

PROCEEDINGS OF SPIE

# ***Digital Optical Technologies 2021***

**Bernard C. Kress**  
**Christophe Peroz**  
*Editors*

**21–25 June 2021**  
**Online Only, Germany**

*Sponsored by*  
SPIE

*Cooperating Organisations*  
European Optical Society  
German Scientific Laser Society (Wissenschaftliche Gesellschaft Lasertechnik e.V.)

*Published by*  
SPIE

**Volume 11788**

Proceedings of SPIE 0277-786X, V. 11788

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 [SPIDigitalLibrary.org](http://SPIDigitalLibrary.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 *Digital Optical Technologies 2021*, edited by Bernard C. Kress, Christophe Peroz, Proc. of SPIE 11788, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510644106

ISBN: 9781510644113 (electronic)

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

[SPIE.org](http://SPIE.org)

Copyright © 2021 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at [copyright.com](http://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.

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.

**SPIE. DIGITAL  
LIBRARY**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

---

**Paper Numbering:** A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE 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

---

## DIGITAL OPTICS FOR AR, VR AND MR SYSTEMS

---

- 11788 05 **Effect of specialized applications on the visual functions of amblyopic eye in Latvian children** [11788-3]
- 11788 06 **Using augmented reality devices for remote maintenance and repair of industrial equipment as new challenges in the COVID-19 pandemic** [11788-4]
- 11788 07 **VR: a new challenge in digital teaching of optics and photonics** [11788-5]

---

## NOVEL MATERIALS AND PROCESSES FOR DIGITAL OPTICS IN AR

---

- 11788 0B **Latest Bayfol HX® developments: ultrahigh index modulation and NIR recordable holographic films** [11788-9]
- 11788 0C **Slanted gratings with varying slant angle by localized reactive ion beam processing** [11788-31]

---

## DIGITAL OPTICS FOR SENSING

---

- 11788 0D **A compact low-power gaze gesture sensor based on laser feedback interferometry for smart glasses (Invited Paper)** [11788-10]
- 11788 0E **A lightweight and robust VCSEL-based 3D-depth sensing approach for mobile application** [11788-11]
- 11788 0G **Indirect time-of-flight 3D imaging using large-area transmission modulators** [11788-13]
- 11788 0H **High-speed and flexible 3D high-resolution fusion of photoacoustic information based on visualization software** [11788-14]

---

## COMPUTATIONAL OPTICS FOR DISPLAY, IMAGING AND SENSING

---

- 11788 0I **Virtual compressed sensing photoacoustic tomography using BPDN algorithm based on k-space** [11788-15]
- 11788 0K **Laser-excited volumetric display using aerial re-imaging by parabolic mirrors** [11788-17]
- 11788 0L **Probability distribution free multi-level sampling pattern design for single pixel cameras** [11788-18]

- 11788 OM **HEVC improved performance with end-to-end super resolution** [11788-19]
- 11788 ON **Prescription, accommodation, and presbyopia correcting fluid-filled lenses for digital display technologies** [11788-30]

---

#### DIGITAL OPTICS FOR IMAGE FORMATION

---

- 11788 OO **Digital optics with a pixelated  $\mu$ LED source (Invited Paper)** [11788-20]
- 11788 OP **High-efficiency near-infrared OLED microdisplay with fine pixel array** [11788-21]
- 11788 OQ **Ultracompact RGB laser diode module for near-to-eye displays** [11788-22]
- 11788 OR **Recommendations on the viewing distance of light field displays** [11788-23]
- 11788 OS **3D light field LED wall** [11788-24]

---

#### SWITCHABLE, TUNABLE AND DIGITALLY RECONFIGURABLE OPTICS

---

- 11788 OT **Phase-only spatial light modulator having high reflectance, high-definition pixels and high photo-durability** [11788-25]
- 11788 OU **Fast-switching liquid crystal diffusers: outlook on optical properties and applicability in volumetric display architecture** [11788-26]
- 11788 OW **A novel multifocal acoustic lens for photoacoustic imaging to achieve large depth of field imaging** [11788-29]