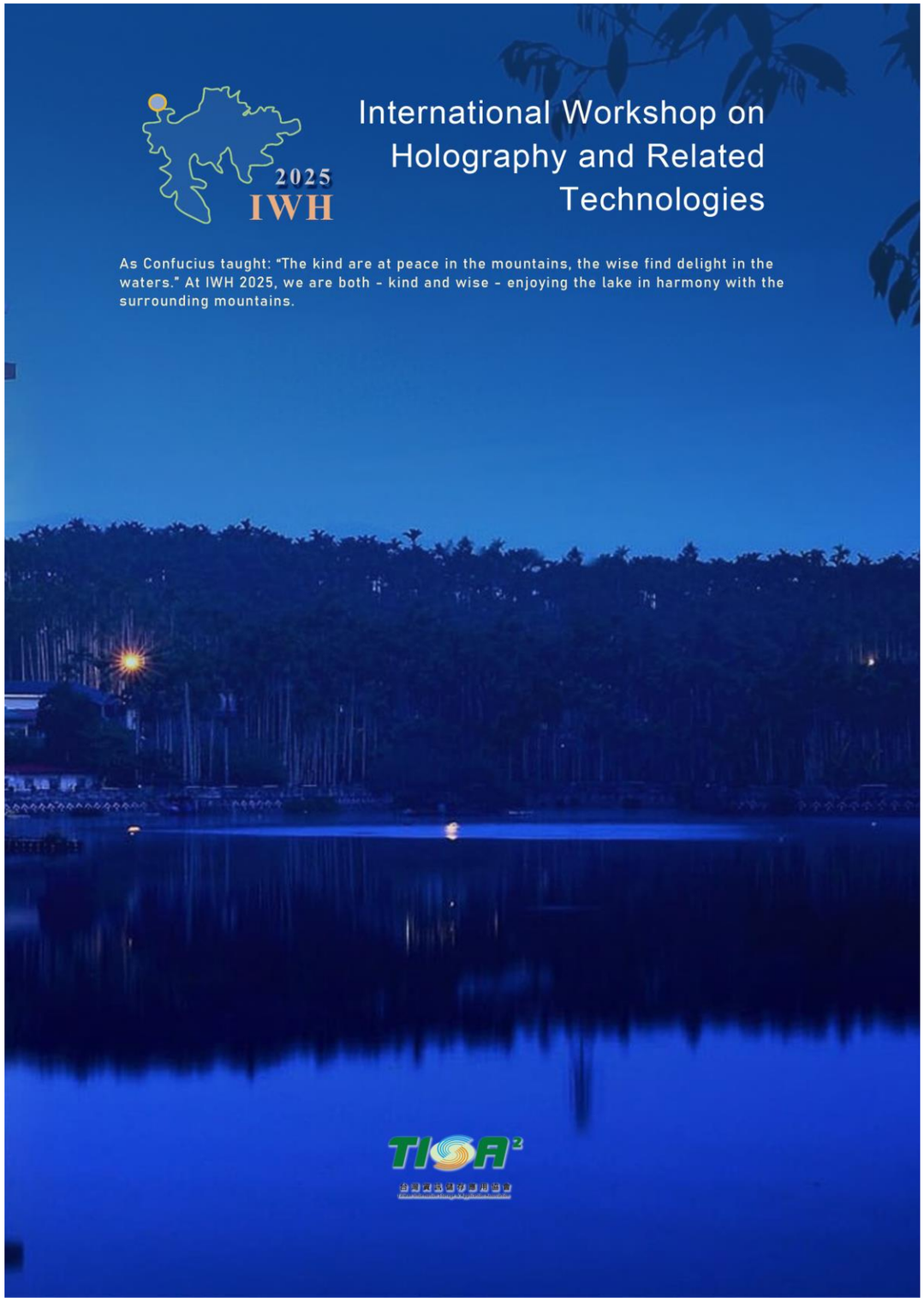


Book of Program

International Workshop on
Holography & Related Technologies

12-14 November 2025, Sun Moon Lake Hotel, Taiwan

Organized by

DOP (National Central University / Taiwan)
Taiwan Information Storage & Application Association

Sponsor

National Science and Technology Council, Taiwan
Ministry of Education, Taiwan
National Central University Foundation,Taiwan
國科會前瞻延展實境智慧顯示科技專案計畫

PREFACE

Dear Colleagues and Guests,

The organizing Committee warmly welcomes you to join the International Workshop on Holography and Related Technologies (IWH 2025) during 12-14 November 2025 in Sun Moon Lake Hotel, Taiwan.

The aim of the IWH 2025 conference is to bring together scientists from all aspects on holography and related technologies, holographic memories, displays, holographic measurement, computer generated holograms and digital holography, ranging from their fundamental physics and technologies to practical systems. We believe the event will provide many opportunities for the participants to discuss and exchange new ideas and to find partners for future collaborations. We also welcome young scientists to join the event and to share their research progress.

The conference is jointly organized by the Department of Optics and Photonics, National Central University, Taiwan, and the Taiwan Information Storage & Application Association. We would like to extend our sincere appreciation to the Ministry of Education, the National Science and Technology Council and National Central University Foundation for their generous financial support. We also gratefully acknowledge our international partners and collaborators for their invaluable contributions to the successful organization of this conference.

With warmest regards,

Prof. Ching-Cherng Sun
Conference Chair
IWH 2025

CONFERENCE CHAIRPERSON/ COMMITTEE MEMBERS

Honorary Chair

Ken-Yuh Hsu (Natl. Yang Ming Chiao Tung Univ.)

General Chair

Ching-Cherng Sun (Natl. Central Univ.)

Steering Committee

Chair

W. C. Su (Natl. Changhua Univ. of Edu., Taiwan)
T. Shimura (Univ. of Tokyo, Japan)

Members

C. F. Chang (Dasen Go Culture and Art Foundation)
C. S. Wu (Natl. Central Univ.)
C. Y. Cheng (Natl. Central Univ.)
H. Horimai (EGARIM)
K. Yamamoto (Tokushima University)
P. C. Liu (Datarit Tech. Inc.)
T. J. Yen (Natl. Tsing Hua Univ.)
T. R. Jeng (Industrial Tech. Research Inst.)
W. K. Lin (Feng Chia Univ.)

Program Committee

Chair

S. H. Lin (Natl. Yang Ming Chiao Tung Univ.)

Members

C. J. Cheng (Natl. Taiwan Normal Univ.)
C. C. Hsu (Natl. United Univ.)
F. L. Hsiao (Natl. Changhua Univ. of Edu.)
H. C. Chen (Fu Jen Catholic Univ.)
H. F. Shih (Natl. Chung Hsing Univ.)
H. M. Chen (Natl. Yang Ming Chiao Tung Univ.)
H. Y. Lin (Natl. Taiwan Univ.)
J. H. Chen (Feng Chia Univ.)
J. P. Liu (Feng Chia Univ.)

J. Y. Lee (Natl. Central Univ.)
K. H. Chen (Feng Chia Univ.)
L. Cao (Tsinghua Univ.)
N. J. Cheng (Natl. Kaohsiung Univ. Sci. & Tech.)
R. Fujimura (Utsunomiya Univ.)
S. H. Ma (Feng Chia Univ.)
V. Marinova (Bulgarian Academy of Sciences)
W. F. Hsu (Natl. Taipei Univ. of Tech.)
W. H. Su (Natl. Sun Yat-sen Univ.)
Y. W. Yu (Natl. Central Univ.)
Y. Luo (Natl. Taiwan Univ.)

INTERNATIONAL ADVISORY COMMITTEE

D. Psaltis (EPFL)
G. Jin (Tsinghua Univ.)
H. Yoshikawa (Nihon Univ.)
K. Kuroda (Utsunomiya Univ.)
K. Y. Hsu (Natl. Yang Ming Chiao Tung Univ.)
L. Hesselink (Stanford Univ.)
M. Inoue (Toyohashi Univ. Tech.)
M. Yamaguchi (Tokyo Inst. Tech.)
O. Matoba (Kobe Univ.)
T. Ito (Chiba Univ.)
T. Nomura (Wakayama Univ.)
T. Kubota (Kubota Holography Lab.)
T. Yatagai (Utsunomiya Univ.)
Y. Awatsuji (Kyoto Inst. Tech.)
Y. Hayasaki (Utsunomiya Univ.)
Y. Sakamoto (Hokkaido Univ.)

