ADVANCE PROGRAM

ISOM'24

IN COOPERATION WITH

The Japan Society of Applied Physics (JSAP)

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 2024

Arcrea HIMEJI,

Himeji, Hyogo, Japan

Oct. 20 - 23, 2024

SPONSORED BY

- The Optical Society of Japan (OSJ)

COSPONSORED BY

-Optoelectronics Industry and Technology Development Association (OITDA)

FINANCIALLY SUPPORTED BY

-The Takano Eiichi Optical Science Funds

-Support Center for Advanced Telecommunications Technology Research, General Incorporated Foundation

-Nippon Sheet Glass Foundation for Materials Science and Engineering

-Murata Science and Education Foundation

-Tsutomu Nakauchi Foundation

-Tateisi Science and Technology Foundation

-Himeji Convention & Visitors Bureau

https://isom.jp/

Ver. 2024.10.02

Symposium Schedule

	Oct. 20, Sun	Oct. 21, Mon	
	Registration 15:00 – 17:20	Registration 8:30 – 13:00	
9:00			9:00
		Mo-A Opening Remarks & Keynote	
		Short Break	
10:00		**Mo-B** Three-dimensional Sensing	10:00
		Break	
11:00			11:00
		Mo-C Quantum Sensing, Nanosensing, Nanophotonics	
12:00			12:00
		Lunch	
13:00			13:00
14:00		**Mo-D** Holographic Memory I	14:00
		Short Break	
15:00		**Mo-E** Digital Holography I	15:00
16:00		Break	16:00
		Mo-F Computational Imaging I	
17:00			17:00
18:00	Get Togegher (17:00 ~ 19:00)		18:00
19:00			19:00
20:00			20:00

	Oct. 22, Tue	Oct. 23, Wed	
	Registration 8:30 – 13:00	Registration 8:30 – 12:00	
9:00	**Tu-A** Digital Holography II	**We-A** [Special Session] AI and Deep Learning	9:00
10:00			10:00
	Break	Break	
11:00	**Tu-B** Display	**We-B** Computational Imaging II	11:00
12:00	ISOM'25 Announcement & Photo	Lunch	12:00
13:00	Lunch		13:00
14:00	**Tu-C** Special Invited	**We-C** Holographic Memory II	14:00
	Short Break	Short Break	
15:00	**Tu-D** Sensing System	**We-PD** Post Deadline	15:00
		Short Break	
		Award & Closing	
	Break		
16:00	**Tu-E** Poster Session		16:00
17:00			17:00
18:00	Move to Banquet		18:00
18:20			18:20
19:00	Banquet (18:20 ~ 20:20)		19:00
20:20			20:20

WELCOME TO ISOM'24

WELCOME STATEMENT FROM THE ORGANIZING COMMITTEE CHAIRPERSON

The 34th ISOM (ISOM'24) will be held from Oct. 20 to Oct. 23, 2024 at the Arcrea HIMEJI in Himeji, Hyogo, Japan.

On behalf of the ISOM organizing committee, I am delighted to welcome all of you to the ISOM'24.

The last ISOM meeting, held in Takamatsu City, Kagawa Prefecture, attracted the largest number of participants and presenters in the past 10 years. Last year's meeting was also a face-to-face meeting, which led to lively discussions and a deepening of friendships among the participants.

We believe that ISOM's activities have been very fruitful and have produced significant results. Since the first ISOM in 1987, many papers have been presented and discussed in depth at the conference, which has led to new developments and new applications in the field of optical memory. It has not only produced innovations in optical memory technology, but has also led to the economic development of optical memory-related industries.

In 2017, 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 and new applications in whole field related to this conference.

I sincerely ask all of ISOM'24 participants to discuss on new technologies of the next generation optical memory and new applications of optical memory technologies in coming ISOM'24.

志村努

Tsutomu Shimura

ISOM'24 Organizing Committee, Chairperson

INTRODUCTION

The 34th ISOM (ISOM'24) will be held from Oct. 20 to Oct. 23, 2024 at Himeji.

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 3,823, and the total number of participants has reached 10,943.

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 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'24, 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, lots of papers have been submitted more than usual in this ISOM.

As the COVID-19 pandemic has calmed down, we are now able to hold face-to-face events. Therefore, this ISOM will be held as a face-to-face event, in principle, with the exception of some invited speakers, but we will adopt a hybrid style where participants can attend online. We appreciate your participation as presenters and audience, and we are looking forward to seeing you at HYBRID style meeting in Himeji.

SCOPE OF THE SYMPOSIUM

ISOM’24 will provide opportunities to discuss the current status of Optical Memory, Imaging, Sensing, and Other Related Technologies.

The scope of ISOM'24 includes the above research fields and provides a platform to exchange the latest advances and ideas, as well as to encourage scientific interaction and collaboration.

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

1. Optical Memory
- Holographic Memory: Recording and Reproducing Technologies
- Holographic Memory: Signal Processing
- Optical Disk: High-density and Large-capacity Recording
- Optical Disk: Drive Technologies and Signal Processing
- Media and Material Science
- Archival Memory
- MO, HAMR, and Other Optics-used Techniques
- Others

2. Imaging
- Computational Imaging
- Digital Holography
- Image Processing
- Scattering Imaging
- Adaptive Optics
- Display
- Medical and Biological Imaging
- Others

3. Sensing
- Three-dimensional Sensing
- LiDAR
- Nano-sensing
- Spectroscopy
- Sensors and Sensing-systems
- Environment, Agriculture, and Infrastructure Sensing
- Others

4. Other Related Technologies
- Materials, Components, and Devices
- Nanophotonics, Metamaterials, and Plasmonics
- Optical Information Processing
- Optical System Design
- Optical Interconnection and Switching
- AI and Deep Learning
- Emerging Technologies on Optics
- Others

REGISTRATION

All participants (including speakers) are requested to register, and are encouraged to register in advance (by Oct. 3, 2024) in order to receive the early registration discount.

I. Registration Fees

The Symposium registration information and forms can be obtained from ISOM'24 website (https://isom.jp/). If you have any questions, please contact ISOM'24 secretariat.

Type	Advance Rate Before / On Oct. 3, 2024	Standard Rate After Oct. 3, 2024
Conference Registration		
Regular	JPY 65,000	JPY 75,000
Student & Retiree	JPY 20,000	JPY 25,000
Banquet		
Regular	JPY 7,000	JPY 8,000
Student & Retiree	JPY 5,000	JPY 7,000

The registration fee for the symposium includes admission to all the technical sessions and an online Technical Digest. The information to join the online Symposium will be informed those who paid the participation fee, later. Students are asked for showing their ID cards.

II. Registration and Payment

Those who wish to attend ISOM'24 will be able to register on the web (https://isom.jp/) after about August 2024. The deadline for advance registration is Oct. 3, 2024 24:00 (JST). After that, registrations will be charged the standard rate.

Onsite Registration will start at 15:00 on Oct. 20 at the 4th floor of "Arcrea HIMEJI". You can register using the PC at the Registration Desk.

Payment should be made in Japanese Yen by credit cards (VISA and Master Card) payable to ISOM'24. No cash will be accepted.

III. 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.

► For onsite presentations, the conference room will be equipped with a projector, a PC, a podium microphone, and a screen.

► All speakers can use either their own PC or the PC provided in the conference room. Onsite speakers are requested to confirm the connection with the projector in advance, while online invited speakers should confirm the connection with the web system beforehand. If onsite speakers do not use their own PC, they are asked to upload their presentation materials to the podium PC before the beginning of the session.

► All online invited speakers should log into the web system before the beginning of the session and make their presentations online.

► We recommend that all speakers use a font size at least 16 points in their presentation materials. The audience expects well-prepared presentations with clearly visible figures and captions, as well as strong conclusions.

POSTER PRESENTATION

► All authors making a poster presentation should prepare a one-page poster in PDF format for online participants. The file should be uploaded to the ISOM'24 website by Oct. 11, 2024.

► Authors should bring their poster and display it on the designated board during the poster session. The board can hold a poster up to A0 size that is vertically long. Presenters should stay near their poster during the poster session at least during the indicated core time. You may visit other posters outside of the core time, but please remain at your poster as much as possible.

► Please refer to the ISOM website for details on the presentation.

