


ADVANCE PROGRAM

International Topical Meeting on
Information
Photonics
2008



November 16-20, 2008

Awaji Yumebutai International Conference Center
Hyogo, Japan

Organized by

Group of Information Photonics of the OSJ

Sponsored by

OSJ (The Optical Society of Japan (JSAP))

Endorsed by

OSA (Optical Society of America)

ICO (International Commission for Optics)

OSK (Optical Society of Korea)

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

LSJ (The Laser Society of Japan)

EOS (European Optical Society)

JOEM (Japan Optomechatronics Association)

OITDA (Optoelectronic Industry and Technology Development Association)

JPS (The Physical Society of Japan)

SCOPE OF THE CONFERENCE

Information photonics is an emerging field that includes state-of-the-art methods, devices, models, and applications related to the utilization of optics in information society. The objective of this meeting is to bring together international scientists, researchers, engineers and students to discuss recent developments in the field of information photonics.

CONFERENCE SCHEDULE

Sunday, November 16		Monday, November 17		Tuesday, November 18		
14:00		8:00		8:00		
15:00		9:00		Registration		Registration
16:00		Registration	10:00	Opening Remark	10:00	Company Exhibition
17:00		11:00	Plenary p. 4	11:00	Plenary pp. 11	
18:00		Get Together Party	12:00	Lunch	11:00	
19:00		13:00		12:00	Lunch	
		14:00		Computational Optical Sensing and Imaging p. 4	13:00	
		15:00	Coffee Break	14:00		
		16:00	New Schemes for Optical Computing p. 5	15:00		Excursion Himeji Castle and Japanese Garden
		17:00		16:00		
		18:00		Poster Session pp. 6-11		17:00
		19:00		18:00		
				19:00	Banquet The Plants Museum of Miracle Planet	

Information Photonics

Wednesday, November 19	
8:00	Registration
9:00	
10:00	Holography and Applications pp. 12-13
11:00	
12:00	Coffee Break
13:00	Materials p. 13
14:00	
15:00	Lunch
16:00	Optics and Photonics Devices and Technologies pp. 13-14
17:00	
18:00	Coffee Break
19:00	Applications of Information Photonics pp. 14-15
20:00	
21:00	Poster Session pp. 15-21
22:00	
23:00	Company Exhibition
24:00	

Thursday, November 20	
8:00	Registration
9:00	
10:00	Digital Holographic Microscopy p. 21
11:00	
12:00	Coffee Break
13:00	3D Imaging p. 22
14:00	
15:00	Company Exhibition
16:00	
17:00	Company Exhibition
18:00	
19:00	Company Exhibition
20:00	

• **Location**

- Opening Remark, Plenary, and Oral Presentations:
Main Hall
- Poster Presentations:
Reception Hall B and Foyer

TECHNICAL PROGRAM

Monday, November 17

Opening Session

10:00-10:15

Presider: *T. Shimura*
The Univ. of Tokyo, Japan

Opening Remarks

10:00 *J. Tanida*
Osaka Univ., Japan

Plenary Session

10:15-11:45

Presider: *J. Tanida*
Osaka Univ., Japan

1-a1

10:15 **High speed vision and its applications**

M. Ishikawa
The Univ. of Tokyo, Japan

1-a2

11:00 **An ultrafast all-optical digital technology**

A. Huang
Terabit Cooperation, USA

Lunch 11:45-13:15

Computational Optical Sensing and Imaging

13:15-15:00

Presider: *D. J. Brady*
Duke Univ., USA

1-p1 Invited

13:15 **New flexibility for optical metrology and optical trapping by digital holography**

W. Osten, S. Zwick, X. Schwab, G. Pedrini
Universität Stuttgart, Germany

Digital holography in combination with spatial light modulators applied for reconstructing digitally stored holograms enables various new applications for metrology and wave front control such as the comparative holography and the flexible manipulation of tiny particles by holographic optical tweezers.

1-p2 Invited

13:45 **Computational compound imaging system**

J. Tanida
Osaka Univ., Japan

A computational compound imaging system is a novel form of imaging system. TOMBO is an example of the system applicable to various problems. Irregular lens arrangement and inter-lens integration are effective to enhance the performance and the functionality of the compound imaging system.

1-p3

14:15 **Scaling laws for single- and multi-aperture optical systems**

N. Hagen, D. J. Brady
Duke Univ., USA

The information transmitted by an imaging system involves tradeoffs in cost, field-of-view, pupil size, and f-number. We show how the information scales with these system parameters for single and multi-aperture systems, and outline the design space in which multi-aperture systems can provide better information throughput

1-p4

14:30 **Three-dimensional object reconstruction and classification using computational integral imaging and statistical analysis**

S. Yeom, D. Lee, S. Kim, J.-Y. Son
Daegu Univ., Korea

Integral imaging records three-dimensional information on elemental images. Computational reconstruction and pattern classification are performed with statistical analysis of elemental images. The proposed methods are applied to occluded targets and out-of-plane rotated objects showing promising results.

1-p5

14:45 **First experimental report for fully interferometric three-dimensional imaging spectroscopy**

K. Yoshimori, M. Sasamoto
Iwate Univ., Japan

Three-dimensional 3D spectral image has been obtained by fully passive interferometric technique using two-wavefronts-folding interferometer. This paper reports first experimental results in which measured object is a monochromatic point source. Numerical results for imaging properties are also shown for comparison.

Coffee Break 15:00-15:30

**New Schemes for Optical Computing
15:30-17:00**

Presider: *Y. Hayasaki*
Utsunomiya Univ., Japan

**1-p6 Invited
15:30**

**Coherence dynamics, coherence topology,
and singular optical coherence**

W. Wang¹, M. Takeda²
1: Heriot-Watt Univ., UK,
2: The Univ. of Electro-Communications, Japan

This paper is a review and extension of our recent work on singular optical coherence, which deals with the topological defects in optical coherence functions. Some dynamics properties associated with a phase singularity in correlation function and the related topological rules have been explored theoretically and experimentally.

**1-p7
16:00**

**Concept and primal implementation of
photonic nanoscale automaton**

Y. Ogura, T. Nishimura, Y. Horiguchi, J. Tanida
Osaka Univ., Japan

We describe on photonic nanoscale automata as an embodiment of a fundamental structure for photonic computation at a nanoscale. The method is realized by combining photonics with DNA technologies to control nano-sized objects using propagating light. Experimental results demonstrated correct state transitions of DNA-based automata through photonic signals.

**1-p8
16:15**

**Hierarchical information retrieval based on
optical near-field interactions**

N. Tate¹, W. Nomura¹, T. Yatsui¹, M. Naruse^{1,2}, M. Ohtsu¹
1: The Univ. of Tokyo, Japan
2: National Inst. of Information and Communication Technology, Japan

Optical near-field interactions exhibit hierarchical responses in the nanometer-scale, and allow unique nanophotonic system functions. Design logic of physical properties of a medium is essential factor for implementation of hierarchical processing based on the nanophotonics. We numerically demonstrate basic concept of hierarchical information retrieval based on optical near-field interactions.

**1-p9
16:30**

**Lensless optical correlator using two
phase-only spatial light modulators**

N. Fukuchi, T. Inoue, H. Toyoda, T. Hara
Hamamatsu Photonics, Japan

A lensless optical correlator using two phase only spatial light modulators SLMs is proposed. The SLMs are used for displaying input and filter patterns respectively. By adding spherical phase distributions to the patterns, the lensless design is realized. This lensless system is simple and easy to adjust its alignment.

**1-p10
16:45**

**Visual cryptography decoding with periodic
pattern**

R. Shogenji, J. Ohtsubo
Shizuoka Univ., Japan

We propose an encoding method based on visual cryptography scheme to solve the alignment difficulty in the decoding process. A periodic pattern is adopted as a key image to achieve easy decoding. Examples of the extended decoding result are demonstrated to verify the validity of the proposed method.

Break 17:00-17:15

Poster Session

17:15-18:45

Presider: N. Yoshikawa
Saitama Univ., Japan

p1-1 Phase locking conditions of VCSEL array with Talbot cavity

T. Oiwa¹, K. Tachi¹, T. Nishina², T. Miyamoto², T. Kurokawa¹
¹: Tokyo Univ. of Agriculture and Technology, Japan
²: Tokyo Inst. of Technology, Japan

We studied phase locking conditions of two-dimensional VCSEL array with a Talbot cavity. The emission wavelength of the fabricated 7×7 VCSEL array was distributed within 0.1 nm, and the injection locking of laser diodes were achieved for the frequency detuning over 20 GHz.

p1-2 Perfect invisibility devices constructed using left-handed metamaterials

T. Ochiai¹, U. Leonhardt², J.C. Nacher³
¹: Toyama Prefectural Univ., Japan
²: Univ. of St Andrews, UK
³: Future University-Hakodate, Japan

In this work, we propose a novel design of invisibility devices based on negative refraction that seems to create perfect invisibility. In this device, both the time delay and the reflection are zero. These findings strongly indicate that perfect invisibility with optically isotropic materials is possible.

p1-3 Talbot effect and Lau effect caused by light emitter arrays with a finite number of point light sources

K. Tachi¹, T. Oiwa¹, T. Nishina², T. Miyamoto², T. Kurokawa¹
¹: Tokyo Univ. of Agriculture and Technology, Japan
²: Tokyo Inst. of Technology, Japan

We successfully observed a self-image reproduced from two pinhole arrays illuminated with LEDs. This result indicates the feasibility of the phase locking for a two-dimensional vertical cavity surface emitting laser VCSEL array using a Talbot cavity.

p1-4 Implementation of elemental operations in SIMD pattern processing with image compression

K. Nitta, T. Minami, O. Matoba
Kobe Univ., Japan

Elemental operations for SIMD Single Instruction stream Multiple Data stream pattern processing by means of image compression are designed for LSI implementation. Three logical operations which are NOT, AND, and XOR are constructed and verified.

p1-5 Construction of optical hardware for parallel modulo multiplication

N. Katsuta, K. Nitta, O. Matoba
Kobe Univ., Japan

A system to control an optical interferometer for parallel modulo multiplication is developed. In the system, preprocessing to determine tilt angles of mirrors in the interferometer is executed and signals to control the rotation stages are transmitted to a stage controller. It is verified that the constructed system can provide desired results for prime factorization.

p1-6 Allowable alignment errors of components in an optically reconfigurable gate array

H. Morita, M. Watanabe
Shizuoka Univ., Japan

An optically reconfigurable gate array ORGA is a type of multi-context field programmable gate arrays. The ORGA consists of a holographic memory, a laser diode array, and a gate array VLSI. The ORGAs are very advanced devices. However, the allowable alignment errors between a holographic memory and an ORGA-VLSI and between a laser array and the holographic memory were concerns in an ORGA. Therefore, to clarify the assembly accuracy for future manufacture of ORGAs, this paper presents allowable alignment errors of components constituting an ORGA.