Agenda

	November 12 (Wed.)	November 13 (Thu.)	November 14 (Fri.)
		Holographic Technologies	Holographic Devices and Systems I
		Vera Marinova/Yeh-Wei Yu	Wei-Chia Su/Wen-Kai Lin
		8:50~9:15 TI-P-01 Tsutomu Shimura	8:50~9:15 FI-P-01 Yuan Luo
		9:15~9:35 TI-I-01 Yeh-Wei Yu	9:15~9:35 FI-I-01 Jung-Ping Liu
		9:35~9:55 TI-I-02 Tomoyoshi Shimobaba	9:35~9:55 FI-I-02 Daisuke Barada
		9:55~10:15 TI-I-03 Wei-Hung Su	9:55~10:10 FI-C-01 Tzu-Chieh Huang
10:15 - 10:30		Coffee Break	Coffee Break
10:30 - 12:05	Arrival, Conference registration	Optical Technologies and Applications I	Holographic Devices and Systems II
		Ju-Yi Lee/Fan-Hsi Hsu	Jung-Ping Liu/Shiuan Huei Lin
		10:30~10:50 TII-I-01 Yutaka Endo	10:30~10:50 FII-I-01 Wen-Kai Lin
		10:50~11:10 TII-I-02 Ju-Yi Lee	10:50~11:05 FII-C-01 Shoichi Sakai
		11:10~11:30 TII-I-03 Jing-Heng Chen	11:05~11:20 FII-C-02 Guan-Ying Su
		11:30~11:45 TII-C-01 Guan-Xuan Yu	11:20~11:35 FII-C-03 Pin-Duan Huang
		11:45~12:00 TII-C-02 Siao-Yu Chang Jian	Closing Remarks
12:05 - 13:30		Lunch	
13:30 - 15:25	13:30~13:40 Opening Remarks	Optical Technologies and Applications II	
	Holography for AR/MR Display	Wei-Hung Su/Jing-Heng Chen	
	Ching-Cherng Sun/Wei-Feng Hsu	13:30~13:50 TIII-I-01 Yoshio Hayasaki	
	13:40~14:05 WI-P-01 Yuzuru Takashima	13:50~14:10 TIII-I-02 Junichi Ikeda	
	14:05~14:30 WI-P-02 Wei-Chia Su	14:10~14:30 TIII-I-03 Hui-Hsin Hsiao	
	14:30~14:50 WI-I-01 Tsung-Xian Lee	14:30~14:50 TIII-I-04 Chih-Wei Huang	
	14:50~15:10 WI-I-02 Ryushi Fujimura	14:50~15:10 TIII-I-05 Ko-Ting Cheng	
	15:10~15:25 WI-C-01 Wan Pin Tsai	15:10~15:25 TIII-C-01 Kodai Kobayashi	
15:25 - 15:40	Coffee Break	Coffee Break	
15:40 - 17:35	Holographic Displays and Devices	Poster Session	
	Tsung-Xian Lee/Shiuan Huei Lin		
	15:40~16:00 WII-I-01 Vera Marinova		
	16:00~16:20 WII-I-02 Wei-Feng Hsu		
	16:20~16:40 WII-I-03 Hiroshi Yoshikawa		
	16:40~17:00 WII-I-04 Yuji Sakamoto		
	17:00~17:20 WII-I-05 Shiuan-Huei Lin		
	17:20~17:35 WII-C-01 Itsuki Ino		
18:00 - 21:00	Welcome Reception	Banquet	

PROGRAM
International Workshop on
Holography and Related Technologies

12-14 Nov. 2025, Sun Moon Lake Hotel, Taiwan

1th DAY WEDNESDAY – 12 November

12:00-13:30 Arrival, Conference registration

13:30-13:40 Opening:
Welcome greetings: **Ching-Cherng Sun, Ken Yuh Hsu**

Conference Remarks: Ching-Cherng Sun

SESSION I

Holography for AR/MR Display

Presider: Ching-Cherng Sun/Wei-Feng Hsu

13:40 "Beam and Image Steering with MEMS SLM for Display, Lidar, and Beyond: Can it be a Counterpart of Optical Phased Array?" . . . . . **Yuzuru Takashima (UA, USA)**

14:05 "Effect of Angle Multiplexing Recording on Imaging Performance in Volume Holographic Light-guide Display" . . . . . **Wei-Chia Su (NCUE, Taiwan)**

14:30 "Ray-Based Simulation Framework for VHOE Design Optimization and Applications" . . . . . **Tsung-Xian Lee (NTUST, Taiwan)**

14:50 "Volume Holographic Waveguides for AR/MR Glasses: Concepts and Challenges" . . . . . **Ryushi Fujimura (Utsunomiya Univ., Japan)**

15:10 "Enhancing Color Performance in VHOE-Based Waveguide AR Glasses via Joint Display Light Spectral Design and VHOE Multiplexing" . . . . . **Wan-Pin Tsai (NTUST, Taiwan)**

15:25-15:40 Coffee Break

SESSION II

Holographic Displays and Devices

Presider: Tsung-Xian Lee/Shiuan Huei Lin

15:40 "2D materials in Holographic Display and Flat optics" . . . . . **Vera Marinova (BAS, Bulgaria)**

16:00 "Non-iterative Algorithm for Phase-Only Computer-Generated Holograms in Holographic Near-Eye Displays" . . . . . **Wei-Feng Hsu (NTUT, Taiwan)**

16:20 "Real Time Display of 14K Fresnel Hologram with Transmission Liquid Crystal Panel" . . . . . **Hiroshi Yoshikawa (Nihon Univ., Japan)**

16:40 "Hologram Data Generation Method for Various Electro-Holography Displays from Common Object Light" . . . . . **Yuji Sakamoto (Hokkaido Univ., Japan)**

17:00 "Design of VHOE-based Waveguide for a Full-Color Eyewear Display using Gradient Descent Learning" . . . . . **Shiuan Huei Lin (NYCU, Taiwan)**

17:20 "Inter-Page Crosstalk Noise-Driven Phase Detection with 3D CNN in Holographic Data Storage Systems" . . . . . **Itsuki Ino (Utsunomiya Univ., Japan)**

18:00-20:00 Welcome Reception

20:00-21:00 Round Table Discussions

2nd DAY THURSDAY – 13 November

SESSION III

Holographic Technologies

Presider: Vera Marinova/Yeh-Wei Yu

08:50 "Phase, polarization, and amplitude control with dielectric metasurface" . . . . **Tsutomu Shimura (Univ. of Tokyo, Japan)**

09:15 "Simulation and Optimization of EPE Lightguides with VHOEs" . . . . . **Yeh-Wei Yu (NCU, Taiwan)**

09:35 "Hologram generation on a quantum computer" . . . . . **Tomoyoshi Shimobaba (Kanazawa Univ., Japan)**

09:55 "Phase Unwrapping using the Phase-wedged Encoding Algorithm for Phase-shifting Projected Fringe Profilometry" . . . . . **Wei-Hung Su (NSYU, Taiwan)**

10:15-10:30 Coffee Break

SESSION IV

In memory of Prof. Der-Chin Su

Optical Technologies and Applications I

Presider: Ju-Yi Lee/Fan-Hsi Hsu

10:30 "Efficient Hologram Generation Using Integer-Quantized Neural Networks" . . . . . **Yutaka Endo (Kanazawa Univ., Japan)**

10:50 "Total internal reflection polarization interferometry for refractive index measurement" . . . . . **Ju-Yi Lee (NCU, Taiwan)**

11:10 "Manufacturing a Holographic Cylindrical Vector Beam Converter" . . . . . **Jing-Heng Chen (Feng Chia Univ., Taiwan)**

11:30 "Innovative Optical System Design for a Laser Tracking Interferometer Based on a Holographic Quarter-Wave Plate" . . . . . **Guan-Xuan Yu (NFU, Taiwan)**

11:45 "Scene Reconstruction Technique with a Optomechanical Structure" . . . **Siao-Yu Chang Jian (Feng Chia Univ., Taiwan)**

12:00-13:30 Lunch Break

SESSION V

Optical Technologies and Applications II

Presider: Wei-Hung Su/Jing-Heng Chen

13:30 "Volumetric beam shaping for material laser processing" . . . . . **Yoshio Hayasaki (Utsunomiya Univ., Japan)**

