14th Workshop on Information Optics
(WIO2015)

Conference Program and Technical Digest

1 – 5 June 2015
Kyoto Garden Palace
Kyoto, Japan
Welcome Message

Welcome to the 14th Workshop on Information Optics (WIO2015) in Japan.

The workshop will address the latest advances in information optics, information photonics, imaging sciences and engineering, display technologies and 3D displays, 3D image sensing, image-based information security, image recognition, biophotonics, and novel image sensors. It will be a forum for scientific interaction and collaboration between well-known scientists in the field and educational outreach to students.

The workshop has been running for more than 20 years, starting with the Euro-American Workshop on Optical Pattern Recognition in La Rochelle, 1994. Previous workshop locations include Barcelona (1997), Colmar (1999), Valencia (2001), Toledo (2006), Reykjavik (2007), Annecy (2008), Paris (2009), Helsinki (2010), Benicasim (2011), Quebec (2012), Teneriffe (2013), and Neuchâtel (2014). It is a small workshop (typically limited to 30-35 talks, single session), with invited participants selected from the leaders in the field from the area of information optics and photonics. There is an emphasis on allowing time for interaction, collaboration, and networking in a friendly atmosphere.

We hope that all of you enjoy this conference and have excellent time in Kyoto.

Conference Co-chairs

Bahram Javidi  
Univ. Connecticut  
USA

Takanori Nomura  
Wakayama Univ.  
Japan

Osamu Matoba  
Kobe Univ.  
Japan

Yasuhiro Awatsuji  
Kyoto Inst. Tech.  
Japan
Committee

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Bahram Javidi (University of Connecticut, USA)
Takanori Nomura (Wakayama University, Japan)
Osamu Matoba (Kobe University, Japan)
Yasuhiro Awatsuji (Kyoto Institute of Technology, Japan)

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T. Scharf (École polytechnique fédérale de Lausanne, Switzerland)
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Osamu Matoba (Kobe University, Japan)
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General Information

1. Registration hours

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<td>Sunday, May 31</td>
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<td>Monday, June 1</td>
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<td>Tuesday, June 2</td>
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<td>Friday, June 5</td>
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2. Poster Session

Poster Session will be held on the room, Kurama, on June 4, 2015

By June 3, lunch time

Please come to the registration desk during the lunch time on June 3rd and give us the ppt file or pdf of your short presentation. Short presentation will be used in one computer provided by the conference committee. In order to run the schedule on time, the use of your own computer is prohibited.

14:00-14:45

Short presentation
3 minutes oral presentation per person using a computer provided by the conference committee

14:45-16:00

Poster presentation
Panel Size: 180 cm (Height) x 90 cm (Width)
Special Events

1. Welcome Reception
   Monday, June 1, 18:00-20:00
   Room Kurama

2. Social Activity
   Tuesday, June 2, 13:00-21:00
   Meeting point at front desk on 1st floor at 13:00
   Any person who wants to join us, please purchase the ticket on the registration desk.
   Fee of each person is 15,000 JPY. The tour goes to Kinkakuji temple and Fushimi-inari jinjya (shrine) by bus. Please take the walking shoes for this activity. The fee includes the entrance ticket of Kinkakuji temple and dinner at Ganko Nijyo, Japanese Garden Restaurant.

3. Banquet
   Wednesday, June 3, 15:30-22:00
   Meeting point at front desk on 1st floor at 15:30
   Banquet will be held at Higashiyama SODOH. In the banquet, the entertainment by Maiko and Geisha is provided. Any person who wants to join us, please purchase the ticket on the registration desk. Fee of each person is 10,000 JPY. Before the banquet, the tour goes to Heian Jingu Shrine, historical places in downtown Kyoto, and the experience of green powdered tea (Maccha) at Kodaiji Temple. Please take the walking shoes for this activity.
Monday, June 1

8:30-9:30  ● Registration

9:50-10:00  ● Opening Remark

10:00-12:00
M1  ● Information Optics
Presider: Prof. Bahram Javidi

M1-1  10:00-10:30  Plenary
Holographic Data Storage; Challenging Again, Toyohiko Yatagai\textsuperscript{1}; \textsuperscript{1}Center for Optical Research and Education, Utsunomiya University, Japan

M1-2  10:30-11:00
Image Denoising by Combining Partial Compressed Sensing Reconstructions, Jean-Christophe Olivo-Marin\textsuperscript{1}, \textsuperscript{1}Institute Pasteur, CNRS UMR 3691, France