p1-7 Three-dimensional shape measurement using optimum synthesized color grating

N. Yoshikawa, M. Kimura, S. Yamazaki
Saitama Univ., Japan

We propose a new method for performing accurate 3D shape measurements by using an optimum synthesized color grating. We have experimentally demonstrated that a color grating pattern is decomposed correctly into RGB channels and that three deformed grating patterns can be independently obtained in a single measurement operation.

p1-8 Reconstruction evaluation of absorbers in secure data storage using diffusing optical medium

*K. Fujimoto, S. Matsuki, K. Nitta, O. Matoba
Kobe Univ., Japan*

Reconstructed quality of absorbers in a highly scattering medium is evaluated for assessment of storage density. The absorbers can be used as secure data when scattering is strong enough. We present numerical results of evaluation of contrast in absorption coefficients as a function of normalized distance of absorbers in different scales.

p1-9 Parallel phase-shifting digital holography with simultaneous use of visible and invisible light

*K. Ito¹, T. Tahara¹, T. Wakamatsu¹, A. Kaneko¹, T. Koyama¹, Y. Awatsuji^{1,2}, K. Nishio¹, S. Ura¹, T. Kubota³, O. Matoba⁴
1: Kyoto Inst. of Technology, Japan
2: Japan Science and Technology Agency, Japan
3: Kubota Holography Laboratory, Japan
4: Kobe Univ., Japan*

We proposed phase-shifting digital holography using visible and invisible light simultaneously as a technique capable of single-shot three-dimensional structure and spectral image measurement. Effectiveness of the digital holography was verified by both numerical simulation and preliminary experiment using two lasers operated at 633nm and 830nm wavelengths.

p1-10 Single-shot phase-shifting digital holography with dual-wavelength phase unwrapping

*T. Wakamatsu¹, A. Kaneko¹, T. Koyama¹, Y. Awatsuji^{1,2}, K. Nishio¹, S. Ura¹, T. Kubota³, O. Matoba⁴
1: Kyoto Inst. of Technology, Japan
2: Japan Science and Technology Agency, Japan
3: Kubota Hologram Lab., Japan
4: Kobe Univ., Japan*

We propose a single-shot phase-shifting digital holography with two different wavelengths to achieve more accurate phase-unwrapping and longer measurable range. Compared to the range in phase-shifting digital holography with a wavelength 633 nm, the range was lengthened fivefold in the proposed technique with two wavelengths 633 nm and 532 nm.

p1-11 Light-induced refractive index profile measurement using digital holographic microscopy

*C.-J. Cheng¹, Y.-C. Lin¹, H.-Y. Tu^{2,3}, J.-S. Chiang³
1: National Taiwan Normal Univ., Taiwan
2: St. John's Univ., Taiwan
3: Tamkang Univ., Taiwan*

We propose and demonstrate an in situ measurement technique of the light-induced refractive index profile in the holographic recording media by use of the phase-shifting digital holographic microscopy. The dynamic behaviors of grating formation and the refractive index 3-D profile in PQ:PMMA holographic recording media can be quantitatively measured.

p1-12 Single-shot in-line digital holography recording two fringe images generated at two different planes

*Y. Awatsuji^{1,2}, T. Koyama¹, T. Tahara¹, T. Wakamatsu¹, A. Kaneko¹, K. Ito¹, K. Nishio¹, S. Ura¹, T. Kubota³, O. Matoba⁴
1: Kyoto Inst. of Technology, Japan
2: Japan Science and Technology Agency, Japan
3: Kubota Holography Laboratory, Japan
4: Kobe Univ., Japan*

The authors propose an in-line digital holography that can simultaneously record two interference-fringe images generated at different planes using an image sensor. The technique is capable of three-dimensional measurement of moving object and does not require phase-shifting interferometry to reconstruct accurate image. The technique was successfully demonstrated by numerical simulation.

p1-13 Characteristics of shift multiplexed recording of the holographic memory system with certification function

*Y. Suzuki, T. Nomura, E. Nitanaï, T. Numata
Wakayama Univ., Japan*

A holographic memory system using an optical encryption method has been proposed. We investigate crosstalk of a single hologram in the proposed system. By the experiments, it is shown that diffraction efficiency deteriorates enough if the media is shifted 4 μm .

p1-14 Storage density consideration of collinear holographic memory

*T. Shimura, Y. Sumi, R. Fujimura, K. Kuroda
The Univ. of Tokyo, Japan*

We derived formulas that describe the relationship among the storage density and system parameters in the collinear holographic memory. We estimated the system parameters required for the storage capacity of 1TB per disc of CD size.

p1-15 High-spatial-frequency pre-enhancement for holographic memory

*N. Kinoshita, T. Muroi, N. Ishii, K. Kamijo, N. Shimidzu
NHK, Japan*

A signal beam modulated spatially by datapages in holographic memory goes through lens when recording into and reproducing from a holographic medium. In that case, the amplitude of the high-spatial-frequency components of the datapage decreases, causing deterioration of the signal quality of the reproduced datapage. We experimentally investigate the effectiveness of a high-spatial-frequency pre-enhancement to improve the deterioration.

p1-16 Optical compensation method for reproduced digital-bit-data in holographic data storage

*T. Muroi1, N. Kinoshita1, N. Ishii1, K. Kamijo1, N. Shimidzu1, M. Booth2, R. Juskaitis2, T. Wilson2
1: NHK, Japan
2: Univ. of Oxford, UK*

Adaptive optics controlled by a genetic algorithm were used to compensate for the distortion caused by shrinkage of the photopolymer medium in reproduced digital-bit-data. The signal-to-noise ratio in the local area increased from -19.4 to 3.3 dB and the average signal-to-noise ratio in the whole area increased by 1.6 dB.

p1-17 Diffraction efficiency increase of polarization holographic gratings in erasable and rewritable dye-doped liquid-crystal films

*W.-C. Su, J.-Y. Chen, C.-Y. Huang
National Changhua Univ. of Education, Taiwan*

The diffraction efficiency of a polarization hologram in dye-doped liquid-crystals can be increased by using two writing beams with unequal intensity. We find the achievable maximum diffraction efficiency of a sample with thickness of 6 μ m can reach 18% when the beam ration of two recording beams is 10:1.

p1-18 Control of binocular cameras for large stereoscopic LED display

*K. Yamaguchi, H. Yamamoto
The Univ. of Tokushima, Japan*

This paper proposes a method control binocular cameras in order to adjust the depth of field and reproduced distance. Proposed method makes the most use of the reproducible depth and provides a linear relationship between the distances between objects and their reproduced distances by a large stereoscopic LED display.

p1-19 Effects of performance characteristics of LCD panel on reconstruction of 3-D images

*K. Sato
Univ. of Hyogo, Japan*

Reconstruction of 3-D images using a LCD panel is studied by the numerical simulation. The nonlinear response of the LCD panel and the shifted phase of modulated light have significant influences upon the quality of reconstructed images. New methods are described for improving the quality of image.

p1-20 Reconstruction of occluded regions in integral imaging using arbitrary view generation and optical flow

*J.-H. Jung1, J.-H. Park2, B. Lee1
1: Seoul National Univ., Korea
2: Chungbuk National Univ., Korea*

Optical flow is a concept which approximates the motion of objects within a visual representation. In this paper, we propose a method for reconstruction of occluded region of elemental image using optical flow. In the reconstruction of partially occluded 3D object, optical flow can easily segment sub-images and find occluded regions. Each sub-image is compared with the central sub-image and we accumulate the difference of sub-images in occlusion regions. The occlusion regions of elemental images are reconstructed by the accumulated difference.

p1-21 Improved three-dimensional depth plane reconstruction using light fields

*J.-M. Kang1, J.-H. Park2, B. Lee1
1: Seoul National Univ., Korea
2: Chungbuk National Univ., Korea*

A novel depth plane image generation algorithm using lens array is proposed. In integral imaging, elemental image can be regarded as sampling of light fields. Light fields are used for synthetic aperture photography. We propose a new synthetic aperture photography method which overcomes the viewing angle limitation of lens array.

p1-22 **Three-dimensional moving picture recording and observation of visible femtosecond light pulse propagation by means of light-in-flight recording by holography**

*S. Nakajima*¹, *M. Makino*¹, *M. Aihara*¹, *T. Kakue*¹, *A. Kuzuhara*¹, *Y. Awatsuji*^{1,2}, *K. Nishio*¹, *S. Ura*¹, *T. Kubota*³
1: Kyoto Inst. of Technology, Japan
2: Japan Science and Technology Agency, Japan
3: Kubota Holography Laboratory, Japan

398-picosecond moving picture of three-dimensional image of propagation of 224-femtosecond laser pulse with 400-nm center wavelength was demonstrated by light-in-flight recording by holography. The pulse was generated from near-infrared femtosecond light pulse by SHG with BBO crystal. Konica Minolta P5600 was used for recording material sensitive for the visible light.

p1-23 **Fiber transmission characteristics of optical short pulses generated with optical pulse synthesizer**

Y. Kodama, *R. Kobe*, *T. Shioda*, *Y. Tanaka*, *T. Kurokawa*
Tokyo Univ. of Agriculture and Technology, Japan

Using an optical synthesizer that can produce arbitrary pulse shape from optical frequency comb by precisely controlling its intensity and phase spectra, we experimentally clarified the pulse shape optimal for fiber transmission.

p1-24 **Photonic label recognition by time-space conversion and two-dimensional filtering with delay compensation**

*H. Tsunematsu*¹, *T. Arima*², *N. Goto*¹, *S. Yanagiya*¹
1: The Univ. of Tokushima, Japan
2: Toyohashi Univ. of Technology, Japan

Optical label recognition system using time-to-space conversion and spatial Vander Lugt two-dimensional correlation and post-processing with a slit and delay compensator is proposed. For four-bit BPSK labels at 160Gb/s, eight different labels are distinguished. The ratio of auto-correlation to cross-correlation is 0.62 and 0.4 without and with time gating.

p1-25 **Buffering of 2.5-Gbps optical packets by fiber loop with optical switch and EDFA**

K. Fujii, *K. Kashiwagi*, *T. Shioda*, *Y. Tanaka*, *T. Kurokawa*
Tokyo Univ. of Agriculture and Technology, Japan

Optical memory for optical packet storage remained in the optical domain is required for future packet-switched photonic networks. We propose the optical fiber loop memory in a simple conformation with an optical switch and an EDFA. 2.5-Gbps packet pattern was successfully buffered for 5.5 μ s corresponding to 10 circulations.

p1-26 **A visual calibration method for calibrating the tone reproduction curve of a PC display**

