TECHNICAL PROGRAM

Oct. 19, 2025 (Sunday)

17:00 **Get Together**

Oct. 20, 2025 (Monday)

Mo-A: Opening Remarks & Keynote

Presider: Takayuki Shima (AIST, Japan)

Opening Remarks

8:40
Takanori Nomura (Wakayama Univercity, Japan)
Yuichi Nakamura (Toyohashi University of Technology, Japan)

Mo-A-01 **Keynote**
8:55 **Pb optical data storage and beyond**

Min Gu

University of Shanghai for Science and Technology (P.R.China)

Although big data centres that use electronic or magnetic recording media have emerged as a technology platform for storing a vast amount of data, this technology is not a sustainable solution for the digital future because a big data centre storing Petabyte data information needs huge space and consumes a significant amount of energy. However, 70%-90% of the generated data are cold data which do not need a frequent access and would not require energy for achieving. The optical data storage technology, though it has its distinguished feature of low energy consumption, has not been competitive due to the fundamental physical limit called Abbe's law discovered by a German physicist, Ernst Abbe, in 1873. Abbe's barrier means that the size of the information bits is approximately 300 nm, for example, in a blue-ray disk, resulting in the capacity cap of tens of Gigabytes for each disk. In 2013, researchers show Abbe's barrier can be broken with the development of optical beam nanolithography. Therefore, the information bit size can be remarkably reduced to 9 nm, which means that the potential capacity of an optical disk could be as high as Petabytes.

9:30 - 9:35 Short Break

Mo-B: Display

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

Mo-B-01 **Invited**

9:35 **Design and fabrication of freeform holographic optical elements**

Rengmao Wu

Zhejiang University (P.R.China)

Holographic optical elements (HOEs) can be broadly divided into photopolymer HOEs (PPHOEs) and liquid-crystal HOEs (LCHOEs). In order to enhance the degrees of freedom of phase modulation, we employ freeform wavefronts to fabricate photopolymer HOEs and liquid-crystal POEs, which yields high-performance freeform photopolymer HOEs and freeform liquid-crystal POEs.

Mo-B-02

10:00 **Naked-Eye Stereoscopic Viewing of Dual-Projected Images Using a Reflective Volume Holographic Element**

Tomoyo Ota, Daisuke Barada

Utsunomiya University (Japan)

In this study, an AR display that enables naked-eye stereoscopic viewing from multiple viewpoints is investigated. It is expected to be used to view virtual objects from different viewpoints and to allow multiple people to view 3-D images. Multiple images are diffracted independently by a hologram for stereopsis.

10:20 - 10:40 Break

Mo-C: Imaging for Measurement and Analysis

Presiders: Ryushi Fujimura (Utsunomiya University, Japan)
Shuhei Yoshida (Kindai University, Japan)

Mo-C-01 **Invited**

10:40 **Polarizing multiplexing imaging and further**

Ki-Nam Joo[1], Seongwook Jang[1], Luke D. Mayer[2], Daewook Kim[2]

[1]Chosun University (Korea), [2]University of Arizona (U.S.A.)

In this presentation, various polarization multiplexed optical systems are introduced. With the aid of a polarization camera, four kinds of polarized images can be simultaneously obtained,

and it is used for snapshot measurements. Shearing interferometry, rotation measurement of an object and 2D wavelength mapping techniques are explained and experimentally verified.

Mo-C-02

11:05 Passive mode measurement for incoherent quantum-inspired super-resolution imaging

Qiushuang Lian, Qiaofeng Tan, Liangcai Cao

Tsinghua Univ. (P.R.China)

We propose a passive super-resolution imaging method using hologram-based spatial mode measurement. Inspired by quantum spatial demultiplexing, our approach enables sub-Rayleigh localization of incoherent sources without active illumination. Experiments demonstrate accurate reconstruction of point pairs, showing potential for non-invasive imaging in challenging environments.

Mo-C-03

11:25 Arrayed Digitally Directed Beams for Optical Inspection

Hiroshi Ohno

Toshiba Corp. (Japan)

An array of digitally directed beams capable of instantaneously controlling their direction at every point within a wide field of view, is proposed for the inspection of microscale defects in manufacturing processes. Bundles of arrayed beams, with directionality color-encoded, have been shown to effectively capture microscale ridges with high clarity.

Mo-C-04

11:45 Estimating Locations from SNS Images Using Shizuoka Prefecture's 3D Point Cloud Data

Takahito Umehara, Masaki Shiozaki, Masaki Nagata

Shizuoka University (Japan)

We geolocate social-media disaster images by matching them to virtual views rendered from a Cesium digital twin built with Shizuoka Prefecture 3D point clouds. A triplet-trained LPIPS feature extractor indexed with FAISS achieves 700× faster retrieval than exhaustive LPIPS while maintaining comparable accuracy.

12:05 - 13:35 Lunch

Mo-D: Digital Holography I

Presiders: Tetsuhiko Muroi (NHK, Japan)
Hiroshi Ohno (Toshiba Corporation, Japan)

Mo-D-01

13:35 **Volumetric beam shaping for holographic laser processing**

Nami Kuroo, Yoshio Hayasaki

Utsunomiya University (Japan)

Design framework for volumetric beam shaping enables three-dimensional control of laser beams. Holographic beam shaping is implemented by displaying a computer-generated hologram (CGH) on a spatial light modulator (SLM). Holographic laser processing using this framework improved functionality while meeting industry demands for quality and throughput.

Mo-D-02

13:55 **Observation of liquid drying process using digital holography with linear imaging sensor**

Yuma Sato, Yoshio Hayasaki

Utsunomiya University (Japan)

In this study, digital holography is realized using a linear sensor to measure the height of objects moving in a straight line. A one-dimensional Fourier transform method is applied. This DH system can measure objects moving at a high speed. We have named this method “linear digital holography.”

