December 1, 2020 (Tuesday)

Tu-A: Special Invited

Presider: Takanori Nomura (Wakayama University, Japan)

Tu-A-01 Special Invited

9:00 Development of remote sensing methods in vegetation area

Kazuo Oki

Kyoto University of Advanced Science (Japan)

The use of remote sensing is useful to manage large scale vegetation area. However, there are limitations such as lack of the spatial resolution and high operative cost in remote sensing technologies using satellite sensors and airborne platforms respectively. Here, I introduce remote sensing methods to solve these problems.

09:30 - 09:45 Break

Tu-B: Sensing II

Presider: Takayuki Shima (AIST, Japan)

Tu-B-01 Invited

9:45 Laser Gas Sensing for Inspecting Cashmere Place of Origin

Souichi Oka, Yuuichi Akage, Yurina Tanaka

NTT Device Innovation Center (Japan)

The aim of this study is to identify cashmere place of origin using a laser of two micrometer wavelength in order to measure the stable isotope ratios of carbon and deuterium. Experimental results showed that cashmere place of origin could be identified with an accuracy of 90 percent.

Tu-B-02 Invited

10:10 Beans-size mid-infrared (LWIR: Longwave Infrared) hyperspectral camera

Ichiro Ishimaru, Natsumi Kawashima

Kagawa University (Japan)

We proposed the point-one-shot mid-infrared Fourier spectroscopic imager composed of only one Ge lens (diameter: 6 mm, thickness: 5 mm) and a two-dimensional array device. The lens is a non-spherical lens at the front side and a dual-axis inclined wedge prism at the back side.

Tu-B-03

10:35 Localized Scattering Estimation In Turbid Medium Using Backscattered Light From Surface - For Noninvasive Sensing of Blood Turbidity -

Shiyang Liang, Koichi Shimizu

Waseda University (Japan)

To realize a noninvasive turbidity measurement in the blood vessel, a technique to estimate the reduced scattering coefficient from backscattered NIR light was developed. Using a differential principle, we can measure the scattering in the localized position in the medium. In the Monte Carlo simulation, its validity was verified.

10:50 - 11:05 Break

Tu-C: Digital Holography III

Presider: Takanori Nomura (Wakayama University, Japan)

Tu-C-01 Invited

11:05 Space-Bandwidth Product Extension with Compressed Sensing for Off-Axis Digital Holography

Shuhei Yoshida

Kindai University (Japan)

We propose a wavefront reconstruction method with a high SBP that can be applied to conventional off-axis DH without any alteration. The proposed method can reconstruct a high-SBP wavefront by solving the hologram recording model via compressed sensing (CS) with total variation (TV) regularization.

Tu-C-02

11:30 In-situ Calibration for a Spatial Light Modulator Based On Digital Holography

Rujia Li, Liangcai Cao

Tsinghua University (P.R.China)

We proposed an in-situ phase-SLM’s calibration method based on digital holography. The differential phase on hundreds of blocks that include multiple pixels can be reconstructed through the holograms. The spatial nonuniformity of the modulation on the panel can be measured for calibration with high efficiency.

Tu-C-03

11:45 Detection of positional error due to hardening process of UV curable adhesive by using digital holography

Kakeru Inagaki[1], Masayuki Yokota[1], Katsuhiro Iwasaki[2], Katuya Kito[2]

[1]Shimane University (Japan), [2]Kohoku Kogyo Company Limited (Japan)

The temporal displacement of a mirror cube in the adhesion process of the UV adhesive is evaluated by using digital holographic interferometry. This method can detect three-dimensional displacement with high sensitivity. In addition, the relationship between the orientation of displacement and the degree of hardening in adhesive is investigate.

12:00 - 12:05 ISOM'21 Announcement

12:05 - 13:00 Lunch

Tu-D1: Special Session 3D Imaging/Sensing, Display

Presider: Yusuke Nakamura (Hitachi, Ltd., Japan)

Tu-D1-01 Invited

13:00 Light ray direction identification imaging system to obtain physical property of object

Hiroshi Ohno

Toshiba Corporation (Japan)

A direction of a light ray coming from an object is affected by physical properties of the object such as shape, surface roughness, and refractive index distribution that cause reflection, scattering, and refraction. Optical imaging system that can identify light ray direction to obtain physical properties is described here.