T. Yuasa, *Y. Aizu*
Muroran Inst. of Technology, Japan

In order to provide color management environment with high quality, it is necessary to calibrate the tone reproduction curve of a PC display. We developed a visual calibration method of a PC display using the Color Matching Method CMM that employs a visual evaluation but not a colorimeter.

p1-27 **Development of the algorithm to separate halftone dots for evaluation of printed image quality**

T. Yuasa, *Y. Aizu*
Muroran Inst. of Technology, Japan

Printed images are generally controlled by area modulation of halftone dots. Therefore, it is important to measure accurately dot areas for controlling printing processes. In this paper, new algorithm is developed for separating halftone dots consisting of 4 color inks each other and measuring the area of halftone dots.

p1-28 **Improvement of GPU particle filter for fast head tracking**

S. Hosooka, *T. Makino*, *H. Kinoshita*, *N. Tsumura*, *T. Nakaguchi*, *Y. Miyake*
Chiba Univ., Japan

In this paper, we present improved GPU particle filter for 3D head position and rotation tracking by using shapefree texture technique. The proposed system enables to track user's head position and rotation with low calculation cost by the use of the pre-composed 3D model of the tracking target.

p1-29 A measurement of bidirectional texture function for flatbed scanning system

*Y. Itakura, M. Yokoyama, N. Tsumura, T. Nakaguchi, Y. Miyake
Chiba Univ., Japan*

Recently, a flatbed scanning system which can measure the glossiness of the object is required for digital archives. To develop the “simulator” of this scanning system, we propose a novel measurement method to obtain Bidirectional Texture Function BTF, and a model of irradiance distribution from the linear light source.

p1-30 Determination of a fringe peak of an interferogram by low-coherent interferometry

*Y. Tanohata, T. Nomura, E. Nitandai, T. Numata
Wakayama Univ., Japan*

The method to determine the fringe peak of an interferogram by low-coherent interferometry is proposed. Phase relation between two wavelengths is used for determination. Preliminary experimental results are shown to confirm the proposed method.

p1-31 Method for determining microindenter tip topography with a scanning white light interferometer and the uses of image stitching method

*Y.-L. Chen, H.-C. Hsieh, W.-T. Wu, D.-C. Su, K.-Y. Hsu
National Chiao-Tung Univ., Taiwan*

A scanning white light interferometer is used to test a microindenter tip from two different angles, and two results are obtained. Then these two results are merged together to form the 2D topography by using the image stitching method. Its validity is demonstrated.

p1-32 Reproduction system of sound information from wax phonograph cylinders based on low-coherence topography

*T. Hasegawa, T. Iwai
Tokyo Univ. of Agriculture and Technology, Japan*

We build up a new reproduction system of sounds from old wax phonograph cylinders based on a low-coherence topographic method. The surface profile of the wax phonograph cylinder is measured by this system, and transformed numerically to the sound.

p1-33 Limits of measurement uncertainty of white-light interferometry on rough surfaces

*P. Pavlíček1, O. Hýbl1, 2
1: Joint Laboratory of Optics of Palacky University and Institute of Physics of the Academy of Sciences of the Czech Republic, Czech
2: Univ. of Erlangen-Nuremberg, Germany*

White-light interferometry measuring optically rough surface shows an error caused by surface roughness. This error has a statistical character and is nonzero even if the determination of the contrast maximum of the interferogram were completely accurate. The analysis of this error is discussed in the presented paper.

p1-34 Wavelength shift of surface plasmon resonance depending on the carrier density of the layer piled on an Ag thin film

*N. Saiga, R. Nakao, S. Adachi
Yonago National College of Technology, Japan*

Using Kretschmann arrangement of a right triangle prism with a thin Ag film piled a metal or weak conductive semiconductor film, the surface plasmon was excited by He-Ne laser of 632.8 nm. It was assured that the plasmon exhibited the shifted absorption dip depending on their density of free electrons.

p1-35 Observation of 380 nm electroluminescence from monolayer ZnO nanoparticles/organic heterostructure

*C.-Y. Lee, C.-F. Lin
National Taiwan Univ., Taiwan*

We report electroluminescence from ZnO nanoparticle-based devices prepared by the dry-coating method. With dry-coating process, the structure of the ZnO nanoparticle monolayer in the device can be achieved. The devices show the ZnO band-gap emission at 380 nm and the background emission from the interface between host matrix and Alq3.

p1-36 Simultaneously sensing differential pressure and temperature using fiber Bragg gratings

*H.-J. Sheng1, W.-F. Liul, K.-R. Lin1, M.-Y. Fu2
1: Feng-Chia Univ., Taiwan
2: Air Force Academy, Taiwan*

By a novel packaging design of fiber Bragg grating, a simultaneously temperature and differential pressure fiber sensor is proposed. The pressure sensitivity and the temperature sensitivity are $5.27 \times 10^{-1} \text{ Mpa}^{-1}$ and $0.04 \text{ nm} / ^\circ\text{C}$ respectively. This simple and low-cost device can be applied in the wide range of multifunction sensing heads.

p1-37 **Using immersion lithography for fabricating the ridged polymeric waveguide with a reflective end**

R. F. Shyu¹, S. L. Lu¹, J.-J. Wu², H. Yang²
1: National Formosa Univ., Taiwan
2: National Chung Hsing Univ., Taiwan

This contrivance aims to develop the ridged polymeric waveguides with a reflective end on plane. The key process is to immerse the photomask and substrate in DI water for lithography expose and the ridged polymer waveguides with a 45° reflective end can be fabricated.

p1-38 **Wavelet generic Fourier descriptor for pattern classification and recognition using optical joint transform correlator**

R. B. Yadav, A. K. Gupta
Instrument Research and Development Establishment, India

In this paper, we report retrieval and classification of various shapes employing wavelet generic Fourier descriptor WGFD. WGFD technique has been applied to a database of 1000 shapes, with 20 different classes. For retrieved shape recognition, an optical experiment employing joint transform correlator architecture has been carried out.

p1-39 **Intraoral three-dimensional shape measurement using a compound-eye camera with integrated pattern projector**

H. Tanabe¹, K. Kagawa¹, C. Ogata², Y. Ogura¹, Y. Nakao³, T. Toyoda³, Y. Masaki³, M. Ueda², J. Tanida¹
1: Osaka Univ., Japan
2: Osaka Dental Univ., Japan
3: FUNAI Electric, Japan

We propose an intraoral three-dimensional shape-measurement system in which a pattern projector based on a diffractive optical element is integrated in the lens gap of a compound-eye camera. An evaluation system with a liquid crystal spatial light modulator demonstrated distance accuracy of 0.46 mm rms..

Tuesday, November 18

Plenary Session

9:00-10:30

Presider: *T. Shimura*
The Univ. of Tokyo, Japan

2-a1

9:00

Ultrafast optics and nanophotonics in information systems

Y. Fainman
Univ. of California, San Diego, USA

2-a2

9:45

Optical scanning holography: principles and applications

T. Poon
Virginia Polytechnic Inst. and State Univ., USA

Coffee Break 10:30-11:00

Novel Optical Metrology

11:00-12:00

Presider: *K. Hsu*
National Chiao Tung Univ., Taiwan

2-a3 Invited

11:00

Multispectral Microscopy using Coded Aperture Snapshot Spectral Imaging

D. Brady, C. Fernandez
Duke Univ., USA

Coded aperture snapshot spectral imaging uses compressive sampling and constrained image estimation to reconstruct full data cubes from single frames, thus enabling real-time multispectral imaging. This talk describes the spectral microscopy using this approach, focusing particularly on images of multiple fluorescent markers in biological assays.

2-a4

11:30

Remote and in-situ calibration of translation stage by low-coherence tandem interferometer

*A. Hirai*¹, *J. Kitta*², *F. Kobayashi*³, *K. Sasaki*¹,
*H. Matsumoto*⁴

1: National Inst. of Advanced Industrial Science and Technology, Japan

2: Japan Quality Assurance Organization, Japan

3: Tokyo Univ. of Agriculture and Technology, Japan

4: The Univ. of Tokyo, Japan

In-situ calibration system of translation stage by transferring length information between two distantly located low coherence interferometers through a single-mode optical fiber is developed. Experimental results of repeatability of 21 nm and reproducibility of 40 nm are achieved. In-situ calibration of a translation stage is demonstrated.

2-a5

11:45

Vibration-insensitive scanning white-light interferometer

*M. E. Pawlowski*¹, *M. Takeda*²

1: Anritsu Precision, Japan

2: Univ. of Electro-Communications, Japan

A vibration-insensitive scanning white-light interferometer is presented, which is capable of shape measurement with nanometer-range repeatability in ordinary room condition. Measurement in a hostile environment is possible due to the use of a high speed camera and a self-calibration algorithm based on a reference fringe signal generated by a He-Ne laser.

Wednesday, November 19

Holography and Applications

9:00-10:30

President: *B. Lee*
Seoul National Univ., Korea

3-a1 Invited

9:00 **3D optics**

G. Barbastathis
MIT, USA

In 3D optics, light interacts with an entire volume of modulated refractive index. We review light propagation in 3D optical elements with a spatial carrier “volume holograms” and their use as highly shift variant lenses with depth selectivity for scan-less 3D imaging and compare with digital holographic imaging.

3-a2 Invited

9:30 **Holography in femtosecond laser processing**

Y. Hayasaki
Utsunomiya Univ., Japan

Holographic technique using a computer-generated hologram displayed on a liquid crystal spatial light modulator performs parallel femtosecond laser processing with high throughput and high light-use efficiency. We demonstrate some control methods of the diffraction peak of CGH and two-dimensional and three-dimensional parallel laser processing.

3-a3

10:00

Calculation method considering reflectance distribution for computer-generated hologram using micro-facets

K. Yamaguchi, Y. Sakamoto
Hokkaido Univ., Japan

In this paper, we propose a new method that takes into consideration the reflectance distribution of object surfaces. To improve the reality of reconstructed images for computer-generated hologram, the reflectance distribution for computer-generated hologram was confirmed by comparing theoretical and simulated values and using optically reconstructed images.

3-a4

10:15

One-shot color digital holography

*K. Maejima, H. Toge, K. Sato
Univ. of Hyogo, Japan*

One-shot digital holography is developed in order to record the complex-amplitude hologram for a color 3-D image instantaneously. The complex-amplitude hologram is obtained by spatially sampling the recorded hologram and by interpolating the sampled hologram data. A fine color images is reconstructed from the RGB complex-amplitude in-line hologram.