M1-3  11:00-11:30
New Advances for Light Sheet Imaging, Kishan Dholakia\textsuperscript{1}; \textsuperscript{1}School of Physics and Astronomy, University of St Andrews, UK

M1-4  11:30-12:00
Interactive 3D Touch Sensing Display Using Holographic Screen, Masahiro Yamaguchi\textsuperscript{1}; \textsuperscript{1}Department of Information Processing, Tokyo Institute of Technology, Japan

12:00-14:00  ● Lunch
14:00-15:30

**M2 • Imaging 1**

Presider: Prof. Joung-Young Son

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**M2-1 14:00-14:30**

Multi-aperture Imaging and its Application, Jun Tanida¹; ¹Graduate School of Information Science and Technology, Osaka University, Japan

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**M2-2 14:30-15:00 Plenary**

Detectors and Optics for Multi-aperture Ultra-thin Flexible Imagers, Hooman Mohseni¹; ¹Department of EECS, Northwestern University, USA

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**M2-3 15:00-15:30**

Lightfields behind Amplitude and Phase Masks: Applications in High Resolution Proximity Lithography, Toralf Scharf¹; ¹Optics and Photonics Technology Laboratory OPT, EPFL, Switzerland

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15:30-16:00 • Coffee break

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16:00-17:30

**M3 • Digital Holography**

Presider: Prof. Masahiro Yamaguchi

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**M3-1 16:00-16:30**

Single-Exposure Generalized Phase-shifting Digital Holography, Takanori Nomura¹ and Masatoshi Imbe²; ¹Faculty of Systems Engineering, Wakayama University, Japan; ²Graduate School of Systems Engineering, Wakayama University, Japan
M3-2  16:30-17:00

Digital Super-resolution Interference Microscopy (DiSRIM), Yoshio Hayasaki¹ and Shinji Ishikawa¹; ¹Center for Optical Research and Education (CORE), Utsunomiya University, Japan

M3-3  17:00-17:30

Single-shot 3-D Measurement by Multi-wavelength Parallel Phase-shifting Digital Holography, Yasuhiro Awatsuji¹, Yonghee Lee¹, Tatsuki Tahara¹, Peng Xia¹, Kenzo Nishio¹, and Osamu Matoba²; ¹Kyoto Institute of Technology, Japan; ²Kobe University, Japan

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17:30-18:00  ● Break

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18:00-20:00  ● Welcome Reception
Tuesday, June 2

8:00-8:30 ● Registration

8:30-10:00
Tu1 ● Imaging 2
Presider: Prof. Yoshio Hayasaki

Tu1-1 8:30-9:00
Compressive Holography with Phase-structured Illumination, Lluis Martínez-León¹, Pere Clemente², Yutaka Mori³, Kouichi Nitta⁴, Vincent Climent¹, Jesús Lancis¹, and Enrique Tajahuerce¹; ¹GROC·UJI, Institute of New Imaging Technologies, Universitat Jaume I, Spain; ²Servei Central d’Instrumentació Científica (SCIC), Universitat Jaume I, Spain; ³Faculty of Engineering, Kagawa University, Japan; ⁴Graduate School of System Informatics, Kobe University, Japan

Tu1-2 9:00-9:30
Liquid Crystal Active Optics and its Application to Optical Apparatus, Nobuyuki Hashimoto¹; ¹Development division, CITIZEN Holdings Co. Ltd., Japan

Tu1-3 9:30-10:00
Vertically Integrated Array-type Mirau-based OCT Microsystem for Early Diagnostics of Skin Pathologies, Christophe Gorecki¹; ¹Micro Nano Science and Systems Department (MN2S), Institute FEMTO-ST, University of Franche-Comté (UMR CNRS 6174), France

10:00-10:30 ● Coffee break
10:30-12:00

Tu2  • 3D Imaging
Presider: Prof. Toyohiko Yatagai

Tu2-1  10:30-11:00  Plenary
3D Imaging with Applications to Displays, Quantum Imaging, Optical Security, and Healthcare, Bahram Javidi1; 1Electrical & Computer Engineering Dept., University of Connecticut, USA

Tu2-2  11:00-11:30
Single-shot Phase Imaging with a Coded Aperture and its Applications, Ryoichi Horisaki1; 1Graduate School of Information Science, Osaka University, Japan