Mo-D-03

14:15 **Simultaneous recording of audible and ultrasound fields by parallel phase-shifting digital holography**

Daiki Ishii[1], Sudheesh K Rajput[1], Kenzo Nishio[1], Hou Natsu[2], Osamu Matoba[3], Yasuhiro Awatsuji[1]

[1]Kyoto Institute of Technology , [2]National Institute of Advanced Industrial Science and Technology, [3]Kobe University (Japan)

Simultaneous recording of audible and ultrasonic fields was experimentally demonstrated using parallel phase-shift digital holography (PPSDH). A PPSDH system with a high-speed polarization camera was constructed to record both sound fields simultaneously. The frequencies of the 15 kHz and 40 kHz sound fields emanating from individual speakers were clearly reconstructed.

Mo-D-04

14:35 **3D Tracking of Multiple Microorganisms Using Twin Images in FIWI-Based Digital Holography**

Chihiro Sato, Kousuke Nakao, Maryam Faheem, Rintaro Horimizu, Ayaka Tabuchi, Eriko Watanabe

The University of Electro-Communications (Japan)

A compact digital holographic microscopy system using a functionally integrated waveguide illuminator realizes two adjacent light sources for depth-resolved tracking. This configuration enables geometric estimation of three-dimensional (3D) positions from interference patterns without reconstruction. Combined with deep learning-based detection, the method achieves accurate, efficient 3D tracking of multiple objects.

14:55 - 15:15 Break

Mo-E: Optical Memory I

Presiders: Satoru Higashino (Sony Storage Media Solutions, Japan)
Daisuke Barada (Utsunomiya University, Japan)

Mo-E-01

15:15 **Detection of Intensity-Phase-Modulated Multilevel Signals Using a Designed Phase Mask**

Takuya Nonaka, Ryushi Fujimura

Utsunomiya University (Japan)

We detected and evaluated intensity-phase modulated multilevel signals using a newly designed phase mask in holographic data storage. By adding phase signals to the non-signal areas of a conventional designed mask, the recording density was improved while preserving the crosstalk noise suppression concept.

Mo-E-02

15:35 **Information Storage Based on Polarization Holographic Modulation of Light Field Amplitude, Phase, and Polarization**

Xueyan Chen, Hongjie Liu, Shujun Zheng, Jinyu Wang, Ruixian Chen, Lin Peng, Ruying Xiong, Xu Zheng, Dakui Lin, Xiao Lin, Yi Yang, Xiaodi Tan

Fujian Normal University (P.R.China)

This work achieves dual-channel storage via orthogonal linear polarization's faithful reconstruction and null reconstruction in polarization holography. Moreover, deep learning is utilized to reconstruct stored data, and the recovery performance of amplitude/phase information under varying diffraction distances is thoroughly analyzed.

Mo-E-03

15:55 **Three-dimensional Modulated Holographic Data Storage by Amplitude, Phase and Polarization**

Shenghui Ke, Shujun Zheng, Yongkun Lin, Hongjie Liu, Luyi Xie, Xueyan Chen, Junhui Wu, Jingjun Huang, Yi Yang, Xiao Lin, Xiaodi Tan

Fujian Normal University (P.R.China)

By using orthogonal circularly polarized dual channels to achieve three-dimensional holographic data storage by the amplitude, phase and polarization of light under paraxial approximation conditions. The experimental results show that when decoding the recorded multi-dimensional holograms, the amplitudes and phase BRE of both are less than or equal to 0.5%.

Mo-E-04

16:15 **Effect of Diffusion Barrier Layer in Multilayer Recording Media for Magnetic Hologram Memory**

Misako Okamoto, Sumiko Bharti Singh Chauhan, Yuichi Nakamura, Pang Boey Lim

Toyohashi University of Technology (Japan)

In multilayer recording media for magnetic hologram memory, Ga diffusion from the heat dissipation layers that are inserted to suppress the effect of heat diffusion, may decrease the Faraday rotation angle. In this study, we investigated the effect of diffusion barrier layers on the design and properties of multilayer media.

16:35 - 16:40 Short Break

Mo-F: Information Processing and Microfabrication

Presider: Koichi Iiyama (Kanazawa University, Japan)

Mo-F-01 **Invited**

16:40 **Recent Progress of Silicon Photonics for Quantum Information and Communication Technologies**

Nobuyuki Matsuda

Tohoku Univ. (Japan)

Research and development in quantum computing and communication are heating up. I will discuss the recent progress of quantum information processing devices based on silicon photonics, as well as future prospects in the field.

Mo-F-02 **Invited**

17:05 **Computer-Generated Holography for Laser Microfabrication**

Satoshi Hasegawa

Utsunomiya Univ. (Japan)

We demonstrate holographic laser microfabrication using computer-generated holograms displayed on a spatial light modulator. Applications include high-speed periodic structuring via pulse-to-pulse beam modulation, microscopic QR code fabrication using multi-spot beams, and selective ITO film delamination with line beams. The results highlight precision, versatility, and industrial relevance in microfabrication processes.

Mo-F-03

17:30 **U-Net-based modeling and initial evaluation of input-output mapping in a multimode fiber**

Nanami Yoshida, Kanami Ikeda, Sota Ogawa, Osanori Koyama, Makoto Yamada

Osaka Metropolitan University (Japan)

We employed U-Net to model the input-output mapping of a multimode fiber by training two models: Image-to-Speckle and Speckle-to-Image. The Speckle-to-Image model successfully reconstructed images from both experimentally acquired and model-generated speckle patterns, demonstrating that two models effectively learn the mapping.