Coffee Break 10:30-11:00

Materials

11:00-12:00

Presider: *O. Matoba
Kobe Univ., Japan*

3-a5 Invited

11:00

Advances in doped photopolymers for information storage and processing

*S. H. Lin, K. Hsu
National Chiao Tung Univ., Taiwan*

We present a two-step approach for fabricating cm-thick doped photopolymer materials. Experimental characterizations show extra-low photo-induced shrinkage in these samples. These materials are promising for volume holographic data storage and image processing applications.

3-a6

11:30

Optical information recording in films of photoinduced birefringent materials and its application

*D. Barada^{1,2}, K. Tamura³, T. Fukuda², T. Yatagai^{1,3}
1: Utsunomiya Univ., Japan
2: National Inst. of Advanced Industrial Science and Technology, Japan
3: Univ. of Tsukuba, Japan*

Polarization recording of optical information in films made of azobenzene-containing materials was described. It was theoretically verified that photoinduced birefringence of azobenzene films are applicable to polarization holographic recording media. Based on the recording principle, the optical recording of a two dimensional phase pattern in an azobenzene film was demonstrated.

3-a7

11:45

Moving picture recording of femtosecond light pulse propagation with rewritable recording material

*K. Tosa¹, M. Aihara¹, T. Kakue¹, A. Kuzuhara¹, M. Makino¹, Y. Awatsuji^{1,2}, S. Ura¹, K. Nishio¹, T. Kubota³
1: Kyoto Inst. of Technology, Japan
2: Japan Science and Technology Agency, Japan
3: Kubota Holography Laboratory, Japan*

We succeeded in recording and observing, for the first time, moving pictures of femtosecond light pulse propagation by light-in-flight recording by holography using rewritable recording material. We used an ultrashort pulsed laser that generated 130fs duration pulse of 400nm center wavelength, and photo-conductor plastic hologram plate as rewritable recording material.

Lunch 12:00-13:30

Optics and Photonics Devices Technologies

13:30-15:00

Presider: *M. Naruse
NICT, Japan*

3-p1 Invited

13:30

Freeform (Micro-) optics for information photonics

*S. Sinzinger
Technische Universität Ilmenau, Germany*

We discuss recent technological developments focused on the fabrication of efficient microoptical elements and systems for various applications. Ultraprecision micromachining and holographic lithography have reached a high level of precision and flexibility which is interesting for the fabrication of freeform (micro-)optical elements e.g. for beam shaping and optimized imaging.-

3-p2

14:00

Planar-integrated optics and micro-fluidics for lab-on-a-chip systems

*P. Deiter, C. Bonerz, M. Gruber
Univ. of Hagen, Germany*

We present a planar integration platform for lab-on-a-chip systems. Proof-of-principle demonstrators equipped with ultrasonic micro-fluidic pumps and with various built-in microscopic illumination schemes were constructed and tested

3-p3
14:15

Plasma-deposited silicon nitride/ silicon dioxide waveguide for on-chip scale photonic integrated circuit

*K. Ikeda, Y. Fainman
Univ. of California, San Diego, USA*

We report a silicon nitride/ silicon dioxide waveguide prepared using plasma-enhanced chemical vapor deposition for on-chip scale photonic integrated circuit, which has the propagation loss of ~4dB/cm. We obtain the quality factor of ~35,000 for a ring resonator with the waveguide and study its thermal and Kerr nonlinearities.

3-p4
14:30

Design of a wavelength selective switch using an LCOS and a multi-stacked AWG fabricated on wedge-shaped substrates

*K. Sorimoto¹, H. Tsuda¹, H. Ishikawa², T. Hasama², H. Kawashima², K. Kintaka², M. Mori², H. Uetsuka³
1: Keio Univ., Japan
2: National Inst. of Advanced Industrial Science and Technology, Japan
3: Hitachi Cable, Japan*

We designed a compact wavelength selective switch using an LCOS and a multi-stacked arrayed-waveguide grating using wedge-shaped substrate. It had 11 output ports and could route 40 optical signals of 100-GHz-spacing wavelength channels.

3-p5
14:45

Supercontinuum comb generation using optical pulse synthesizer and highly-nonlinear dispersion-shifted-fiber

*N. Tamura, S. Choi, K. Kashiwagi, T. Shioda, Y. Tanaka, T. Kurokawa
Tokyo Univ. of Agriculture and Technology, Japan*

Supercontinuum comb light was generated by using an optical pulse synthesizer and a highly-nonlinear fiber. To broaden the spectral bandwidth, we investigated comb generation conditions including the seed pulse shape, the repetition frequency rate and the fiber length.

Coffee Break 15:00-15:30

Applications of Information Photonics

15:30-17:00

President: *S. Sinzinger
Technische Universität Ilmenau, Germany*

3-p6 Invited

15:30

Interacting with the nano-world on the all-optical photonics workstation

*J. Glückstad
Technical Univ. of Denmark, Denmark*

A unique Photonics Workstation has been developed for generating arrays of currently 100 fully reconfigurable laser-traps making 3D real-time optical manipulation and characterization possible with the use of a joystick or computer vision. A patented spatial mapping is used to obtain real-time reconfigurable optical traps in the sample volume where the manipulation of a plurality of nano-featured micro-objects takes place.

3-p7

16:00

Spatio-temporal characteristics of a wavefield with lateral and longitudinal periodicity

*J. Jahns¹, S. Helfert¹, A. W. Lohmann²
1: FernUniversität in Hagen, Germany
2: Univ. of Erlangen, Germany*

We consider the properties of an optical wavefield which is periodic in lateral and longitudinal direction. Such wavefields can be generated by a Fabry-Perot resonator with periodic mirrors or by a multimode waveguide with z-periodic modulation. The wavefield may be temporally stationary or pulsed.

3-p8

16:15

DWDM transmission of 27-frequency channels with 50-GHz spacing using frequency comb light source

*Y. Matsunaga, T. Hoshi, Y. Tanaka, T. Shioda, T. Kurokawa
Tokyo Univ. of Agriculture and Technology, Japan*

We generated a multi-frequency light with 27-frequency channels of 50-GHz spacing using tandem-connected two LN LiNbO₃ modulators. The RIN for each channel was comparable with the seed LD. The error-free 10-Gbps DWDM transmission was successfully achieved over 20-km transmission.

3-p9
16:30

**Duty-cycle-division-multiplexing DCDM:
towards the largest network capacity**

G. A. Mahdiraji¹, A. F. Abas¹, M. K. Abdullah², A. M. Mohammadi¹, M. Mokhtar¹
1: Univ. Putra Malaysia, Malaysia
2: Significant Technologies, Malaysia

A multiplexing technique based on duty-cycle is proposed. The channel demultiplexing is performed electronically at single user bit rate, which is very economic. In a three-user system 3×10 Gb/s, the worst receiver sensitivity achieved is -25.7 dBm. The chromatic dispersion tolerance ranging from 205 ps/nm to 226 ps/nm.

3-p10
16:45

**AWG-based tunable optical dispersion
compensator using integrated thermo-optic
phase shifters**

Y. Ikuma, H. Tsuda
Keio Univ., Japan

We have proposed and fabricated the tunable optical dispersion compensator using integrated lens-shaped phase shifters in the slab waveguide of the AWG. The tuning range was from 0 to +125 ps/nm with a bandwidth of 51 GHz. The power penalty was less than 3 dB for 12.5 GHz RZ-PRBS signals.

Break 17:00-17:15

**Poster Session
17:15-18:45**

President: *H. Tsuda*
Keio Univ., Japan

**p3-1 Simple method for characterizing
picosecond optical pulse without
autocorrelation measurements**

K. Wada, D. Noritake, H. Fukui, T. Matsuyama, H. Horinaka
Osaka Prefecture Univ., Japan

A simple method for characterizing amplitude and phase of picosecond optical pulse without autocorrelation measurements is proposed, which is based on an iterative calculation using only its fundamental and second harmonic power spectra. The feature of this method is examined by comparing it with a conventional method using autocorrelation techniques.

**p3-2 Controlling transit thermal lensing effect in
transparent liquids by femtosecond laser
pulses**

J.-L. Tang¹, S.-Z. Kuol, Y.-C. Li¹, T.-H. Wei¹, J.-N. Wang²
1: National Chung Cheng Univ., Taiwan
2: National Yunlin Univ. of Science and Technology, Taiwan

A simple and novel way to control thermal lensing effect in transparent molecular liquids, by interrupting the continuously output 28 femtosecond laser pulses into trains of various widths with respect to the thermal diffusion time, is presented.

p3-3 Multi-speed configuration for ORGAs

M. Nakajima, M. Watanabe
Shizuoka Univ., Japan

Optically reconfigurable gate arrays ORGA are a type of multi-context field programmable gate arrays. The gate array of an ORGA is optically reconfigured using a holographic memory addressed by a laser diode array. However, the holographic reconfiguration speed for each configuration context differs. Therefore, this paper presents a multi-speed configuration method and experimental results obtained for ORGAs.

p3-4 Robustness improvement in double random phase encoding using fingerprint keys

*H. Suzuki, T. Ito, T. Obi, M. Yamaguchi, N. Ohyama
Tokyo Inst. of Technology, Japan*

An image encryption technique with fingerprint keys by applying double random phase encoding has been proposed where the false rejection rate is not sufficient compared with conventional biometric authentication techniques. We propose a method to improve the robustness of such technique against rotation or distortion of fingerprints.

p3-5 Fully phase-encoding for digital holographic encryption based on liquid crystal spatial light modulators

*H.-Y. Tu^{1,2}, J.-S. Chiang², J.-W. Chou³, C.-J. Cheng³
1: St. John's Univ., Taiwan
2: Tamkang Univ., Taiwan
3: National Taiwan Normal Univ., Taiwan*

This work describes a fully phase-encoding technique for optoelectronic encryption scheme based on liquid crystal spatial light modulators which are operated at phase mode to perform the phase-encoding capability. Double key holograms are employed to promote the information security. Both analytical and experimental results are presented and discussed.

p3-6 An implementation of a nanoscale automaton using DNA conformation controlled by optical signals

*H. Sakai, Y. Ogura, J. Tanida
Osaka Univ., Japan*

We study an implementing method for realizing an automaton in a nanoscale towards nano-information processing based on photonics. Conformation of DNA is utilized to represent the state of automaton. Experimental results demonstrated intentional conformation-change of DNA with optical signals, which can be remotely operated in parallel.

p3-7 3D motion estimation of imaging device using on-sensor motion detection

*K. Nakayama¹, A. Shikino¹, T. Hamamoto¹, K. Kodama²
1: Tokyo Univ. of Science, Japan
2: National Inst. of Informatics, Japan*

We propose a method for three-dimensional motion estimation of imaging device. By using two-dimensional motion of each pixel detected on an image sensor at high frame rate, we estimate the motion of the sensor itself in real time.

p3-8 Three-dimensional shape reconstruction based on multi-cameras located at different distances and its applications

