ADVANCE PROGRAM

ISOM'19

IN COOPERATION WITH

SPIE

The Magnetics Society of Japan (MSJ)

The Institute of Electronics, Information and Communication Engineers (IEICE)

The Chemical Society of Japan

Information Processing Society of Japan

The Institute of Electrical Engineers of Japan

The Institute of Image Electronics Engineers of Japan

The Institute of Image Information and Television Engineers

The Japan Society for Precision Engineering

The Laser Society of Japan

International Symposium on

Imaging, Sensing, and Optical Memory 2019

TOKI MESSE, Niigata, Japan

Oct. 20 - Oct. 23, 2019

SPONSORED BY

-The Optical Society of Japan (OSJ)

COSPONSORED BY

-The Japan Society of Applied Physics (JSAP)
-Optoelectronics Industry and Technology Development Association (OITDA)

FINANCIALLY SUPPORTED BY

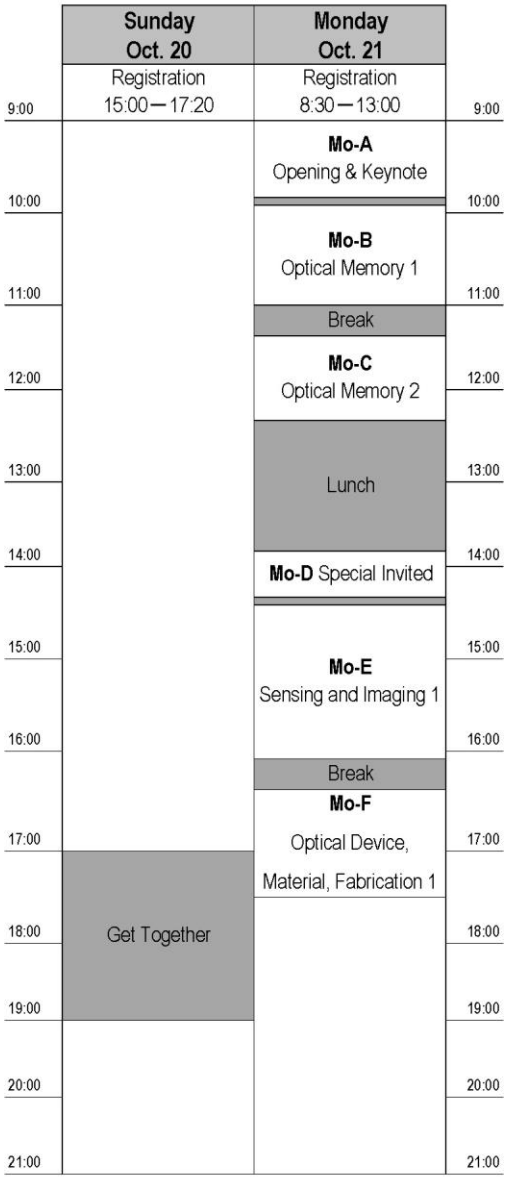
-The Takano Eiichi Optical Science Funds
-Support Center for Advanced Telecommunications Technology Research, Foundation
-Niigata Prefecture
-Niigata City

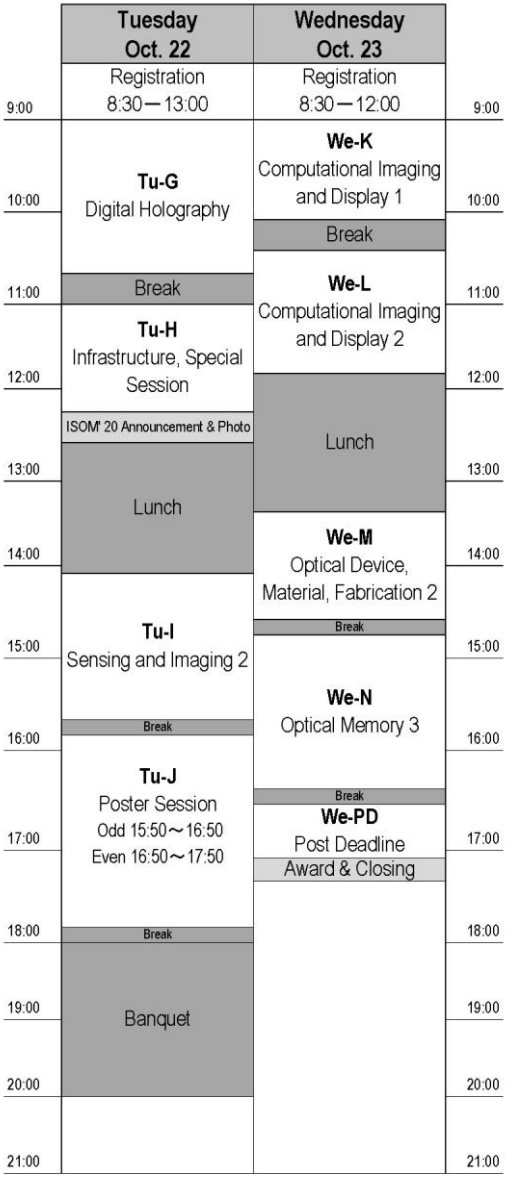
Deadlines
Post Deadline Papers:
Sep. 2, 2019
Advance Registration:
Oct. 7, 2019

http://www.isom.jp/

ver.2019.08.15

Symposium Schedule




Tuesday
Oct. 22
Wednesday
Oct. 23
Registration
8:30—13:00
Registration
8:30—12:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
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20:00
21:00
Tu-G
Digital Holography
Break
Tu-H
Infrastructure, Special Session
ISOM' 20 Announcement & Photo
Lunch
Tu-I
Sensing and Imaging 2
Break
Tu-J
Poster Session
Odd 15:50～16:50
Even 16:50～17:50
Break
Banquet
We-K
Computational Imaging and Display 1
Break
We-L
Computational Imaging and Display 2
Lunch
We-M
Optical Device, Material, Fabrication 2
Break
We-N
Optical Memory 3
Break
We-PD
Post Deadline
Award & Closing

WELCOME TO ISOM'19

WELCOME STATEMENT FROM THE ORGANIZING COMMITTEE CHAIRPERSON

The 29th ISOM (ISOM'19) will be held in Niigata, Japan from Oct. 20 to 23, 2019.

On behalf of the ISOM organizing committee, I am delighted to welcome all of you to the ISOM'19 in Japan.

The last ISOM meeting held in Kitakyushu, Japan was very successful to share new developments of holographic memories, digital holography, computational imaging, bio-sensing, display, nanophotonics and plasmonics, etc.

Two years ago, ISOM extended the conference scope to broader optical fields and applications, and changed the conference name as "International Symposium on Imaging, Sensing, and Optical Memory." The new ISOM includes the fields of image sensing, medical and bio-optics, nano photonics, information system, holographic technologies, as well as optical memory. We believe that the change of ISOM produces technological innovations in imaging and sensing technologies, and many applications of optical memory technologies in the fields of medical and bio-technologies, image sensing, nanotechnologies, etc.

We are very proud of the ISOM activities, because many of technologies leading new developments and new applications have been first presented and discussed in ISOM meeting. Since the first ISOM meeting in 1987, ISOM has led innovation of optical memory and economic growth in optical industry.

I sincerely ask all of ISOM'19 participants to discuss on new technologies of the next generation optical memory and new applications of optical memory technologies in coming ISOM'19.

志村努

Tsutomu Shimura
ISOM'19 Organizing Committee, Chairperson

INTRODUCTION

The 29th ISOM (ISOM'19) will be held from October 20 to October 23, 2019 at TOKI MESSE, Niigata, Japan.

The origin of ISOM is SOM (Symposium on Optical Memory), which was held firstly in 1985 in Tokyo as a Japanese domestic symposium. The first ISOM (International Symposium on Optical Memory) was held in 1987 also in Tokyo. Until 1994, ISOM and SOM were held alternately every other year, and since 1995, ISOM has been held every year. The total number of papers of the past symposiums has reached 3,440, and the total number of participants has reached 10,410.

The purpose of the symposium was to provide a forum for information exchange on a broad range of topics covering science and technology in optical memory and its related fields. However, information explosion in the internet and cloud service has been enforcing optical memory to change from that for consumer storage to that for enterprise storage. Many colleagues of us have been seeking for new frontiers of optical memory technologies. Considering this situation, the scopes of ISOM are being continuously updated and have been reorganized in 2016. To further highlight them, the official name of ISOM was changed from "International Symposium on Optical Memory" to "International Symposium on Imaging, Sensing, and Optical Memory" in 2017. Presentations related to the new scopes as well as the conventional ones would be strongly encouraged.

