaka Karaoke Night

Time: 20:30 - 22:30

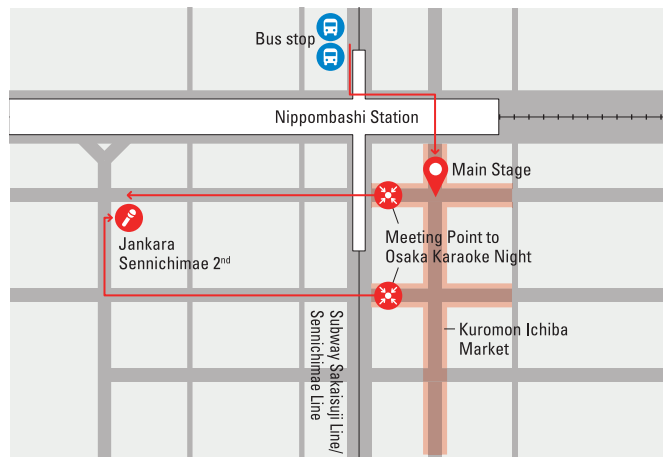
Place: Jankara Sennichimae 2<sup>nd</sup> / ジャンカラ千日前2号店

Meeting place: on the map

Meeting time: 20:00

Participation fee: free \* No ticket required!

more detailed info



Wednesday, 27 March

## VR Zone Osaka

Time: 19:00 - 21:00

Place: HEP FIVE 8F, 9F

Meeting place: Ground floor of the conference venue

Meeting time: 18:00

Participation fee: 3,900 JPY \* Ticket required

more detailed info



## Kyohritsu Electronic Industry Tour

Time: 18:00 - 20:00

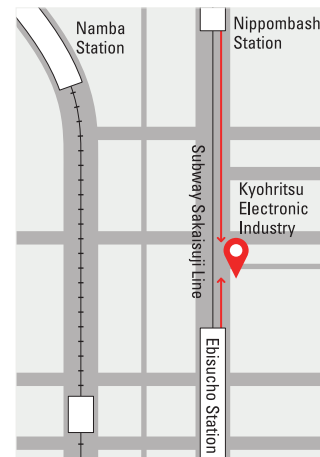
Place: Silicon House Kyoritsu / シリコンハウス共立

Meeting place: Ground floor of the conference venue

Meeting time: 18:00

Participation fee: free \* Ticket required

more detailed info



# Restaurant guide

## 1 McDonald's



Open 24 hours  
Closed Always open  
Tel 06-6451-0684

## 2 Tully's COFFEE



Open 7am-10pm  
Closed Always open  
Tel 06-6454-1784

## 3 Sanku (Ramen)



Open 11:39am-2:39pm  
6:39pm-11:39pm  
Closed 2nd & 4th Sun  
Tel 06-6451-4115

## 4 551HORAI (Chinese)



Open 11:00am-9:30pm(L.O.)  
Closed 1st & 3rd Tue  
(following day in case of holiday)  
Tel 06-6453-5516

## 5 Slow Café



Open 8am-3pm  
4pm-6pm  
Closed Sun/Holidays  
Tel 06-6450-8501

## 6 FLOWERS (CAFÉ&DINER)



Open 11:30am-9:30pm(L.O.)  
11:30am-7:30pm(L.O)(Sun)  
Closed Mon (following day in case of holiday)  
Tel 06-6443-3375

## 7 Minryu (Chinese food)



Open 11am-10:30pm  
Closed New Year holidays  
Tel 06-6443-5166

## 8 Ichiyoshi (Ramen)



Open 11am-3pm  
5pm-11:30pm  
Closed Sun/Holidays  
Tel 06-6443-8231

## 9 Tsurumaruudon Nakanosima (Udon)

Open 11am-8pm(Weekday)  
11am-3pm(Sat/Sun/Holidays)  
Closed Always open  
Tel 06-6443-2725