*S. Maehara, K. Fujimoto, K. Nitta, O. Matoba
Kobe Univ., Japan*

A method to obtain three-dimensional 3D shape using multi-cameras located at different distances is presented. After magnification ratios in all perspectives are measured, 3D data can be reconstructed by multiplying phase function like synthetic aperture. We present experimental results of reconstruction and extraction of 3D object.

p3-9 Irregular lens arrangement in compact compound-eye digital camera TOMBO for high-resolution imaging and accurate depth estimation

*R. Horisaki¹, Y. Nakao², T. Toyoda², K. Kagawa¹, Y. Masaki², J. Tanida¹
1: Osaka Univ., Japan
2: Funai Electric, Japan*

Irregular lens arrangement and a depth-incorporated super-resolution algorithm are proposed for a compound-eye camera to increase imaging resolution and depth estimation accuracy. Simulation shows that the sampling coverage at the distance of 10 m was improved by 53%. 6dB improvement of the power spectrum at 0.25/ pixel is confirmed experimentally.

p3-10 An inverse imaging approach to sectional image reconstruction in optical scanning holography

*X. Zhang¹, T.-C. Poon², E. Y. Lam¹
1: The Univ. of Hong Kong, Hong Kong
2: Virginia Polytechnic Inst. and State Univ., USA*

Inverse imaging is proposed to reconstruct the sectional images in a hologram by optical scanning holography. The methodology is based on formulating the reconstruction as an inverse problem, which is ill-posed and requires regularization. Experiments on multiple-section holograms demonstrate the efficacy of the approach in sectional image reconstruction with suppression of the defocus noise.

p3-11 Numerical optimization of dynamic holographic optical tweezers by Jones matrix

*Y. Doi, J. Yamamoto, T. Iwai
Tokyo Univ. of Agriculture & Technology, Japan*

The 0-th order diffraction light in the reconstructed image disturbs the particle manipulation in the performance of the dynamic optical holographic tweezers. The purpose of this research is to investigate polarization characteristics of amplitude and phase modulations in the HOTs to reduce the influence of the 0-th order diffraction light.

p3-12 Stability of particles trapped by optical tweezers using time-division holograms

*J. Yamamoto, T. Iwai
Tokyo Univ. of Agriculture & Technology, Japan*

We so far have developed optical tweezers using time-divided holograms. In this technique, we have to consider the effect of the time-division optical trapping of particles. In this research, we investigate the stability of optical trapping of particles by experiments and numerical analysis.

p3-13 Numerical study on moving picture recording of ultrashort light pulse magnified by microscope objective lens in light-in-flight recording by holography

*M. Makino¹, T. Kakue¹, M. Aihara¹, A. Kuzuhara¹, Y. Awatsuji^{1,2}, K. Nishio¹, S. Ura¹, T. Kubota³
¹: Kyoto Inst. of Technology, Japan
²: Japan Science and Technology Agency, Japan
³: Kubota Holography Laboratory, Japan*

We numerically simulated the recording and reconstruction of moving picture of light propagation magnified 10 times by a microscope objective lens consisting of two lens groups containing four elements in light-in-flight recording by holography. Recordability of the moving picture of propagating 130fs pulse during time range about 800fs was verified.

p3-14 Implementation of non-monotonic logic by Fourier-holography technique: logic with exceptions

*A. M. Alekseev, A. V. Pavlov
St. Petersburg State Univ. for Information Technologies, Russia*

Based on our previous work on implementation of fuzzy-valued logic by Fourier-holography setup, in this paper we make next step – from monotonic logic to non-monotonic one. We discuss implementation of the logical operators and use both computer simulation and experimental verification to confirm our conclusions.

p3-15 Recording of Fourier transform hologram in glass plate

*D. Miho, K. Harada, D. Sakai, T. Tsukahara, S. Kamemaru
Kitami Inst. of Technology, Japan*

We propose a technique of hologram recording in glass plate using corona charging. The recording material used in this study is conventional soda-lime glass. Fourier transform hologram recorded in glass plate can be reconstructed using visible laser beam. The first-order diffraction efficiency of the hologram is 0.03%.

p3-16 Integrated holographic imaging element for three-dimensional eye-gaze detection system

*M. Ono¹, O. Matoba¹, M. Zhou², Y. Kitagawa², H. Ueda³, N. Kosaka⁴, A. Mizuno⁵
¹: Kobe Univ., Japan
²: Hyogo Prefectural Inst. of Technology, Japan
³: DAISO, Japan
⁴: The New Industry Research Organization, Japan
⁵: KYOWA ELECTRONICS, Japan*

An integrated holographic imaging element HIE for wearable glasses used in a 3D eye-gaze detection is fabricated. The integrated HIE consists of a transmission-type and a reflection-type HIEs to detect user's eyes and scenes. Experimental results of the integrated HIE are presented.

p3-17 Integrated holographic imaging element using white light for 3D eye-gaze detection system

*M. Zhou¹, Y. Kitagawa¹, O. Matoba², Y. Takizawa¹, T. Matsumoto¹, H. Ueda³, A. Mizuno⁴, N. Kosaka⁵
¹: Hyogo Prefectural Inst. of Technology, Japan
²: Kobe Univ., Japan
³: DAISO, Japan
⁴: Kyowa Electronics, Japan
⁵: The New Industry Research Organization, Japan*

A new integrated optical imaging element which is used to obtain images from two different directions by using one imaging sensor has been proposed and fabricated. The imaging characteristics were evaluated experimentally. As a result, our holographic imaging element exhibited high resolution even under a white light illumination. Thus, it would be expected to act as an important part in eye-gaze detection system.

- p3-18 Optimization of hologram based on optical estimation of parallel laser beam**
S. Hasegawa, Y. Hayasaki
Utsunomiya Univ., Japan
 Computer-generated hologram is optimized on the basis of a uniformity estimation of the diffraction peaks in its optical reconstruction. The optical optimization is iteratively performed by rewritable capability of a liquid crystal spatial light modulator. The improvement of uniformity of the diffraction peaks with the optical optimization method is demonstrated.
- p3-19 Three-dimensional user interface using a haptic device for volumetric display**
D. Miyazaki, T. Honda, K. Ohno, T. Mukai
Osaka City Univ., Japan
 A new user interface for intuitive manipulation of three-dimensional information is proposed. A haptic threedimensional input device is introduced into a volumetric display system. The experimental results of force feedback operation and three-dimensional dragging operation with a stylus for a virtual object formed by a volumetric display are presented.
- p3-20 System for synthesizing arbitrary viewpoint images by random access image sensors**
S. Ogura1, Y. Haruta1, T. Hosaka1, A. Kubota2, R. Oi3, T. Hamamoto1
1: Tokyo Univ. of Science, Tokyo, Japan
2: Tokyo Inst. of Technology, Yokohama-shi, Japan
3: National Inst. of Information and Communications Technology, Japan
 In this paper, we propose the method to estimate highly accurate depth information and synthesize high-quality arbitrary viewpoint images by using image sensors arranged on a grid. Experimental result showed the favorable performance. Further, the overview of prototype system to realize the proposed method in real-time is described.
- p3-21 Combination of a lens array and a mirror as three-dimensional screen for projection-type integral imaging system**
G. Park1, K. Hong1, S.-W. Min2, B. Lee1
1: Seoul National Univ., Korea
2: Kyung Hee Univ., Korea
 Conventional integral imaging system has weak points from the viewpoints of resolution and pseudoscopic problems. In order to overcome both problems, we propose optical depth converter modified by a lens array and a mirror as a three-dimensional screen for projection-type integral imaging systems. It is verified by experiments.
- p3-22 Simultaneous implementation of real and virtual integrated images with a micro convex lens array**
Y. Kim1, S.-W. Min2, B. Lee1
1: Seoul National Univ., Korea
2: Kyung Hee Univ., Korea
 We developed an integral imaging system for displaying real and virtual images simultaneously. A plano-convex lens array is adopted for using both lens effect and mirror effect. An objective lens is employed for implementing high quality 3D images.
- p3-23 Numerical analysis for an imaging optics with micromirror array**
Y. Matsukura1, K. Nitta1, O. Matoba1, S. Maekawa2
1: Kobe Univ., Japan
2: National Inst. of Information and Communications Technology, Japan
 Characteristics of a transmission mirror device is analyzed numerically. Point spread of the device is estimated. As a result of estimation, the relations between positions of targets and resolution of images are investigated.
- p3-24 Polarization-analyzing CMOS sensor for μ TAS**
T. Tokuda, H. Yamada, K. Minakawa, K. Sasagawa, J. Ohta
Nara Inst. of Science and Technology, Japan
 We have proposed and designed a polarization-analyzing CMOS photosensor and demonstrated its functionality. A microchamber device equipped with the sensor was also developed.

p3-25 **Determination method of orientation of a rough surface by the degree of polarization**

*M. Tani, K. Tabata, A. Mizutani, H. Kikuta
Osaka Prefecture Univ., Japan*

A method for determining an orientation of a rough surface by measuring the polarization of scattered light has been proposed. The object surface is illuminated with the linearly polarized light with different angles. The polarization states of light scattered is analyzed by a polarimeter consisting of a rotating quarter-wave plate, an analyzer, and a band-pass wavelength filter. The surface orientation can be determined from the degree of polarization.

p3-26 **Visualization of skin hemodynamics by use of digital RGB images**

*I. Nishidate¹, T. Maeda², Y. Aizu², K. Niizeki³
1: Tokyo Univ. of Agriculture & Technology, Japan
2: Muroran Inst. of Technology, Japan
3: Yamagata Univ., Japan*

A method is proposed for visualizing the concentrations of melanin, oxygenated blood and deoxygenated blood in skin tissue using digital RGB images. The total blood concentration and oxygen saturation can also be reconstructed. Monte Carlo simulation of light transport specifies a relation between the chromophore concentrations and CIEXYZ which are compatible with the common RGB working space. *In vivo* imaging of a human hand during forearm occlusion demonstrated the ability of the method to evaluate the spatiotemporal hemodynamics of skin tissue.

p3-27 **Polarized light for measuring a human skin feature indicating aging**

*J.-Y. Son¹, Y. A. Vashpanov², D.-H. Jung¹,
K.-D. Kwack², D.-S. Lee¹
1: Daegu Univ., Korea
2: Hanyang Univ., Korea*

The hand skin surfaces of different age men are illuminated by a polarized light and the skin images are taken through an analyzer. When the analyzer is adjusted to obtain the brightest picture of each hand, the amount of the bright spots and their distinctiveness are increasing with the age.

p3-28 **Analysis of curing process of urushi lacquer by digital speckle correlation**

*M. Nagamatsu^{1,2}, K. Mitani², K. Nakagawa²,
H. Shimizu²
1: Shikoku Polytechnic College, Japan
2: Kagawa Univ., Japan*