POST-DEADLINE PAPERS

A limited number of papers will be accepted for presenting significant results obtained after the deadline. An author needs to fill in the paper submission form, including a 50-word abstract, and submit a 2-page PDF summary following the instructions for submission on the ISOM website (https://isom.jp/).

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

The submission deadline is Sep. 4, 2024. Among the accepted post-deadline papers, selected ones will be presented as oral presentations in the final session. Other accepted post-deadline papers will be presented in the poster session. Authors will be notified whether their papers are accepted or not by late September 2024.

- Time assigned for:

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

FINANCIAL SUPPORT

For students participating in ISOM'24, financial support may be available for those who meet the following criteria. However, the amount of support will vary between those from the host country and those from other countries, taking travel expenses into consideration.

Part of the support for students from outside the host country will be funded by the Takano Eiichi Optical Science Funds.

Criteria for Financial Support:

1. Must be a full-time student.

2. Must be the first author and the presenter.

3. The student's supervisor must approve the application.

Due to a limited budget, not all applications will be approved. The ISOM Steering Committee will review the applications. Among the applications deemed appropriate, support will be provided on a first-come, first-served basis.

If you wish to apply for financial support, please fill out the application form that will be announced later and submit it.

DEMO PRESENTATION IN POSTER SESSION

The Demo Presentation is a special poster presentation with a technical demonstration and will be held during the poster session. The technical demonstration will take place repeatedly upon request by participants. This unique presentation method is direct and appealing to the participants.

Technical Demonstration: Tu-E-47

Aerial Optical Equipments Using Hard Candy for Aero Signage Which is Floating in the Air and Enables to Make Images Invisible from Back Side

Kunio Sakamoto and Kanaho Ishikawa

Konan University (Japan)

PUBLICATION OF SYMPOSIUM PAPERS

Online Technical Digest includes invited papers, accepted contributed papers, and limited numbers of post deadline papers. It will be available from Oct. 11 to Oct. 23, 2024. If you complete the payment, you will be informed of the website of the online Technical Digest on Oct. 11, 2024 and able to download it in advance.

The conference papers will be published in October 2025 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'24 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 Progress Reviews and Regular Papers, respectively.

The instructions for preparation of manuscript for the special issue will be sent via e-mail after the conference. The deadline for submission of manuscripts is Feb. 28, 2025. Submitted papers will be reviewed based on the OPTICAL REVIEW standard.

SPECIAL PROGRAMS

Get Together Reception

- Date & Time: Sunday, Oct. 20, 17:00-19:00
- Venue: Italian Dining Ricordo (Terasso 4F)
  (5 minute walk from Himeji station)
- Fee: No charge

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

Banquet Reception

- Date & Time: Tuesday, Oct. 22, 18: 20-20:20
- Venue: Himeji Monolith
  (12 minute walk from Himeji station)
- Fee: Advance ticket JPY 7,000
  Standard ticket JPY 8,000

Ticket for the Banquet Reception is not included in the conference registration fee. Application for Banquet can be made online by Oct. 13.

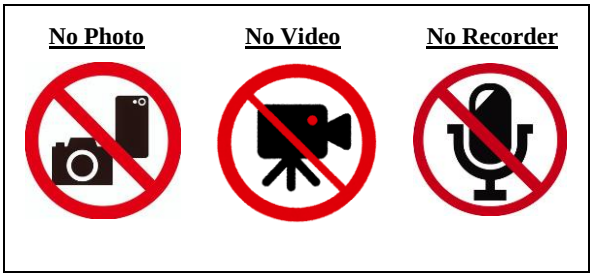
ISOM'24 Secretariat

Mitsuhiro Kimura (Secretary)

- Tel: +81-3-3528-9841
- E-mail: secretary@isom.jp
- Add: c/o Adthree Publishing Co., Ltd.
  3F Sunrise Build II, 5-20 Shinogawamachi,
  Shinjuku-ku, Tokyo 162-0814 Japan

ATTENTION

It is not allowed to take photos and videos of any presentation materials in ISOM'24.
Do not download the PDF files uploaded for the posters.



GENERAL INFORMATION

I. Official Language

The official language of ISOM'24 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'24 Symposium Registration Desk.

III. Lunches

A lunch map in the vicinity of The Arcrea HIMEJI will be provided at the Registration Desk.

IV. Others

To receive further ISOM'24 announcement, please visit ISOM website (https://isom.jp/).

Information of Himeji City

Himegi City has a lot of fascinating sightseeing places such as Himeji Castle, Himeji Castle Nishi-Oyashiki-ato Garden "KOKO-EN" (A Japanese Garden looking towards the Himeji Castle), Himeji City Museum of Art and so on.

We are going to supply the brochures of Himeji sightseeing information at the Registration Desk. Please feel free to use them.

Himeji Castle
https://www.himejicastle.jp/en/

Visit Himeji
https://visit-himeji.com/en/

TECHNICAL PROGRAM

Oct. 20, 2024 (Sunday)

17:00 **Get Together**

Oct. 21, 2024 (Monday)

Mo-A: Opening Remarks & Keynote

Presider: Takayuki Shima (AIST, Japan)

Opening Remarks

8:50

Tsutomu Shimura (The University of Tokyo, Japan)
Yuichi Nakamura (Toyohashi University of Technology, Japan)

Mo-A-01 **Keynote**

9:05 **Invention of phase shifting mask and super-resolution technology, seen from imaging theory**

Masato Shibuya

Tokyo Polytechnic University (Japan)

I introduce the background of the invention of the phase-shifting mask. Simultaneously, I examined the imaging theory, leading to the consistent scalar imaging theory. In lithography, object and image fidelity is not necessary, but exposure margin and depth of focus are required. I discuss from this perspective.

9:40 - 9:45 Short Break

Mo-B: Three-dimensional Sensing

Presider: Koichi Iiyama (Kanazawa University, Japan)

Mo-B-01

9:45 **Tunable abrupt autofocusing meta-devices**

Rong Lin, Mu Ku Chen, Din Ping Tsai

City University of Hong Kong (Hong Kong)

Abrupt autofocusing (AAF) beam, known for its non-diffractive properties, extended focal depth, and self-healing capabilities, are advantageous over conventional Gaussian beams in the biomedical field. Compared to the previous method that can only generate a passive AAF

beam, we introduce meta-devices to manipulate its steered angle and focal length flexibly.

Mo-B-02

10:05 **Surface normal vector field estimation algorithm using time-of-flight camera**

Hiroshi Ohno

Toshiba Corporation (Japan)

An estimation algorithm for surface normal vector fields that does not require specifying local neighborhood points around each point is proposed using a time-of-flight camera. Experimental results validate the basic mechanism of the algorithm and demonstrate its potential for real-time sensing.

10:25 - 10:45 Break

Mo-C: Quantum Sensing, Nanosensing, Nanophotonics

Presiders: Ryuichi Katayama (Fukuoka Institute of Technology, Japan)
Yuichi Nakamura (Toyohashi University of Technology, Japan)

Mo-C-01 **Invited**

10:45 **Quantum sensing using entangled photons**

Shigeki Takeuchi

Kyoto University (Japan)

We will report our recent progress in developing quantum entangled-photon sources and applications to quantum sensing, particularly quantum infrared spectroscopy (QIRS). Since QIRS only requires a light source or detector for the visible wavelength region, infrared spectrometers can be made more compact and less invasive, which will find novel applications.

Mo-C-02

11:10 **Spin Defects in Hexagonal Boron Nitride: Towards Nano-Sensing**

Katarzyna Ludwiczak, Johannes Binder, Aleksandra Krystyna Dąbrowska, Piotr Tatarczak, Andrzej Wysmołek

University of Warsaw (Poland)

We present a spectroscopic study of optically active spin defects in epitaxially grown hexagonal boron nitride. By performing polarization-resolved measurements at different

magnetic fields, we learn about the structure of color centers in the material. hBN is a promising candidate for future nano-sensing devices.

Mo-C-03

11:30 **Cascading meta-devices for advanced functions and applications**

Jingcheng Zhang, Din Ping Tsai

City University of Hong Kong (Hong Kong)

Multilayer meta-devices provide a greater degree of freedom to manipulate the light and have a better ability to perform various functions. In this thesis, various multilayer meta-devices have been systematically developed for advanced functions and applications, such as 6G communications, chiral imaging, and light field control for other advanced applications.

