## PROCEEDINGS OF SPIE

## Dimensional Optical Metrology and Inspection for Practical Applications VI

Kevin G. Harding Song Zhang Editors

13 April 2017 Anaheim, California, United States

Sponsored and Published by SPIE

**Volume 10220** 

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 *Dimensional Optical Metrology and Inspection for Practical Applications VI*, edited by Kevin G. Harding, Song Zhang, Proceedings of SPIE Vol. 10220 (SPIE, Bellingham, WA, 2017) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510609419

ISBN: 9781510609426 (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

Copyright © 2017, 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 \$18.00 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/17/\$18.00.

Printed in the United States of America V m7 i ffUb  $^{\circ}5\,ggc\,WJUhY\,g\ddot{z}\,$   $\oplus\,W\ddot{z}\,$ i bXY f $^{\circ}\,$ JWY bgY  $^{\circ}Z\dot{c}\,$ a  $^{\circ}GD-9$ .

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

V	Aumors  Conform on Committee
Vİİ	Conference Committee
SESSION 1	METROLOGY AND 3D METHODS
10220 03	<b>3D</b> shape measurement using image-matching-based techniques (Invited Paper) [10220-2]
10220 04	High-speed 3D surface measurement with mechanical projector [10220-3]
10220 05	High-speed, high-accuracy large range 3D measurement [10220-4]
10220 06	Design and implementation of an electronic system to real-time capture and processing speckle interference patterns [10220-5]
SESSION 2	METROLOGY ANALYSIS
10220 07	Wavelength dependency of optical 3D measurements at translucent objects using fringe pattern projection [10220-6]
10220 08	Influence of the measurement object's reflective properties on the accuracy of array projection-based 3D sensors [10220-7]
10220 09	Absolute phase unwrapping for dual-camera system without embedding statistical features [10220-8]
10220 OB	Measuring optical phase digitally in coherent metrology systems [10220-10]
SESSION 3	METROLOGY APPLICATIONS I
10220 0E	Optimized measurement of gaps [10220-13]
10220 OF	Temporal speckle correlations for optical alignment [10220-14]

SESSION 4	METROLOGY APPLICATIONS II
10220 OI	Three-dimensional metrology for printed electronics [10220-17]
10220 OJ	Measurement of material thickness in the presence of a protective film [10220-18]
	POSTER SESSION
10220 OP	Fast 3D NIR systems for facial measurement and lip-reading [10220-23]