Tu2-3  11:30-12:00
Three-dimensional Imaging Spectrometry by Coherence Measurement, Kyu Yoshimori1 and Masaki Obara1; 1Graduate School of Engineering, Iwate University, Japan

12:00-13:00  • Lunch

13:00-   • Social Tour
Wednesday, June 3

8:00-8:30  ● Registration

8:30-10:30

W1  ● 3D Display
Presider: Prof. Toralf Scharf

W1-1  8:30-9:00
Aerial Projection of Three-dimensional Images Reconstructed from Computer-generated Image Holograms, Takashi Kakue¹, Takashi Nishitsuji¹, Tetsuya Kawashima¹, Tomoyoshi Shimobaba¹, and Tomoyoshi Ito¹; ¹Graduate School of Engineering, Chiba University, Japan

W1-2  9:00-9:30
Holographic 3-D Display Viewable from All Horizontal Directions by Using a Single High-speed SLM, Yusuke Sando¹,²,³, Daisuke Barada¹,², and Toyohiko Yatagai¹; ¹Center for Optical Research & Education, Utsunomiya University, Japan; ²Graduate School of Engineering, Utsunomiya University, Japan; ³Technology Research Institute of Osaka Prefecture, Japan

W1-3  9:30-10:00
fvision: Glasses-free Tabletop 3D Display that Provides Virtual 3D Images on a Flat Tabletop Surface, Shunsuke Yoshida¹; ¹National Institute of Information and Communications Technology, Japan

W1-4  10:00-10:30
Unconscious Imaging (UcI) and its Applications for Digital Signage, Hirotsugu Yamamoto¹; ¹Dept. of Optical Engineering, Utsunomiya University, Japan
10:30-11:00  ● Coffee break

11:00-12:30

W2  ● Display Technology

Presider: Prof. Allard Mosk

W2-1 11:00-11:30
Color Speckle in Laser Display, Kazuo Kuroda\(^1\); \(^1\)Center for Optical Research and Education, Utsunomiya University, Japan

W2-2 11:30-12:00
Color Moires in 3-D Displays and their Application, Jung-Young Son\(^1\), Beom-Ryeol Lee\(^2\), and Hyung Lee\(^3\); \(^1\)Biomedical Engineering Dept., Konyang University, Korea; \(^2\)Next generation visual computing research Section, Electronics and Telecommunication Research Institute Daejeon, Korea; \(^3\)Sensor Systems Research center, Korea Institute of Science and Technology, Korea

W2-3 12:00-12:30  Plenary
Integral Three-dimensional Television, Jun Arai\(^1\); \(^1\)Science and Technology Research Laboratories, NHK, Japan

12:30-14:00  ● Lunch
14:00-15:00
W3  • SLM and Display
Presider: Prof. Hooman Moheseni

W3-1  14:00-14:30
Application of Liquid Crystal on Silicon Spatial Light Modulator (LCOS-SLM) for Manipulation and Sensing, Haruyoshi Toyoda¹, Takashi Inoue¹, and Tsutomu Hara¹; ¹Central Research Laboratory, Hamamatsu Photonics K. K, Japan

W3-2  14:30-15:00
Reduction of Memory Usage and Full-color Reconstruction in High-definition Computer Holography, Kyoji Matsushima¹ and Yasuhiro Tsuchiyama¹; ¹Department of Electrical and Electronic Engineering, Kansai University, Japan

15:00-15:30
W4  • Special Talk
Dr. Jim Hunter (Silicon Light Machines)
Dr. Haruo Uemura (Screen Holdings Co., Ltd.)
MEMS Based Diffractive Spatial Light Modulators: Performance and Applications
Presider: Prof. Osamu Matoba

15:30-20:00  • Banquet
Thursday, June 4

8:00-8:30  ● Registration

8:30-10:30

Th1  ● Scattering Imaging
Presider: Prof. Osamu Matoba

Th1-1  8:30-9:00
Simultaneous 3-D Visualization and Position Tracking of Optically Trapped Particles Using Optical Diffraction Tomography, YongKeun (Paul) Park; 1
1Department of Physics, KAIST, Republic of Korea

Th1-2  9:00-9:30
Non-invasive Single-shot Imaging through Scattering Media via Speckle Correlations, Ori Katz, Pierre Heidmann, Mathias Fink, and Sylvain Gigan; 1
1Laboratoire Kastler-Brossel, Encole Normale Supérieure- Paris, France