Curing process of urushi lacquer is analyzed from the dynamic behavior of the speckle images, using the temporal autocorrelation function of the light intensity at a pixel in the image and the spatial cross-correlation function between the successive frames. There is no inconsistency between the experimental results and the curing theory.

p3-29 **Monitoring of polymer particle growth in self-organized precipitation phenomena**

*Y. Yamamoto¹, T. Iwai¹, H. Yabu², M. Shimomura²
1: Tokyo Univ. of Agriculture & Technology, Japan
2: Tohoku Univ., Japan*

The self-organized precipitation method was proposed to manufacture nano-structural polymer particles. We need to measure the particle growth in size as a function of the depth from the liquid-air interface. We develop a new *in situ* measurement system of the particle size depending on the depth and the time.

p3-30 **Spatial phase-shifting digital holography for 3D particle tracking velocimetry**

*S. Murata, D. Harada, Y. Tanaka
Kyoto Inst. of Technology, Japan*

This paper presents a spatial phase-shifting digital holography for three-dimensional particle tracking velocimetry. The present method employs a pair of two spatially phase-shifted holograms captured at an extremely short time interval. The performance of the present method is evaluated by numerical simulation to demonstrate its feasibility in velocity measurement.

p3-31 **Two-wavelength full-field heterodyne interferometry for measuring large step height**

*H.-C. Hsieh, Y.-L. Chen, W.-T. Wu, D.-C. Su,
K.-Y. Hsu
National Chiao Tung Univ., Taiwan*

A collimated heterodyne light beam is introduced into a Twyman-Green interferometer, and the phase of each pixel on the camera can be measured accurately with the heterodyne interferometry. The same test is operated again with two-wavelength interferometry and two-dimensional surface profile can be obtained.

p3-32 **Observation of addition of multiple laser-induced shock waves with pumpprobe interference microscopy**

*A. Takita, Y. Hayasaki
Utsunomiya Univ., Japan*

Pump-probe interference microscope was constructed for an observation of ultrafast laser-induced phenomena. Refractive index changes caused by laser-induced shock waves in water were measured. An addition of two shock waves was observed. The refractive index change was twice as that formed by single shock wave.

p3-33 **Oil leakage sensor for plant inspection**

*T. Nakashima¹, H. Nakajima¹, O. Matoba²
¹: Mitsubishi Electric Corp, Japan
²: Kobe Univ., Japan*

The oil leakage sensor for plant inspection has been developed. New detection method that simultaneously utilizes light absorption characteristic and fluorescence characteristic was proposed focusing on optical characteristic of oil. The experimental result confirmed its enough sensitivity for practical application and ensured reliable detection eliminating surface conditions.

p3-34 **Development of localized surface plasmon resonance based reactive oxygen species ROS detection method using silver nanoparticles**

*T. Endo, Y. Yanagida, T. Hatsuzawa
Tokyo Inst. of Technology, Japan*

The quantitative determination of reactive oxygen species ROS such as hydrogen peroxide has possibilities for applying to medical and environmental applications. In this study, a localized surface plasmon resonance LSPR based quantitative determination of hydrogen peroxide using silver nanoparticles was carried out.

p3-35 **A novel technique to measure the phase-drift of an optical phase modulator**

*R.-C. Twu, H.-Y. Hong, H.-H. Lee
Southern Taiwan Univ., Taiwan*

In this paper, we develop a measurement system with capabilities of phase unwrapping, real-time and long-term monitoring for measuring a phase-drift caused by photorefractive effects in lithium niobate phase modulators. To extract the phase-drift variations, the experimental setup uses a homodyne interferometer with a phase-modulation and a Fast Fourier Transform FFT demodulation schemes.

p3-36 **High numerical aperture microlens and its array using proximity printing with the microlens mask**

*S.-S. Hsu, T.-Y. Chang, H. Yang
National Chung Hsing Univ., Taiwan*

A novel high numerical aperture NA microlens array fabrication method using proximity printing process with the microlens mask is proposed. The microlens mask is a transparent glass with the fabricated microlens array on one side. High NA value 0.66 microlens array was developed through UV lithography process.

p3-37 **Easily controllable LCOS spatial light modulator for precise phase modulation**

*N. Matsumoto, T. Inoue, N. Fukuchi, H. Tanaka, M. Takumi, N. Mukozaka, T. Hara
Hamamatsu Photonics K.K., Japan*

We have developed phase modulation type of liquid-crystal-on-silicon spatial light modulators which are easy to control. The devices have high light-utilization efficiency, high diffraction efficiency and high precision in phase modulation. The characteristics of the devices and some experimental results are reported.

p3-38 **An electrodynamical model of a transmission-mode vertical-cavity modulator based on Si/SiO₂ microstructure for inter/intra-chip interconnects**

*H. V. Baghdasaryan¹, T. M. Knyazyan¹, A. S. Berberyan¹, T. T. Hovhannisyan¹, M. Marciniak²
¹: State Engineering Univ. of Armenia, Armenia
²: National Inst. of Telecommunications, Poland*

An electrodynamical model of a transmission-mode vertical-cavity modulator EA consisting of Si p-n junction embedded between Si/SiO₂ DBRs for inter/intra-chip interconnects is suggested. The transparency of the structure permits to have a cascade of modulators installed in special trunks in chips for connection between different layers of an integrated circuit.

p3-39

Real-time three-dimensional measurement system by confocal optical system with inclined plane and smart image sensor

Y. Hisano¹, K. Hayashi¹, T. Murai¹, D. Miyazaki¹, T. Mukai¹, K. Kagawa², J. Ohta³
1: Osaka City Univ., Japan
2: Osaka Univ., Japan
3: Nara Inst. of Science and Technology, Japan

We developed a high-speed three-dimensional measurement method based on a confocal system with an inclined image plane and a smart image sensor. The proposed confocal optics is suitable to measure a three-dimensional shape of an object rapidly. We report the results of real-time three-dimensional measurement by a smart image sensor.

p3-40

Flow control of microspheres in fluid based on optical repulsive radiation force

M. Miyazaki¹, H. Yamamoto¹, Y. Hayasaki^{1,2}
1: The Univ. of Tokushima, Japan
2: Utsunomiya Univ., Japan

Flow of a micro object with lower refractive index than surrounding solvent is controlled by optical repulsive radiation forces. The repulsive forces are generated by multiple focused beams formed with a computer-generated hologram.

p3-41

High light uniformity dot pattern design of light guide plate with LEDs light source

L. S. Chou, C. H. Fu
Yuan Ze Univ., Taiwan

A novel design with high light uniformity and light emission efficiency is obtained, in which the diffusers and brightness enhancement films are no longer needed. As comparing with the CCFL used, the design provides much better performance in brightness, increasing emission efficiency from 53% up to 87.55% and light uniformity has reached 88.66%. A software of Trace Pro is used for simulation.

Thursday, November 20

Digital Holographic Microscopy

9:00-10:00

Presider: *G. Barbastathis*
MIT, USA

4-a1 Invited

9:00 Digital holographic microscopy

C. Depeursinge
EPFL, Switzerland

4-a2

9:30

Confocal scheme to improve the reconstructed image in digital holographic microscopy

W. T. Hsieh¹, G. L. Chen¹, M. K. Kuo², C. C. Chang³

1: School of Defense Science, National Defense Univ., Taiwan
2: Department of Electronic & Electrical Engineering, National Defense Univ., Taiwan
3: Ming Dao Univ., Taiwan

A confocal configuration for reconstruction that uses one off-axis digital hologram without additional phase-retrieval elements in experimental setup is presented. The system can be applied to digital holographic microscopy to reconstruct image without defocus aberration. The results demonstrate that the twin-image can be suppressed and the absolute phase can be retrieved without aberration.

4-a3

9:45

Holographic microscope with large visual depth

H. Toge, O. Murata, K. Sato
Univ. of Hyogo, Japan

A new technology of the holographic microscope is developed for recording a high-resolution 3-D image with large visual depth. A number of holograms are recorded for various incident angles of illuminating light, and these holograms are arranged for generating a wide hologram for the image reconstruction.

Coffee Break 10:00-10:30

3D Imaging

10:30-12:00

Presider: *H. Yoshikawa*
Nihon Univ., Japan

4-a4 Invited

10:30 Recent works on integral imaging and its 100-year of history

B. Lee
Seoul National Univ., Korea

Integral imaging is a promising way to display three-dimensional 3D images with 100 years of history. It displays real-time 3D movies with full color and parallax. Recent works on integral imaging are introduced.

4-a5 Invited

11:00 Three-dimensional television based on the integral method

F. Okano, J. Arai, M. Kawakita
NHK, Japan

Three-dimensional television 3DTV based on the integral method is introduced. The method combines a lens array and an extremely high resolution video system. It realizes full-color and full-parallax moving images in real-time, enabling the 3D television system to be achieved. Integral images captured by incoherent light can be converted to holography.

4-a6

11:30 Multi-functional display by use of polarization processing

H. Yamamoto
The Univ. of Tokushima, Japan

A multi-functional display is realized by use of polarization processing. The proposed display consists of two spatial light modulators of polarization processing type. By use of encryption, the viewing zone is limited in three-dimensional space. By use of information sharing, two different images are viewed at the two viewing positions.

4-a7

11:45

Image synthesis using eight cameras array and its real time implementation on FPGA

H. Sato1, K. Kimura1, A. Kubota2, R. Oi3, T. Hosaka1, T. Hamamoto1
1: Tokyo Univ. of Science, Japan
2: Tokyo Inst. of Technology, Japan
3: National Inst. of Information and Communications Technology, Japan

We propose a method to compose the image of a virtual viewpoint from the eight cameras array. The synthesis is based on the reconstruction filter derived from the relation with light field rendering. The image composition can be implemented in real time using an FPGA.

INSTRUCTION FOR SPEAKERS

All speakers are required to register for participation in IP2008.

- **Oral presentation**

- Location: Main Hall
- Presentation time

	Presentation	Discussion	Total
Plenary	35min	5min	40min
Invited Papers	25min	5min	30min
Contributed Papers	10min	5min	15min

- **Equipment**

A PC-based data projector will be available at the conference site. Speakers are asked to bring in their own personal computer plus a back-up USB Flash Drive (Windows based) with downloaded presentation material. Speakers are recommended testing in advance before their session.

- **Poster presentation**

- Location: Reception Hall B and Foyer

Poster session will be held from 17:15 to 18:45 on November 17 and 19. Each speaker is provided a 1.8 m height x 1.8 m width bulletin board on which to display his/her summary of the paper. Speakers must remain in the vicinity of the bulletin board during the poster session to answer questions of attendees in English.

