PROCEEDINGS OF SPIE

[SPIDigitalLibrary.org/conference-proceedings-of-spie](https://spiedigitallibrary.org/conference-proceedings-of-spie)

Front Matter: Volume 9530

, "Front Matter: Volume 9530," Proc. SPIE 9530, Automated Visual Inspection and Machine Vision, 953001 (22 June 2015); doi: 10.1117/12.2199155

SPIE.

Event: SPIE Optical Metrology, 2015, Munich, Germany

PROCEEDINGS OF SPIE

Automated Visual Inspection and Machine Vision

Jürgen Beyerer
Fernando Puente León
Editors

24 June 2015
Munich, Germany

Sponsored by
SPIE

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

Published by
SPIE

Volume 9530

Proceedings of SPIE 0277-786X, V. 9530

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

Automated Visual Inspection and Machine Vision, edited by Jürgen Beyerer,
Fernando Puente León, Proc. of SPIE Vol. 9530, 953001 · © 2015 SPIE
CCC code: 0277-786X/15/\$18 · doi: 10.1117/12.2199155

Proc. of SPIE Vol. 9530 953001-1

The papers included 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. The papers published in these proceedings 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 this book:

Author(s), "Title of Paper," in *Automated Visual Inspection and Machine Vision*, edited by Jürgen Beyerer, Fernando Puente León, Proceedings of SPIE Vol. 9530 (SPIE, Bellingham, WA, 2015) Article CID Number.

ISSN: 0277-786X

ISBN: 9781628416909

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 © 2015, 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/15/\$18.00.

Printed in the United States of America.

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

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print. Papers are published as they are submitted and meet publication criteria. A unique citation identifier (CID) number is assigned to each article at the time of the first 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, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four 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. The complete citation is used on the first page, and an abbreviated version on subsequent pages.

Contents

v	Authors
vii	Conference Committee

SESSION 1	MEASUREMENT
9530 02	Camera series and parallel networks for deformation measurements of large scale structures (Invited Paper) [9530-1]
9530 03	Extending critical dimension measurement for optical microlithography with robust SEM image contours [9530-2]
9530 04	Towards one trillion positions [9530-3]
9530 05	Application of a reflectance model to the sensor planning system [9530-4]
9530 06	The application of vision measurement in aerodynamic testing combined with speckle correlation [9530-5]
SESSION 2	MULTISPECTRAL INSPECTION
9530 07	Research of the fusion methods of the multispectral optoelectronic systems images (Invited Paper) [9530-6]
9530 08	A new indicator in early drought diagnosis of cucumber with chlorophyll fluorescence imaging [9530-7]
SESSION 3	OPTICAL SORTING
9530 09	Spatial regularization for the unmixing of hyperspectral images (Invited Paper) [9530-9]
9530 0A	Identification and sorting of regular textures according to their similarity [9530-10]
9530 0B	The influence of the design features on optical sorter effectiveness [9530-12]
SESSION 4	INSPECTION, MONITORING AND DETECTION
9530 0C	Investigation into the use of smartphone as a machine vision device for engineering metrology and flaw detection, with focus on drilling [9530-13]
9530 0D	Range imaging behind semi-transparent surfaces by high-speed modulated light [9530-15]
9530 0E	Retroreflective micropismatic materials in image-based control applications [9530-16]

- 9530 OF **Object recognition in 3D point clouds with maximum likelihood estimation** [9530-17]
- 9530 OG **Automatic detection system of shaft part surface defect based on machine vision** [9530-18]

POSTER SESSION

- 9530 OH **Modeling and analysis of the two-dimensional polystyrene aggregation process** [9530-14]
- 9530 OI **Fast interframe transformation with local binary patterns** [9530-19]
- 9530 OJ **New opportunities of pegmatites enrichment by optical sorting** [9530-11]
- 9530 OK **The algorithm for generation of panoramic images for omnidirectional cameras** [9530-20]
- 9530 OL **Automatic online laser resonator alignment based on machine vision: analysis** [9530-21]
- 9530 OM **Control system of warehouse robots' position** [9530-22]
- 9530 ON **A novel regularization method for optical flow-based head pose estimation** [9530-23]
- 9530 OO **Accurate invariant pattern recognition for perspective camera model** [9530-24]
- 9530 OP **Stereo sequences analysis for dynamic scene understanding in a driver assistance system** [9530-25]
- 9530 OQ **Image restoration using aberration taken by a Hartmann wavefront sensor on extended object, towards real-time deconvolution** [9530-26]
- 9530 OR **A FragTrack algorithm enhancement for total occlusion management in visual object tracking** [9530-27]

Author Index

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four 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.