13:50 "Thermal Stability Evaluation of Holographic Recording Media: HMC-1" . . . . . **Junichi Ikeda (Hencotz Ikeda Labo., Japan)**

14:10 "Ultra-broadband high efficiency polarization beam splitter metagratings working in the near-infrared oxygen bands" . . . . . **Hui-Hsin Hsiao (NTU, Taiwan)**

14:30 "AI-Driven Multi-User Holographic Rendering" . . . . . **Chih-Wei Huang (NCU, Taiwan)**

14:50 "Liquid Crystal Polarization Rotators and Converters" . . . . . **Ko-Ting Cheng (NCU, Taiwan)**

15:10 "Single-shot multi-plane observation of axially shaped beam for material laser processing" . . . . . **Kodai Kobayashi (Utsunomiya Univ., Japan)**

15:25-15:40 Coffee Break

Poster Session

Time: 15:40 - 17:35 pm

P-01 "Design of phase-only CGH for full color holographic display by using gradient decent method" . . . . . **Chiungtze Wan (NYCU, Taiwan)**

P-02 "Optimized CGH Generation for AR-HUD Using Phase Shift Methodology" . . . . . **Ren-Xiang Ou (NTU, Taiwan)**

P-03 "Numerical simulations on denoising capability of self-referential holographic data storage with built-in denoising function" . . . . . **Yuta Eto (KIT, Japan)**

P-04 "Diffraction Uniformity Analysis of Surface Relief Gratings for Waveguide Display with 20° Field of View" . . . . . **Ying-Pin Tsai (NCUEU, Taiwan)**

P-05 "Light Field Near Eye Display Base On View-Angle Extraction" . . . . . **Yu-Hua Chou (NCU, Taiwan)**

P-06 "Near-Eye Display with a Volume-Holographic Optical Coupler" . . . . . **Hao En Tang (Feng Chia Univ., Taiwan)**

P-07 "Field-of-view Extension Array of Near Eye Display" . . . . . **Chun-Yu Hsieh (NCU, Taiwan)**

P-08 "Design of Single-beam Optical Replication for Reflection Image-plane Disk-type Multiplex Holography" . . . . . **Chih-Hung Chen (NCU, Taiwan)**

P-09 "Two-step Process of Image Replication for 360-degree viewable Image-plane Disk-type Multiplex Holography" . . . . . **Chih-Hung Chen (NCU, Taiwan)**

P-10 "Refractive Index Distribution Measurement of Volume Holographic Optical Elements" . . . . . **Jun-Sheng Hsiao (NCU, Taiwan)**

P-11 "Diffraction Efficiency Characteristics of Reflection-type VHOE-based Diffractive Light Guide" . . . . . **Yuan-Yen Liang (NYCU, Taiwan)**

P-12 "Full-color CGH Generation Method Using Geometric Quantities of 3D Gaussian Splatting" . . . . . **Yutaro Koike (Hosei Univ., Japan)**

P-13 "Three-Dimensional Profile Measurements using Coaxial Pattern Projections" . . . . . **Wei-Hung Su (NSYU, Taiwan)**

P-14 "Three-dimensional Shape Measurements using One-shot Phase-Shifting Fringe Projection" . . . . . **Wei-Hung Su (NSYU, Taiwan)**

P-15 "PMMA photopolymers available for holographic inscriptions using wavelengths of 633nm" . **Wei-Hung Su (NSYU, Taiwan)**

P-16 "Simplified Measurement of Refractive Index Modulation in VHOE-Based Exit-Pupil Expanders" . . . . . **Wen-Kai Lin (Feng Chia Univ., Taiwan)**

P-17 "Design of VHOE-Based Waveguide Out-Couplers with Position-Dependent Diffraction Efficiency for Enhanced Optical Utilization and Eye-box Uniformity in AR Glasses" . . . . . **Li Chen Wang (NTUST, Taiwan)**

P-18 "Non-Contact Optical Detection Technology for Sub-Micron Deformation" . . . . . **Chi-Shou Wu (NCU, Taiwan)**

P-19 "Dos-enabled snapshot 3D sensing and object classification using pointnet" . . . . . **Chu-Yao Chen (NCU, Taiwan)**

P-20 "Fabrication of Geometric Phase Modulated Nematic Liquid Crystal Grating using Polarization Holographic Technique" . . . . . **Chau Nguyen Hong Minh (NYCU, Taiwan)**

P-21 "Proposal of a Shape Measurement Method Using a Fringe Pattern Generated by a Volume Holographic Optical Element" . . . . . **Shota Hasui (Utsunomiya Univ., Japan)**

P-22 "Stereoscopic Viewing Using a Volume Holographic Screen on a 3D-Printed Model" . . . . . **Tomoyo Ota (Utsunomiya Univ., Japan)**

P-23 "A study on the fabrication of a holographic AR combiner with 3D printer resin" . . . . . **Koichiro Yurugi (Utsunomiya Univ., Japan)**

P-24 "Numerical Simulation of Autonomous Mask Design for Optoelectronic Deep Neural Network by Hyperparameter Optimization" . . . . . **Rio Tomioka (KIT, Japan)**

18:00-20:00 Banquet

20:00-21:00 Round Table Discussions

3rd DAY FRIDAY – 14 November

SESSION VI

Holographic Devices and Systems I

Presider: Wei-Chia Su/Wen-Kai Lin

08:50 "Advanced Optical Systems through Flat Optics for Biomedical Applications" . . . . . **Yuan Luo (NTU, Taiwan)**

09:15 "Interferenceless Optical Scanning Holography" . . . . . **Jung-Ping Liu (Feng Chia Univ., Taiwan)**

09:35 "Light Propagation Analysis in Volume Holographic Optical Elements by FDTD method" . . . . . **Daisuke Barada (Utsunomiya Univ., Japan)**

09:55 "Analysis of Continuously Varying Temporal Signals in Holographic Storage Systems：A Comparison between Pulse and Sinusoidal Types" . . . . . **Tzu-Chieh Huang (NCU, Taiwan)**

10:15-10:30 Coffee Break

SESSION VII

Holographic Devices and Systems II

Presider: Jung-Ping Liu/Shiuan Huei Lin

10:30 "Two-Dimensional Exit Pupil Expander Based on Bayfol HX200" . . . . . **Wen-Kai Lin (Feng Chia Univ., Taiwan)**

10:50 "Numerical Simulations of Parallel Image Recognition with Self-Referential Holographic Deep Neural Network" . . . . . **Shoichi Sakai (K IT, Japan)**

11:05 "Measurement and analysis of secondary diffraction loss in pupil expansion light guides" . . . . . **Guan-Ying Su (NCU, Taiwan)**

11:20 "Table-based High-speed Imaging Communication" . . . . . **Pin-Duan Huang (NCU, Taiwan)**

11:35-12:00 Closing remarks, Best paper awards

ABSTRACTS
ORAL PRESENTATIONS

WI-P-01

Beam and Image Steering with MEMS SLM for Display, Lidar, and Beyond: Can it be a Counterpart of Optical Phased Array?

Yuzuru Takashima[1)], Xianyue Deng,[1)] Jeff Ching-wen Chang[1)], Ted Liang-tai Lee[1)], Pengyu Liu[1)], Gregory Nero[1)], Tianyao Zhang[1)], Chuan Luo[1)], Yexin Pei[1)], Rajesh Shrestra[1)], Yefu Zhang[1)], Emil Rajan Varghese[1)], Jeff Chen[1)], and Yushi Kaneda[1)]

[1)]*J. C. Wyant College of Optical Sciences, University of Arizona, 1630 E. University Blvd. Tucson AZ 85721, USA*

In this invited plenary talk, we overview novel applications of MEMS-SLMs in a context of breaking the etendue by space- and time-multiplexed beam and image steering.