## 10 Komeda Coffee



Open 7am-10pm  
Closed Irregular holidays  
Tel 06-6136-3014

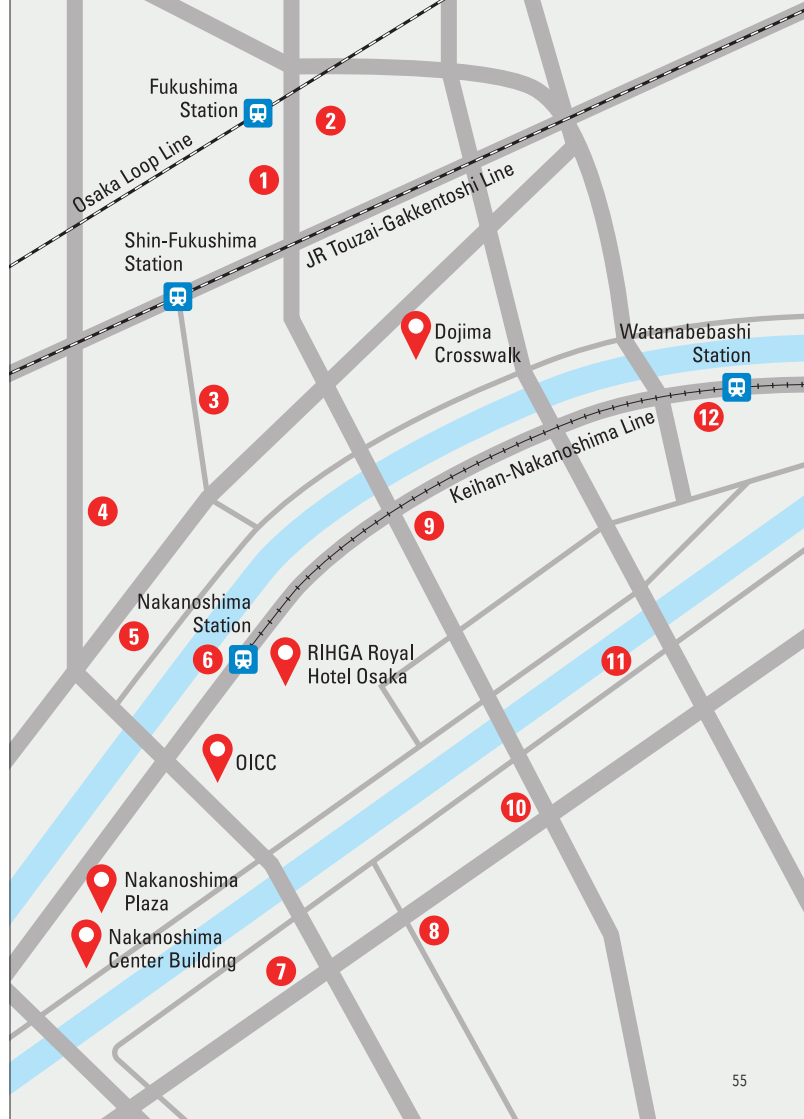
## 11 Rocca (Vegetable base)

Open 11:30am-2:45pm  
6pm-10pm(Weekday)  
11:30am-2:45pm(Sat)  
Closed Sun/Holidays /2nd Sat  
Tel 06-6444-5765

## 12 STARBUCKS



Open 7am-8pm(Weekday)  
8am-7pm(Sat)  
Closed Sun/Holidays  
Tel 06-4803-9031





## Nakanoshima Center Bldg.

### 1F Bonjour (Western food)

Open Weekday  
7am–9:30am, 11:30am–2:30pm(L.O.2pm)  
Sat/Sun/holidays  
11:30am–1:30pm(L.O.1pm)

Closed Always open

Tel 06-6443-1152

### B1 Daiu Nakano (Udon/Soba noodles)

Open Weekday  
11am–3pm, 5pm–7pm  
Sunday  
11am–1:30pm

Closed Sunday & National Holidays

Tel 06-6441-0356

### 31F Uoman (Japanese food)

Open 11am–2pm(L.O.1:30pm), 5pm–9:30pm(L.O.9pm)

Closed Weekends & National Holidays

Tel 06-6445-1977



## RIHGA ROYAL HOTEL

### B1 Doutonbori IMAI (Udon/Soba noodles)

Open 11am–9:30pm  
\*11am–2pm: All seats are non smoking  
\*3pm–9:30pm: Separation of smoking areas

Tel 06-6448-0880

### 1F Melissa (Bread/Side dish/Cake)

Open 10am–8pm

Tel 06-6448-2412



## DOJIMA CROSSWALK

### 1F DIWALI (Indian food)

Open \*11am–1:30pm: All seats are non smoking  
Weekday  
11am–3pm, 5pm–11pm(L.O.10:30)  
Sat/Sun/holidays  
11am–11pm(L.O.10:30pm)

Closed Always open

Tel 06-4749-0655

### 1F Negiyaki Yamamoto (Okonomiyaki)

Open 11:30am–10pm

Closed 2nd/4th Wed

Tel 06-4798-8220

### 1F Osaka dosanjin (Soba noodles)

Open Weekday  
11:30am–3pm(L.O.2:30pm), 5:30pm–10:30pm(L.O.10pm)  
Sun&National Holidays  
11:30am–3:30pm(L.O.3pm), 5:30pm–10pm(L.O.9:30pm)

Closed 2nd/4th Mondays, Tuesday, National Holidays

Tel 06-6345-3360



## Osaka International Convention Center

### 2F OIC CAFÉ

Open 9am–7pm(L.O.6:30pm)

Tel 06-4803-5539

### 5F Self-Service Restaurant MAIDO OOKINI Osaka Kokusai Kaigijo Shokudo

Open 11am–3pm(L.O.2:30pm)

Tel 06-4803-5561

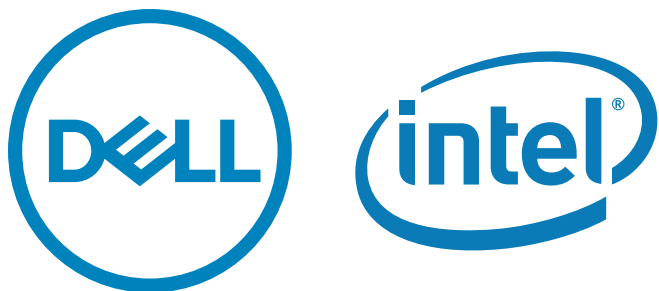
### 12F GRANDE TOQUE restaurant

Open 11am–2pm

Tel 06-6441-1485

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The Japan Society of Mechanical Engineers  
Japanese Society for Medical and Biological Engineering  
The Institute of Image Information and Television Engineers  
The Society of Instrument and Control Engineers  
The Institute of Electronics, Information and Communication Engineers  
The Institute of Electrical Engineers of Japan  
The Society for Art and Science  
Japan Ergonomics Society  
The Japanese Society of Medical Imaging

Notes:



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