In ISOM'19, along this direction, it will be very much expected to discuss the current status of optical memory, imaging, sensing, and other related technologies. In addition, we are planning to have a demonstration session at the symposium as in the last four years, in which authors will be able to show their vivid and attractive research results.

We are looking forward to your paper submission and seeing you in Niigata, Japan.

SCOPE OF THE SYMPOSIUM

ISOM'19 will discuss the current status of Optical Memory, Imaging, Sensing, and Other Related Technologies.

The scope of ISOM'19 covers the above research fields. ISOM will provide the attractive fields to exchange the latest advances and/or ideas in the above research fields and also provide scientific interaction and collaboration.

Topics to be covered in this symposium include, but are not restricted to:

1. Optical Memory
- Professional Archive System
- Holographic Memory
- High-density Recording
- Media and Material Science
- Drive Technologies and Signal Processing
- Components and Devices
- Testing Methods
- Others

2. Imaging
- Computational Imaging
- Wavefront Coding
- Image Processing
- Optical System Design
- Devices
- Others

3. Sensing
- Medical and Bio-systems
- Three-dimensional Sensing
- Digital Holography
- Spectroscopy
- Bio-lab on a Disc
- Others

4. Other Related Technologies
- Optical Interconnection and Switching
- Optical Information Processing
- Nanophotonics and Plasmonics
- Components
- Material
- Display
- Photolithography
- Nonvolatile Memory
- Emerging Technologies and New World
- Others

REGISTRATION

All participants (including speakers) are requested to register, and are encouraged to register in advance (by **October 7, 2019**) in order to receive the early registration discount.

I. Advance Registration

The Symposium registration information and forms can be obtained from ISOM'19 website (**http://www.isom.jp**). If you have any questions, please contact ISOM'19 secretariat office.

II. Onsite Registration

The registration desk will be located at the 4th floor of "TOKI MESSE" (Niigata Convention Center) from Sunday through Wednesday during the following hours.

Oct. 20: 15:00 - 17:20
Oct. 21: 08:30 - 13:00
Oct. 22: 08:30 - 13:00
Oct. 23: 08:30 - 12:00

Type	Before / On October 7, 2019	Onsite
Regular	JPY 55,000	JPY 65,000
Student & Retiree	JPY 15,000	JPY 20,000
Banquet	JPY 5,000	JPY 7,000

The registration fee for the symposium includes admission to all the technical sessions and an online Technical Digest. Students are asked for showing their ID cards.

III. Registration and Payment

Those who wish to attend ISOM'19 will be able to register on the web (http://www.isom.jp/) after about August, 2019. The deadline for advance registration is **October 7, 2019**. After that, the registration will be processed at the symposium site upon arrival.

Payment should be made in Japanese Yen by bank transfer (inside Japan only) or by credit cards (VISA and Master Card) payable to ISOM'19. No personal checks will be accepted.

IV. Registration Cancellation Policy

As a rule, no refunds of the registration fee will be made for any reasons whatever. Even in the event of registrant unable to attend the symposium, they will be able to download the online Technical Digest.

INSTRUCTION FOR SPEAKERS

ORAL PRESENTATION

- Time assigned for

Type	Total	Presentation	Discussion
Keynote	35 min.	30 min.	5 min.
Special Invited	30 min.	25 min.	5 min.
Invited	25 min.	20 min.	5 min.
Contributed	20 min.	15 min.	5 min.

- All speakers are requested to get in touch with their presiders 15 minutes before their sessions start.
- The conference room will contain a projector, a laptop, a podium microphone, a screen and a laser pointer.
- If speakers use their own laptop, they will be requested to confirm its connection with the projector in the conference room during break time or in the morning. We recommend all speakers to have this check the day before their presentations.
- If speakers don't use their own laptop, they are requested to upload their presentation materials in a USB memory at the podium at least one hour prior to their presentations. We recommend the speakers to use PDF files in order to prevent file format or version troubles.
- We recommend all speakers to use more than 16-point font. The audience expects well-prepared presentations with clearly visible figures and captions, as well as good conclusion.

POSTER PRESENTATION

- Your session code will be indicated on the panel board. You will be provided with the material to mount your poster onto the board.
- Each author is provided with a 210 cm high x 120 cm wide poster space on which a summary of the paper is to be displayed.
- All authors are requested to affix their posters before 15:50 on the day of the poster session. Posters are to be removed immediately after the session ends.
- Authors must remain in the vicinity of the poster board at least for the duration of the assigned time (1 hour). The first half (15:50-16:50) is for authors with odd-number papers (Tu-J-01, 03, ---) and the second half (16:50-17:50) is for authors with even-number papers (Tu-J-02, 04, ---). The absence of authors during the assigned time is treated as "CANCELLED". The session presiders will check all authors during the assigned time.

Any papers which are not presented during the Oral or Poster session will be regarded as "CANCELLED".

POST-DEADLINE PAPERS

A limited number of papers will be accepted for presentation of significant results obtained after the deadline. A delegated author has to fill in the paper submission form including a 50-word abstract following the instruction for submission at the ISOM website (http://www.isom.jp/), and then a 2-page PDF summary should be submitted through the website.

The ISOM web submission system does not accept any PDF file including 2-byte characters (for example, Japanese, Chinese and Korean characters). The local fonts should be removed from the text body and figures before submission.

Submission deadline is Sep. 2, 2019. The best two post-deadline papers are allowed as oral presentations in the final session. Other post-deadline papers (but limited numbers) will be presented in the poster session. Authors will be notified by the middle of September, 2019 whether their papers are accepted.

・ Time assigned for:

Type	Total	Presentation	Discussion
Post deadline	15 min.	12 min.	3 min.

FINANCIAL SUPPORT

Thanks to the Takano Eiichi Optical Science Funds, limited financial support for student presenters in ISOM'19 will be provided.

Applicants must be full-time students living overseas.

Student presenters who are interested in getting this support should submit an application form (announced later) after receiving the acceptance notice of their submitted paper.

DEMO PRESENTATION IN POSTER SESSION

Poster presentations with demonstration will be given in the poster session. This is a new approach of poster session in addition to usual poster presentation.

The technical demonstration will be exhibited repeatedly during the session in front of poster boards. Participants can take a close look at the new technologies!

Technical demonstration 1:

Integrated Egarimic Technologies 1 mm Thick Holographic Polarized Beam Splitter ～Egarim PBS～

Toshihiro Kasezawa[1], Hideyoshi Horimai[1], Tsutomu Shimura[2]

[1]Egarim Co. Ltd., [2]The University of Tokyo (Japan)

Abstract: Egarim is the first company to be able to totally coordinate planning, development and trial manufacture of hologram applied products and 3D hologram content production from small to large orders. We are also developing hologram media, photopolymer. This time, we exhibit Egarimic Holography which is integrated Ega-rim with image hologram.

In addition to above presentation, some presenters may show technical demos in poster session.

PUBLICATION OF SYMPOSIUM PAPERS

Online Technical Digest includes invited papers, accepted contributed papers, and limited numbers of post deadline papers. It will be available on October 14-23, 2019. If you complete the payment, you will be informed of the website of the online Technical Digest on October 14, 2019 and able to download it in advance. Otherwise, you will be able to download it onsite.

The conference papers will be published in September 2020 as a special issue of the OPTICAL REVIEW, which is the English-language journal of the Optical Society of Japan (OSJ). The authors who will have, by themselves, presented papers at ISOM'19 will be allowed to submit their papers for publication in this special issue. The authors of invited and contributed (including post-deadline) papers are encouraged to submit Invited Review Papers and Regular Papers, respectively.

The instructions for preparation of manuscript will be sent via e-mail after the conference. The deadline for submission of manuscripts is January 31, 2020. Submitted papers will be reviewed based on the OPTICAL REVIEW standard.

SPECIAL PROGRAMS

SOCIAL PROGRAM

Get Together Reception

- Date & Time: Sunday, October 20, 17:00-19:00
- Place: Niigata Toei Hotel 9F
  (12 minute walk from Toki Messe)
- Fee: No charge

All attendees including spouses are invited to the Get Together Reception.

