PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 10845

, "Front Matter: Volume 10845," Proc. SPIE 10845, Three-Dimensional Image Acquisition and Display Technology and Applications, 1084501 (12 December 2018); doi: 10.1117/12.2521331

SPIE.

Event: International Symposium on Optoelectronic Technology and Application 2018, 2018, Beijing, China

PROCEEDINGS OF SPIE

Three-Dimensional Image Acquisition and Display Technology and Applications

**Byoung-ho Lee
Yongtian Wang
Liangcai Cao
Guohai Situ**
Editors

**22–24 May 2018
Beijing, China**

Organized by
Chinese Society for Optical Engineering (CSOE) (China)
Photoelectronic Technology Committee, Chinese Society of Astronautics (China)
Photoelectronic Industrialization Committee, CHIA (China)
Department of Cooperation and Coordination for Industry, Academe and Research, CHIA (China)
Science and Technology on Low-light-level Night Vision Laboratory (China)

Sponsored by
Division of Information and Electronic Engineering of Chinese Academy of Engineering (China)
Chinese Society for Optical Engineering (CSOE) (China)

Published by
SPIE

Volume 10845

Proceedings of SPIE 0277-786X, V. 10845

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

Three-Dimensional Image Acquisition and Display Technology and Applications, edited by Byoung-ho Lee,
Yongtian Wang, Liangcai Cao, Guohai Situ, Proc. of SPIE Vol. 10845, 1084501
© 2018 SPIE · CCC code: 0277-786X/18/\$18 · doi: 10.1117/12.2521331

Proc. of SPIE Vol. 10845 1084501-1

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 *Three-Dimensional Image Acquisition and Display Technology and Applications*, edited by Byoung-ho Lee, Yongtian Wang, Liangcai Cao, Guohai Situ, Proceedings of SPIE Vol. 10845 (SPIE, Bellingham, WA, 2018) Seven-digit Article CID Number.

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

ISBN: 9781510623323
ISBN: 9781510623330 (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 © 2018, 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/18/\$18.00.

Printed in the United States of America.

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

SPIE. DIGITAL LIBRARY

SPIEDigitalLibrary.org

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	<i>Authors</i>
vii	<i>Conference Committee</i>
ix	<i>Introduction</i>

THREE-DIMENSIONAL IMAGE ACQUISITION AND DISPLAY TECHNOLOGY AND APPLICATIONS

10845 02	Homogenization research of waveform sampling LiDAR point cloud data [10845-1]
10845 03	The advantages and applications of three-dimensional integral imaging technology [10845-2]
10845 04	Research progress of computational integral imaging [10845-3]
10845 05	3D reconstructions in coregistered photoacoustic and ultrasonic imaging using clinical ultrasonic system [10845-4]
10845 06	Evaluation of a novel reconstruction method for synthetic aperture in-line digital holograms with seams [10845-5]
10845 07	Rapid algorithm of multi-plane holographic display [10845-6]
10845 08	Research on dispersion of light in integrated imaging LED display technology [10845-7]
10845 09	Design of an autostereoscopic 3D shooting system with adjustable spacing between camera arrays [10845-8]
10845 0A	Effect of tube setting on image quality in industrial x-ray computed tomography [10845-9]
10845 0B	Three-dimensional display using multi-layer translucencies [10845-10]
10845 0C	Calibration of 3D imaging system based on multi-line structured-light [10845-11]
10845 0D	Configurable cameras with MMS architecture [10845-12]
10845 0E	Design and analysis of an analog signal readout circuit for SPAD [10845-13]
10845 0F	Liquid crystal phase modulator based on deep sub-grating structure [10845-14]