Adamo, F., 0R	Maruev, Ivan A., 0M
Alekhin, Artem A., 0J	Mazzeo, P. L., 0R
Anastasiadis, Johannes, 0A	Neumann, Florian, 09
Anisimov, Andrei G., 0E	Nikulin, Anton V., 0M
Asgari, Reza, 0Q	Osten, Wolfgang, 04
Bakhshi, Hadi, 0Q	Paloušek, David, 05
Bateman, Richard, 0C	Pantyushin, Anton V., 0E
Bauer, Sebastian, 09	Pantyushina, Ekaterina N., 0O
Brandejs, Jan, 05	Pavlenko, Nikita A., 0B
Bubnova, Tatiana P., 0J	Pruss, Christof, 04
Bui, Duc Anh, 04	Puente León, Fernando, 09, 0A, 0N
Chen, Ding, 06	Razdan, Vikram, 0C
Chertov, Aleksandr N., 0J	Rodrigues, Joel J. P. C., 0O
Dantanarayana, Harshana G., 0F	Schaal, Frederik, 04
Darudi, Ahmad, 0Q	Serikova, Mariya G., 0E, 0O
Deleener, R., 0D	Shang, Yang, 02
Distante, C., 0R	Sidyakin, Sergey V., 0I
Dong, Lizhi, 0L	Skamniitskaya, Lyubov S., 0J
Feng, Jia-bo, 06	Skorupski, Krzysztof, 0H
Geerardyn, D., 0D	Spagnolo, P., 0R
Gorbatsevich, Vladimir S., 0I	Sun, Kuoyuan, 0G
Gorbulova, Elena V., 0E, 0J	Vasilev, Aleksandr S., 07
Gronle, Marc, 04	Vater, Sebastian, 0N
Guan, Banglei, 02	Vetrano, Maria Rosaria, 0H
Haist, Tobias, 04	Vishnyakov, Boris V., 0I, 0P
Hao, Xiangyang, 0G	Vizilter, Yuri V., 0P
He, Xing, 0L	Vygodov, Oleg V., 0P
Hernández Mesa, Pilar, 0A	Wang, Heng, 08
Horvath, Imre, 0H	Wang, Shuai, 0L
Huntley, Jonathan M., 0F	Wang, Wei, 06
Ingelberts, H., 0D	Weisbuch, Francois, 03
Jiang, Bofan, 04	Xu, Bing, 0L
Jiang, Lixing, 0G	Xu, Liang, 08
Knyaz, Vladimir A., 0P	Yang, Ping, 0L
Korotaev, Valery V., 07, 0B, 0J, 0K, 0O	Yarishchev, Sergey, 0K
Koutecký, Tomáš, 05	Yu, Qifeng, 02
Kuijk, M., 0D	Zhang, Jin-guo, 06
Lazarenko, Vasily P., 0K	Zhang, Shang-bin, 06
Lebedko, Eugene G., 0M	Zhang, Ye-hua, 06
Lei, Zhihui, 02	Zhao, Fulai, 0G
Li, Haifeng, 08	Zhelto, Sergey Y., 0P
Liu, Wenjin, 0L	Zyuzin, Vadim V., 0O
Liu, Xiaolin, 02	
Liu, Xu, 08	
Ma, Hong-qiang, 06	
Malin, Ivan K., 0P	
Mann, Guillermo, 0N	

Conference Committee

Symposium Chairs

Wolfgang Osten, Universität Stuttgart (Germany)
Gunther Notni, Fraunhofer-Institut für Angewandte Optik und
Feinmechanik IOF (Germany)
Andrew J. Moore, Heriot-Watt University (United Kingdom)

Conference Chairs

Jürgen Beyerer, Fraunhofer-Institut für Optronik, Systemtechnik und
Bildauswertung (Germany)
Fernando Puente León, Karlsruher Institut für Technologie (Germany)

Conference Program Committee

Christian Frese, Fraunhofer-Institut für Optronik, Systemtechnik und
Bildauswertung (Germany)
Andreas Heinrich, Hochschule Aalen (Germany)
Michael Heizmann, Fraunhofer-Institut für Optronik, Systemtechnik
und Bildauswertung (Germany)
Bernd Jähne, Ruprecht-Karls-Universität Heidelberg (Germany)
Thomas Längle, Fraunhofer-Institut für Optronik, Systemtechnik und
Bildauswertung (Germany)
Markus Maurer, VITRONIC Dr.-Ing. Stein Bildverarbeitungssysteme
GmbH (Germany)
Wolfgang Osten, Universität Stuttgart (Germany)
Felix Salazar, Universidad Politécnica de Madrid (Spain)
Robert Schmitt, Fraunhofer-Institut für Produktionstechnologie
(Germany)
Hugo Thienpont, Vrije Universiteit Brussel (Belgium)
Stefan Werling, Fraunhofer-Institut für Optronik, Systemtechnik und
Bildauswertung (Germany)
Ernst Wiedenmann, AiMESS Products GmbH (Germany)
Volker Willert, Technische Universität Darmstadt (Germany)

Session Chairs

- 1 Measurement
Jürgen Beyerer, Fraunhofer-Institut für Optronik, Systemtechnik und
Bildauswertung (Germany)
- 2 Multispectral Inspection
Fernando Puente León, Karlsruher Institut für Technologie (Germany)

- 3 Optical Sorting
Jürgen Beyerer, Fraunhofer-Institut für Optronik, Systemtechnik und
Bildauswertung (Germany)
- 4 Inspection, Monitoring and Detection
Fernando Puente León, Karlsruher Institut für Technologie (Germany)