POST-DEADLINE PAPERS

A limited number of post-deadline papers will be accepted for oral or poster presentation. The authors should bring their printed 50-word abstract and their printed 2-page manuscript to the registration desk by 17:00, Sunday, November 16. The authors should prepare both the oral and poster presentation. Please see the guideline in both presentation styles. Review result will be noticed at the registration desk by 10:00, Monday, November 17.

Please see the information of paper submission on the website,
<http://ip2008.i-photonics.jp/submission.html> .

- **For inquiries, please contact: Secretariat for IP2008**

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IP2008 SPECIAL ISSUE OF JAPANESE JOURNAL OF APPLIED PHYSICS

The special issue of JAPANESE JOURNAL OF APPLIED PHYSICS, the journal of the Japan Society of Applied Physics, for IP2008 will be published in September, 2009. Every authors of IP2008 are strongly encouraged to submit the original papers to the special issue. The deadline for submission is January 20, 2009. Application form for the special issue will be distributed on site. Please note that all the submitted papers will be judged following the editorial policy of JAPANESE JOURNAL OF APPLIED PHYSICS. For your information, visit the website, <http://www.ipap.jp/>. The submission from invited speakers are also welcome. The information of online submission will be announced in the website, <http://ip2008.i-photonics.jp/>.

If you want any further information, please contact,

Dr. O. Matoba
Editor/Secretariat, IP2008 Special Issue
Kobe University
E-mail: matoba@kobe-u.ac.jp

COMPANY EXHIBITION

Company Exhibition is planned with the following schedule. Many kinds of optics related businesses will be presented.

Date & Time:

Monday, November 17	10:00-17:00
Tuesday, November 18	9:00-12:00
Wednesday, November 19	9:00-17:00
Thursday, November 20	9:00-12:00

Companies:

FDK CORPORATION
FUNAI ELECTRIC CO. LTD
Hamamatsu Photonics K. K.

(as of August 5, 2008)

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Nobukazu Yoshikawa

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Hongchen Zhai

Nankai University, China

REGISTRATION

You are welcome to register to attend IP2008 via the website,
<http://ip2008.i-photonics.jp/> .

The regular participant's fee includes admission to all the technical sessions, the get together party, the banquet and the excursion, and a copy of the Technical Digest.

The student participant's fee includes admission to all the technical sessions and the get together party, and a copy of the Technical Digest. A limited number of tickets for the banquet may be purchased at the reception desk.

The accompanying person's fee includes admission to the get together party, the banquet, and the excursion.

Category	On and before October 17	After October 18
Regular Participant	50,000 yen	60,000 yen
Student Participant	15,000 yen	20,000 yen
Accompanying Person	15,000 yen	15,000 yen

• Cancellation Policy

There will be no refunds for the registration fee.

Get Together Party

Sunday, November 16, from 17:00 to 19:00

The Get Together Party will take place in the Reception Hall (B) in Awaji Yumebutai International Conference Center. Enjoy the beginning of the event with refreshments and informal discussions.

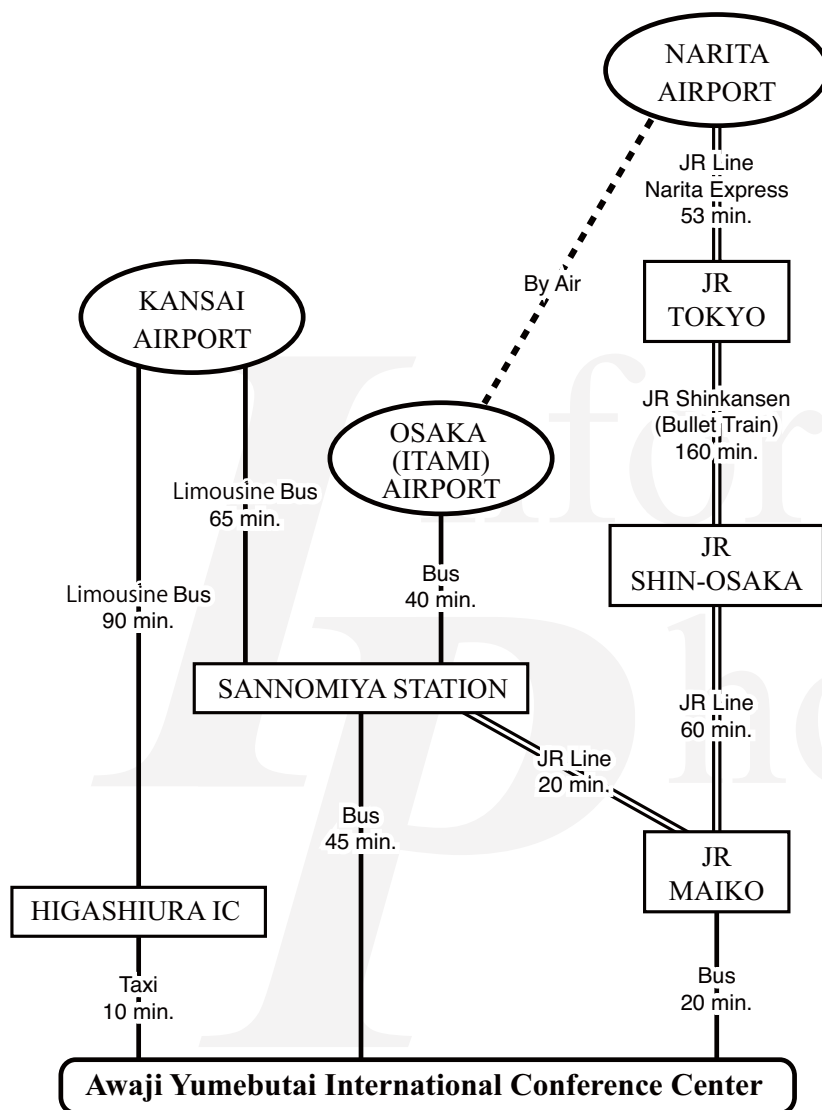
ACCOMMODATION

The Westin Awaji Island Hotel is located next to the International Conference Center, and other hotels are listed in
<http://www.yumebutai.org/english/guide/stay.html>.

You can make your hotel reservation via the IP2008 website,
<http://ip2008.i-photonics.jp/> .

CONFERENCE SITE

Awaji Island - the place where the romance of magnificent Japanese mythology and natural scenery still exist. The Awaji Yumebutai International Conference Center is a resort and conference center surrounded by a rich natural environment. The conference center assures you of a success in every conceivable type of international and academic conference, as well as incentives, trainings, seminars, or ceremonies. In cooperation with the adjoining The Westin Awaji Island, we offer a wide variety of options for your activities and parties that you cannot experience anywhere else but in Awaji. The location is easily accessible from Kobe and Osaka via the Akashi Kaikyo Bridge. Public Bus services from the Kansai International Airport also offer an easy access to the conference center.



SOCIAL PROGRAM

We would like to invite you to the IP2008 Banquet which is to be held in the Plants Museum of Miracle Planet. Please join us for this opportunity to mingle with your fellow participants! Date: Tuesday, November 18

An excursion is planned for the afternoon of Tuesday, November 18. This will be a tour to Himeji Castle, which, in December 1993, became the first site in Japan to be registered as a world cultural heritage site by UNESCO. Enjoy the highest international reputation of all Japanese castles.

<Himeji Castle and Japanese garden: Half-day Tour>

Fee: Included in the registration fee

Date: Tuesday, November 18

Assemble time and place: Entrance Lobby of the conference location 13:00

[SCHEDULE]

Awaji Yumebutai International Conference Center 13:00

- by bus - 14:10 Himeji Castle and Japanese garden 16:10

- by bus - 17:20 Awaji Yumebutai International Conference Center

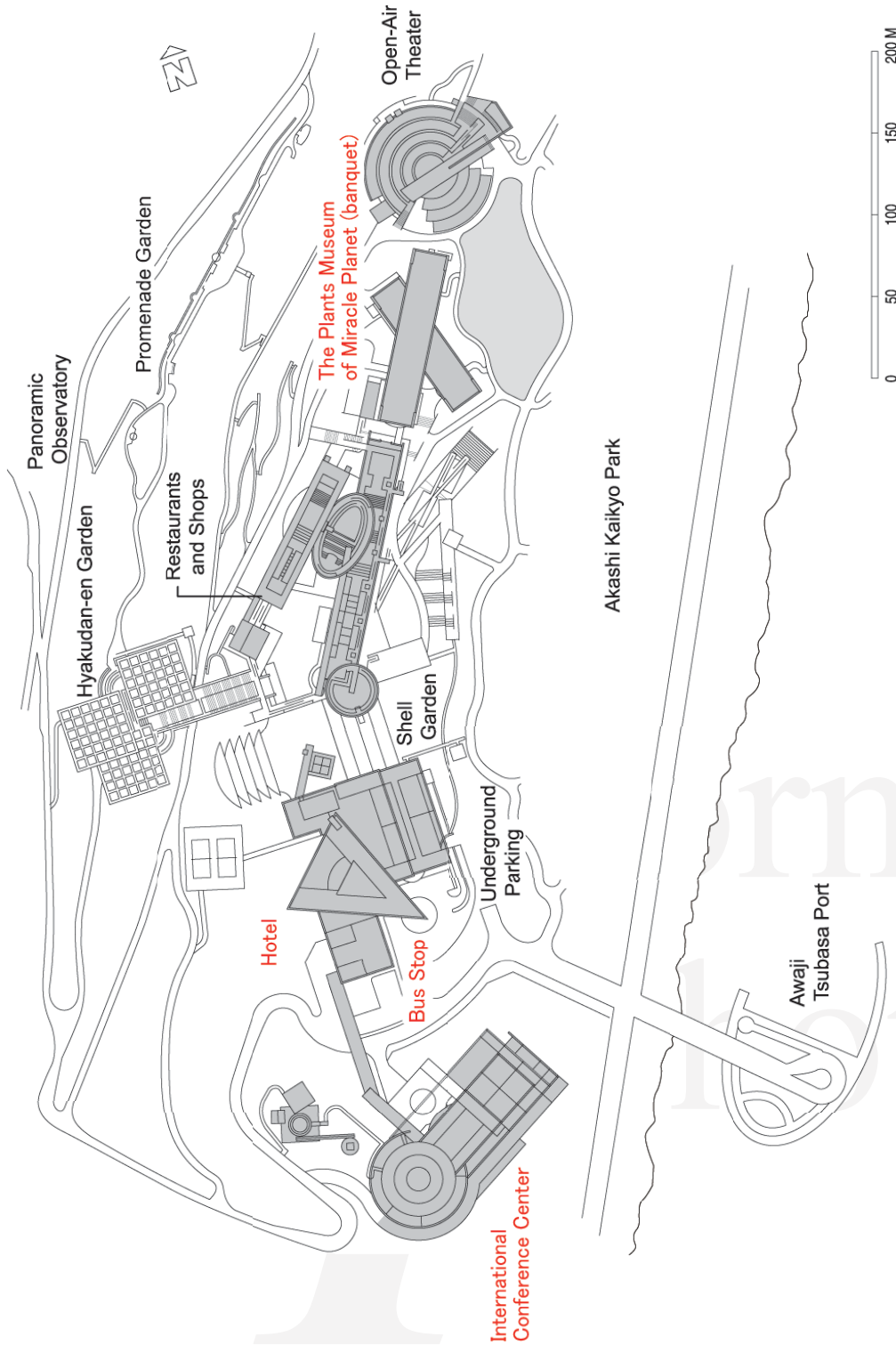
19:00- Banquet at The Plants Museum of Miracle Planet

"Himeji Castle"

Himeji Castle, built in the early 17th century, represents the highest achievement in Japanese castle architecture.