WI-P-02

Effect of Angle Multiplexing Recording on Imaging Performance in Volume Holographic Lightguide Display

Wei-Chia Su,[1)] Yuan-Yen Liang,[2)] Wen-Kai Lin,[3)] Shao-Kui Zhou,[1)] Shiuan-Huei Lin,[2)] Tsung-Hsun Yang,[4)] Yeh-Wei Yu,[4)] Tsung-Xian Lee,[5)] and Ching-Cherng Sun[2,4)]

[1)]*Graduate Institute of Photonics, National Changhua University of Education, Taiwan*

[2)]*Department of Electrophysis, National Yang Ming Chiao Tung University, Taiwan*

[3)]*Department of Photonics, Feng Chia University, Taiwan*

[4)]*Department of Optics and Photonics, National Central University, Taiwan*

[5)]*Graduate Institute of Color and Illumination Technology, National Taiwan University of Science and Technology, Taiwan*

Effect of angle multiplexing recording for VHGs in lightguide display is analyzed. VHG-lightguide display with angle multiplexing recording is helpful to expand image FOV and presents better performance on color gamut.

WI-I-01

Ray-Based Simulation Framework for VHOE Design Optimization and Applications

Tsung Xian Lee,[1)] Wan Pin Tsai,[2)] and Li Chen Wang[1)]
[1)]Graduate Institute of Color and Illumination Technology, National Taiwan University of Science and Technology, Taiwan
[2)]Graduate Institute of Applied Science and Technology, National Taiwan University of Science and Technology, Taipei 10607, Taiwan

The integrated simulation framework provides a reliable tool for VHOE-based AR waveguides, combining geometric and diffractive modeling for accurate performance evaluation and efficient design. Its applications in color control, vision correction, and eyebox uniformity highlight its potential to address critical AR optics challenges and enable more practical AR display solutions.

WI-I-02

Volume Holographic Waveguides for AR/MR Glasses: Concepts and Challenges

Ryushi Fujimura,[1), 2)] Toshiteru Nakamura[1)], Daiki Kataoka,[1)] Shota Omori[1)] and Satoshi Ishihara[1)]
[1)]Graduate School of Regional Development and Creativity,
[2)]Center for Optical Research and Education (CORE),
Utsunomiya University, 7-1-2, Yoto, Utsunomiya, Tochigi 321-8585, Japan

Volume holographic waveguides promise thin, wide-FOV optics for AR/MR glasses. This presentation highlights novel strategies addressing luminance uniformity and design flexibility, providing perspectives on the challenges and opportunities of next-generation display architectures.

WI-C-01

Enhancing Color Performance in VHOE-Based Waveguide AR Glasses via Joint Display Light Spectral Design and VHOE Multiplexing

Wan Pin Tsai,[1)]Tsung Xian Lee,[2)] and Li Chen Wang[2)]
[1)]Graduate Institute of Applied Science and Technology, National Taiwan University of Science and Technology, Taipei 10607, Taiwan
[2] Graduate Institute of Color and Illumination Technology, National Taiwan University of Science and Technology, Taiwan

Color uniformity is vital in AR near-eye displays. VHOE waveguides suffer chromatic deviations from spectral–angular selectivity. We propose a perceptually driven co-optimization using MacAdam ellipses to jointly tune spectrum and gratings, improving efficiency and visual comfort.

WII-I-01

2D materials for Holographic Display and Flat Optics

Vera Marinova,[1,2)] Dimitre Dimitrov,[1,3)] Ken Yuh Hsu[4)] and Shiuan Huei Lin[2)]
[1)]Institute of Optical Materials and Technologies, Bulgarian Academy of Sciences, Sofia, Bulgaria
[2)]Department of Electrophysics, National Yang Ming Chiao Tung University, Hsinchu, Taiwan
[3)]Institute of Solid-State Physics, Bulgarian Academy of Sciences, Sofia, Bulgaria
[4)] Department of Photonics, National Yang Ming Chiao Tung University, Hsinchu, Taiwan

This paper reviews the key properties of two-dimensional (2D) materials such as graphene, black phosphorus (BP), and transition metal dichalcogenides (TMDs). Their exceptionally high refractive indices and strong anisotropy make them ideal candidates for next-generation photonics. We discuss the successful fabrication of optical components, including waveplates and metalenses. Finally, we examine the role of metasurfaces based on 2D nanolayers as building blocks for advanced wavefront shaping, paving the way for dynamic holographic displays.

WII-I-02

Non-iterative Algorithm for Phase-Only Computer-Generated Holograms in Holographic Near-Eye Displays

Wei-Feng Hsu, Ya-Hsuan Lee, and Wei-Ren Chen
Department of Electro-Optical Engineering, National Taipei University of Technology, 10608 Taipei, Taiwan
whsu@ntut.edu.tw

We propose a non-iterative, phase-only CGH algorithm based on double phase decomposition, enabling real-time holographic displays. It supports fast image resizing and speckle reduction via temporal integration, achieving high-quality images with predictable, low-latency computation.

WII-I-03

Real Time Display of 14K Fresnel Hologram with Transmission Liquid Crystal Panel

Hiroshi Yoshikawa and Takeshi Yamaguchi
Dept. Computer Eng., Nihon University 7-24-1 Narashinodai, Funabashi, 274-8501 Japan

It is realized that real time 14K Fresnel hologram display with a transmission liquid crystal panel. This paper describes configuration of the holographic video display and experimental results to reconstruct Fresnel hologram.

WII-I-04

Hologram Data Generation Method for Various Electro-Holography Displays from Common Object Light

Yuji Sakamoto
Hokkaido University, N14,W9, Kita-ku, Sapporo, 060-0814, Japan

Holographic television system must support various holographic display devices for individual users. This paper discusses a common data format and convertion into hologram data suitable for each display device.

WII-I-05

Design of VHOE-based Waveguide for a Full-Color Eyewear Display using Gradient Descent Learning

Zih Fan Chen[1)], Shiuan Huei Lin[1)], Tsung-Hsun Yang[3)], Yeh-Wei Yu[3)], Wei-Chia Su[3)], Wen-Kai Lin[4)], Ching-Cherng Sun[1,3)], Vera Marinova[1,5)], and Ken Y. Hsu[2)]
[1)] Department of Electrophysics, National Yang Ming Chiao Tung University, Hsinchu 30010, Taiwan,
[2)]Department of Photonics, National Yang Ming Chiao Tung University, Hsinchu 30010, Taiwan,
[3)]Department of Optics and Photonics, National Central University, Chung-Li, Taiwan,
[4] Department of Photonics, Feng Chia University, Taichung 407102, Taiwan,
[5)] Institute of Optical Materials and Technologies, Bulgarian Academy of Science, Sofia, Bulgaria.

By leveraging gradient-based updates with the Adam optimizer, we identify the recording conditions of a volume holographic optical element (VHOE) to optimize the performance of waveguide for delivering a AR glasses with capability for transmit true-color image to viewer.

WII-C-01

Inter-Page Crosstalk Noise-Driven Phase Detection with 3D CNN in Holographic Data Storage Systems

Itsuki Ino,[1)] and Ryushi Fujimura,[1),2)]
[1)] Graduate School of Regional Development and Creativity, Utsunomiya University,7-1-2 Yoto, Utsunomiya, Tochigi 321-8585, Japan
[2)]Center for Optical Research and Education (CORE), Utsunomiya University, 7-1-2 Yoto, Utsunomiya, Tochigi 321-8585, Japan

We developed a detection method that utilizes inter-page crosstalk noise arising from angular multiplexing in holographic data storage systems. Simulation results with a 3D CNN demonstrate the feasibility of high-density holographic data storage utilizing crosstalk noise.

TI-P-01

Phase, Polarization and Amplitude Control with Dielectric Metasurface

Tsutomu Shimura
Utsunomiya University, 7-1-2, Yoto, Utsunomiya, Tochigi 321-8585, Japan

Dielectric metasurfaces can freely control the phase delay for two orthogonal polarization components, enabling control of both the wavefront and polarization. However, amplitude control cannot be achieved simultaneously. We report on a method for amplitude control using a metasurface based on the principle of double-phase holography.

TI-I-01

Simulation and Optimization of EPE Lightguides with VHOEs

Yeh-Wei Yu, Chung-Wei Lin, Tsung-Hsun Yang, Ching-Cherng Sun
Department of Optics and Photonics, National Central University, Taiwan

This study explores the application of EPE lightguides in AR/MR glasses and enhances optical efficiency using VHOEs. Key contributions include the VOHIL model, ASP methods, and optimized spectrum distribution.