Mo-C-04

11:50 **The simplest but efficiency design of color router**

Chen-Yi Yu[1], Yo-Song Huang[1], Qiu-Chun Zeng[1], Yen-Chun Chen[1], Wei-Lun Hsu[1], Yu-Hsin Lin[2], Fong-Zhi Chen[2], Chih-Ming Wang[1]

[1]National Central University, [2]Taiwan Instrument Research Institute (R.O.C.)

The paper presents a metasurface color router with nanopillars in an RGGB Bayer pattern. This design redistributes light to adjacent pixels, enhancing efficiency over traditional microlenses, and offers a potential replacement for microlens arrays in image sensors.

12:10 - 13:40 Lunch

Mo-D: Holographic Memory I

Presider: Ryushi Fujimura (Utsunomiya University, Japan)

Mo-D-01

13:40 **Self-Referential Holographic Data Storage with Integrated Denoising Function by Deep Learning**

Yuta Eto, Tomioka Rio, Takatsu Taichi, Takabayashi Masanori

Kyushu Institute of Technology (Japan)

We propose to improve the quality of the

reconstructed datapages of self-referential holographic data storage (SR-HDS) using the principle of self-referential holographic deep neural network (SR-HDNN). To verify the feasibility of the proposed method, we perform numerical simulation of the combination system of SR-HDS with SR-HDNN.

Mo-D-02

14:00 **High-speed Reading in Holographic Data Storage System**

Jing Xu, Yongkun Lin, Yuping Ke, Linli Zhong, Chen He, Dakui Lin, Xiao Lin, Xiaodi Tan

Fujian Normal University (P.R.China)

In this paper, through studying the frame frequency matching of the device in the collinear holographic data storage system, we realized the 2KHz reading frame frequency under the condition of material moving speed of 10mm/s, the bit error rate of the data reading was below 3%.

Mo-D-03

14:20 **Development of HDL Multilayer Recording Media with Diffusion Barrier for Magnetic Hologram Recording Media**

Sumiko Bharti Singh Chauhan, Misako Okamoto, Tomoyuki Sakamoto, Shunsuke Fukuchi, Yuichi Nakamura, Pang Boey Lim

Toyohashi University of Technology (Japan)

This study investigates the effect of a diffusion barrier in Bi:RIG multilayer films to enhance recording material properties. Tantalum oxide was used as a diffusion barrier inserted between Bi:RIG and HD layers to reduce Ga diffusion. Results show diffusion barrier reduce Ga diffusion, improving Faraday rotation angles and diffraction efficiency.

14:40 - 14:45 Short Break

Mo-E: Digital Holography I

Presider: Shuhei Yoshida (Kindai University, Japan)

Mo-E-01 **Invited**

14:45 **Modeling 3D surface diffraction in light-in-flight holography**

David Blinder[1,2,3] and Takashi Kakue[3]

[1]Vrije Universiteit Brussel, [2]IMEC (Belgium), [3]Chiba University (Japan)

Light-in-flight holography is an ultrafast imaging technique that can reconstruct the evolving wavefield of light, encoding 3D data at femtosecond resolutions. Existing algorithms for modelling those are computationally intensive and have limited accuracy and capabilities. This study proposes new algorithms for efficiently calculating ultrafast light wavefronts emanating from 3D objects.

Mo-E-02

15:10 **Generation of Speckle Pattern on a Grindstone Surface Using a Self-Affine Fractal Model**

Yohsuke Tanaka, Ryoka Hara, Dai Nakai, Keishi Yamaguchi

Kyoto Institute of Technology (Japan)

This study generates grindstone surfaces using a self-affine fractal model and evaluates their usefulness through speckle contrast. By comparing laser microscope measurements with generated fractal surfaces, we assess randomness via light intensity and speckle contrast (SC) of the speckle patterns.

Mo-E-03

15:30 **Reduction of Reconstructed Particle Elongations by Using Wavelength-Shifted Reconstruction in Phase Retrieval Holography**

Mitsuki Ishiyama, Yohsuke Tanaka, Dai Nakai

Kyoto Institute of Technology (Japan)

We propose a method to reduce the particle elongation in phase retrieval holography by using wavelength-shifted reconstruction. The effect of this method has been verified experimentally using the amount of shift by analyzing by the equation for the reproduced position using wavelength shift and the equation for the particle elongation.

15:50 - 16:10 Break

Mo-F: Computational Imaging I

Presiders: Hiroshi Ohno (Toshiba Corporation, Japan)
Ryota Kawamata (Hitachi, Ltd., Japan)

Mo-F-01 **Invited**

16:10 **Exploring the design of coded optical systems for computational lensless imaging**

Tomoya Nakamura

Osaka University (Japan)

In this talk, I introduce recent research results by my research group on designing coded masks for computational lensless imaging, including radial mask design, multi-layered mask design, and developing a demonstration system with them.

Mo-F-02 **Invited**

16:35 **Efficient Deep Learning for Snapshot Compressive Imaging**

Xin Yuan and Miao Cao

Westlake University (P.R.China)

We will discuss the principle of Snapshot Compressive Imaging (SCI), which is an elegant way to sample the high-dimensional data. It is composed of a hardware encoder and software decoder. With the recent advances of deep learning, various neural networks-based inversion algorithms have been proposed. We will review the idea, hardware, algorithms of SCI, and then some recent applications.

Mo-F-03

17:00 **AR Camera: Camera Integrated with AR Displays**

Yuchen Ma, Yunhui Gao, Jiachen Wu, Liangcai Cao

Tsinghua University (P.R.China)

Cameras are crucial for augmented reality (AR) as they provide basis for content generation, yet integrating them into transparent AR devices remains challenging. We present a computational imaging-based plug-and-play camera design integrated with AR display components, enabling functionalities like eye gaze tracking, enhancing the immersive experience and interaction possibilities.

Mo-F-04

17:20 **Improvement of Measurement Accuracy by Using Only Positive or Negative Defocus Distances for Quantitative Phase Imaging Based on Gaussian Process Transport-of-**

Intensity Equation

Yuta Suwa, Takanori Nomura, Yusuke Saita

Wakayama University (Japan)

Gaussian process transport-of-intensity phase imaging with improved defocus distances to obtain intensity distributions is proposed. The method can measure spatial frequency components of the object with a wider bandwidth without increasing the number of measurements. The feasibility of the proposed method is confirmed by an optical experiment.

Oct. 22, 2024 (Tuesday)

Tu-A: Digital Holography II

Presiders: Masanori Takabayashi (Kyushu Institute of Technology, Japan)
Shuhei Yoshida (Kindai University, Japan)

Tu-A-01

8:50 **Compressive color incoherent digital holography with arbitary depth and wavelength information in a reconstructed image**

Takumi Ura, Takanori Nomura, Yusuke Saita

Wakayama University (Japan)

In color incoherent digital holography with compressive sensing, the method to remove not only undesirable components such as twin and zeroth-order images but also reconstructed images for undesirable wavelengths by obtaining two holograms with different propagation distances is proposed. Experimental results confirm the feasibility of the method.

Tu-A-02

9:10 **Estimating Depth Distance Using Deep Learning for Incoherent Digital Holography**

Shion Arai[1], Teruyoshi Nobukawa[2], Yasunobu Akiyama[1], Tetsuhiko Muroi[2]

[1]Tokai University, [2]Japan Broadcasting Corporation (NHK) (Japan)

We investigated the data preprocessing approach so that deep learning functions well for estimating the depth distance of an object in incoherent digital holography. We found that the depth distance can be estimated with high accuracy when phase distribution of hologram or hologram images are used as larging data.

Tu-A-03

9:30 **High Dynamic Range Algorithm with Simplified Rendering for Incoherent Digital Holography**

Yusuke Kikuchi[1], Teruyoshi Nobukawa[2], Eriko Watanabe[1], Tetsuhiko Muroi[2]

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

Blocked-up shadows and blown-out highlights

on captured holograms lead to serious image degradation in incoherent digital holography (IDH). We proposed a simpler algorithm for high dynamic range imaging based on consideration of complex amplitude calculation of hologram. Proof-of-principle experiments show that the proposed method can enlarge the dynamic range.