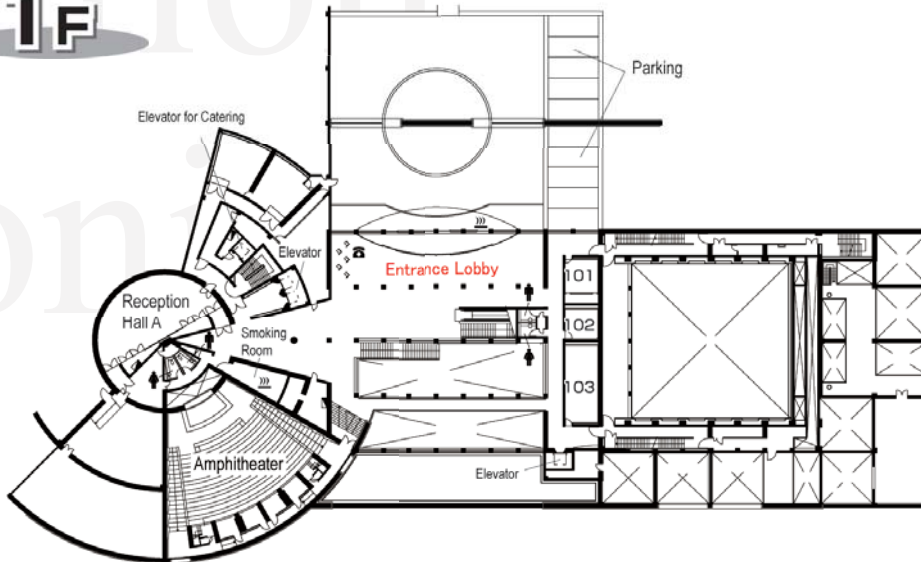
Designated as a national treasure in 1931, the castle was registered as the World Cultural Heritage in 1993 as the first cultural site in Japan. The registration occurred because the castle has kept its original design at the time of construction, such as turrets, stone walls, gates, and moats, which still survive today. The main castle keep (Dai-ten-shu) connected with three small keeps (Ko-tenshu) linked by passage turrets (Watari yagura) remains perfectly in their original forms. Because of its elegant appearance totally covered with white plaster, the castle has been compared to a white bird flying off to the sky. Its famous nickname is White Heron Castle. Take enough time to tour around the castle.

MAP OF CONFERENCE CENTER

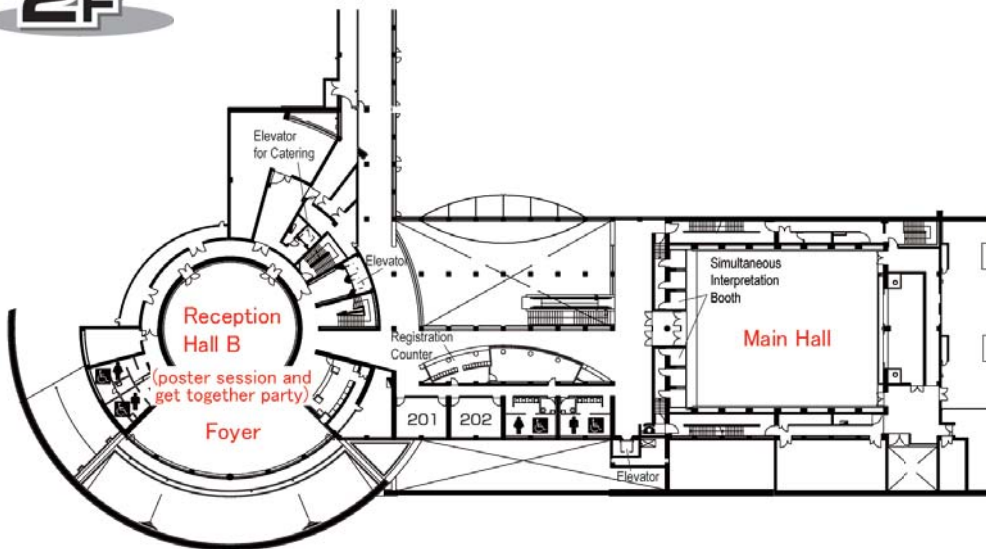


FLOOR MAP

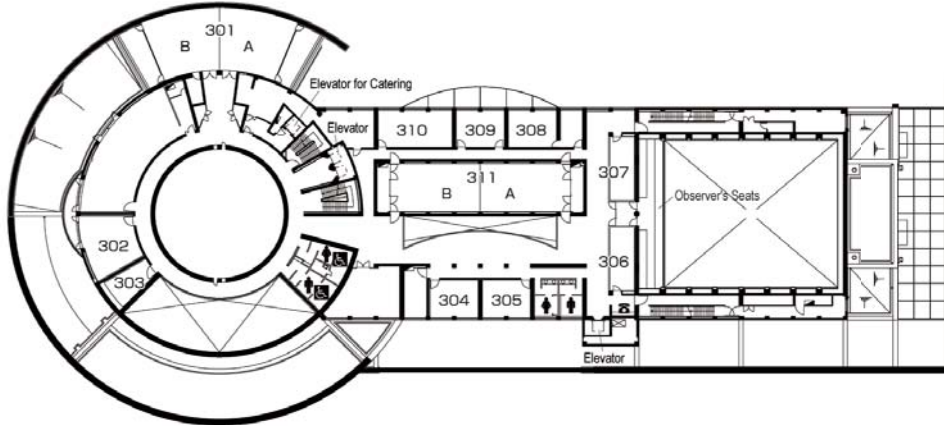
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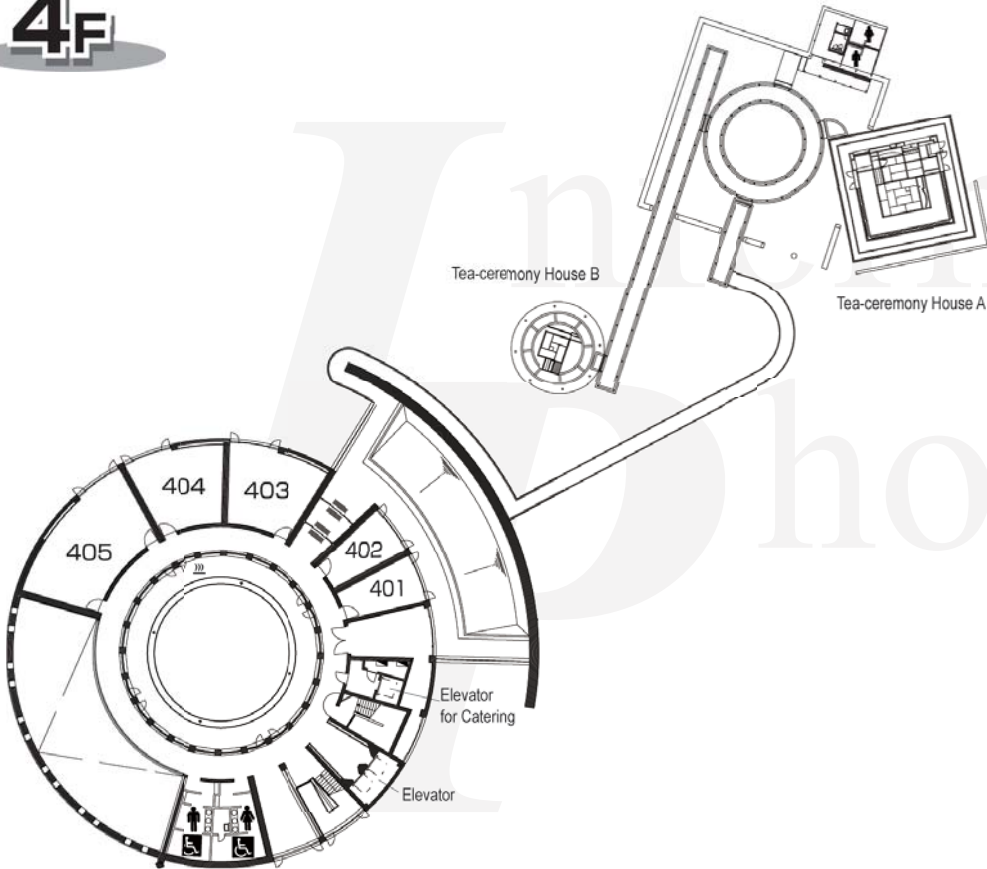
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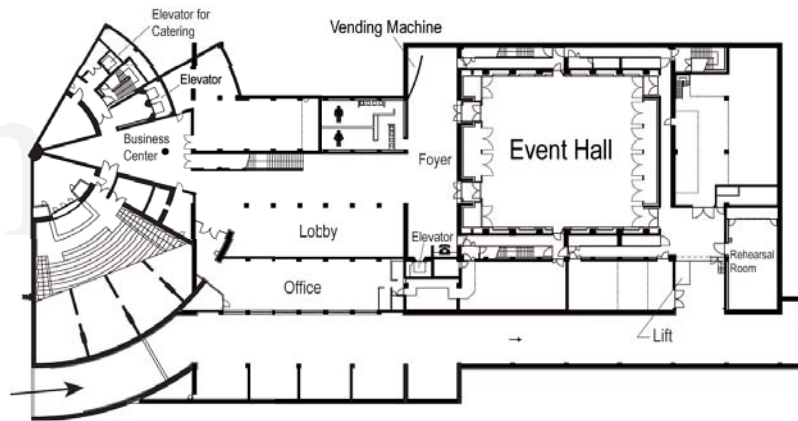
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4F



B1F





MEMO

Information Photonics

- **Deadlines**

Post-deadline Papers:	November 16, 2008
Early Registration:	October 17, 2008
Online Registration:	October 31, 2008
Hotel Reservation:	October 31, 2008

- **For inquiries, please contact: Secretariat for IP2008**

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