TI-I-02

Hologram generation on a quantum computer

Tomoyoshi Shimobaba, Fan Wang, Shotoku Masato, and Tomoyoshi Ito
Graduate School of Engineering, Chiba University, 1-33, Yayoi-cho, Chiba-shi, Inage-ku, Chiba 263-8522, Japan

this study introduces quantum computer-generated holography (QGH) as a promising approach to mitigate the computational bottleneck inherent in hologram generation by exploiting the intrinsic parallelism of quantum computation. The proposed QGH framework is based on the point-cloud method. In this approach, point-cloud data are represented as superposition states of qubits, allowing simultaneous computation of light-wave propagation from all point sources to the hologram plane in accordance with quantum mechanical principles. The paper discusses the potential advantages, current limitations, and prospective research directions of QGH as a foundation for future high-performance holographic display systems.

TI-I-03

Phase Unwrapping using the Phase-wedged Encoding Algorithm for Phase-shifting Projected Fringe Profilometry

Wei-Hung Su[1)], Yeh-Wei Yu[2)], and Ching-Cherng Sun[2)]
[1)]Department of Material Science and Optoelectronic Engineering, National Sun Yat-Sen University, Kaohsiung 804, Taiwan
[2)]Department of Optics and Photonics, National Central University, Taiwan

A phase unwrapping method using the phase-wedged encoding algorithm for phase-shifting projected fringe profilometry is presented. There is no need to take additional projections for phase unwrapping. The patterns used to perform the phase-extraction can be employed for unwrapping directly.

TII-I-01

Efficient Hologram Generation Using Integer-Quantized Neural Networks

Yutaka Endo
Institute of Science and Engineering, Kanazawa University, Kakuma-machi, Kanazawa, Ishikawa 920-1192, Japan

Our previous work demonstrated quantized CNNs for generating complex holograms, achieving substantial acceleration while preserving high fidelity in reconstructed images. Building on this, we have recently extended the approach to phase-only hologram generation using autoencoder-based models. In this talk, I will present these developments, highlighting both the previously published results on complex holograms and our latest findings on phase-only holograms, and discuss their potential for real-time and resource-constrained holographic displays.

TII-I-02

Total internal reflection polarization interferometry for refractive index measurement

Ju-Yi Lee, Chia-Yu Chiang, and Tsai-Zhen Lin
Department of Mechanical Engineering, National Central University, Taoyuan City 32001, Taiwan

This study proposes a refractive-index measurement technique based on total internal reflection (TIR) using a common-path polarimetric interferometer, enabling accurate measurement of irregularly shaped objects.

TII-I-03

Manufacturing a Holographic Cylindrical Vector Beam Converter

Jing-Heng Chen[1)], Kun-Huang Chen[2)], and Jiun-You Lin[3)]
[1)]Department of Photonics, Feng Chia University, Taichung 407102, Taiwan
[2)]Department of Electrical Engineering, Feng Chia University, Taichung 407102, Taiwan
[3)] Department of Mechatronics Engineering, National Changhua University of Education, Changhua County 500208, Taiwan

This study introduces an innovative holographic cylindrical vector beam converter design and an accompanying recording method utilizing a truncated cone prism. The holographic cylindrical vector beam converter was successfully recorded.

TII-C-01

Innovative Optical System Design for a Laser Tracking Interferometer Based on a Holographic Quarter-Wave Plate

Guan-Xuan Yu,[1)] Hung-Yu Chen,[2)] Ting-Han Chen [1)] Fan-Hsi Hsu,[2)] and Yu-Ta Chen,[1)]
[1)]Department of Mechanical Design Engineering, National Formosa University, Huwei Township, Yunlin County 632301, Taiwan
[2)]Department of Electro-Optical Engineering, National United University, Miaoli 360302, Taiwan

Innovative LTI design integrates holographic quarter-wave plate to reduce cost, simplify structure, and improve measurement accuracy with high diffraction efficiency and compactness.

TII-C-02

Scene Reconstruction Technique with a Optomechanical Apparatus

Siao-Yu Chang Jian[1)], Kun-Huang Chen[1)], Jing-Heng Chen[1)] and Jiun-You Lin[3)]
[1)]Department of Electrical Engineering, Feng Chia University, Taichung 407102, Taiwan
[2)]Department of Photonics, Feng Chia University, Taichung 407102, Taiwan
[3)] Department of Mechatronics Engineering, National Changhua University of Education, Changhua County 500208, Taiwan

This study presents a 2.5D scene reconstruction technique using a simple optical structure composed of a liquid lens, a self-fabricated diffuser, and a sensing module. The system is low-cost, independent of external light, and real-time capable, demonstrating strong potential for practical applications.

TIII-I-01

Volumetric beam shaping for material laser processing

Nami Kuroo and Yoshio Hayasaki
Center for Optical Research and Education (CORE), Utsunomiya University
7-1-2 Yoto, Utsunomiya 321-8585, Japan

We developed the framework for volumetric shaping of laser beam. The volumetric beam shaping is especially effective to laser cutting and laser drilling of thick transparent materials.

TIII-I-02

Thermal Stability Evaluation of Holographic Recording Media: HMC-1

Junichi Ikeda[1)], Hideyoshi Horimai[2)]
[1)]*HENCOTZ Ikeda Labo, Takaidanaka 1-5-3, Higashiosaka-shi, Osaka 577-0065, Japan*
[2)]*HOLOMEDIA LLC, Kawaharagaya 591-17, Mishima-shi, Shizuoka 411-0022, Japan*

We will introduce some of the performance of HENCOTZ Hologram Recording Media: HMC-1; 1) control of η by the changing irradiation condition and 2) as part of the heat countermeasures that have been a hot topic recently.

TIII-I-03

Ultra-broadband high efficiency polarization beam splitter metagratings working in the near-infrared oxygen bands

Hui-Hsin Hsiao[1,2)]
[1)]*Department of Engineering Science and Ocean Engineering, National Taiwan University, Taipei, 10617, Taiwan*
[2)] *Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei, 10617, Taiwan*

We have developed a broadband high efficiency polarized beam splitting metagrating based on integrated resonant units to simultaneously enable polarization analysis, spectral dispersion, and spatial imaging in the near infrared.

TIII-I-04

AI-Driven Multi-User Holographic Rendering

Chih-Wei Huang
[1)]*Department of Mechanical Engineering, National Central University, Taoyuan City 32001, Taiwan*

The emergence of holographic communication and mixed reality (MR) marks a new era in human interaction, where physical and virtual environments seamlessly converge through ultra-low-latency rendering and intelligent connectivity. This talk presents an AI-driven multi-user holographic rendering framework that integrates real-time localization and adaptive streaming to enable immersive and synchronized experiences across MR users. Building upon our Localization-Assisted Remote Rendering (LARR) architecture, the system leverages learning-based data optimization to conceal latency-induced position errors while dynamically managing volumetric content delivery. Finally, we envision how interconnected AI models can further enhance this framework, paving the way toward truly interactive and scalable holographic collaboration in future MR environments.

TIII-I-05

Liquid Crystal Polarization Rotators and Converters

Yi-Xuan Liu, Pravinraj Selvaraj, Chi-Tang Huang, Chun-Ting Wu, Shao-Hao Liao, and Ko-Ting Cheng
Department of Optics and Photonics, National Central University, Taoyuan City 320317, Taiwan

The manipulation of light polarization has garnered significant interest due to its potential applications across various domains. Liquid crystals have served as standard tools for polarization state modulation, including linear, elliptical, circular, and vector-beam polarizations.

TIII-C-01

Single-shot multi-plane observation of axially shaped beam for material laser processing

Kodai Kobayashi, Nami Kuroo, and Yoshio Hayasaki
Center for Optical Research and Education (CORE), Utsunomiya University, 7-1-2 Yoto, Utsunomiya 321-8585, Japan

We demonstrate observing the 3D beam shape with a single imaging by the superposition of a CGH for the point spread function control to the CGH for 3D beam shaping.