Th1-3  9:30-10:00
Shaped Wavefronts and Speckle Correlations: A Digital Window through Opaque Media, Hasan Yılmaz, Sebastianus A. Goorden, Jacopo Bertolotti, Boris Skoric, Pepijn W. H. Pinkse, Ad Lagendijk, Willem L. Vos, and Allard P. Mosk; 1Complex Photonic Systems (COPS), Dept. TNW and MESA+ Institute for Nanotechnology, University of Twente, The Netherlands; 2Department of Physics and Astronomy, University of Exeter, UK; 3Dept. of Mathematics & Comp. Science, TU Eindhoven, The Netherlands

10:00-10:30  ● Coffee break
10:30-12:00
Th2 ● Light Field Imaging
Presider: Prof. Ryoichi Horisaki

Th2-1  10:30-11:00 Plenary
Acquisition and Processing of Ray-Space/Light Field Data, Toshiaki Fujii\(^1\);
\(^1\)Graduate School of Engineering, Nagoya University, Japan

Th2-2  11:00-11:30 Plenary
Light Field Reconstruction, Dongkyung Nam\(^1\) and Du-sik Park\(^1\); \(^1\)Samsung Advanced Institute of Technology, Korea

Th2-3  11:30-12:00
Extended Depth of Field System for Long Distance Iris Acquisition, Chung-Hao Tien\(^1\); \(^1\)Department of Photonics, National Chiao Tung University, Taiwan

12:00-14:00 ● Lunch
14:00-16:00

● Poster Session
14:00-14:45 Short presentation
14:45-16:00 Poster presentation

Th-P1
Recording Spatially Incoherent Hologram Using Rotational Shearing Interferometer with a Lens for the Parallel Shear, Kaho Watanabe¹ and Takanori Nomura²; ¹Graduate School of Systems Engineering, Wakayama University, Japan; ²Faculty of Systems Engineering, Wakayama University, Japan

Th-P2
Wavefront Measurement with Large Dynamic Range Using Holographic Shack-Hartmann Wavefront Sensor, Yusuke Saita¹, Hironobu Shinto², and Takanori Nomura¹; ¹Faculty of Systems Engineering, Wakayama University, Japan; ²Graduate School of Systems Engineering, Wakayama University, Japan

Th-P3
Recording a Phase Data Page in Super-Resolution Holographic Data Storage for High Light Efficiency, Teruyoshi Nobukawa¹ and Takanori Nomura²; ¹Graduate School of Systems Engineering, Wakayama University, Japan; ²Faculty of Systems Engineering, Wakayama University, Japan

Th-P4
Controlled Multi-beam Supercontinuum Generation in Fused Silica by Means of Spatial Light Modulators, Jorge Pérez Vizcaíno¹, Rocio Borrego-Varillas¹, Miguel Carbonell-Leal¹, Carlos D. Buendia¹, and Enrique Tajahuerce Romera¹; ¹Institute de Nuevas Tecnologías de la Imagen (INIT), Universidad Jaume I, Spain
Th-P5

Eye-contact 3D Visual Communication through Integral Imaging-based Display System, Ji-Hoon Kang¹,², Minju Kim¹, Byoungsub Song¹, Byeong-Kwon Ju², and Min-Chul Park¹,³; ¹Sensor System Research Center, Korea Institute of Science and Technology, South Korea; ²Display and Nanosystem Laboratory, College of Engineering, Korea University, South Korea; ³Department of Human Computer Interaction and Robotics, Korea University of Science and Technology, South Korea

Th-P6

Application of Digital Holography on Diagnosis of Malignant Lymphoma, Sykran Hakim Bin Norazman¹, Fumikazu Kimura¹, and Masahiro Yamaguchi¹; ¹Interdisciplinary Graduate School of Science and Engineering, Department of Information Processing, Tokyo Institute of Technology, Japan

Th-P7

Efficient Calculation of Hologram Using Ray-sampling Plane from Orthographic Projection Images, Shunsuke Igarashi¹ and Masahiro Yamaguchi¹; ¹Department of Information Processing, Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology, Japan

Th-P8

Divided Hadamard Pattern Illumination for Fewer Times Measurements, Kouichi Nitta¹, Shunji Hayashi¹, and Osamu Matoba¹; ¹Department of Systems Science, Graduate of System Informatics, Kobe University, Japan