Banquet Reception

- Date & Time: Tuesday, October 22, 18:00-20:00
- Place: Toki Messe 4F
- Fee: Advance registration 5,000 JPY
  Onsite registration 7,000 JPY

Ticket for the Banquet Recption is not included in the registration fee. Application for Banquet can be made online or onsite.

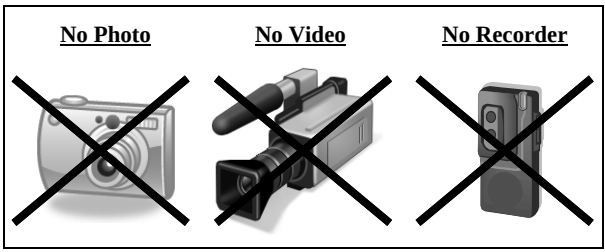
ISOM'19 Secretariat

Mitsuhiro Kimura (Secretary)

- Tel: +81-3-5925-2840 / Fax: +81-3-5925-2913
- E-mail: secretary@isom.jp
- Add: c/o Adthree Publishing Co., Ltd.
  27-37, Higashinakano 4-chome,
  Nakano-ku, Tokyo 164-0003, Japan

ATTENTION

It is not allowed to take photos and videos of any presentation materials in ISOM'19.



GENERAL INFORMATION

I. Official Language

The official language of ISOM'19 is English.

II. Message Board

Official Information Board and Message Board will be set near the Registration Desk. Message will be taken during registration hours on Monday through Wednesday and posted on the Message Board. Please check the bulletin board daily to receive your messages. Messages for participants at the meeting should be directed to ISOM'19 Symposium Registration Desk.

III. Lunches

A lunch map in the vicnity of Toki Messe will be provided at the Registration Desk.

IV. Others

To receive further ISOM'19 announcement, please visit ISOM website (http://www.isom.jp/).

Information of Niigata City

Niigata City has a lot of fascinating sightseeing places such as Pia Bandai, Minatopia, and so on. We are going to supply the brochures of Niigata sightseeing information at the Registration Desk. Please feel free to use them.

"Enjoy Niigata"
http://enjoyniigata.com/english/

「にいがた観光ナビ」
http://www.niigata-kankou.or.jp/

"Welcome to Niigata city"
https://www.nvcb.or.jp/travelguide/en/

TECHNICAL PROGRAM

October 21, 2019 (Monday)

Mo-A: Opening & Keynote

Presider: Takanori Nomura (Wakayama University, Japan)

Mo-A-01

09:00 Opening Remarks

Tsutomu Shimura (The University of Tokyo, Japan)

Organizing Committee Chairperson

Mo-A-02 Keynote

09:15 Learning-Based Pattern Classification with Digital Holography

Chau-Jern Cheng[1], Kuang-Che Chang Chien[1], Yang-Jie Gao[1], Hen-Yen Tu[2]

[1]National Taiwan Normal University, [2]Chinese Culture University (Taiwan)

Deep neural network is a data-driven machine learning system to execute multiple information processing, including image segmentation, classification, and related inverse problem solvers. Digital holography is a three-dimensional imaging technique providing new medium and novel data augmentation for training deep neural networks to achieve high accuracy performance of the learning-based system.

9:50 - 9:55 Break

Mo-B: Optical Memory 1

Presiders: Nobuhiro Kinoshita (NHK, Japan)
Yusuke Saita (Wakayama University, Japan)

Mo-B-01 Invited

9:55 Reconstruction Characteristics of Polarization Holography

Xiaodi Tan[1], Zhiyun Huang[1], Lili Zhu[1], Yuanying Zhang[2], Ying Liu[2], Fenglan Fan[2], Jinliang Zang[2]

[1]Fujian Normal University, [2]Beijing Institute of Technology (China)

The polarization holography theory based on

tensor method is introduced. Based on the theory, the faithful state and null reconstruction of the signal wave which is recorded by two orthogonal polarization waves are derived. The highly agreements of the experimental results prove the correctness of the polarization holography tensor theory.

Mo-B-02

10:20 **Reproduction of SQAM Signal Using Interleaved Phase Page Based on Two-Step Exposure Method for Holographic Memory**

Satoshi Honma, Haruki Funakoshi

University of Yamanashi (Japan)

We propose reproduction of spatial quadrature amplitude modulated (SQAM) signal using interleaved phase page based on two-exposure method for holographic memories. We demonstrate generation of the SQAM light signal and evaluate the reproduction accuracy against number of SLM's pixels constructing of one symbol of SQAM signal.

Mo-B-03

10:40 **Complex Amplitude Data Page Reconstruction in Holographic Data Storage Based on a Fourier-Fringe-Analytic Hologram**

Naru Yoneda, Yusuke Saita, Takanori Nomura

Wakayama University (Japan)

To increase the recording density of computer-generated-hologram-based holographic data storage, phase signals are utilized through the Fourier fringe analysis. Although an additional reference path is required, phase signals can be obtained with in-line configuration with the help of computer-generated hologram technique. The feasibility was numerically confirmed.

11:00 - 11:20 Break

Mo-C: Optical Memory 2

Presiders: Ryushi Fujimura (Utsunomiya University, Japan)
Satoru Higashino (Sony Storage Media Solutions Corporation, Japan)

Mo-C-01

11:20 **Optical Disc Writing Strategy for Analog Signal Recording**

Kimihiro Saito

Kindai University Technical College (Japan)

A method for recording analog signal in optical disc systems by using DSM was proposed and demonstrated by the simulation. The combination of pre-emphasis, adaptive VF and DSM make it possible to create the marks that generate the same analog readout signal as the target.

Mo-C-02

11:40 **Non-Interferometric Phase Retrieval for Collinear Phase-Modulated Holographic Data Storage**

Xiao Lin, Jianying Hao, Yuanying Zhang, Yuhong Ren, Hui Li, Xiaodi Tan

Fujian Normal University (China)

The advanced non-interferometric phase retrieval method based on the collinear system is proposed to increase the code rate and storage density by 2 times and accelerate phase retrieval further to increase the data transfer rate.

Mo-C-03

12:00 **High Density Recording by Interleave Method with RLL Code for Holographic Memory**

Haruki Funakoshi, Satoshi Honma

University of Yamanashi (Japan)

We have considered SQAM signal generation for holographic memory by interleaved phase page. RLL code is effective to suppress the spectrum spread of the recording signal. In this paper, we propose application of RLL code to SQAM signal for our method for improvement of reproduction accuracy and recording density.

12:20 - 13:50 **Lunch**

Mo-D: Special Invited

Presider: Takanori Nomura (Wakayama University, Japan)

Mo-D-01 Special Invited

13:50 Imaging LIDARs by Digital Micromirror Device

Yuzuru Takashima, Brandon Hellman, Joshua Rodriguez, Chuan Luo, Iain Bridger Donnelly, Ted Liang-tai Lee, Xianyue Deng, Youngsik Kim, Heejoo Choi, Erik Evans, Daewook Kim

The University of Arizona (USA)

Leveraging commercially available Digital Micromirror Device (DMD) for time-of-flight lidar provides solutions for a high performance yet cost effective solution while satisfying requirements for a field-of-view, angular resolution, and scanning speed. We introduce new beam steering concepts by using DMD, and their applications for various lidar demonstrations.

14:20 - 14:25 Break

Mo-E: Sensing and Imaging 1

Presiders: Kimihiro Saito (Kindai University Technical College, Japan)
Takayuki Shima (AIST, Japan)

Mo-E-01 Invited

14:25 Photothermal Microscopy for High-Sensitivity Absorption Imaging of Biological Tissues

Jun Miyazaki

Wakayama University (Japan)

We developed highly-sensitivity photothermal microscopy for visualizing non-fluorescent chromophores with high temporal and spatial resolution. This system was utilized for label-free dynamic imaging of cellular organelles (mitochondria and lysosome) that play a crucial role in maintaining cellular homeostasis in a living system.

Mo-E-02 **Invited**

14:50 ***En-face* Multifrequency-Swept Optical Coherence Microscope for in vivo Intracochlear Vibration Visualization**

Samuel Choi, Takeru Ota, Fumiaki Nin, Shogo Muramatsu, Hiroshi Hibino

Niigata University, AMED-CREST (Japan)

En-face multifrequency-swept optical coherence microscope was developed with a supercontinuum light source characterized by high output power and an analytical technique that extracts full-field vibration distributions. Tomographic measurement visualized active interactions in epithelial layer of the cochlea. This information may help to elucidate the mechanisms underlying the biomechanics of hearing.