FI-P-01

Advanced Optical Systems through Flat Optics for Biomedical Applications

Yuan Luo[1,2,3,4)]
[1)]Institute of Medical Device and Imaging, NTU College of Medicine
[2)]NTU YongLin Institute of Health
[3)]Department of Biomedical Engineering, NTU College of Engineering
[4)]Program for Precision Health and Intelligent Medicine, NTU Graduate School of Advanced technology

Optical microscopic techniques are the most commonly used methods in biology and medical research. In recent years, structured light plays vital roles to enhance resolution. In addition, metasurfaces, the emerging optical techniques, with unique optical capabilities to manipulate the basic characteristics of light have received a significant amount of interest in the optical microscopic field. This talk will introduce the latest studies on the biomedical use of structured light, as well as metasurface. The following are the topics that will be covered: quantitative cell imaging, optical sectioning microscopy; light sheet microscopy; and optical tweezers. This talk will also discuss the technological challenges presently encountered with metasurface from the point of view of brain imaging systems.

FI-I-01

Interferenceless Optical Scanning Holography

Jung-Ping Liu[1,2)], Chen-Ming Tsai[1)], and Da-Wei Huang[1)]
[1)] Department of Photonics, Feng Chia University, 100 Wenhua Rd., Xitun District, Taichung 407102, Taiwan
[2)] Digital Optics Center, Feng Chia University, 100 Wenhua Rd., Xitun District, Taichung 407102, Taiwan

We have proposed a new type of optical scanning holography (OSH), the interferenceless OSH (I-OSH). Since there is no interference involved in I-OSH, the technique is little affected by the environmental fluctuation and thus may find potential practical applications.

FI-I-02

Light Propagation Analysis in Volume Holographic Optical Elements by FDTD method

Daisuke Barada
[1)] *Graduate School of Regional Development and Creativity, Utsunomiya University, 7-1-2 Yoto, Utsunomiya, Tochigi 321-8585, Japan*

In general, the diffraction properties of VHOEs are analyzed by Born approximation or plane wave expansion with phase modulation. In this paper, FDTD method is investigated to analyze in more detail.

FI-C-01

Analysis of Continuously Varying Temporal Signals in Holographic Storage Systems：A Comparison between Pulse and Sinusoidal Types

Tzu-Chieh Huang, Yu-Che Lu, Jia-Kai Ye, Yeh-Wei Yu, Tsung-Hsun Yang, and Ching-Cherng Sun,
Department of Optics and Photonics, National Central University, Chungli 32001, Taiwan

The primary objective of this study is to evaluate the overall performance of holographic storage systems by comparing pulsed signals with sinusoidal phase signals. Unlike pulsed signals, the sinusoidal phase–based encoding scheme preserves the same amount of information while reducing the number of recorded pages, thereby indirectly increasing storage capacity. Moreover, sinusoidal phase signals enhance signal discrimination and retrieval accuracy. By adopting an analytical approach different from that used for pulsed signals, this method allows for the simultaneous processing of all signals, which further improves the system's reading speed.

FII-I-01

Two-Dimensional Exit Pupil Expander Based on Bayfol HX200

Wen-Kai Lin
Department of Photonics, Feng Chia University, Taichung 407102, Taiwan

This study presents an improved design approach for 2D EPEs. In this configuration, the in-coupler, fold element, and out-coupler each consist of three multiplexed volume gratings, resulting in a total of nine gratings.

FII-C-01

Numerical Simulations of Parallel Image Recognition with Self-Referential Holographic Deep Neural Network

Shoichi Sakai[1)], Rio Tomioka[1)], Eto Yuta[1)] and Masanori Takabayashi[2, 3)]
[1)] *Graduate School /* [2)]*Faculty of Computer Science and Systems Engineering, Kyushu Institute of Technology, 680-4 Kawazu, Iizuka, Fukuoka 820-8502, Japan*
[3)]*Research Center for Neuromorphic AI Hardware, Kyushu Institute of Technology,2-4 Hibikino, Wakamatsu-ku, Kitakyushu, Fukuoka 808-0196, Japan*

We propose a parallel image recognition method for self-referential holographic deep neural networks (SR-HDNNs). While four-class parallel image recognition simulations demonstrated basic capability with 78.5% total accuracy, recognition failures in certain regions require further investigation.

FII-C-02

Measurement and analysis of secondary diffraction loss in pupil expansion light guides

Guan-Ying Su, Kai-Jui Liang, Yeh-Wei Yu, Ching-Cherng Sun, Tsung-Hsun Yang
Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd., Zhongli, District, Taoyuan City 320317, Taiwan

This study examines how coupling grating width affects secondary diffraction in VHOE-based waveguides. Experiments with 532 nm lasers and a revised model show coupling width strongly impacts efficiency, improving design optimization.

FII-C-03

Table-based High-speed Imaging Communication

Pin-Duan Huang, Yeh-Wei Yu, Tsung-Hsun Yang, and Ching-Cherng Sun
Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd., Zhongli, District, Taoyuan City 320317, Taiwan

To meet high data rate demands, we use Free Space Optical (FSO) communication. Our novel coding method utlizes table desig to overcome atmospheric distortions and interference, ensuring efficient and high-quality signal transmission.

ABSTRACTS
POSTER PRESENTATIONS

P-01

Design of phase-only CGH for full color holographic display by using gradient decent method

Chiungtze Wang [1)], Shiuan Huei Lin[2)], Ken Yu Hsu [1)]
[1)]Department of Photonicss, National Yang Ming Chiao Tung University, Taiwan
[2)]Department of Electrophysis, National Yang Ming Chiao Tung University, Taiwan

In this study, we use gradient decent algorithm with log(cosh(x)) loss function to design the phase-type CGH for R,G,B images, respectively. The parameters PSNR (Peak signal-to-noise ratio) and SSIM (Structural Similarity Index) are used to analyzed the similarity between the original image and the reconstructed image. From the simulations, the PSNR are larger than 30dB and the SSIM are larger than 0.9 for all R,G,B images.

P-02

Optimized CGH Generation for AR-HUD Using Phase Shift Methodology

Ren-Xiang Ou, Pin-Yin Huang, and Hoang Yan Lin
Graduate Institute of Photonics and Optoelectronics, and Department of Electrical Engineering, National

Real-time AR-HUD hologram generation via phase shift on pre-generated CGH, avoiding GS iteration and complex deep learning training.

P-03

Numerical simulations on denoising capability of self-referential holographic data storage with built-in denoising function

Yuta Eto[1)], Rio Tomioka[1)] and Masanori Takabayashi[2, 3)]
[1)] Graduate School / [2)]Faculty of Computer Science and Systems Engineering, Kyushu Institute of Technology, 680-4 Kawazu, Iizuka, Fukuoka 820-8502, Japan
[3)]Research Center for Neuromorphic AI Hardware, Kyushu Institute of Technology,2-4 Hibikino, Wakamatsu-ku, Kitakyushu, Fukuoka 808-0196, Japan

We evaluated the effectiveness SR-HDNN-based denoising on reconstructed datapages in SR-HDS under random noise conditions. Numerical simulations demonstrated effective denoising up to ±0.35 random noise intensity for both random noise only and composite noise environments.

P-04

Diffraction Uniformity Analysis of Surface Relief Gratings for Waveguide Display with 20° Field of View

Ying-Pin Tsai,[1)] Wen-Kai Lin,[2)] Fu-Li Hsiao,[1)] and Wei-Chia Su[1)]
[1)]Graduate Institute of Photonics, National Changhua University of Education, 50007, Taiwan
[2)]Department of Photonics, Feng Chia University, Taichung 407102, Taiwan

This study analyzes diffraction uniformity of surface relief gratings for lightguide displays. Finite element simulations evaluate in/out-coupler parameters, showing trade-offs between efficiency and angular uniformity, guiding optimal grating design for a 20° field-of-view AR system.

P-05

Light Field Near Eye Display Base On View-Angle Extraction

Yu-Hua Chou, Guan-Yu Ji, Sheng-min Shen, Yeh-Wei Yu, Tsung-Hsun Yang, and Ching-Cherng Sun
Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd. Zhongli Dist., Taoyuan 320317, Taiwan

We propose a near-eye light field display using volume holographic optical elements (VHOEs) to replace microlens arrays for angle-selective subimago extraction. Leveraging Bragg selectivity and a holographic lens design, the system expands the field of view and reduces the vergence–accommodation conflict. Fabricated lateral and longitudinal VHOE microlens arrays achieve up to 2.79° viewing-angle separation and 2.2–2.3 magnification, offering a compact, high-performance solution for enhanced depth perception and visual comfort.