Tu-A-04

9:50 **Design and fabrication of multilevel phase grating for space-division phase-shifting incoherent digital holography**

Teruyoshi Nobukawa, Yasutaka Maeda, Nobuhiro Kinoshita, Kei Hagiwara, Tetsuhiko Muroi

Japan Broadcasting Corporation (NHK) (Japan)

We propose the use of a multilevel phase grating to increase the light utilization efficiency in space-division phase-shifting incoherent digital holography. The grating is designed with simulated annealing and is fabricated with two-photon polymerization lithography. Proof-of-principle experiment verified that the proposed grating enables us to increase the light utilization efficiency

10:10 - 10:30 Break

Tu-B: Display

Presider: Takanori Nomura (Wakayama University, Japan)

Tu-B-01 **Invited**

10:30 **Development of polarization imaging cameras based on liquid crystal polarization grating technology**

Moritsugu Sakamoto[1,2], Kohei Noda[1,2], Masato Suzuki[1,2], Tomoyuki Sasaki[1,2], Nobuhiro Kawatsuki[2,3], Hiroshi Ono[1,2]

[1]Nagaoka University of Technology, [2]CREST JST, [3]University of Hyogo (Japan)

Liquid crystal polarization grating (LCPG) is thin and flat optical element that shows the ability to spatially separate orthogonally polarized light. These LCPG's characteristics enable us to add polarization imaging functionality to existing imaging devices. In this presentation, we report on our activities to develop polarization cameras based on LCPG.

Tu-B-02 **Invited**

10:55 **Curved Mirror Reflection for Wide Viewing Zone in Holographic 3D Display**

Yusuke Sando[1], Kazuo Satoh[1], Makoto Kawamura[1], Yutaro Goto[1], Daisuke Barada[2], Toyohiko Yatagai[2]

[1]Osaka Research Institute of Industrial Science and Technology, [2]Utsunomiya University (Japan)

Curved mirrors can widen the range of reflection and propagation directions of incident lights. This property is very useful for enlarging the viewing zone in holographic 3D displays. We have investigated the effectiveness of some curved mirrors: a parabolic mirror, conical volume holographic mirror, and hyperboloidal mirror.

Tu-B-03

11:20 **Multiple Image Diffraction by Using a Reflective Volume Holographic Element**

Tomoyo Ota, Daisuke Barada

Utsunomiya University (Japan)

In this study, a method for an AR combiner enabling autostereoscopic 3D viewing was proposed. This method allows viewing different images from multiple viewpoints, providing binocular and parallaxes. It was confirmed that two pairs of three images could be simultaneously viewed from two different head positions.

11:40 - 12:00 **ISOM'25 Announcement & Photo**

12:00 - 13:30 **Lunch**

Tu-C: Special Invited

Presider: Takayuki Shima (AIST, Japan)

Tu-C-01 **Special Invited**

13:30 **High-resolution digital holographic imaging via regularized inversion**

Yunhui Gao, Zhenghzong Huang, Jiachen Wu, Liangcai Cao

Tsinghua University (P.R.China)

Digital holographic imaging provides access to the optical phase information. However, the intensity-only response of commercial imaging

devices leads to ill-posedness of the reconstruction problem. Here, we introduce a general algorithmic framework based on regularized inversion to realize high-quality, high-resolution digital holographic imaging. Specifically, we exploited various signal priors of the sample including sparsity and learned implicit representations to suppress the phase ambiguities. We experimentally demonstrate our algorithm on various holographic imaging setups, including lensless on-chip microscopy, synthetic aperture imaging, and near-field ptychography.

14:00 - 14:05 Short Break

Tu-D: Sensing System

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

Satoru Higashino (Sony Storage Media Solutions, Japan)

Tu-D-01 **Invited**

14:05 **Transport-of-intensity microscopy under partially coherent conditions**

Naru Yoneda[1], Manoj Kumar[1], Joe Sakamoto[2], Takumi Tomoi[3], Osamu Matoba[1]

[1]Kobe University, [2]ExCELLS, [3]Tokyo University of Science (Japan)

Quantitative phase imaging (QPI) based on the transport of intensity equation (TIE) can be useful for various biological applications with partially coherent illumination condition. In this talk, we introduce the results of TIE-based QPI under commercially available confocal microscope and TIE-based three-dimensional imaging under self-built fluorescence microscope.

Tu-D-02

14:30 **Real-time Imaging of Transcutaneous Volatile Chemicals Using a Gas-Phase Biofluorometric Camera**

Kohji Mitsubayashi, Kenta Ichikawa, Kenta Iitani

Institute of Science Tokyo (Japan)

A biofluorometric gas-imaging system (sniff-cam) for ethanol in the gas phase was fabricated with an ADH (alcohol dehydrogenase) immobilized mesh and an NADH visualization unit (UV-LED sheet array & highly sensitive CCD), thus

imaging human ethanol vapor not only exhaled air but also skin gas after drinking.

Tu-D-03

14:50 **Low Frequency Bandwidth Characteristics of Self- Coupling Laser Doppler Velocimeter Using Triangular Wave Chirped Pulse Signal Processing**

Daiki Sato, Norio Tsuda

Aichi Institute of Technology (Japan)

Velocity measurement result of self-coupling Laser Doppler velocimeter in a frequency inversion environment using triangular chirp pulse signal processing were found to be generally accurate, but the measurement error was larger in the low-frequency region. In this study, the causes of this problem are also discussed.

Tu-D-04

15:10 **Time-Synchronized Wireless Camera Networks for 3D Imaging**

Joshua Kazuo Junker, Taiyou Mizuno, Akinori Furuya, Hiroyuki Kawai, Masahiro Ueno

Tokushima Bunri University (Japan)

This study presents a method for generating 3D images using wireless time-synchronized cameras, eliminating the need for wired connections. Using ZigBee technology, the system achieves a maximum time deviation of 23 milliseconds. The results show that wireless synchronization can accurately capture 3D images, comparable to traditional wired methods.

15:30 - 15:40 Break

Tu-E: Poster Session

Presiders: Koichi Iiyama (Kanazawa University, Japan)
Tetsuhiko Muroi (NHK, Japan)
Takayuki Shima (AIST, Japan)

15:40 - 17:40

Core time for the odd Tu-E numbers: 15:40-16:40
Core time for the even Tu-E numbers: 16:40-17:40

Tu-E-01

Formation of holographic memory using laser combiner consisting of three laser sources

with different wavelength for optical reconfiguration

Akifumi Ogiwara[1], Minoru Watanabe[2]

[1]Kobe City College of Technology, [2]Okayama University (Japan)

The formation of a holographic memory is proposed by using the optical setup composed of the laser combiner based on three laser sources with different wavelengths to develop the optical parallel performance for optically reconfigurable gate arrays.

Tu-E-02

Robust Multi-book Recording with Signal Beam Phase Optimization

Makoto Hosaka, Ryushi Fujimura

Utsunomiya University (Japan)

We developed a signal beam phase optimization technique for robust multi-book recording for holographic data storage. Optical simulation results show the inter-book-interference can be properly reduced by this technique. In addition, the almost same level of DC suppression to the conventional phase randomizing technique can be retained.

Tu-E-03

Design of Positioning Strategy for Aging Experiment in Collinear Holographic Data Storage System

Li Wang[1], Xu Zheng[1], Ruying Xiong[1], Zeyi Zeng[1], Hongjie Liu[1], Junchao Jin[1], Haiyang Song[1], Yongkun Lin[1], Chen He[1], Po Hu[2], Junhui Wu[1], Qingdong Li[1], Xiao Lin[1], Xiaodi Tan[1]

[1]Fujian Normal University, [2]Henan Key Laboratory of Smart Lighting (P.R.China),

When recording materials on the collinear holographic data storage system, due to strict Bragg conditions, it is difficult to accurately locate the recording position when the material is removed and replayed back into the system. We have designed a positioning strategy and verified its feasibility through experiments.

Tu-E-04

Additional Pattern Design Method Using Deep Learning for Multi-Level Self-

Referential Holographic Data Storage

Ryotaro Iwamoto, Masanori Takabayashi

Kyushu Institute of Technology (Japan)

We propose and numerically demonstrate the application of a deep learning-based additional pattern (AP) design method for multi-level self-referential holographic data storage (SR-HDS) realized using unequally spaced phase modulation (USPM) and complex amplitude modulation (CAM) methods.