Mo-E-03 **Invited**

15:15 **Simple and Effective Illumination to Observe iPS Cell Colonies**

Yoshimasa Suzuki

Olympus Corporation (Japan)

Just by introducing an annular aperture into an illumination system of a microscope, phase images of induced pluripotent stem (iPS) cell colonies with clear outlines are easily obtained.

Mo-E-04 **Invited**

15:40 **Recent Progress in Common-Path Off-Axis Incoherent Digital Holographic Microscopy**

Xiangyu Quan[1], Kumar Manoj[1], Osamu Matoba[1], Yasuhiro Awatsuji[2]

[1]Kobe University, [2]Kyoto Institute of Technology (Japan)

Incoherent digital holographic microscopy, which is believed to be an alternative to conventional epifluorescence microscopy and confocal microscopy, is brought to a focus. Here, we will discuss recent progress in common-path off-axis incoherent digital holographic microscopy, and their pros and cons in terms of recording speed and image quality.

16:05 - 16:25 Break

Mo-F: Optical Device, Material, Fabrication 1

Presiders: Din Ping Tsai (Academia Sinica, Taiwan)
Minoru Takeda (Kyoto Institute of Technology, Japan)

Mo-F-01 **Invited**

16:25 **Integrated Egarimic Technologies 1 mm Thick Holographic Polarized Beam Splitter ～ Egarim PBS～**

Toshihiro Kasezawa[1], Hideyoshi Horimai[1], Tsutomu Shimura[2]

[1]Egarim Co. Ltd., [2]The University of Tokyo (Japan)

We proposed the brand-new Egarimic technologies Ega-rim, Egarim PBS and Holo-Jector. Especially Egarim has a strong PBS function even in 1mm thick. Combination of Ega-rim & Egarim PBS can replace the conventional cube type PBS, thus miniaturize the size of projection optical system. We explain more detail in this conference.

Mo-F-02

16:50 **The Design of Non-Separable Two-Dimensional Grating of Multi-Channel Orbital Angular Momentum with Arbitrary Energy Distribution**

Yuanying Zhang[1], Xiaochuan Jiang[2], Xiao Lin[1], Yuhong Ren[1], Xiaodi Tan[1]

[1]Fujian Normal University, [2]Xiamen University (China)

We design the high efficiency grating of multi-channel OAM with non-separable two-dimensional grating with each channel mutually independent and controllable phase and amplitude. Besides, by using the Gerchberg-Saxton (GS) algorithm instead of Newton's method we do an improvement in solving the constrained problem.

Mo-F-03

17:10 **Resonance Energy Transfer Process in Plasmon-Assisted Random Lasing of Nanocrystalline Metal-Halide Perovskites**

Tsung Sheng Kao, Yu-Heng Hong, Pin-Yu Kung, Yi-Cheng Su, Kuo-Bin Hong, Tien-Chang Lu

National Chiao Tung University (Taiwan)

With an optimized fabrication process, the nanoparticle-embedded perovskite thin films can be uniformly synthesized, which offering the

resonance energy transfer between the metallic nanostructures and the surrounding perovskite nanocrystals. The laser light emission from the perovskite thin film can be enhanced, achieving room-temperature lasing performance in a broad spectral range.

October 22, 2019 (Tuesday)

Tu-G: Digital Holography

Presiders: Tsutomu Shimura (The University of Tokyo, Japan)
Daisuke Barada (Utsunomiya University, Japan)

Tu-G-01

9:00 **Digital Holographic Tomography Based on Compressed Sensing for 3D-PIV**

Shuhei Yoshida, Kan Itakura, Fukune Kaya

Kindai University (Japan)

Particle image velocimetry (PIV) is widely used as a method to visualize the flow field. Generally, PIV is a two-dimensional measurement technique, and a complex system is required for three-dimensional measurement. In this study, we realize 3D PIV with a simple optical system by holographic tomography based on compressed sensing.

Tu-G-02

9:20 **Encryption of Simultaneous Fingerprint and Voice Data**

Sudheesh K. Rajput, Osamu Matoba

Kobe University (Japan)

We present simultaneous optical recording and encryption of fingerprint and voice data. Both the data are recorded simultaneously by use of digital holography and then encrypted using optical encryption method. The proposed scheme is supported by results of optical recording and encryption.

Tu-G-03

9:40 **Transmittance Function for a Transparent Droplet in Holographic Measurement**

Yasuhiro Nakatani, Yohsuke Tanaka, Shigeru Murata

Kyoto Institute of Technology (Japan)

Holographic measurement is affected by transmitted light. In previous researches, the transmission function is represented using disk model and ball lens model. However, previous study do not explain the definition of the diameter of ball lens. In this study, the transmission

function is defined by the focal length using ray tracing.

Tu-G-04

10:00 **Particle Measurement Method by Phase Retrieval Digital Holography Using Multiple Wavelengths**

Masatsugu Murayama, Shigeru Murata, Yohsuke Tanaka

Kyoto Institute of Technology (Japan)

The performance of digital holographic particle measurement is improved by using multi-wavelength illumination and 3CCD color camera. The performance improvement is accomplished with phase retrieval method in which the phase information on a hologram plane is recovered with a set of color holograms to suppress the twin image.

Tu-G-05

10:20 **Parallel Phase-Shifting Digital Holography by Use of the Talbot Effect with a Binary Phase Grating**

Daichi Kishiwaki, Takanori Nomura

Wakayama University (Japan)

To reconstruct an object image with higher spatial resolution in parallel phase-shifting digital holography, the use of the Talbot effect with a binary phase grating is proposed. Optical experimental results show that an object image without twin and zero-order images can be obtained.

10:40 - 11:00 Break

Tu-H: Infrastructure, Special Session

Presiders: Takayuki Shima (AIST, Japan)
Takanori Nomura (Wakayama University, Japan)

Tu-H-01 **Invited**

11:00 **Spatiotemporal Phase-Shifting Method for Accurate Optical Methodology**

Shien Ri, Qinghua Wang, Peng Xia, Hiroshi Tsuda

National Institute of Advanced Industrial Science and Technology (AIST) (Japan)

A novel accurate phase recovering technique, called the spatiotemporal phase-shifting method, is developed to measure the phase information robustly by utilizing high-dimensional intensity data in spatial- and temporal-domains. Simulation and experimental results indicated that our method allows the analysis of fringe patterns under extremely low noisy or extreme saturation conditions.

Tu-H-02 **Invited**

11:25 **Development of Laser-Based Remote Sensing Technique for Detecting Defects of Concrete Lining**

Yoshinori Shimada[1], Shinri Kurahashi[1], Oleg Kotyaev[1], Naotoshi Yasuda[2], Yoshiaki Oka[3], Eiichi Oketani[3]

[1]Institute for Laser Technology, [2]Kyoto University, [3]West Japan Railway Company (Japan)

We have been developed the laser-based remote sensing system for detecting defects of concrete lining. A giant pulse laser initiates the vibration. A CW detection laser measure the vibration spectrum that varies depending on the defects. It was confirmed that this system can be used as the remote inspected technique.

Tu-H-03 **Invited**

11:50 **Remote Sensing of Concrete Structure Using the High-Sensitive Near-Infrared Spectroscopy**

Hiromitsu Furukawa

National Institute of Advanced Industrial Science and Technology (AIST) (Japan)

The high-sensitive near-infrared spectroscopy has developed for remote sensing of concrete structure. The concentrations of water and salt on

the surface were simultaneously evaluated from more than 5 meters apart. Showing the results of field tests, the influence of sunlight was also mentioned with comparing to the fluorescence X-ray analysis.

12:15 - 12:35 ISOM'20 Announcement & Photo

12:35 - 14:05 Lunch

Tu-I: Sensing and Imaging 2

Presiders: Jun Miyazaki (Wakayama University, Japan)
Kimihiro Saito (Kindai University Technical College, Japan)

Tu-I-01 **Invited**

14:05 **Precise Vibration Measurement Techniques Based on Laser Diode Interferometry**

Takamasa Suzuki, Yuta Ohara, Takumi Sumizawa, Samuel Choi

Niigata University (Japan)

Several vibration measurement techniques that use a compact and robust coaxial optical system, a synchronous detection capable of real-time measurement, and a combination of phase-shifting interferometry and down-sampling signal processing, respectively, are introduced. The last system measures full-field high-speed vibration without expensive high-speed camera.