P-06

Near-Eye Display with a Volume-Holographic Optical Coupler

Hao En Tang,[1)] Wen-Kai Lin,[1,2)] and Jung-Ping Liu[1,2)]
[1)]Department of Photonics, Feng Chia University, 100 Wenhua Rd., Xitun District, Taichung 407102, Taiwan
[2)]Digital Optics Center, Feng Chia University, 100 Wenhua Rd., Xitun District, Taichung 407102, Taiwan

We designed and fabricated a volume holographic optical element (VHOE) for near-eye-display (NED). This VHOE combines the functions of focusing and reflection and thus reduces the space significantly. The diffraction efficiency of the VHOE is 78% within 22.7º × 15.3º angular range.

P-07

Field-of-view Extension Array of Near Eye Display

Chun-Yu Hsieh, Wei-Chi Wu, Yeh-Wei Yu, Tsung-Hsun Yang and Ching-Cherng Sun
Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd. Zhongli Dist., Taoyuan 320317, Taiwan

Near-eye displays require wide field of view (FOV) without sacrificing transparency or weight. We present a material-agnostic FOV-expansion method that embeds lens-like power in volume holographic optical elements (VHOEs) recorded by spherical–plane interference. In a three-element waveguide, VHOE1 couples a collimated input, VHOE2 (convex holographic lens) angle-magnifies the guided beams, and VHOE3 (concave holographic lens) re-collimates them to optical infinity. The magnification is set by the spherical-wave focal length, decoupling performance from refractive-index-modulation limits. Experiments use a white-LED pattern, a projection lens, and a USB camera focused on infinity for consistent measurements.

P-08

Design of Single-beam Optical Replication for Reflection Image-plane Disk-type Multiplex Holography

Chih-Hung Chen[1, 2)] and Yih-Shyang Cheng[1)]
[1)]Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd. Zhongli Dist., Taoyuan 320317, Taiwan
[2)]Research Center of Holographic Information Display, FARCH Lab Studio, Taipei, Taiwan

The methods of image design and replication in image-plane disk-type multiplex holograms is introduced. Single-beam optical replication for walk-around viewing holograms is also presented by using two-step holographic process.

P-09

Two-step Process of Image Replication for 360-degree viewable Image-plane Disk-type Multiplex Holography

Chih-Hung Chen[1, 2)] and Yih-Shyang Cheng[1)]
[1)]Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd. Zhongli Dist., Taoyuan 320317, Taiwan
[2)]Research Center of Holographic Information Display, FARCH Lab Studio, Taipei, Taiwan

To yield highest diffraction efficiency of the multiplex holograms, a two-step holographic process is presented to produce real-image generation holograms, as well as virtual-image generation holograms, for the 360-degree viewable image-plane disk-type multiplex holography.

P-10

Refractive Index Distribution Measurement of Volume Holographic Optical Elements

Jun-Sheng Hsiao, Chi-Ho Lee, Yeh-Wei Yu, Tsung-Hsun Yang, and Ching-Cherng Sun
Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd. Zhongli Dist., Taoyuan 320317, Taiwan

This study proposes a quality-inspection method for volume holographic optical elements (VHOEs). By designing and recording volume holographic gratings and combining optical diffraction tomography (ODT), we precisely obtain phase distributions and reconstruct refractive-index maps. Overall, the method offers a practical analytical tool and theoretical basis for designing and applying high-quality VHOEs, providing concrete guidance for manufacturing.

P-11

Diffraction Efficiency Characteristics of Reflection-type VHOE-based Diffractive Light Guide

Yuan-Yen Liang,[1)] Chi Sun,[1)] Zih-Fan Chen[1)] Tsung-Hsun Yang,[2)] Yeh-Wei Yu,[2)] Wei-Chia Su,[3)]Wen-Kai Lin,[4)] Ching-Cherng Sun,[1,2)] and Shiuan-Huei Lin[1)]

[1)] Department of Electrophysis, National Yang Ming Chiao Tung University, Taiwan

[2)]Department of Optics and Photonics, National Central University,Taiwan

[3)]Graduate Institute of Photonics, National Changhua University of Education, Chunghua, Taiwan,

[4)] Department of Photonics, Feng Chia University, Taichung 407102, Taiwan,

This paper investigates the diffraction characteristics of reflection-type VHOE-based AR devices. Simulations show that recording condition variations cause spectral shifts and slope changes in the efficiency curve. Understanding these effects enables more efficient multiplexing design, achieving target performance with fewer steps.

P-12

Full-color CGH Generation Method Using Geometric Quantities of 3D Gaussian Splatting

Yutaro Koike and Takafumi Koike

Graduate School of Computer and Information Sciences, Hosei University, 3-7-2 Kajino-cho, Koganei-shi, Tokyo 184-8584, Japan

We present a CGH generation method which uses geometric quantities of 3D Gaussian Splatting extended to RGB wavelengths. Experiments demonstrate faster computation and reduced memory usage compared to the point-based method.

P-13

Three-Dimensional Profile Measurements using Coaxial Pattern Projections

Nai-Jen Cheng[1)], Liang-Cheng Xu[1)], Bo-Hao Huang[1)], and Wei-Hung Su[2)]

[1)] Institute of Photonics Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 807, Taiwan

[2)] Department of Material Science and Optoelectronic Engineering, National Sun Yat-Sen University, Kaohsiung 804, Taiwan

A method based on coaxial pattern projection to describe the profile of the inspected object is presented. Depth position for each pixel is can be identified by finding the maximum of the fringe amplitude. Accuracy of the retrieved 3D profile can be achieved in the order of sub-millimeters.

P-14

Three-dimensional Shape Measurements using One-shot Phase-Shifting Fringe Projection

Yih-Ting Song, Pei-Chi Li, and Wei-Hung Su

Department of Material Science and Optoelectronic Engineering, National Sun Yat-Sen University, Kaohsiung 804, Taiwan

A one-shot projection scheme using the phase-shifting technique to describe the profile of the dynamic object is presented.

P-15

PMMA photopolymers available for holographic inscriptions using wavelengths of 633nm

Heng-Da Reynold Chi, Hong-Jyun Guo, Kai-Dong Hsu, and Wei-Hung Su
Department of Material Science and Optoelectronic Engineering, National Sun Yat-Sen University, Kaohsiung 804, Taiwan

A volume hologram is formed by distributing the monomers EGPEA and the photo-initiators into the host matrix PMMA. For a polymer with an illuminating power density of 2mW/cm2, a Bragg grating with the diffraction efficiency of 92% can be formed in 20 seconds.

P-16

Simplified Measurement of Refractive Index Modulation in VHOE-Based Exit-Pupil Expanders

Wen-Kai Lin
Department of Photonics, Feng Chia University, Taichung 407102, Taiwan

We propose a simplified method for measuring the refractive-index modulation. This approach isolates the grating's optical signal from the material contributions of Fresnel loss, absorption, and scattering.

P-17

Design of VHOE-Based Waveguide Out-Couplers with Position-Dependent Diffraction Efficiency for Enhanced Optical Utilization and Eyebox Uniformity in AR Glasses

Li-Chen Wang[1)] , Wan-Pin Tsai[2)] , Tsung-Xian Lee[2)]
[1)] Graduate Institute of Color & Illumination Technology, National Taiwan University of Science and Technology, Taipei 10607, Taiwan
[2)]Graduate Institute of Applied Science and Technology, National Taiwan University of Science and Technology, Taipei 10607, Taiwan

Simulations and experiments reveal that out-coupler diffraction efficiency in VHOE waveguides drives a trade-off: higher efficiency increases utilization but lowers uniformity, guiding future designs with zoned-efficiency.

P-18

Non-Contact Optical Detection Technology for Sub-Micron Deformation

Chi-Shou Wu, Po-Chun Chao, Shih-Heng Tang, Ching-Cherng Sun, Tsung-Hsun Yang, and Yeh-Wei Yu
Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd., Zhongli Dist., Taoyuan 320317, Taiwan

This study aims to develop a real-time optical inspection technique based on holographic interferometry for observing nanoscale morphological changes. A green laser was used as the illumination source, and an optical inspection system was constructed by integrating optical interference principles with a high-resolution CCD imaging system, enabling real-time observation of subtle variations.