Tu-E-05

Evaluation of magnetization patterns from changes in observed images due to the focal height of a scanning magneto-optical microscope

Yuya Suzuki, Tsubasa Ebihara, Ryota Komiya, Yuichi Nakamura, Pang Boey Lim

Toyohashi University of Technology (Japan)

In this study, the magnetization state of magnetic hologram was observed using a scanning magneto-optical microscope. The effect of the focal height of the objective lens on the observed image was evaluated, suggesting that it is possible to evaluate the magnetization state in three dimensions.

Tu-E-06

Single shot detection of polarization and phase encoded signal for holographic data storage with deep learning

Toru Tatsuki, Sota Aizawa, Ryushi Fujimura

Utsunomiya University (Japan)

This research proposes using deep learning for single-shot detection of phase and polarization states in holographic memory, addressing crosstalk issues. The model shows higher accuracy and recording density than traditional methods, suggesting further improvements with broader training data and including circular polarization signals.

Tu-E-07

Improving Storage Density Using Five-Ary Run-Length-Limited (1, 4) Modulation Code for Multilevel Optical Recording Channels

Zheng Fang[1], Meng Zhang[1], Tianwei Gui[1], Na Dong[2], Changsheng Xie[1], Fei Wu[1]

[1]Huazhong University of Science and Technology, [2]Wuhan Huaray Precision Laser Co., Ltd (P.R.China)

In this paper, we propose a novel five-ary run-length-limited (RLL) (1,4) code for multilevel optical recording channels. The code rate is 5/4 (bits/symbol), and the density ratio is 2.4 bits per minimum recording symbol ,which is larger than that of binary 17PP codes used for typical blu-ray disc recoding systems.

Tu-E-08

iRSPC: Exploiting Irregular Reed-Solomon Product Codes to Improve Reliability for Optical Disc Storage

Tianwei Gui, Meng Zhang, Zhihu Tan, Zheng Fang, Changsheng Xie, Fei Wu

Huazhong University of Science and Technology (P.R.China)

We propose an irregular Reed-Solomon product code (iRSPC) to improve the data reliability of optical disc storage. iRSPC improves the error correction capability for block errors by interleaving strong and weak error-correcting codewords in the rows and columns. In terms of error correction performance, iRSPC outperforms conventional RSPC codes.

Tu-E-09

Soft-Output Demodulation for High-Density Optical Storage

Haibo Xue, Ke Shi, Diqing Hu, Peixiang Zhan

Huazhong University of Science and Technology (P.R.China)

To address the challenges of high-density optical storage, we conducted a thorough analysis of the impact of crosstalk on the bit error rate, constructed a readback signal model based on an actual dataset, enhanced the Partial Response Maximum Likelihood method, and proposed two soft-output demodulation algorithms.

Tu-E-10

Adaptive Reed-Solomon Decoder for High-Density Optical Storage

Danyang Li, Diqing Hu, Ke Shi, Yang Liu

Huazhong University of Science and Technology (P.R.China)

In the era of rapid digitization, the challenges posed by the storage of vast quantities of cold data are driving the pursuit of higher storage densities in optical storage technology. However, increased storage density exacerbates the issues of inter-code and inter-channel crosstalk, leading to higher data bit error rates (BER), which complicates data error correction. Optical disk systems typically depend on Reed-Solomon (RS) codes for data error correction, thus demanding further analysis and design of RS decoding methods to meet the demands of high-density optical disk systems.To address the challenges, this paper introduces an RS decoding strategy that combines soft/hard decision decoding based on signal stream analyzing and splitting. This strategy utilizes the Maximum Likelihood Sequence Error Estimation (MLSE) to evaluate the signal quality and divides the signal flow into high BER stream and low BER stream. A hard decision decoding algorithm with higher efficiency decodes the low BER stream, and a soft decision decoding algorithm with superior error correction decodes the high BER stream. Therefore, this strategy promises enhanced decoding efficiency and robust error correction capabilities.

Tu-E-11

Analog signal recording method by forcibly applying PRML

Kimihiro Saito

Kindai University Technology College (Japan)

A simple method for analog recording on optical disc media by using forcibly applied conventional PRML is proposed. Various PR classes are simulated to investigate the reproducibility of the original analog signal. In PR21 case, an SNR of 20[dB] was obtained.

Tu-E-12

The effects of Bi, Dy, Al and Ga substitution on magneto-optical properties in yttrium iron garnet

Ilham Zaki Bin Mohd Daud[1], Sumiko Bharti Singh Chauhan[1], Shusuke Arai[2], Yuichi

Nakamura[1], Shinichiro Mito[2], Lim Pang Boey[1]

[1]Toyohashi University of Technology, [2]National Institute of Technology, Tokyo College (Japan)

In this study, RIG films with Bi, Dy, and Al or Ga substitutions were prepared by the Metal Organic Deposition (MOD) method to see the effects of substitution on the properties of magnetic garnets.

Tu-E-13

Deep Learning-Based Resolution Enhancement of Digital Holograms Using Spatial Frequency Domain Loss Function

Ryo Esaki, Masanori Takabayashi

Kyushu Institute of Technology (Japan)

We perform the experiment on off-axis digital holography to investigate the usefulness of deep learning for the resolution enhancement of digital holograms. We propose to use spatial frequency domain information as the loss function in the deep neural network to achieve further improvement of the resolution enhancement.

Tu-E-14

Single-pixel imaging with digital holographic optical system

Atsushi Mori, Shuhei Yoshida

Kindai University (Japan)

Single-pixel imaging (SPI) uses a single-pixel photodetector instead of an image sensor. In this study, we proposed a method for reconstructing the number of measurements by ghost imaging (GI) and digital holography (DH) using four-step phase shift method, and examined its effectiveness.

Tu-E-15

Diffraction tomography optics using spatial light modulator

Kochi Shodai, Kiori Mukai, Shuhei Yoshida

Kindai University (Japan)

The goal of this project is to realize high-precision 3D bio-imaging using optical diffraction tomography, which is an application of tomography techniques to digital holography.

Tu-E-16

Optical diffraction tomography based on parallel phase-shifting method

Kiori Mukai, Kochi Shodai, Shuhei Yoshida

Kindai University (Japan)

Optical diffraction tomography (ODT) is an application of tomography techniques to digital holography to enable measurement of three-dimensional information with higher precision. In this experiment, we constructed an ODT optical system based on the parallel phase shift method that can achieve both high resolution and high-speed measurement.

Tu-E-17

Digital ghost holography using the parallel phase-shifting optical system

Daisuke Hiraiwa, Shuhei Yoshida

Kindai University (Japan)

In this study, we created an optical system that applies digital holography using a parallel phase-shift method to the ghost imaging technique, and measured the complex amplitude. As a result, the complex amplitude was successfully obtained by the constructed optical system.

Tu-E-18

Parallel phase-shifting digital holography using a single-pixel detector

Saneto Matsuoka, Shuhei Yoshida

Kindai University (Japan)

Phase information, which cannot be obtained with ghost imaging optics, was successfully measured with a reduced number of measurements by combining phase-shift digital holography optics.

Tu-E-19

Wavefront measurement by digital ghost holography using spatial orthogonal basis

Ibuki Tsuchiya, Shuhei Yoshida

Kindai University (Japan)

Ghost imaging is an imaging technique that uses a single-pixel detector. The purpose of this study is to establish a GI method that can reconstruct

complex amplitude distributions by applying digital holography using parallel phase-shift optics to GI.

Tu-E-20

Study on image reconstruction for wavefront sensing with single pixel imaging

Naohiro Kobayashi, Kouichi Nitta

Kobe University (Japan)

Deep learning is applied to post signal processing in a method for single pixel imaging for the Shack Hartmann wavefront sensor. Considering the characteristics of patterns obtained images, physical enhanced deep learning is employed in our method. As results of the analysis, effectiveness of the developed processing is verified.

Tu-E-21

Reducing speckle noise by superimposing random phase in electro-holography

Sosuke Hidaka, Shuhei Yoshida

Kindai University (Japan)

This research aims to improve the quality of full-color reconstructed images in reflective electro-holography using a digital micromirror device (DMD) by superimposing random phases on the hologram.