Tu-I-02 **Invited**

14:30 **Selfie Fundus Camera with Near Infrared Coloring Technology**

Jun Ohta[1], Hironari Takehara[1], Makito Haruta[1], Kiyotaka Sasagawa[1], Hirofumi Sumi[2], Motoshi Sobue[3], Ryo Kawasaki[4], Kohji Nishida[4]

[1]Nara Institute of Science and Technology, [2]The University of Tokyo, [3]Nanolux, [4]Osaka University (Japan)

We have developed a new fundus camera in which a fundus image can be taken by oneself, that is a selfie fundus camera, by using near infrared (NIR) coloring technology. We demonstrate the basic structure and some experimental results and show the future prospective of this camera.

Tu-I-03 **Invited**

14:55 **RGB Camera-Based Optical Imaging of in vivo Tissue Physiology and Functions**

Izumi Nishidate[1], Satoko Kawauchi[2], Shunichi Sato[2], Manabu Sato[3], Yasuaki Kokubo[3]

[1]Tokyo University of Agriculture and Technology, [2]National Defense Medical College Research Institute, [3]Yamagata University (Japan)

We developed a method to quantify and visualize chromophore concentrations and light scattering

property of biological tissues with a digital red-green-blue camera. Experiments with small animals and human subjects demonstrated the ability of the method to evaluate physiological functions and viability of in vivo living tissues.

Tu-I-04

15:20 **Blood-Flow Visualization in Skin in Response to Taste Stimuli Using General-Purpose Camera**

Yukinobu Tanaka, Seiji Murata

Hitachi, Ltd. (Japan)

The aim of our study is to create a technology for monitoring dynamic internal changes in the biological body in particular, the sensing technology is for visualizing the state of blood flow in response to taste stimuli with a general-purpose camera built into a mobile phone.

15:40 - 15:50 Break

Tu-J: Poster Session

Presiders: Takanori Nomura (Wakayama University, Japan)
Yusuke Nakamura (Hitachi, Ltd., Japan)
Kimihiro Saito (Kindai University Technical College, Japan)
Takayuki Shima (AIST, Japan)

15:50-17:50

Core time for odd numbers : 15:50-16:50
Core time for even numbers: 16:50-17:50

Tu-J-01

Near-Field Communication Using a Car Body as a Transmission Path

Yoshiki Matsui[1], Koki Yoshioka[1], Kenta Nezu[1], Mitsuru Shinagawa[1], Kohei Hamamura[2], Hiroshi Nakamura[2], Naohiro Shimizu[2]

[1]Hosei University, [2]NEXTY Electronics (Japan)

We proposed a near-field communication using the car body as a transmission path for reducing the number of wire harnesses. The car body was modeled into a large aluminum plate. An optical tool was used for electrically isolating an electrical-to-optical converter from a spectrum analyzer.

Tu-J-02

Frequency Characteristics Estimation of Human Body in Intra-Body Communication Using Optical Technique

Koki Yoshioka[1], Mitsuru Shinagawa[1], Masaaki Tsuji[2], Naohiro Itoh[2], Kohji Kawahata[2], Syuji Kubota[2]

[1]Hosei University, [2]Ricoh Co., LTD. (Japan)

This paper describes the frequency characteristics of the human body in intra-body communication by using an optical technique. It was verified that the flatness of the frequency characteristics of the human body is within 2 dB from 3 MHz to 19 MHz.

Tu-J-03

Orthonormal Eigenvector Expansions for Finite Fresnel Transform

Tomohiro Aoyagi, Kouichi Ohtsubo, Nobuo Aoyagi

Toyo University (Japan)

We seek the function that its total power in finite Fresnel transform plane is maximized, on condition that an input signal is zero outside the bounded region. This leads to the eigenvalue problems of Fredholm integral equation of the first kind. All orthonormal eigenvectors are computed by the Jacobi method.

Tu-J-04

Coherent Beam Combining of Two Independent Lasers

Tomoharu Konishi, Iwao Mizumoto, Yotsumi Yoshii

National Institute of Technology, Toyama College (Japan)

Coherent beam combining is a technique used to generate a high-power laser beam which can only be used at specific wavelengths in a master oscillator power amplifier configuration as the constituent optical amplifiers have wavelength dependency. We investigated beam combining using two independent lasers.

Tu-J-05

Single-Shot In-Line Phase-Shifting Incoherent Digital Holography with a Randomly Placed Dual Checkerboard Phase Grating

Shota Sakamaki, Naru Yoneda, Takanori Nomura

Wakayama University (Japan)

Single-shot in-line Fresnel incoherent correlation holography is proposed. It can be realized by a randomly placed dual checkerboard phase grating. The designed checkerboard phase mask gives four holograms necessary for the phase-shifting technique can be obtained simultaneously. The results of numerical and optical experiments confirm the feasibility of the method.

Tu-J-06

The Full Color See-Through Head Mounted Display Based on Transmission-Type Holographic Optical Elements

Zih-Yuan Wong[1], Wen-Kai Lin[1], Shao-Kui Zhou[1], Bor-Shyh Lin[2], Wei-Chia Su[1]

[1]National Changhua University of Education, [2]National Chiao Tung University (Taiwan)

A full color see-through display which has a pair of symmetry transmission-type holographic optical elements (HOEs) is proposed. The symmetry linear gratings were utilized to compensate the dispersion of diffraction images. Spatial-multiplexing technique is employed to achieve the full color display. The resulting image locates at infinity.

Tu-J-07

Improvement of Signal Quality for Multi-Level Amplitude Modulation in Holographic Data Storage

Nobuhiro Kinoshita, Yutaro Katano, Teruyoshi Nobukawa, Tetsuhiko Muroi, Norihiko Ishii

Japan Broadcasting Corporation (NHK) (Japan)

To improve the signal quality of 4-level amplitude modulation in holographic data storage, we propose a method that uses a spatially guard interval and a filter with a transmittance distribution defined by a roll-off function. The experimental results showed a practical low bit-error rate.

Tu-J-08

Plasmonic Color Pixels Fabricated by Nanoimprinting Process

Minoru Takeda, Noriyuki Hasuike

Kyoto Institute of Technology (Japan)

We designed and fabricated micro color pallets composed of plasmonic nanostructures applying cost-effective nanoimprinting process and confirmed the wide range tuning ability of reflection color by changing the size parameter of the nanostructures. This color printing technique is very promising for various applications, such as security labels, anti-counterfeiting devices, information storage.

Tu-J-09

Single-Pixel Transport-of-Intensity Phase Imaging

Koshi Komuro, Takafumi Ito, Takanori Nomura

Wakayama University (Japan)

For the quantitative phase imaging under low signal-to-noise ratio, the transport of intensity equation (TIE) has been applied to the computational ghost imaging (CGI). In this study, the TIE is applied to another single-pixel imaging called Hadamard transform imaging, and the accuracy is compared with the use of the CGI.

Tu-J-10

Effective Data-Decoding Method by Combining Convolutional Neural Network and Spatially Coupled Low-Density Parity-Check Code for Holographic Data Storage

Yutaro Katano, Teruyoshi Nobukawa, Tetsuhiko Muroi, Nobuhiro Kinoshita, Norihiko Ishii

Japan Broadcasting Corporation (NHK) (Japan)

We proposed an effective data-decoding method for holographic data storage by combining the convolutional neural network and spatially coupled low-density parity-check code. We focused on the class probabilities outputted from the learned CNN and utilized them for iterative error correction.

Tu-J-11

Correlation-Based Multiplexing in Holographic Data Storage Based on a Computer Generated Hologram

Aoto Matsumoto, Yusuke Saita, Naru Yoneda, Takanori Nomura

Wakayama University (Japan)

For multiplexing without lateral shift, introduction of the correlation-based multiplexing in holographic data storage based on a computer-generated hologram is proposed. Owing to uncorrelated reference beams, crosstalk noises are sufficiently small in the retrieving process. Experimental results confirm the feasibility of multiplexing recording in the proposed method.

Tu-J-12

Image Recovery by Deep Learning for Single-Pixel Digital Holography

Toshiki Inaritai, Nobukazu Yoshikawa

Saitama University (Japan)

We propose pattern generation and recovery methods in SPI-DH using deep learning with convolutional auto-encoder networks. We trained the network with the bipolar weight to display the phase-type SLM. We verify the recovery of the intensity image using SPI with deep learning by computer simulation.