P-19

Dos-enabled snapshot 3D sensing and object classification using pointnet

Chu-Yao Chen, Li-Shuo Chen, Ching-Cherng Sun, Tsung-Hsun Yang and Ye-Wei Yu
Department of Optics and Photonics, National Central University, No. 300, Zhongda Rd., Zhongli Dist., Taoyuan 320317, Taiwan

Proposed snapshot 3D sensing uses DOE-generated speckle and multi-plane calibration to reconstruct depth from a single image. PointNet-based classification enables reliable object recognition with simple hardware.

P-20

Fabrication of Geometric Phase Modulated Nematic Liquid Crystal Grating using Polarization Holographic Technique

Chau Nguyen Hong Minh[1)], Vera Marinova[1, 2)], Shiuan Huei Lin[1)], and Ken Y. Hsu[3)]

[1)] Department of Electrophysics, National Yang Ming Chiao Tung University, Hsinchu 30010, Taiwan,
[2)] Institute of Optical Materials and Technologies, Bulgarian Academy of Science, Sofia, Bulgaria,
[3)] Department of Photonics, National Yang Ming Chiao Tung University, Hsinchu 30010, Taiwan,

This study presents the design, fabrication, and electrical characteristics of switchable LC geometric phase grating devices with PAZO photo-alignment layer using Polarization holographic technique. This device can reach a higher diffractive efficiency with faster response under applied voltages.

P-21

Proposal of a Shape Measurement Method Using a Fringe Pattern Generated by a Volume Holographic Optical Element

Shota Hasui
Optics and Bio design program, Utsunomiya University, 7-1-2 Yoto, Utsunomiya, Tochigi 321-8585, Japan

In this paper, a fringe pattern is generated from a volume holographic optical element (VHOE) by illumination with incoherent light, and this fringe pattern is used to measure the shape of three-dimensional objects.

P-22

Stereoscopic Viewing Using a Volume Holographic Screen on a 3D-Printed Model

Tomoyo Ota
Graduate School of Regional Development and Creativity, Utsunomiya University, 7-1-2 Yoto, Utsunomiya, Tochigi 321-8585, Japan

In this paper, a method is proposed for projecting stereoscopically viewable virtual objects by attaching a volume holographic screen to a model fabricated with a 3D printer, using two projectors to generate the stereoscopic images.

P-23

A study on the fabrication of a holographic AR combiner with 3D printer resin

Koichiro Yurugi
Graduate School of Regional Development and Creativity, Utsunomiya University, 7-1-2 Yoto, Utsunomiya, Tochigi 321-8585, Japan

A method for fabricating holographic AR combiners using 3D printer resin was investigated. A diffraction grating was formed by exposing the resin to a two-beam laser interference pattern, and its diffraction characteristics were evaluated.

P-24

Numerical Simulation of Autonomous Mask Design for Optoelectronic Deep Neural Network by Hyperparameter Optimization

Rio Tomioka[1)] and Masanori Takabayashi[2, 3)]
[1)]Graduate School / [2)]Faculty of Computer Science and Systems Engineering, Kyushu Institute of Technology, 680-4 Kawazu, Iizuka, Fukuoka 820-8502, Japan
[3)]Research Center for Neuromorphic AI Hardware, Kyushu Institute of Technology,2-4 Hibikino, Wakamatsu-ku, Kitakyushu, Fukuoka 808-0196, Japan

We propose a method for designing autonomous binary amplitude masks for optoelectronic deep neural networks (OE-DNNs) using hyperparameter optimization. The effectiveness of this method is numerically demonstrated through image classification simulations.

General Information

Oral presentation

Oral session is to be held in the Star Moon Hall on the RF floor in Sun Moon Lake Hotel. The presentation time will be 25 minutes for plenary papers (including 5 minutes discussion), 20 minutes for invited papers (including 5 minutes discussion) and 15 minutes for regular papers (including 3 minutes discussion). Attention bell will be given three times as in the table below. A PC-based data projector and a computer equipped with USB ports are available. Speakers are asked to bring in USB memory or their own personal computer (Windows based). Prior to the starting time of the session, the speakers are asked to contact the session chairs and to confirm uploading the presentation materials or the connection between their computer and the projector.

Poster presentation

Poster session will be held in "Star Moon Hall on the RF floor in Sun Moon Lake Hotel" from 15:40 - 17:35 pm on Thursday, 13 November.

Poster boards will be around 1.8 m high and 1.0 m wide double sided boards, on which A0 portrait (1189 x 841 mm) can be placed. Poster should have minimum font size for text of 18 pt. Text and graphics should be readable from at least one meter.

Authors must remain in the vicinity of the bulletin board for the duration of the session to answer questions in English. Authors are allowed to continue the discussion after the end of session if necessary, but are required to remove all the materials on the bulletin board within 30 minutes after the session.

To start the session on time, each author is recommended to complete the preparation during the lunch break from 12:05 - 13:30pm. Poster number will be displayed at upper left side on the bulletin board.

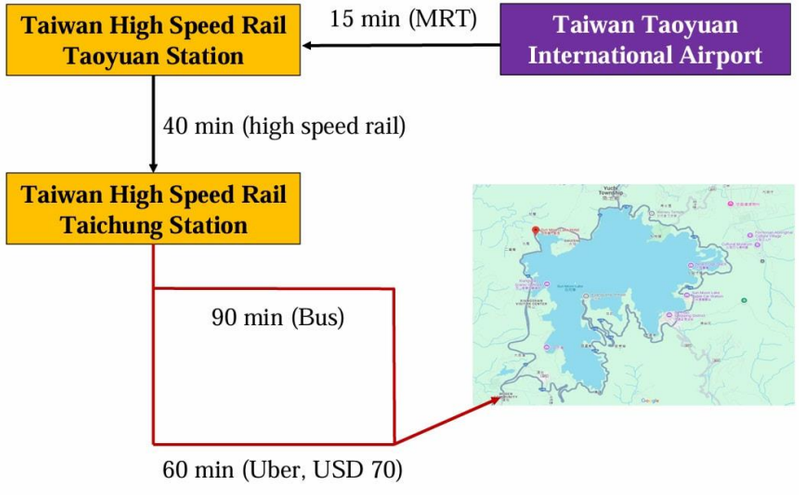
Best Paper/Poster Award

The best paper and best poster among all papers will be awarded through the examination by the program committee at the Closing Ceremony.

Transportation

As there is no direct transportation between the airport and Sun Moon Lake, traveling by Taiwan High Speed Rail (THSR) is recommended as the most convenient option.

From the airport, please take the MRT from the station located in the basement level to reach the THSR Taoyuan Station. From there, take the High Speed Rail to Taichung Station. The Sun Moon Lake Hotel can be accessed from the Taichung Station by taxi, bus, or private car. Among these options, taking a metered taxi is generally the most convenient. More details can be found at https://www.sunmoonlake.gov.tw/en/guide/sunmoonlake.



Accommodation

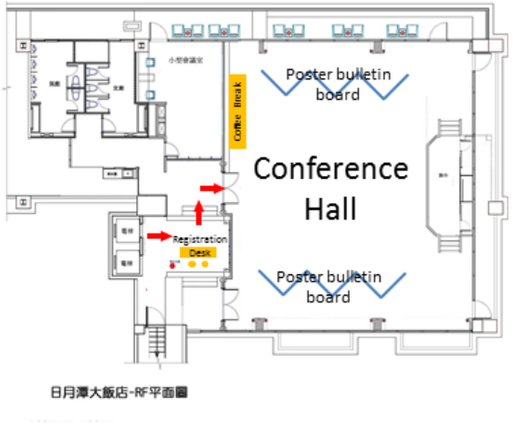
The regular registration fee includes two nights of hotel accommodation at the Sun Moon Lake Hotel. **The default accommodation for 2-night arrangement will be the dates from November 12 - 13**. There are variety of hotels nearby conference venue. The details can be found at https://www.sunmoonlake.gov.tw/en/accommodation/list .

Venue

IWH 2025 will be held in the Sun Moon Lake Hotel at Nantou County, Taiwan. The hotel address is “419 Zhongshan Rd., Yuchi Township, Nantou County 555, Taiwan”. The more details can be found at **https://www.smlh.com.tw/en/**.

The Conference Hall is located in the Star Moon Hall on the RF floor which is the top floor of the hotel. The Welcome Reception and Banquet are held on B1 and B2 floors, respectively. Details of floor map are shown below.

The Conference Hall (RF)



The Welcome Reception (B2)

The Banquet (B1)