Tu-E-22

Investigation of holographic movie with digital micromirror device

Takafumi Kinosada, Shuhei Yoshida

Kindai University (Japan)

Electro-holography is a technology that creates a hologram by computer calculation and projects a three-dimensional image using an optical system. This study investigated MEMS devices and fiber-coupled RGB lasers for full-color electronic holography video.

Tu-E-23

Super-resolution Optical Imaging of Amyloid Fibrils by Near-field Infrared Absorption Spectroscopy

Yuta Hamada[1], Toshiaki Hirose[1], Tatsuo

Dougakiuchi[2], Gen Takebe[2], Yoichi Kawada[2], Yoshimasa Kawata[1], Atsushi Ono[1]

[1]Shizuoka University, [2]Hamamatsu Photonics K.K. (Japan)

This study demonstrates super-resolution imaging of amyloid fibrils using near-field infrared absorption spectroscopy. This technique provides nanoscale resolution of α-helix and β-sheet structures, essential for understanding neurodegenerative diseases. We clearly observed the infrared absorption differences caused by the α-helix and ß-sheet within the amyloid fibrils with 30 nm super resolution.

Tu-E-24

Nonlocal meta-lens for narrowband imaging in visible

Rong Lin, Jin Yao, Mu Ku Chen, Din Ping Tsai

City University of Hong Kong (Hong Kong)

Narrowband imaging (NBI) is a specialized type of imaging technique used primarily in medical diagnostics and advanced display. In this work, we utilize a nonlocal meta-lens to replace the conventional color filter and optical lens for realizing filtering and focusing of incoherent white light simultaneously.

Tu-E-25

Fast and Accurate Three-Dimensional Object Profiling with FMCW Optical Ranging System

Asuka Higuchi, Yogetsu Nagasaka, Yuma Ebisu, Koichi Iiyama

Kanazawa University (Japan)

Three-dimensional object profiling system based the FMCW optical ranging system is developed. By optimizing the design of the auxiliary interferometer for sampling clock generation and improving the linearity of the optical frequency chirp of the laser, accurate profiling of a coin is realized in 0.62 sec measurement time.

Tu-E-26

Accurate FMCW LiDAR by Resampling method for eliminating nonlinearity in the optical frequency chirp

Masafumi Yasuda, Kondo Kosei, Koichi Iiyama

Kanazawa University (Japan)

The ranging performance of the FMCW LiDAR is seriously affected by the nonlinearity in the optical frequency chirp. Here we demonstrate FMCW LiDAR by the Resampling method to eliminate the influence of the nonlinearity. Fine and accurate ranging and object profiling about 50 m away are realized.

Tu-E-27

Simultaneous measurement of distance and velocity of moving target using FMCW LiDAR

Yasuyuki Mori, Yuki Momose, Koichi Iiyama

Kanazawa University (Japan)

Accurate FMCW LiDAR is developed by combination of using a pre-distorted modulation waveform of the laser for the optical frequency chirp and the k-sampling method. The distance and the velocity of a walking person can be simultaneously measured.

Tu-E-28

Study on the Design of LiDAR Optics with Wide FOV based on Single-Axis Rotation of a Polygonal Mirror

Wanchin Kim[1], No-Cheol Park[2]

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

This study investigates an optical system using a polygon mirror with varying pyramidal angles per facet for achieving a 120° horizontal and 30° vertical FoV. We expected that core concept can be utilized for enhancing scanning speed and structural stability while maintaining a compact design and minimizing light losses.

Tu-E-29

Accurate FMCW LiDAR using linearly optical frequency chirped DFB laser by modulation waveform optimization

Daiki Mieda, Meng Shan, Koichi Iiyama

Kanazawa University (Japan)

For accurate FMCW LiDAR, optical frequency of a laser should be linearly chirped. Here the optical frequency chirp of a DFB laser is

linearized by optimizing the modulation waveform with the resampling method using the auxiliary interferometer, and accurate object profiling is realized for the measurement range of 50 m.

Tu-E-30

Super-resolving Spectrometer via Spectral Inversion

Michał Lipka, Michał Parniak

University of Warsaw (Poland)

Mode-specific detection can overcome the classical limits of spectral resolution. We demonstrate a quantum-inspired spectral equivalent of image-inversion interferometry (spectral inversion) for dim, incoherent, and uncontrolled illumination containing spectral features with GHz-scale bandwidth. Experimentally a twofold improvement (super-resolution) over direct spectroscopy is observed.

Tu-E-31

Simultaneous Measurement of Velocity Distribution Based on Three-Dimensional Spatial Encoding Using Fiber Bundle

Shota Eguchi, Koichi Maru

Kagawa University (Japan)

This paper proposes a differential laser Doppler velocimeter (LDV) for simultaneous measurement of the three-dimensional velocity distribution by combining bias-frequency encoding and wavelength encoding. To validate the effectiveness of the proposed method, we conducted an experiment using an optical setup with a fiber bundle to use three wavelengths simultaneously.

Tu-E-32

Solution Process Zinc Tin Oxide Based Photo-Transistors for UV Sensing Application

Kaushlendra Agrahari, Shi-Jie Chen, S. Lakshmi Priya, Pravinraj Selvaraj, Yu-Wu Wang

National Changhua University of Education (R.O.C.)

An ultrahigh sensitive sol-gel zinc-tin oxide base phototransistors is reported. With a 550 μW/cm2 ultraviolet (UV) light illumination, this device

exhibits a sensitivity (responsivity) of 7.33 (0.21 A/W) and 1.34 (0.66 A/W) under atmosphere and vacuum environments, respectively. This proves the oxygen absorption effect during metal-oxide UV sensing process.

Tu-E-33

Efficiency Improvement of Si-based Grating Coupler in Integrated Probe for 3D Velocity Distribution Measurement

Shuya Yamada[1], Koichi Maru[1], Katsumi Nakatsuhara[2], Yoshiki Hayama[2]

[1]Kagawa University, [2]Kanagawa Institute of Technology (Japan)

A Si-based grating coupler that employs multiple layers in the integrated probe for three-dimensional velocity distribution measurements is presented. Simulation results on the relationship between the cladding layer thickness and input/output optical power efficiency showed that changes in cladding layer thickness affected the input/output optical power efficiency.

Tu-E-34

Measurement of Low-Frequency Laser Noise down to DC using a Current-Compensated Photoreceiver

Takahiro Uchida[1], Mitsuru Shinagawa[1], Jun Katsuyama[2], Yoshinori Matsumoto[2], Shinichiro Tezuka[2]

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

An electro-optic sensor is necessary for measuring electric-fields from organic photovoltaics or powder charging in the low-frequency region down to DC. In this paper, a current-compensated photoreceiver was used to expand the bandwidth of the electro-optic sensor, and the laser noise was measured in low-frequency region down to DC.

Tu-E-35

FMCW optical ranging system by comparison of instantaneous beat frequency

Keigo Tsujimura, Saiya Fukushima, Koichi Iiyama

Kanazawa University (Japan)

In the FMCW optical ranging system, the ranging accuracy is seriously affected by nonlinearity in the optical frequency sweep. Here we propose a novel ranging algorithm by comparing the instantaneous beat frequency of the sensing signal and the beat signal generated in the auxiliary interferometer.

Tu-E-36

Optical Response Change due to Polymorphic Crystal-Crystal Transition of MnTe: Application to Phase Change Optical Switches

Haruyuki Sano[1], Masashi Kuwahara[2], Hitoshi Kawashima[2], Hiroyuki Tsuda[3], Goro Mizutani[4], Toshu An[4]

[1]National Institute of Technology, Ishikawa College, [2]National Institute of Advanced Industrial Science and Technology, [3]Keio University, [4]Japan Advanced Institute of Science and Technology (Japan)

First-principles calculations revealed how the phase transition of MnTe causes changes in the refractive index. The light propagation simulations of phase change optical switches containing MnTe films demonstrated that the optical switch can be effectively operated due to the phase change of MnTe.