Tu-J-13

Noise Analysis of Electro-Optic Probe System Using Stokes Parameters

Keita Takano[1], Riku Okada[1], Mitsuru Shinagawa[1], Yoshinori Matsumoto[2], Jun Katsuyama[2], Yoshiaki Tanaka[2]

[1]Hosei University, [2]Yokogawa Electric Corporation (Japan)

This paper describes the signal-to-noise ratio (SNR) analysis of electro-optic probe system. The SNR characteristics corresponding to the optical axis angle of the wave plate were simulated using Stokes parameters. The validity of the previous report was confirmed by using our simulator.

Tu-J-14

Coherent Scattering Noise Reduction Method for Phase Multi-Level Holographic Data Storage System

Yusuke Nakamura, Ryushi Fujimura

Utsunomiya University (Japan)

Wavelength diversity detection with oscillator page recording for improving QPSK signal quality is proposed and its effectiveness is confirmed. It actively utilizes the scattering from the media to suppress coherent noise along with a finite bandwidth of light source, and suppresses its phase error in a page.

Tu-J-15

Complex Amplitude Modulation Using a Spatial Light Modulator for Three-Dimensional Holographic Display

Yusuke Saita, Hiromi Minamitani, Takanori Nomura

Wakayama University (Japan)

The method to modulate a complex amplitude using a spatial light modulator has been proposed. In the study, the method is introduced to a three-dimensional display use. The feasibility of 3-D display using the method is confirmed by an experimental demonstration which reconstructs two objects at different positions along the optical axis.

Tu-J-16

Single Shot Detection of Phase Encoded Signal by Using Deep Learning

Michito Tokoro, Ryushi Fujimura

Utsunomiya University (Japan)

A deep learning is introduced into a single-shot phase detection method in holographic memory system. A pixel error rate (PxER) of phase-encoded signal is evaluated by simulation and experiment. By introducing deep learning, we confirmed that the influence of noise can be suppressed and the PxER can be dramatically improved.

Tu-J-17

Numerical Simulations on Multi-Level Signal Recording in Self-Referential Holographic Data Storage Using Off-the-Focus Method

Kanami Inoue, Masanori Takabayashi

Kyushu Institute of Technology (Japan)

We have numerically shown the feasibility of multi-level SR-HDS using OtF method. Furthermore, it has revealed the relationship between shift distance of recording medium and the readout quality.

Tu-J-18

Super-Resolution Complex Amplitude Measurement Using Virtual Phase Conjugation

Satoshi Kawashima, Atsushi Okamoto, Kazuhisa Ogawa, Akihisa Tomita

Hokkaido University (Japan)

We propose a super-resolution complex amplitude measurement method using virtual phase conjugation (VPC). Applying VPC to the optical system combining random diffusion and digital holography enables super-resolution measurement with a small amount of calculation. The numerical simulation succeeded in measurement at 4 times the resolution of the optical detector.

Tu-J-19

Spatial Mode Exchange Technique Using Volume Hologram with a Phase Plate

Shuanglu Zhang, Atsushi Okamoto, Kazuhisa Ogawa, Akihisa Tomita

Hokkaido University (Japan)

We propose a mode exchange technique using volume hologram with a phase plate to achieve higher exchange performance by modulating the phase of spatial modes to reduce the intensity overlap. The numerical simulation results showed a considerable exchange performance enhancement for a specific mode group by the proposed scheme.

Tu-J-20

Numerical Investigation on Non-Interferometric Single-Shot Detection of SQAM Signal Beam with Pixelated Polarization Camera

Soichiro Sumida, Masatoshi Bunsen

Fukuoka University (Japan)

We investigate a method for single-shot capture of the multiple diffraction intensity images traveling different optical path lengths using a pixelated polarization camera, and its application to SQAM signal detection by transport of intensity equation. We show its detection performance by numerical simulation.

Tu-J-21

Iterative Reconstruction Algorithm for In-Line Digital Holography Using Multiple Phase Codes

Yugo Nakajima, Satoshi Honma

University of Yamanashi (Japan)

We propose an iterative reconstruction algorism for in-line digital holography. We show it is able to retrieve phase and amplitude information of a target with high accuracy and wide area by illuminating the phase encoded light on the target and applying constrain condition of holograms between phase codes.

Tu-J-22

Performance of $Nd_{0.5}Bi_{2.5}Fe_{4.0}Ga_{1.0}O_{12}$ Films as Recording Media for Magnetic Hologram Memory

Kenta Tanaka, Yuichi Nakamura, Taichi Goto, Pang Boey Lim, Hironaga Uchida, Mitsuteru Inoue

Toyohashi University of Technology (Japan)

Magnetic volumetric holograms, which are recorded as magnetization directions through thermomagnetic recording, are rewritable holograms with long-term stability. In this study, we investigated the properties of NBIGG films compared to those of BiDyAl:YIG, and the usability of the films as magnetic hologram recording media was evaluated.

Tu-J-23

Holographic Projector Using Phase Interleaved Method

Haruki Watanabe, Satoshi Honma

University of Yamanashi (Japan)

Interactive projection mapping has attracting attention. We propose a holographic projector using phase interleaved method based on the two exposure method. In this method, speckle noise on reproduction image is suppressed better than the traditional method. In this report, we demonstrated simultaneous reproduction of images on multiple planes.

Tu-J-24

Application of Optical Pickup Heads to the 3D Printing

Hsi-Fu Shih, Ruei-Syuan Liang, Jheng-Jyun Hong, Kuan-Liang Chen, Chia-Chin Tsai, Yu-Lun Wu

National Chung Hsing University (Taiwan)

Three-dimensional (3D) printing is an emerging technology and widely applied to many fields. This study investigates the feasibility of combining the photo-polymerization stereo-lithography with a Blu-ray optical pickup head for fabricating micro devices. The proposed system was implemented and experimental results show the feasibility.

Tu-J-25

Three-Dimensional Simulation of Semiconductor Ring Resonator with Metal Nano-Antenna for HAMR Heat Source

Ryuichi Katayama[1], Satoshi Sugiura[2]

[1]Fukuoka Institute of Technology, [2]InnovaStella, Inc. (Japan)

The resonance wavelengths and electric field distribution corresponding to each resonance wavelength of a novel device for heat-assisted magnetic recording heat source, in which a metal nano-antenna is attached to the side of a semiconductor ring resonator via a dielectric spacer, were numerically simulated using the three-dimensional finite element method.

Tu-J-26

Experimental Demonstration of an Optical Video Retrieval System with Deep Neural Network Features

Mon Nagata, Keisuke Saito, Hidenori Suzuki, Toshihiro Sugaya, Sachiko Masukawa, Kashiko Kodate, Eriko Watanabe

The University of Electro-Communications (Japan)

We develop the optical video retrieval system with deep neural network features by using an autoencoder-based data conversion module. Furthermore, we verify the accuracy of the data conversion module. By applying this optical

video retrieval system, the copyrights management system with web user interfaces is demonstrated.

Tu-J-27

Multi-Wavelength Absorption Contrast Imaging of Individual Single-Wall Carbon Nanotubes with Photothermal Microscopy

Yuya Ishikawa, Jun Miyazaki

Wakayama University (Japan)

Single-wall carbon nanotubes (SWCNTs) are heterogeneous samples containing mixtures of metallic and semiconducting species with a variety of lengths and defects. In this study, we measured individual SWCNTs with multi-wavelength photothermal microscopy and identified metallic and semiconducting SWCNTs by means of spectral unmixing.

Tu-J-28

Study on Super-Resolution Readout Mechanism of an Optical Disc with an Antimonide Active Layer by Multi-Physics Simulation

Haruyuki Sano[1], Masashi Kuwahara[2]

[1]National Institute of Technology, Ishikawa College, [2]National Institute of Advanced Industrial Science and Technology (AIST) (Japan)

We performed multi-physics simulation of the super-resolution optical disc with InSb or Sb_2Te_3, which show different changes in optical absorption due to melting. The calculated response functions for the super-resolution state show different shapes for the two materials. The mechanism of the super-resolution mechanism is proposed.

Tu-J-29

Particle Field Visualization by Sparsity-Constrained Digital Holography

Kan Itakura, Shuhei Yoshida

Kindai University (Japan)

Particle field visualization is applied to the measurement of velocity field and so on. In this study, we propose a particle field visualization technique by sparsely constrained digital holography. In the proposed method, three-dimensional particle field visualization with a simple optical system is possible.

