PROCEEDINGS OF SPIE

Holography, Diffractive Optics, and Applications IX

Yunlong Sheng Changhe Zhou Liangcai Cao Editors

21–23 October 2019 Hangzhou, China

Sponsored by SPIE COS—Chinese Optical Society

Cooperating Organizations

Tsinghua University (China) • Peking University (China) • University of Science and Technology of China (China) • Zhejiang University (China) • Tianjin University (China) • Beijing Institute of Technology (China) • Beijing University of Posts and Telecommunications (China) • Nankai University (China) • Changchun University of Science and Technology (China) University of Shanghai for Science and Technology (China) • Capital Normal University (China) • Huazhong University of Science and Technology (China) • Beijing Jiaotong University (China) • China Jiliang University (China) • Shanghai Institute of Optics and Fine Mechanics, CAS (China) • Changchun Institute of Optics, Fine Mechanics and Physics, CAS (China) Institute of Semiconductors, CAS (China) • Institute of Optics and Electronics, CAS (China) • Institute of Physics, CAS (China) Shanghai Institute of Technical Physics, CAS (China) • China Instrument and Control Society (China) • Japan Optical Society (Japan) • Korea Optical Society (Korea, Republic of) • Australia Optical Society (Australia) • Singapore Optical Society (Singapore) • European Optical Society

Supporting Organizations China Association for Science and Technology (CAST) (China) Department of Information of National Nature Science Foundation, China (NSFC) (China)

Published by SPIE

Volume 11188

Proceedings of SPIE 0277-786X, V. 11188

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIEDigitalLibrary.org.

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in Holography, Diffractive Optics, and Applications IX, edited by Yunlong Sheng, Changhe Zhou, Liangcai Cao, Proceedings of SPIE Vol. 11188 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X ISSN: 1996-756X (electronic)

ISBN: 9781510630932 ISBN: 9781510630949 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445 SPIE.org Copyright © 2019, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$21.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/19/\$21.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.



Paper Numbering: Proceedings of SPIE follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

Contents

vii	Authors
ix	Symposium Committees
xiii	Conference Committee
SESSION 1	ARTIFICIAL INTELLIGENCE IN DIGITAL HOLOGRAPHY I
11188 02	Science and mathematical duality (Invited Paper) [11188-1]
11188 04	Data-centric approach for miscellaneous optical sensing and imaging (Invited Paper) [11188-3]
SESSION 2	ARTIFICIAL INTELLIGENCE IN DIGITAL HOLOGRAPHY II
525510112	
11188 07	Speckle noise reduction in digital holograms based on Spectral Convolutional Neural Networks (SCNN) (Invited Paper) [11188-6]
11188 08	Fast and accurate classification and identification of mass spectra using hybrid optical-electronic convolutional neural networks [11188-7]
11188 09	Phase retrieval algorithm based on the neural network and the GS [11188-8]
SESSION 3	3D IMAGING AND DISPLAY I
11188 OB	Continuous-depth head-mounted display for virtual reality (Invited Paper) [11188-10]
11188 OE	Performance improvement for computer-generated holographic stereogram based on integral imaging [11188-13]
SESSION 4	3D IMAGING AND DISPLAY II
11188 OF	Holographic vision system based on non-diffractive optical scanning holography and deep learning (Invited Paper) [11188-54]
11188 0G	Fast 3D reconstruction method based on 2D gold matrix [11188-15]

11188 0J Adaptive computational imaging improve architecture methodology [11188-18]

- 11188 0K A novel phase retrieval and reconstruction method in optical diffraction tomography [11188-19]
- 11188 0LThree-dimensional morphology measurement of microgrooves based on Dammann zone plate
[11188-20]

SESSION 5 COMPUTER-GENERATED HOLOGRAPHY I

- 11188 0M In-system optimization of hologram for holographic femtosecond laser processing [11188-21]
- 11188 0N From holography to picooptics [11188-22]
- 11188 00 Novel computer-generated hologram encoding method [11188-23]
- 11188 0P Computing and fabrication of high-definition depth-added computer-generated holographic stereogram (Invited Paper) [11188-24]