Tu-E-37

Modeling of Skin Appearance with UV Scattering Agents in Ray-tracing Simulation

Ryoue Hirosawa[1], Masato Toyoda[1], Tomoaki Kashiwao[1], Tomomi Ito[2], Ryo Takeda[2], Atsuko Kubota[2]

[1]Kindai University, [2]Sumitomo Osaka Cement Co., Ltd (Japan)

UV is the serious matter because of global warming. It is harmful to human body. Therefore, UV scattering agents(e.g., sunscreen, foundation) is required. We study a simulation development environment for UV scattering agents containing ZnO particles was built by modeling the skin appearance.

Tu-E-38

A 6G Meta-device for 3D Varifocal

Jingcheng Zhang, Din Ping Tsai

City University of Hong Kong (Hong Kong)

Existing methods have limitations in controlling the radiation direction and coverage area of beams in THz bands without excessive active components. Rotary metasurface technology can overcome these limitations and increase directivity, security, and flexibility in future 6G applications.

Tu-E-39

Nanoparticle Refractive Indexes for Improving Total Luminous Flux of a White LED with Reduced Encapsulating Resin Transmittance

Yuki Hashimoto[1], Tomoaki Kashiwao[1], Kasumi Koyama[1], Tomomi Ito[2], Ryo Takeda[2], Atsuko Kubota[2]

[1]Kindai University, [2]Sumitomo Osaka Cement Co., Ltd (Japan)

We have previously confirmed that nanoparticles in the encapsulating resin of the white light-emitting diode improves the total luminous flux. This study thus uses nanoparticles with different refractive indices encapsulated in the encapsulating resin to investigate the total luminous flux improvement when the transmittance of the encapsulating resin is reduced.

Tu-E-40

Polymer-Dispersed Liquid Crystal Optical Devices Based on the 4D Printing of Photo-Polymerization

Sheng-Yuan Zhang, Hsi-Fu Shih

National ChungHsing University (R.O.C.)

This study investigated the integration of 3D printing of photo-polymerization with the polymer-dispersed liquid crystal (PDLC) technique to create 4D printing optical devices. The printed 3D elements, including Fresnel lenses and gratings combined with PDLC, possess the ability of varying light intensity and exhibit the characteristics of 4D printing.

Tu-E-41 **Withdrawn**

Tu-E-42

Meta-devices for Novel Applications

Jin Yao, Rong Lin, Jingcheng Zhang, Din Ping Tsai

City University of Hong Kong (Hong Kong)

Metasurfaces composed of artificially customized meta-atoms have drawn significant attention because of their preeminent electromagnetic properties exceeding nature materials, which have been widely applied in imaging, nonlinear meta-lens, quantum sources. With the rapid development of meta-optics, meta-devices with fixed responses, and functionalities cannot fulfill the complex requirements in practical operations. To overcome this limitation, tunable metasurfaces have been proposed to dynamically manipulate the electromagnetic responses.

Tu-E-43

Inline Dual-Phase Modulation Method for Enhancing Compactness and Accuracy of LCOS-Based Wave Shaper

Jianglian Wang[1], Atsushi Okamoto[1], Yuta Goto[2], Akihisa Tomita[1]

[1]Hokkaido University, [2]National Institute of Information and Communications Technology (NICT) (Japan)

We propose an Inline Dual-phase Modulation Method (IDPM) to enhance compactness and modulation accuracy in Liquid crystal on silicon (LCOS) wave shaper by using superimposed blazed gratings for simultaneous phase-modulating the upper and lower parts of a single spatial light modulator (SLM).

Tu-E-44

Numerical Simulations of Optoelectronic Deep Neural Network Using Trainable Activation Function

Taichi Takatsu, Rio Tomioka, Masanori Takabayashi

Kyushu Institute of Technology (Japan)

We propose to apply a trainable activation function for optoelectronic deep neural networks (OE-DNNs). The numerical simulations on 4-class complex-valued image classification demonstrated a 10% improvement in accuracy, confirming the effectiveness of this approach. This method is expected to enhance learning

accuracy in various OE-DNN models.

Tu-E-45

Investigation of optical path length control algorithm for higher-power fiber lasers

Kota Kitamura, Shuhei Yoshida

Kindai University (Japan)

There is an optical system for increasing the output power of fiber lasers using coherent addition. This research adds a controller to the coherent addition optical system to develop and automatically control the optical path length. The purpose of this study is to improve the control algorithm of this system.

Tu-E-46

A study on the development of a location information acquisition device

Yukari Akesaka, Yoshikazu Yamamoto, Akinori Furuya

Tokushima Bunri University (Japan)

With GPS usage widespread, location-based research and services have become common. We developed a device and system to accurately obtain and store location data, tracking movements of tourists and Shikoku pilgrims.

Tu-E-47 **Technical Demonstration**

Aerial Optical Equipments Using Hard Candy for Aero Signage Which is Floating in the Air and Enables to Make Images Invisible from Back Side

Kunio Sakamoto, Kanaho Ishikawa

Konan University (Japan)

We have developed one-way observable window signage. But observers could not freely walk through images although they appear to be floating in the air. This paper shows optical equipments for aerial display using hard candy made from boiled down sugar with water which will harden and can keep its shape.

Tu-PP-01

Proposal of a table-top-screen-type volume holographic combiner

Taiyo Kikuchi, Daisuke Barada

Utsunomiya University (Japan)

A table-top-screen-type combiner for AR is proposed to address the 180° field-of-view limitation of previous head-mounted displays. This design allows for naked-eye viewing, providing a wider field of view and larger eyebox, offering a novel approach beyond conventional AR glasses.

Tu-PP-02

Proposal of a method for rotational motion of walking human body with LiDAR

Shota Hasui, Daisuke Barada

Utsunomiya University (Japan)

This study explores a simplified single-camera method for tracking human motion, focusing on estimating upper body posture without markers. Building on previous work with gradient square markers and depth cameras, it proposes a method using a top-down view to estimate posture based on deviations from a reference standard over time.

17:40 - 18:20 Break (Move to Banquet)

18:20 - 20:20 Banquet

Oct. 23, 2024 (Wednesday)

We-A: [Special Session] AI and Deep Learning

Presiders: Tetsuhiko Muroi (NHK, Japan)
Masanori Takabayashi (Kyushu Institute of Technology, Japan)

We-A-01 Invited

8:50 Development of magneto-optical diffractive deep neural network device

Takayuki Ishibashi[1], Hotaka Sakaguchi[1], Honma Takuma[1], Reo Akagawa[1], Juri Ikeda[1], Jian Zhang[1], Fatima Zahra Chafi[1], Satoshi Sumi[2], Hiroyuki Awano[2], Hirofumi Nonaka[3]

[1]Nagaoka University of Technology, [2]Toyota Technological Institute, [3]Aichi Institute of Technology (Japan)

We have proposed the magneto-optical diffractive deep neural network device (MO-D2NN). This device can perform calculations utilizing light propagation in hidden layers made of MO materials, in which phase modulations and diffractions are controlled by MO effect. We will report on the simulation and development status of MO-D2NN.

We-A-02 **Invited**

9:15 **Photonic reservoir computing and decision making for artificial intelligence**

Atsushi Uchida

Saitama University (Japan)

We introduce a scheme of transfer learning to improve the performance of photonic reservoir computing using a semiconductor laser with opitcal feedback. In addition, we experimentally perform photonic decision making for a large number of slot machines.

We-A-03

9:40 **Efficient Extraction of Colliding Droplet Holograms Using Machine Learning**

Dai Nakai[1, 2], Yohsuke Tanaka[1]

[1]Kyoto Institute. of Technology, [2]Japan Society for the Promotion of Science (Japan)

A machine learning model was developed to identify holograms of colliding water droplets. The model, trained on a balanced dataset of synthetic holograms, maintained high recall even on imbalanced datasets with proximity to non-proximity hologram ratios ranging from 1:1 to 1:10000, demonstrating its potential for extracting rare collision events.

We-A-04

10:00 **Broadband Achromatic Thermal Metalens for Gesture Recognition Application**

Bo-Jyun Chen[1], Pin-Do Chen[1], Wei-Lun Hsu[1], Chih-Chun Tan[1], Qiu-Chun Zeng[1], Chen-Yi Yu[1], Yen-Chun Chen[1], Noreena Yi-Chin Liu[2], Chih-Ming Wang[1]

[1]National Central University (R.O.C.), [2]Universiti Brunei Darussalam (Brunei)

We presents a high-resolution wafer-level thermal imaging metalens created via i-line

stepper lithography and silicon deep etching. Teamed with a CNN model, it delivered 94.8% accuracy in recognizing gestures, underscoring its efficacy in thermal imaging feature identification.

