PROCEEDINGS OF SPIE

Current Developments in Lens Design and Optical Engineering XXIII

R. Barry Johnson
Virendra N. Mahajan
Simon Thibault
Alfonso Padilla-Vivanco

Editors

23–24 August 2022
San Diego, California, United States

Sponsored and Published by
SPIE

Volume
12217

Proceedings of SPIE 0277-786X, V. 12217
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 *Current Developments in Lens Design and Optical Engineering XXIII*, edited by R. Barry Johnson, Virendra N. Mahajan, Simon Thibault, Alfonso Padilla-Vivanco, Proc. Of SPIE 12217, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510654181
ISBN: 9781510654198 (electronic)

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time)
SPIE.org
Copyright © 2022 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. 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
SPIEDigitalLibrary.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

vii *Conference Committee*

THEORY AND APPLICATIONS I

12217 02 **Simultaneous multiple surfaces method applied to infrared lenses** [12217-1]

12217 03 **Through focus point spread function and modulus transfer function for multifocal lenses** [12217-2]

12217 04 **Multifocal lens HDR image simulation showing dysphotopsia** [12217-3]

12217 05 **Passive athermalization of MWIR optical designs utilizing different infrared optical materials** [12217-38]

DEVELOPMENTS IN OPTICAL COMPONENTS, TECHNIQUES, AND MATERIALS

12217 07 **Latest advancements at NILT on flat metalens based camera modules in near infrared (Invited Paper)** [12217-7]

12217 08 **Wide aperture (50 mm), compact, and high-quality continuous focus tunable Gradient Refractive Index (GRIN) liquid crystal lenses** [12217-8]

12217 09 **Widely tunable large area thin liquid crystals lens** [12217-9]

12217 0A **Measurement of refractive index and liquid diffusion coefficient based on focal plane imaging method** [12217-11]

SIMULATION OF OPTICAL SYSTEMS

12217 0B **Accurate camera performance prediction using optical and imaging simulation pipeline for super wide-angle lens** [12217-13]

12217 0C **A toolkit for multiscale optical system inverse-design** [12217-15]

12217 0D **Caustic produced by refractive conic surfaces** [12217-16]

12217 0E **Challenges using data-driven methods and deep learning in optical engineering** [12217-17]

12217 0F **A file sharing site for lens design** [12217-18]

MODELING AND ILLUMINATION

12217 0G **Light source modeling for UltraViolet-C Light-Emitting Diodes (UV-C LEDs) with aid of fluorescent film** [12217-32]

12217 0H **Achieving multiple beam patterns using 3-D printable lens by altering the positioning of LEDs** [12217-33]

12217 0I **An LED metalens for uniform illumination** [12217-34]

12217 0J **Adjustable mini-LED array applied to low/high beam meet the K-mark regulation** [12217-35]

INTEGRATION OF OPTICAL DESIGNS INTO COMPLETE INSTRUMENTS

12217 0K **An endoscopic lens with internal focusing** [12217-20]

12217 0M **Design of projection-based augmented reality system using holographic screen display** [12217-23]

12217 0O **Generative design and digital manufacturing: using AI and robots to build lightweight instrument structures** [12217-37]

THEORY AND APPLICATIONS II

12217 0P **Optical design process of a human eye inspired lens** [12217-26]

12217 0S **Realizing low-distortion in wide-angle lens with freeform optics technique** [12217-29]

POSTER SESSION

12217 0W **Method for designing optical systems from the off-the-shelf optical components** [12217-19]

12217 0X **Multichannel-optical prism** [12217-22]

12217 0Y **Design of an expander lens for an MWIR zoom camera using the third-order aberration analysis** [12217-24]

12217 10 **Changing field of view by applying voltage difference** [12217-39]

12217 11 **Optical design of dual mode imaging infrared system in MWIR and LWIR spectral bands** [12217-40]