SESSION 6 COMPUTER-GENERATED HOLOGRAPHY II

- 11188 OR Direct laser writing of high-NA computer-generated holograms on metal films of the titanium group and chromium (Invited Paper) [11188-26]
- 11188 0S Generalized single-sideband computer-generated holography for high-quality three-dimensional display [11188-27]

SESSION 7 DIFFRACTIVE ELEMENT, GRATING DESIGN, AND FABRICATION

11188 OU	Broadband polarization-independent reflective 1×2 beam splitters under normal incidence based on encapsulated metal-dielectric gratings [11188-29]
11188 OV	Design of a 1*5 transmission grating splitter with triangular structure of MgF ₂ [11188-30]
11188 OW	The intraocular lens based on Dammann zone plate [11188-31]
11188 OX	Improvements of diffractive optical element uniformity and zero order performance using lithographic process parameter optimization method [11188-32]
11188 OZ	Performance improvement of refractive index sensor based on two-dimensional metal-dielectric grating [11188-34]
11188 10	Highly efficient broadband optimization design of gold-plated reflective grating [11188-35]

11188 11 Design of guided mode resonant gratings by modal method [11188-36]

SESSION 8 NOVEL APPLICATIONS

11188 13	Optical vortices generation by digital "blazed" thin holograms [11188-39]
11188 15	Topography measurement by normal-incidence reflection ptychography [11188-41]
11188 17	An advanced ray-tracing model for multi-color holographic optical elements [11188-43]

SESSION 9 DIGITAL HOLOGRAPHIC MICROSCOPY I

11188 18 Microscopic urinalysis by digital holographic microscopy [11188-44]

SESSION 10 HOLOGRAPHIC METROLOGY

11188 1C	Visual and quantitative investigation on heat flow performance from heat sinks using digital holographic interferometer (Invited Paper) [11188-48]
11188 1E	Holographic wavefront sensing and modal decomposition [11188-50]
11188 1F	Holo-shear lens based interferometer for measurement of temperature distribution and fluctuation of temperature in micro flame [11188-51]
SESSION 11	DIGITAL HOLOGRAPHIC MICROSCOPY II
11188 1H	Optical scanning holography: a review of fundamentals with some recent applications (Invited Paper) [11188-53]
11188 1J	A method to achieve color image encryption by using orthogonal compressive sensing and optical scanning holography [11188-55]
11188 1K	Quantitative differential phase microscopy based on structured illumination [11188-56]

POSTER SESSION

11188 1M	Incoherent digital holography with four-step phase-shifting interference [11188-58]
11188 1Q	Numerical model of the quantitative stress detection using the polarized digital holography [11188-62]

11188 1S	High-resolution 3D model reconstruction for light field display [11188-64]
11188 1T	Angular coordinate error testing of circular writing laser system using Fizeau interferometer [11188-65]
11188 1U	Holographic optical element based digital holographic interferometer for label-free imaging of staphylococcus aureus bacteria [11188-66]
11188 1W	Imaging characteristic optimization of digital holographic microscopy for onion epidermal cells [11188-68]
11188 1X	Fabrication of high-efficiency, multilayer-dielectric, spectral-beam-combining gratings [11188-69]
11188 1Y	A method of calculating full-parallax computer-generated hologram with occlusion and lighting in real time [11188-70]
11188 1Z	Research on high efficiency immersed holographic grating [11188-72]
11188 21	Weighted iterative algorithm for phase hologram generation with high-quality reconstruction [11188-74]
11188 22	Three-dimensional measurement of rotating combinative Dammann gratings [11188-75]
11188 23	Optimized holographic imaging with the MIM-based metasurface [11188-76]
11188 25	A new method for non-destructive measuring of grating parameters [11188-78]
11188 26	A three-dimensional PIV system based on camera array [11188-79]
11188 28	Research on slanted trapezoidal surface relief grating [11188-81]
11188 2B	On resizing the reconstructed image in interactive holographic 3D display system [11188-84]
11188 2D	Noise reduction of dual-wavelength digital holography based on a shorter synthetic-wavelength [11188-86]
11188 2F	Design of phase-type soft aperture [11188-88]