10:20 - 10:40 Break

We-B: Computational Imaging II

Presider: Shinsaku Hiura (University of Hyogo, Japan)

We-B-01 **Invited**

10:40 **Advanced Imaging through Random Media: High-Speed Holographic Imaging and Deep Learning-Based Single-Pixel Imaging**

Eriko Watanabe[1], Shinjiro Kodama[1], Chihiro Sato[1], Ayaka Tabuchi[1], Katsunari Okamoto[2], Mitsuo Takeda[3]

[1]The University of Electro-Communications, [2]Okamoto Laboratory, [3]Utsunomiya University (Japan)

Two advanced imaging technologies are presented that visualize objects disturbed through scattering and turbulent media. The first technology is high-speed 3D imaging behind heterogeneous composite media using a Functionally Integrated Waveguide Illuminator based on common-path digital holography. The second technology is single pixel imaging using deep learning reconstruction to suppress atmospheric turbulence.

We-B-02

11:05 **Single-pixel optical “fire extinguisher”**

Zilin Deng, Sicheng Long, Zibang Zhang, Ying Li, Shiping Li, Jingang Zhong

Jinan University (P.R.China)

We report a single-pixel computational optical imaging technique that can see through flames. Flames can be computationally muted in the images recovered through structured illumination and the associated image recovery algorithm. Consequently, an optical fire “distinguisher” is achieved. The reported technique operates at the visible waveband and can see a dynamic scene through flames at the video frame rate in real time.

We-B-03

11:25 **Scanning single-pixel imaging with binary random structured illumination**

Masahiro Imafuku, Takanori Nomura, Yusuke Saita

Wakayama University (Japan)

Scanning single-pixel imaging with binary random structured illumination that can obtain an object image at an arbitrary depth position is proposed. Simulation results show the feasibility of the proposed method for three-dimensional imaging.

11:45 - 13:15 Lunch

We-C: Holographic Memory II

Presider: Satoru Higashino (Sony Storage Media Solutions, Japan)

We-C-01 **Invited**

13:15 **Large capacity holographic data storage using deep learning**

Jianying Hao[1], Xiao Lin[2], Ryushi Fujimura[3], Soki Hirayama[1], Tsutomu Shimura[1], Xiaodi Tan[2]

[1]The University of Tokyo (Japan), [2]Fujian Normal University (P.R.China), [3]Utsunomiya University (Japan)

Traditional holographic data storage only use amplitude to encode information, not fully exploiting capacity potential. In addition to amplitude multi-valued phase encoding can also be utilized to enhance storage capacity. In this report, we introduced deep learning method for complex amplitude decoding, the optical system is simple, stable, and offers higher retrieval accuracy.

We-C-02 **Invited**

13:40 **The Practice of Holographic Data Storage**

Xiao Lin[1], Jianying Hao[2], Yongkun Lin[1], Hongjie Liu[1], Ruixian Chen[1], Rupeng Yang[1], Jing Xu[1], Dakui Lin[1], Xiaodi Tan[1]

[1]Fujian Normal University (P.R.China), [2]The University of Tokyo (Japan)

We study some practical problems in holographic data storage system such as the efficiency of encoding and decoding, the performance of recording media, servo system and high speed reading match. We hope these work will be

helpful for breaking through the bottlenecks of holographic data storage.

We-C-03 Invited

14:05 High-speed recording of holograms by synchronous movement of media and spherical reference wave

Shuhei Yoshida[1], Atsushi Fukumoto[2], Manabu Yamamoto[2]

[1]Kindai University, [2]HoloStorage Inc. (Japan)

This study investigated a high-speed recording technique for holographic data storage by synchronously shifting the reference light and the medium. The signal light's power density is increased using a line beam, and the holograms are recorded at high speed by synchronous shifts of the reference light and the medium.

14:30 - 14:35 Short Break

We-PD: Post Deadline

Presider: Yuichi Nakamura (Toyohashi University of Technology, Japan)

We-PD-01

14:35 Optical Label-free Super-resolution Microscopy By Superoscillation Illumination

Yi Zhou, Wu Shikai, Xiang Jin, Shang Zhengguo, Liang Gaofeng, Zhang Zhihai, Wen Zhongquan, Chen Gang

Chongqing University (P.R.China)

In this work, we proposed a label-free super-resolution microscopy using non-diffraction superoscillation beam illumination. We developed a transmission-mode confocal optical microscopy and experimentally demonstrated an imaging resolution of 0.285 λ (λ=632.8 nm).

We-PD-02

14:50 Multi-channel and Crosstalk-free Holographic Display by a Spin and Angle Co-multiplexed Metahologram

Cheng Zhang

Huazhong University (P.R.China)

We present a novel type of waveguide-based six-channel metaholograms co-multiplexed by spin and azimuthal angle of an incident guided light.

Six target images can be respectively displayed free of crosstalk when the metahologram is under guided light illumination with selected spin and azimuthal angle.

15:05 - 15:10 Short Break

15:10 - 15:25 Award & Closing

AUTHOR INDEX

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自「羽田空港」

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Arcrea HIMEJI Floor Map

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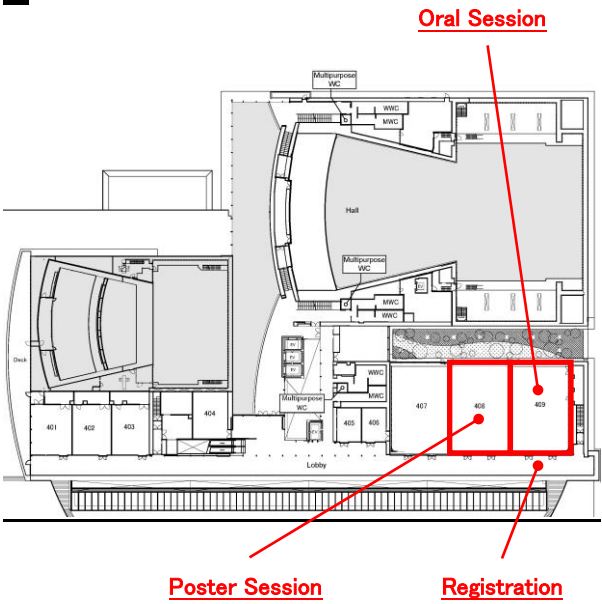

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Shown below are some candidate hotels near the ISOM'24 conference site (Arcrea HIMEJI).

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  https://www.hotelmonterey.co.jp/himeji/
- Daiwa Roynet Hotel HIMEJI
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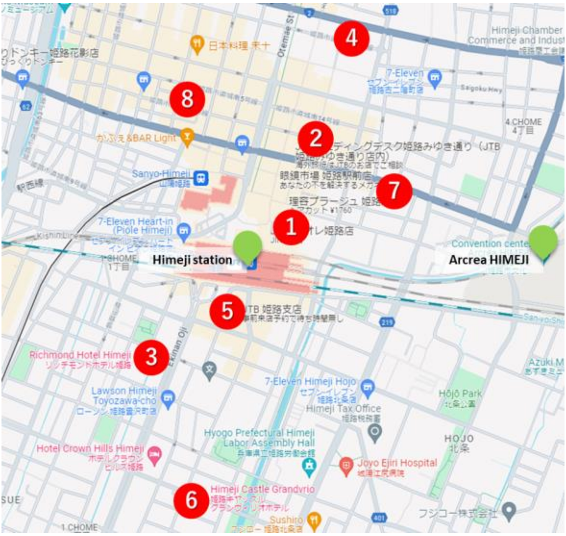
  https://www.himejicastlehotel.co.jp/
- Comfort Hotel Himeji
  https://www.choice-hotels.jp/hotel/himeji/
- Hotel Clair Higasa
  https://www.hotel-higasa.com/

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.

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

CITY AND HOTEL MAP



① Hotel Monterey Himeji

② Daiwa Roynet Hotel HIMEJI

③ Richmond Hotel Himeji

④ Hotel Wing International Himeji

⑤ Hotel Nikko Himeji

⑥ Himeji Castle Grandvrio Hotel

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