Tu-D1-02 Invited

13:25 Recent developments in our 3D displays - Non-overlapped DFD display & Arc 3D display -

Shiro Suyama, Haruki Mizushina

Tokushima University (Japan)

We have proposed Non-overlapped DFD display and Arc 3D display, which satisfy all the features required for large & long-viewing distance 3D display. Our 3D displays have wide viewing zone in horizontal and depth directions, large image depth and simple structure. Moreover, we propose rewriting method for Arc 3D display.

Tu-D1-03

13:50 Depth estimation in 2D transillumination image using focus-stacking method

Sihan Xian, Yingdong Chen, Koichi Shimizu

Waseda University (Japan)

Transillumination imaging with near-infrared (NIR) light is a useful noninvasive technique to visualize the blood vessel network of a living animal. However, the depth of the internal structure cannot be known from the two dimensional image. To solve this problem, we applied a technique of focus-stacking.

Tu-D1-04

14:05 Simulator for System Verification of 3D Shape Measurement Using Fringe Projection Profilometry Based on Game Engine

Kazumasa Ueda, Kanami Ikeda, Osanori Koyama, Makoto Yamada

Osaka Prefecture University (Japan)

A Game-engine-based simulator for verifying a 3D shape measurement system using fringe projection profilometry is proposed. The simulator can import objects and measurement device modules in a virtual 3D space via GUI. A measurement simulation of the shape of a 3D CAD object is shown.

14:20 - 14:30 Break

Tu-D2: Special Session 3D Imaging/Sensing, Display

Presider: Koichi Iiyama (Kanazawa University, Japan)

Tu-D2-01 Invited

14:30 Improvement of Binocular Depth Perception in 3D Displays by Motion Parallax

Haruki Mizushina, Yoko Awata, Yusuke Fukuta, Shiro Suyama

Tokushima University (Japan)

We introduce our recent studies related to improving binocular depth perception in 3D displays by motion parallax. Motion parallax can resolve various perceptual problem in conventional stereoscopic display including depth degradation with unbalance in visual acuity between left and right eyes, and depth degradation in 3D display with vertical disparity.

Tu-D2-02 Invited

14:55 Human-Friendly Communication Media and Its Applications

Hideaki Takada

Nagasaki University (Japan)

Tele-communication service has been progressing from telephone to high-reality communication systems that are based on evolution of network and audio-visual media. Using 3D display and 3D sound effects, we will realize the ultimate communication that goes beyond reality and naturally connects people by the expressing intention, mind and sympathetic response.

Tu-D2-03

15:20 Line symmetric image input technique of volumetric hologram waveguide for wide field of view head mounted displays

Toshiteru Nakamura, Ryushi Fujimura

Utsunomiya University (Japan)

We propose a FOV enlargement method by using a line symmetric image input in the single layer volumetric holographic waveguide. The proposed method achieves 500 times improvement in uniformity of luminance and twice FOV as large as conventional surface relief grating waveguide.

Tu-D2-04

15:35 Scanning Fiber Based Ultra-compact Near-eye Display with a Narrow Beam Waveguiding Technique

Takuma Kuno, Toshiteru Nakamura, Takahiro Matsuda, Shinsuke Onoe, Yoshiho Seo, Satoshi Ouchi

Hitachi, Ltd. (Japan)

We developed a new waveguide configuration that enables achieving a uniform image with a fiber scanning projector. We found that a uniform image could be achieved using our prototype and demonstrated that our proposed optical system enables designing ultra-compact near-eye displays.