Th-P9

Wavelength Scanning Digital Holography Using Temporal Fourier Transform, Atsushi Wada¹ and Yoko Miyamoto²; ¹Department of Communications Engineering, National Defense Academy, Japan; ²Department of Engineering Science, The University of Electro-Communications, Japan
Th-P10
Generation of Multiple Sub-diffraction-limit Spots in 3D Space with Propagating Light, Masahiko Aino¹, Yusuke Ogura¹, and Jun Tanida¹; ¹Graduate School of Information Science and Technology, Osaka University, Japan

Th-P11
Fundamental Experiments of High-resolution Optical Coherence Tomography for Imaging Cellular Spheroids, Noriyuki Nakatani¹,² and Osamu Matoba¹; ¹Graduate School of System Informatics, Kobe University, Japan; ²SCREEN Holdings Co. Ltd., Japan

Th-P12
Photographing-decodable Steganography by Use of a High-frame-rate LED Display, Masashi Takahashi¹ and Hirotugu Yamamoto¹; ¹Dept. of Optical Engineering, Utsunomiya University, Japan

Th-P13
Phase Measurement Using High-speed Movable Stage by Digital Holography under CW Laser Illumination, Peng Xia¹, Xiangyu Quan¹, Kouichi Nitta¹, Osamu Matoba¹, and Yasuhiro Awatsuji²; ¹Grad. School of System Informatics, Kobe University, Japan; ²Grad. School of Science and Technology, Kyoto Institute of Technology, Japan

Th-P14
Expanding the Laser Wavelength Margin of Collinear Holographic Storage System, Xiaotong Li¹, Yong Huang¹, Yabin Cheng¹, Xiao Lin¹, Guoguo Kang¹, and Xiaodi Tan¹; ¹School of Optoelectronics, Beijing Institute of Technology, China

Th-P15
Hybrid Digital Holographic Microscope for Simultaneous Measurement of 3D Phase and 3D Fluorescence Distributions and its Signal Processing, Xiangyu Quan¹, Peng Xia¹, Kouichi Nitta¹, Osamu Matoba¹, and Yasuhiro Awatsuji²; ¹Grad. School of System Informatics, Kobe University, Japan; ²Grad. School of Science and Technology, Kyoto Institute of Technology, Japan
16:00-16:30  ● Coffee break

16:30-18:00

Th3  ● Image Processing
Presider: Prof. Takanori Nomura

Th3-1  16:30-17:00
How to Pattern Codes?, Thierry Fournel¹; ¹Université de Lyon, Université Jean Monnet de Saint Etienne CNRS UMR 5516, Laboratoire Hubert Curien, France

Th3-2  17:00-17:30
High-speed Optical Correlator Using Coaxial Holographic System for Video Identification, Eriko Watanabe¹; ¹The University of Electro-Communications, Japan

Th3-3  17:30-18:00
Flux Transfer Model for Designing Visual Effects by Halftone Printing, Mathieu Hébert¹, Serge Mazauric¹, and Thierry Fournel¹; ¹Université Jean Monnet de Saint-Etienne, CNRS UMR5516 Laboratoire Hubert Curien, France
Friday, June 5

8:00-8:30  ● Registration

8:30-10:30
F1  ● Microscopy
Presider: Prof. Eriko Watanabe

F1-1  8:30-9:00
Image Processing for Structured Illumination Microscopy, Yuki Terui¹; ¹Core Technology Division, Nikon Corporation, Japan

F1-2  9:00-9:30
A Hybrid Digital Holographic Microscopy, Osamu Matoba¹; ¹Graduate School of System Informatics, Kobe University, Japan

F1-3  9:30-10:00
Single-shot Multispectral Digital Holographic Microscopy, Tatsuki Tahara¹, Toru Kaku¹, and Yasuhiro Arai¹; ¹Faculty of Engineering Science, Kansai University, Japan

10:00-10:30  ● Coffee break
10:30-12:00
F2 • Wave Optics and Nano Photonics
Presider: Prof. Enrique Tajahuerce

F2-1 10:30-11:00
Characterization of the Unfolding of an Optical Vortex in a Birefringent Crystal, Yoko Miyamoto¹; ¹Department of Engineering Science, The University of Electro-Communications, Japan

F2-2 11:00-11:30
Optical Processes in the Subwavelength-scale for Information Photonics, Makoto Naruse¹; ¹Photonic Network Research Institute, National Inst. Information and Communications Technology, Japan

11:30-12:00 • Closing Remark