Tu-J-30

Comparative Study of Imaging Algorithms in Single-Pixel Imaging

Fukune Kaya, Shuhei Yoshida

Kindai University (Japan)

Single-pixel imaging (SPI), which is an imaging method using a detector without spatial resolution, is excellent in noise resistance. Moreover, SPI does not require an imaging optics. Various methods have been proposed as an imaging algorithm. In this study, we compared each algorithm and evaluated its performance.

Tu-J-31

Design of Data Page in Space Division Recording Method for Optical Data Retrieval System

Keisuke Saito[1], Taku Hoshizawa[1], Mon Nagata[1], Kanami Ikeda[2], Eriko Watanabe[1]

[1]The University of Electro-Communications, [2]Osaka Prefecture University (Japan)

To calculate the various data with optical correlator at high speed, we propose a space division recording method that can change the dimensions of information beam. First, the required dimensions are evaluated using text data. Moreover, we evaluate the various layouts of data page using our numerical simulator.

Tu-J-32

Transport of Intensity Equation for Phase and Fluorescence Imaging

Sudheesh K. Rajput[1], Osamu Matoba[1], Manoj Kumar[1], Xiangyu Quan[1], Yasuhiro Awatsuji[2]

[1]Kobe University, [2]Kyoto Institute of Technology (Japan)

We present phase and fluorescence imaging using transport of intensity equation-based phase retrieval algorithm. The phase distribution is retrieved from three defocus fluorescence images and focus images can be recovered at desired plane after free space propagation.

17:50 - 18:00 Break

18:00 - 20:00 Banquet

October 23, 2019 (Wednesday)

We-K: Computational Imaging and Display 1

Presiders: Tomoya Nakamura (Tokyo Institute of Technology, Japan)
Yusuke Nakamura (Hitachi, Ltd., Japan)

We-K-01 **Invited**

9:00 **Computational Imaging with Randomness**

Ryoichi Horisaki

Osaka University (Japan)

Computational imaging is a new optical design framework by cooperating optics and signal processing. It enables compact optics and high throughput sensing compared to conventional approaches. In this talk, I will present our researches related to computational imaging based on machine learning and compressive sensing.

We-K-02

9:25 **Transport-of-Intensity Phase Imaging Using Deep Learning**

Shunsuke Kakei, Koshi Komuro, Takanori Nomura

Wakayama University (Japan)

The accuracy of the transport-of-intensity phase imaging can be improved by increasing the number of defocused images. To improve the accuracy without mechanical scanning, the introduction of a phase mask in Fourier plane and deep learning is proposed. The proposed method is confirmed by a numerical experiment.

We-K-03

9:45 **Deep-Learning-Generated Binary Hologram**

Hiroaki Goi, Koshi Komuro, Takanori Nomura

Wakayama University (Japan)

To improve the quality of reconstructed images of binary holograms, deep learning is introduced to computer-generated binary holograms. In this method, a neural network is optimized to generate binary holograms directly. Experimental results confirm the feasibility of deep-learning-generated binary holograms.

10:05 - 10:25 **Break**

We-L: Computational Imaging and Display 2

Presiders: Ryoichi Horisaki (Osaka University, Japan)
Takanori Nomura (Wakayama University, Japan)

We-L-01 **Invited**

10:25 **Computational Lensless Imaging with Coded Image Sensor**

Tomoya Nakamura

Tokyo Institute of Technology, JST PRESTO (Japan)

This talk presents a study on computational lensless imaging using the hole-opening image sensor. The method jointly uses the hole-opening image sensor as a coding optics and sparsity-based image-decoding algorithm. Simulation and experimental results will be introduced and discussed.

We-L-02

10:50 **Acquisition of Dense Parallax Images Using a Two-Dimensional Image Sensor by Applying Single-Pixel Imaging to Integral Photography**

Ren Usami[1], Teruyoshi Nobukawa[2], Masato Miura[2], Norihiko Ishii[2], Eriko Watanabe[1], Tetsuhiko Muroi[2]

[1]The University of Electro-Communications, [2]Japan Broadcasting Corporation (NHK) (Japan)

We propose an acquisition method for capturing dense parallax images using single-pixel imaging. By applying the single-pixel imaging to each pixel of an image sensor, we experimentally confirmed that dense parallax images could be captured. This technology is feasible for improving image quality in integral photography.

We-L-03

11:10 **Super-Resolution Optical Projection Using Single-Lens Spatial Cross Modulation Method**

Yiwo Lu[1], Atsushi Okamoto[1], Hisatoshi Funakoshi[2], Tomohiro Maeda[1], Kazuhisa Ogawa[1], Akihisa Tomita[1]

[1]Hokkaido University, [2]Gifu University (Japan)

We propose a method to project a super-resolution optical field based on spatial cross modulation, focusing on the redundancy of the diffused wavefront. We confirmed that our method generates the image

with a resolution of 256 × 256 by the modulator with that of 32 × 32.

We-L-04

11:30 Accurate Complex Amplitude Modulation by Iterative Spatial Cross Modulation Adapted to Arbitrary Input Intensity Distribution

Tomohiro Maeda, Atsushi Okamoto, Kazuhisa Ogawa, Akihisa Tomita

Hokkaido University (Japan)

In this research, we have proposed an improved algorithm for iterative spatial cross modulation, leading to adapt to the input intensity distribution other than a plane wave. Simulations assuming various input condition have shown that the proposed method is flexibly applicable to complex amplitude conversion and reconstruction.

11:50- 13:20 Lunch

We-M: Optical Device, Material, Fabrication 2

Presiders: Tsutomu Shimura (The University of Tokyo, Japan)
Ryuichi Katayama (Fukuoka Institute of Technology, Japan)

We-M-01 **Invited**

13:20 **Meta-Lens Array for Light Field Imaging and Sensing**

Mu Ku Chen[1,2,3], Cheng Hung Chu[1], Hsin Yu Kuo[2], Ren Jie Lin[2], Shuming Wang[4,5,6], Vin-Cent Su[7], Yi-Teng Huang[1], Jia-Wern Chen[1], Tao Li[4,5,6], Shining Zhu[4,5,6], Din Ping Tsai[1,2,3]

[1]Academia Sinica (Taiwan), [2]National Taiwan University (Taiwan), [3]The Hong Kong Polytechnic Univerisity (Hong Kong), [4]Nanjing Univerisity (China), [5]Key Laboratory of Intelligent Optical Sensing and Manipulation (China), [6]Collaborative Innovation Center of Advanced Microstructures (China), [7]National United University (Taiwan)

Metalenses consisting of a large number of nano-antennas can manipulate the incoming light for specific output wavefront. A 60 × 60 GaN achromatic metalens array in visible frequency are used for light field imaging and sensing. Depth and velocity of moving object can be imaging in real time.

We-M-02 **Invited**

13:45 **Image Guide Design for Near to Eye Displays with Discretely Depth-Varying Grating**

Toshiteru Nakamura[1], Yuzuru Takashima[2]

[1]Hitachi, Ltd. (Japan), [2]The University of Arizona (USA)

For the see-through and near-to-eye displays, an image guide device has been adopted. Light throughput and uniformity of luminance is improved by employing an optical image guide with discretely depth-varying surface relief gratings. A newly developed mathematical model eliminates time consuming iteration of ray tracing but rapidly identifies depth-varying structure.

We-M-03 Invited

14:10 Extreme Resolution by STED Nanoscopy and Its Application to Stereo Lithography

Geon Lim[1], No-Cheol Park[1], Wan-Chin Kim[2]

[1]Yonsei University, [2]Hanbat National University (Korea)

We have investigated several entrance pupil modulation for continuous wave (CW) STED microscopy to increase its resolution comparable with pulsed STED system. In addition, research further covers application feasiblility of STED system to 3D nanostructure direct fabrication.

14:35 - 14:45 Break

We-N: Optical Memory 3

Presiders: Xiaodi Tan (Fujian Normal University, China)
Nobuhiro Kinoshita (NHK, Japan)

We-N-01 Invited

14:45 Suppression and Utilization of Crosstalk-Noise in Multi-Valued Holographic Data Storage System

Ryushi Fujimura, Michito Tokoro, Masaya Saito

Utsunomiya University (Japan)

We report on our recent studies for designing a signal pattern in holographic data storage system. One of the topics is about the phase detection method utilizing crosstalk noise. If the phase-known pixels are appropriately arranged within the signal pattern, we can retrieve the signal phase by only one image acquisition without any additional reference waves.