15:50 - 16:05 Break

Tu-E: Advanced Optics and Device II

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

Tu-E-01

16:05 **Narrowband Focusing Mirror Based on Cavity-resonator-integrated Guided-mode Resonance Filter**

Ryohei Ueda[1], Toshiki Kusuura[1], Junichi Inoue[1], Kenji Kintaka[2], Shogo Ura[1]

[1]KIT (Japan), [2]NAIST (Japan)

A mirror constructed by a focusing grating coupler in a waveguide resonator on a reflective substrate is proposed for retroreflection of a diverging wave. A 21-μm-aperture mirror is fabricated for operation of a 1540-nm wavelength and a 10.6° divergence angle. A 4-nm-width spectrum with the 80% maximum is experimentally confirmed.

Tu-E-02 **Invited**

16:20 **On the Problem of Total Internal Reflection from a Semi-infinite Gain Medium**

Masud Mansuripur[1], Per K. Jakobsen[2]

[1]University of Arizona (U.S.A.), [2]UIT The Arctic University of Norway (Norway)

The problem of Fresnel reflection from the flat interface between a transparent dielectric and a semi-infinite gain medium will be discussed. Special attention will be paid to the case where the incidence angle exceeds the critical angle for total internal reflection.

Tu-E-03

16:45 **Numerical simulation of switching of signal path of FM-MCFs by SLM**

Yuta Abe[1], Atushi Okamoto[1], Kazuhisa Ogawa[1], Akihisa Tomita[1], Daiki Soma[2], Yuta Wakayama[2], Takehiro Tsuritani[2]

[1]Hokkaido University (Japan), [2]KDDI Research, Inc. (Japan)

We conducted a numerical analysis to evaluate the coupling efficiency of the signals path-switched using the spatial light modulator (SLM) in the few mode multi core fiber (FM-MCF). Simulation results showed that the spatial mode distributions through the 6-mode 19-core fiber were retained after switching by SLM.

Tu-E-04

17:00 Cross-talk reduction between layers based on Gaussian distribution in optical tomographic imaging using virtual phase conjugation

Jiang Mengying, Atsushi Okamoto, Kazuhisa Ogawa, Akihisa Tomita

Hokkaido University (Japan)

To achieve a higher resolution performance in virtual phase conjugation-optical tomography, we proposed an algorithm based on assuming the z axle pixel intensity flows Gaussian distribution and carried out it in simulation. The result shows the cross-talk between two layers was suppressed, which indicates the system resolution was improved.

17:15 - 17:30 Break

Tu-F: Biological and Life Application I

Presider: Minoru Takeda (Kyoto Institute of Technology, Japan)

Tu-F-01 Invited

17:30 Extremely Weak Lighting that Brings Out the Potential of Plant

Yuta Kimura, Kohei Miwa, Koji Tanigawa, Atsushi Maeda, Kazunori Matsuda, Hiroshi Kajiyama

Tokushima Bunri University (Japan)

Light is an essential element in growing plants. This paper demonstrates that the extremely weak pulsed lighting doubles photosynthetic products and controls the distribution of them into biomass and secondary metabolite pathways. The property of pulsed light and the growth promotion effect are presented.

Tu-F-02

17:55 Extended depth of light-field microscopy

Ryo Shinke, Xiangyu Quan, Sudheesh K. Rajput, Osamu Matoba

Kobe University (Japan)

Extended depth of light-field microscopy is presented. We introduce an electrically focus tunable lens in a light-field microscope with a lenslet array for extending the depth of field in the reconstruction calculation.

Tu-F-03

18:10 Noise Analysis for Sitting person using Electro-optical Tool in Intra-body Communication

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

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

Intra-body communication uses human body as a transmission path for electric signals. Noise with the sitting person is measured using an electro-optical tool. We verified that the difference between the standing and sitting models is merely a difference in the capacitance values between the human body and the floor.

Tu-F-04

18:25 Improvement of Holographic Multi-spot Pattern with Feedback Optimization for Cell Manipulation

Ryo Ihara[1], Xiangyu Quan[1], Yasuhiro Awatsuji[2], Osamu Matoba[1]

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

Quality of holographic multi-spot pattern is improved by feedback optimization using direct observation. In the biological applications, the number of multi-spots with the same intensity will be controlled, and small intensity deviation and three-dimensional property are required. We present the preliminary experimental results.