10845 OG	3D laser imaging method based on low-cost 2D laser radar [10845-15]
10845 OH	Horizontal parallax light field display using pixel mapping algorithm with high resolution printed EIA (Elemental Image Array) [10845-17]
10845 OI	Fast 3D digital holography tomography based on dynamic compressive sensing [10845-18]
10845 OJ	RGB-D dense SLAM with keyframe-based method [10845-20]
10845 OK	RGB-D dense mapping with feature-based method [10845-21]
10845 OL	Fusion and display processing for 2D and 3D heterogeneous data of enhanced synthetic vision system [10845-22]
10845 OM	Depth estimation based on binocular disparity and color-coded aperture fusion [10845-23]
10845 ON	A new method for violence detection based on the three-dimensional scene flow [10845-24]
10845 OO	Phase retrieval via incremental reweighted gradient descent [10845-25]
10845 OP	Design of LED array light collecting system based on circular aperture mirrors [10845-26]
10845 OQ	Full parallax synthetic hologram based on SRTM elevation terrain data [10845-27]
10845 OR	A large fisheye conversion lens for projectors [10845-28]
10845 OS	Imaging through turbid medium using a new iterative phase retrieval algorithm [10845-29]
10845 OT	Cylindrical sample space imaging and material BRDF performance measurement [10845-31]
10845 OU	Effects of number of elemental images of lens-array based systems on angular resolution [10845-32]
10845 OV	Research on 16K video stream coding and system architecture for 3D display [10845-35]
10845 OW	A new stereo matching method for RAW image data based on improved SGBM [10845-37]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Brady, David J., 0D	Luo, Minzhou, 0G
Cai, Jianyang, 05	Luo, Yanghuan, 05
Chen, Deying, 02	Min, Bu, 0F, 0U, 0V
Cheng, Shichao, 0O	Niu, Lihong, 0C
Cheng, Yunfei, 0N	Pan, Xiaotian, 0M
Deng, Lijin, 08	Pang, Wubin, 0D
Ding, Meng, 06	Pei, Ronghao, 0G
Dong, Zhiwei, 02	Piao, Yan, 08
Fan, Qi, 06	Rong, Lihui, 0A
Feng, Guojin, 0T	RunQin, Rong, 0F, 0U, 0V
Fu, Xingyin, 0J, 0K	Shen, Chuan, 0F, 0U, 0V
Gan, Haiyong, 0T	Shun, Xilu, 0M
Gao, Hui, 04	Su, Binghua, 0C
Gao, Pengxiang, 0L	Su, Yin, 06
Gao, Runsu, 02	Sun, Liyu, 02
Gu, Huarong, 0B	Sun, Tiancheng, 0B
Guo, Buyu, 0Q	Sun, Yunlei, 0J
Han, Yu, 0A	Sun, Yushun, 0C
Han, Zhe, 07, 07	Sun, Zhaoying, 0A
He, Yingwei, 0T	Tan, Shen, 02
Heteng, Hu, 0F, 0U	Tan, Zhiying, 0G
Hou, Rui, 0Q	Wang, ChunShui, 0P, 0R
Hsueh, HanTsung, 0H	Wang, GuiZhu, 0F, 0U, 0V
Hu, Feihang, 0O	Wang, Junfu, 03, 04
Hu, Heteng, 0U, 0V	Wang, Taotao, 08
Huang, Mingwei, 0S	Wang, Wu, 0N
Huang, Wei, 0W	Wang, Xiaoshen, 0M
Huang, Yan, 0I	Wang, Yang, 0E
Jiang, Xiaoyu, 03, 04	Wang, Yanwei, 07
Jin, Chenfei, 0S	Wang, Ye, 0P, 0R
Jin, Senlin, 0I	Wang, Yifei, 03, 04
Jin, Xiang-Liang, 0E	Wang, Yu, 07
Li, Fang, 0P, 0R	Wang, Yuheng, 0W
Li, Hui, 05	Wang, Yun-fei, 06
Li, Jiahuan, 0S	Wei, Sui, 0F, 0U, 0V
Li, Lei, 0A	Wu, Houping, 0T
Li, LiCao, 0H	Wu, Qingxiao, 0J, 0K
Li, Zhifang, 05	Xi, Xiaoqi, 0A
Liang, Wei, 0I	Xie, Junguo, 09
Lin, Yongping, 05	Xu, Tao, 02
Liu, Guixi, 0L	Xu, Wenbin, 0Q
Liu, Huiping, 0Q	Xu, Xiaobin, 0G
Liu, Jinyuan, 0C	Xu, Yuan, 0I
Liu, Sen, 0T	Yan, Bin, 0A
Liu, Yan, 0W	Yan, Boxia, 07
Liu, Yuexia, 0N	Yan, Qi, 07
Liu, Zilong, 0T	Yang, Hong-Jiao, 0E
Lu, Rongrong, 0K	Yang, Yi, 0H
Luo, Jun, 0E	Yang, Yusan, 08

Yao, Hejun, 0I
Yu, Jia, 0Q
Yuan, Yufan, 0O
Zeng, Duo-Duo, 0E
Zhang, Chao, 0L
Zhang, Quanbing, 0O, 0U
Zhang, Siqu, 0S
Zhang, Wenge, 03
Zhao, Hui, 09
Zhao, Yuan, 0S
Zhong, Chongxia, 0I
Zhong, Zhiwei, 0M
Zhou, Dianle, 0M
Zhou, Sangsang, 0A
Zhu, Feng, 0J, 0K
Zou, Yi, 0C

Conference Committee

Conference Chair

Guangjun Zhang, Southeast University (China)

Conference Co-chairs

Junhao Chu, Shanghai Institute of Technical Physics (China)

Qionghai Dai, Tsinghua University (China)

Dianyuan Fan, Shenzhen University (China)

Jiancheng Fang, Beihang University (China)

Gu Min, Royal Melbourne Institute of Technology University (Australia)

Desheng Jiang, Wuhan University of Technology (China)

Huilin Jiang, Changchun University of Science and Technology (China)

Lin Li, The University of Manchester (United Kingdom)

Yueguang Lv, Chinese Academy of Engineering (China)

Zhejin Liu, National University of Defense Technology (China)

Wang Xiaomo, China Academy of Electronics and Information Technology (China)