We-N-02 Invited

15:10 Focus Error Sensing at the Far-Field

Teruo Fujita

Fukui University of Technology (Japan)

Research results of a proposed focus sensing system will be presented. This system utilizes moving interference fringes at the far-field, which is caused by a uniform-pitch grating inside a disc. A two element photodetector was placed at the far-field and its outputs were sampled and digitally processed for well-shaped focus-error-signal generation.

We-N-03 Invited

15:35 Ultrafast All-Optical Magnetic Recording and Spin Dependent Phenomena

Arata Tsukamoto

Nihon University (Japan)

Ultrafast manipulation and detection of spin dependent phenomena are crucial for future applications on ultrafast magnetic memory and spintronic devices. Controlling magnetism by light is one of the promising approaches. Recent progress on All Optical Switching (AOS) and related phenomena triggered by femtosecond laser pulse will be reported.

We-N-04 Invited

16:00 Automatic Disc Identifying System for Addressing Massive Big Data

Qiang Cao, Yao Jie, Yifan Zhang, Changsheng Xie

Huazhong University of Science and Technology (China)

Optical discs are very suitable for massive big-data preservation in long-term due to low media and maintenance cost. We propose an Automatic Disc Identifying System (ADIS) to automatically identify and address massive optical discs and their data by jointly synthesizing mechanics, hardware, and software at low cost and high reliability.

16:25 - 16:35 Break

We-PD: Post Deadline

Presider: Akinori Furuya (Tokushima Bunri University, Japan)

(16:35) We-PD-01

(16:50) We-PD-02

17:05 - 17:20 Award & Closing

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Ono, M. (JVC KENWOOD)
Park, N. -C. (Yonsei Univ.)
Shin, D. -H. (Samsung)
Takabayashi, M. (Kyushu Inst. of Tech.)

Takeda, M. (Kyoto Inst. of Tech.)
Tan, X. (Fujian Normal Univ.)
Tominaga, J. (AIST)
Tsai, D. P. (Academia Sinica)
Wang, Y. (CAS)
Watabe, K. (Toshiba)
Wright, C. D. (Univ. of Exeter)
Yagi, S. (NTT-AT)

Local Steering Committee

Choi, S. (Niigata Univ.)
Ohdaira, Y. (Niigata Univ.)
Ohkawa, M. (Niigata Univ.)
Oka, H. (Niigata Univ.)
Suzuki, T. (Niigata Univ.)

ACCESS TO CONFERENCE SITE

< Access to Niigata Airport >
至「新潟空港」

International direct flights（国際線）
From Incheon Airport: approx. 120 minutes.
From Harbin Airport: approx. 130 minutes.
From Shanghai Airport: approx. 165 minutes.
From Taipei Airport: approx. 210 minutes.

Domestic flights（国内線）
From Narita Airport: approx. 60 minutes.
自「成田空港」
From Kansai International Airport: approx. 60 minutes.
自「関西国際空港」
From Itami Airport: approx. 60 minutes.
自「伊丹空港」
From Chubu Airport: approx. 60 minutes.
自「中部国際空港」
From New Chitose Airport: approx. 75 minutes.
自「新千歳空港」
From Fukuoka Airport: approx. 105 minutes.
自「福岡空港」

< From Niigata Airport to Niigata Station >
自「新潟空港」
Limousine Bus:
Traveling time to JR Niigata Station is approx. 25 minutes.

< From Tokyo Station to Niigata Station >
自「JR 東京駅」
Joetsu Shinkansen line:「上越新幹線」
(From Tokyo to Niigata)
Traveling time is approx. 2 hours.

< From JR Niigata Station to TOKI MESSE >
自「JR 新潟駅」
TAXI approx. 5 minutes from the station.
Walk approx. 20 minutes from the station.

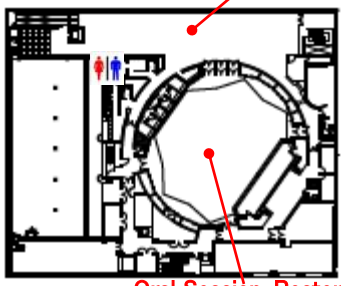
For more information, please refer to the following URL:

http://www.tokimesse.com/english/index.html

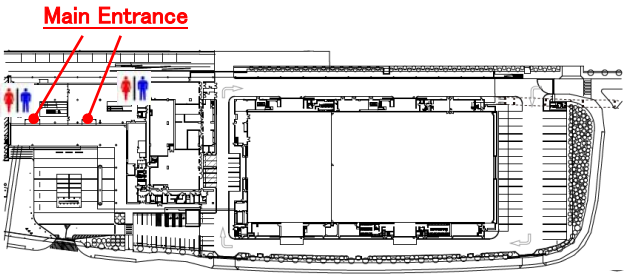
CONFERENCE SITE FLOOR

Toki Messe Floor Map

4F



1F



HOTEL ACCOMMODATIONS

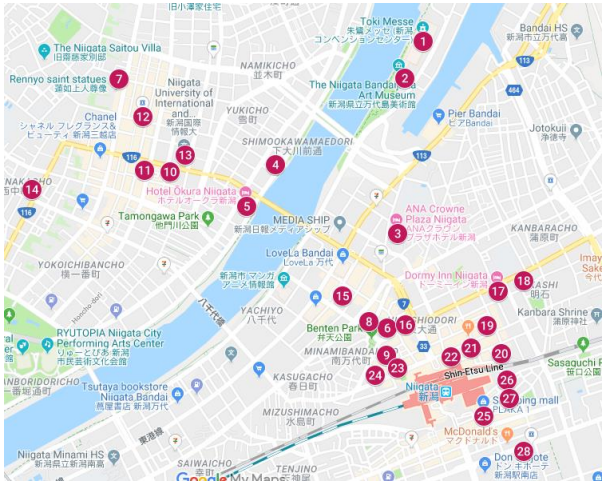
There are a lot of online booking sites in Japan. As the example, some of them are listed below. You can reserve your rooms in English at these sites. ISOM does not prepare any special blocks of rooms for the participants.

- JAPANiCAN.com
  http://www.japanican.com/
- Japan Traveler Online
  http://japantraveleronline.com/
- Rakuten Travel
  http://travel.rakuten.com/
- Hotels.com
  https://www.hotels.com/?pos=HCOM_ASIA&locale=en_JP

Shown below are some candidate hotels near the ISOM'19 conference site (Niigata Convention Center (TOKI MESSE)).

- Hotel Nikko Niigata
  https://www.okura-nikko.com/japan/niigata/hotel-nikko-niigata/
- ANA Crowne Plaza Niigata
  https://www.ihg.com/crowneplaza/hotels/us/en/niigata/kijcp/hoteldetail
- Niigata Grand Hotel
  http://www.ni-grand.co.jp/eng/
- Hotel Okura Niigata
  https://www.okura-nikko.com/japan/niigata/hotel-okura-niigata/
- Niigata Toei Hotel
  https://www.toeihotel-niigata.com/en/
- The Italia-ken
  http://www.italiaken.com/en/index.html
- Court Hotel Niigata
  https://www.courthotels.co.jp/en/niigata/
- Niigata Keihin Hotel
  http://www.keihinhotel.com/en/
- Country Hotel Niigata
  http://www.niigata-c.jp/contents/english.php

CITY AND HOTEL MAP



① Toki Messe (Niigata Convention Center)
② Hotel Nikko Niigata
③ ANA Crowne Plaza Niigata
④ Niigata Grand Hotel
⑤ Hotel Ōkura Niigata
⑥ Niigata Toei Hotel
⑦ Hotel The Italia Ken
⑧ Court Hotel Niigata
⑨ Niigata Keihin Hotel
⑩ Country Hotel Niigata
⑪ APA Hotel Niigata-Furumachi
⑫ Niigata City Hotel
⑬ Toyoko Inn Niigata Furumachi
⑭ APA Hotel Niigata-Higashinakadori
⑮ Bandai Silver Hotel
⑯ APA Hotel Niigata Ekimae Odori
⑰ Dormy Inn Niigata
⑱ Super Hotel Niigata
⑲ Hotel Sunroute Niigata
⑳ Hotel Alpha-1 Niigata
㉑ Niigata Daiichi Hotel
㉒ Toyoko INN Niigata
㉓ Niigata Station Hotel
㉔ Comfort Hotel Niigata
㉕ Art Hotel
㉖ Niigata East Hotel
㉗ Terminal Art Inn
㉘ Niigata Park Hotel

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