Huaming Wang, Beihang University (China)

Lijun Wang, Changchun Institute of Optics, Fine Mechanics and Physics (China)

Wei Wang, China Aerospace Science and Technology Corporation (China)

Jianyu Wang, Shanghai Branch of Chinese Academy of Sciences (China)

Zuyan Xu, The Technical Institute of Physics and Chemistry (China)

Jiubin Tan, Harbin Institute of Technology (China)

Jianquan Yao, Tianjin University (China)

Hao Yin, China Electronic Systems Engineering Corporation (China)

Shaohua Yu, Wuhan Research Institute of Posts and Telecommunications (China)

Renhe Zhang, Institute of Acoustics (China)

Zisen Zhao, Wuhan Research Institute of Posts and Telecommunications (China)

Liwei Zhou, Beijing Institute of Technology (China)

Shouhuan Zhou, North China Research Institute of Electro-optics (China)

Zhongliang Zhu, Southwest Electronic Telecom Technology Research Institute (China)

Program Committee

Byoungcho Lee, Seoul National University (Korea, Republic of)
Liangcai Cao, Tsinghua University (China)
Weibiao Chen, Shanghai Institute of Optics and Fine Mechanics
(China)
Haimei Gong, Shanghai Institute of Technical Physics (China)
Sen Han, University of Shanghai for Science and Technology (China)
Huikai Xie, University of Florida (United States)
John McBride, University of Southampton (United Kingdom)
Yanbiao Liao, Tsinghua University (China)
Dong Liu, Zhejiang University (China)
Jian Liu, Harbin Institute of Technology (China)
Jin Lu, Tianjin Jinhang Institute of Technical Physics (China)
Mircea Guina, Tampere University of Technology (Finland)
Shibin Jiang, AdValue Photonics, Inc. (United States)
Guohai Situ, Shanghai Institute of Optics and Fine Mechanics (China)
Hongbo Sun, Tsinghua University (China)
Yongtian Wang, Beijing Institute of Technology (China)
Yuelin Wang, Shanghai Institute of Microsystem and Information
Technology (China)
Renhe Zhang, Institute of Acoustics (China)
Xuejun Zhang, Changchun Institute of Optics, Fine Mechanics and
Physics (China)
Pu Zhou, National University of Defense Technology (China)
Zhongliang Zhu, Southwest Electronic Telecom Technology Research
Institute (China)

Session Chairs

Yonglian Wang, Beijing Institute of Technology (China)
Byoungcho Lee, Seoul National University (Korea, Republic of)
Guohai Situ, Shanghai Institute of Optics and Fine Mechanics (China)
Ayman Alfalou, ISEN-Brest (France)
Xinzhu Sang, Beijing University of Posts and Telecommunications
(China)
Liangcai Cao, Tsinghua University (China)

Introduction

The International Symposium on Optoelectronic Technology and Application 2018 (OTA 2018) is the annual conference of the Chinese Society for Optical Engineering. It continues to be one of the largest academic and industrial conferences in the field of optical and optoelectronic technology in China. This year's program included academic exchanges, industry exhibitions, and cooperation negotiations together in one event. There were five technical conferences, seven exhibition themes, and 600 technical negotiations. We sincerely hope that this event continues to promote research and development of optoelectronic technology and to enhance international cooperation in the optical and optoelectronic fields.

OTA 2018 was sponsored by The Division of Information and Electronic Engineering of the Chinese Academy of Engineering (China), and The Chinese Society for Optical Engineering (CSOE) (China). The conference was organized by the Chinese Society for Optical Engineering (CSOE) (China), the Photoelectronic Technology Committee, the Chinese Society of Astronautics (China), the Photoelectronic Industrialization Committee, CHIA (China), the Department of Cooperation and Coordination for Industry, Academic, and Research, CHIA (China), and the Science and Technology on Low-light-level Night Vision Laboratory (China). We received more than 759 contributions from more than 15 countries, including the United States, United Kingdom, Germany, France, Spain, Australia, Canada, Mexico, Brazil, Japan, Republic of Korea, Thailand, Singapore, Russian Federation and China. There were more than 400 contributions published in SPIE Proceedings, including 70 contributions from invited speakers. After careful discussion, six keynote speeches were selected and presented by famous scientists from the United States, United Kingdom, Republic of Korea, and China. There were 138 excellent invited talks, 45 from overseas, that reflected first-class level in the field of optics and photonics technology. On behalf of the OTA 2018 Organizing Committee, I would like to express thanks to all the invited speakers and authors for their contributions and support.

Finally, on behalf of the other Co-chairmen and the Organizing Committee, I would like to heartily thank our sponsors and cooperating organizers for all they have done for the conference, and to all of the participants and friends for their interests and efforts in helping us to make the conference a success. Thanks also to the Program Committee for their effective work and valuable advice, especially the Secretariat, and to the staff of SPIE for their tireless efforts and outstanding service preparing and publishing the proceedings.

We hope to see you next year!

Guangjun Zhang