

PROCEEDINGS OF SPIE

Tenth International Symposium on Precision Mechanical Measurements

**Haojie Xia
Lian X. Yang
Liandong Yu**
Editors

**15–17 October 2021
Qingdao, China**

Organized by
Hefei University of Technology (China)

Co-organized by
China University of Petroleum (China)
Chongqing University of Technology (China)
Beijing Information Science and Technology University (China)
Anhui University of Science and Technology (China)

Sponsored by
International Committee on Measurements and Instrumentation (China)
National Natural Science Foundation of China (China)
China Instrument and Control Society (China)

Published by
SPIE

Volume 12059

Proceedings of SPIE 0277-786X, V. 12059

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 *Tenth International Symposium on Precision Mechanical Measurements*, edited by Haojie Xia, Lian X. Yang, Liandong Yu, Proc. of SPIE 12059, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510649934

ISBN: 9781510649941 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

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. 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

TENTH INTERNATIONAL SYMPOSIUM ON PRECISION MECHANICAL MEASUREMENTS

- 12059 02 **Magnetic circuit design and analysis of giant magnetostrictive force sensor based on the Villari effect** [12059-1]
- 12059 03 **The electromechanical brake control strategy based on linear quadratic regulator** [12059-2]
- 12059 04 **Mathematical modeling and parameter optimization of the resonator for the vibrating tube** [12059-3]
- 12059 05 **Research on path planning technology of mobile robot based on visual obstacle avoidance** [12059-4]
- 12059 06 **Calibration method of extrinsic parameters for non-orthogonal shaft laser theodolite measurement system** [12059-5]
- 12059 07 **Research on TE analysis method for improving gearing accuracy of hobbing machine** [12059-6]
- 12059 08 **Research on electronic inclinometer calibration method and uncertainty budget based on GUM method** [12059-7]
- 12059 09 **Fiber optic shape sensor based on differential geometry** [12059-8]
- 12059 0A **Calculation method of projection point of circle center in camera calibration** [12059-11]
- 12059 0B **Image segmentation and fast scanning method of vision-probe measurement system** [12059-14]
- 12059 0C **3D reconstruction of aircraft structures via 2D multi-view images** [12059-16]
- 12059 0D **Visual positioning method based on line laser 3D measurement system** [12059-20]
- 12059 0E **Iterative dynamic condensation method of finite element model for rotor-bearing system** [12059-21]
- 12059 0F **Iterative threshold segmentation method based on information entropy** [12059-22]
- 12059 0G **Measurement of the phase of double laser pulses using the combination algorithm of near-field TS-DFT and GS** [12059-25]
- 12059 0H **Research and design of traffic recognition system based on Hilens** [12059-26]

- 12059 OI **Optical thickness measurement of stacked glass based on balanced cross-correlation** [12059-27]
- 12059 OJ **Extension of Scheimpflug principle in multi-line laser scanning measurement** [12059-29]
- 12059 OK **Design of a piezoelectric pump with arch cantilever beam vibrator** [12059-31]
- 12059 OL **Indoor loop closure detection based on geometric features** [12059-33]
- 12059 OM **Extension of measurement area of stereo deflectometry** [12059-34]
- 12059 ON **A calibration method for the articulated arm coordinate measuring machine based on carbon fiber standard gauge** [12059-36]
- 12059 OO **The error analysis and experimental research of micro-angle measurement system based on F-P etalon** [12059-37]
- 12059 OP **Development of testing machine for joint robots and its lost motion measuring practice** [12059-40]
- 12059 OQ **On line identification method of forming defects of small module plastic gears** [12059-41]
- 12059 OR **A wind-driven triboelectric nanogenerator for formaldehyde gas monitoring** [12059-48]
- 12059 OS **Elimination method of overexposed areas in speckle pattern interferometry** [12059-49]
- 12059 OT **FOC control system of permanent magnet synchronous motor based on fuzzy active disturbance rejection control** [12059-51]
- 12059 OU **Measurement method of high temperature full-field thermal deformation of materials based on digital image correlation** [12059-52]
- 12059 OV **Lightweight optimization of convolutional neural network for multi-objective recognition in structured scene** [12059-54]
- 12059 OW **Measurement and control system design and texture anti-friction test of reciprocating friction tester based on compliant mechanism** [12059-55]
- 12059 OX **Dynamic modeling and simulation of sand core handling robot** [12059-56]
- 12059 OY **Uncertainty analysis of cylindrical gear tooth profile measurement based on profilometer** [12059-57]
- 12059 OZ **Modulation method of air-gap permeance with sinusoidal regularity change for time-grating angular displacement sensor** [12059-60]
- 12059 10 **Spectrally resolved interferometry to measure thickness and refractive index of transparent material** [12059-61]

- 12059 11 **State identification and fault early warning of wind turbine based on MSET** [12059-62]
- 12059 12 **Measurement of three degrees of freedom error motions of rotary axis based on auto-collimation principle** [12059-63]
- 12059 13 **Fractal characterization of nano anisotropic rough surface** [12059-64]
- 12059 14 **Simulation of key parameters of dual soliton microcombs ranging system with high repetition rate** [12059-66]
- 12059 15 **Vehicle suspension design with semi-active inerter and semi-active damper configuration** [12059-67]
- 12059 16 **Single joint module angle error analysis and modelling of self-driving articulated arm coordinate measuring machine** [12059-68]
- 12059 17 **Influence of target surface morphology on LIBS spectrum** [12059-69]
- 12059 18 **Positioning accuracy improvement of industrial robots based on modified differential evolution algorithm** [12059-71]
- 12059 19 **Layered low-frequency extrapolation with deep learning in full-waveform inversion** [12059-73]
- 12059 1A **Simulation analysis on the design of the PZT stacked array deformable mirror** [12059-77]
- 12059 1B **Ground-truth information agnostic deep dehazing network for C919 aircraft image** [12059-79]
- 12059 1C **3D-pix2pix generative adversarial network for history matching with complex geologies** [12059-80]
- 12059 1D **Less false detections, fewer identity switches: methods for the improvement of deep sort** [12059-82]
- 12059 1E **Wiener filter and linear-MVUE for feature point extraction in atmospheric turbulence image** [12059-83]
- 12059 1F **Modeling and optimization design of embedded time-grating sensor based on magnetic equivalent circuit** [12059-85]
- 12059 1G **Research on an embedded detection method for angular displacement of turntable bearing** [12059-86]
- 12059 1H **Design of test and cloud data management system for highway tunnel lighting** [12059-88]
- 12059 1I **Design of intelligent detection system for illumination brightness of highway tunnel** [12059-89]
- 12059 1J **The discriminant model of wind turbine SCADA normal data based on random forest** [12059-91]

- 12059 1K **Simulations of the transmission small angle x-ray scattering for three-dimensional architectures** [12059-92]
- 12059 1L **Design of a high-precision two-dimensional coplanar micro-vibration generator** [12059-93]
- 12059 1M **X-ray scatterometry using deep learning** [12059-96]
- 12059 1N **High sensitivity contact probe based on optical path amplification** [12059-100]
- 12059 1O **Adaptive sinusoidal signal processing techniques for interferometers** [12059-101]
- 12059 1P **Different measuring methods of REVO five-axis coordinate measuring machine** [12059-102]
- 12059 1R **An improved particle information extraction method for laser interference particle imaging technology** [12059-105]
- 12059 1S **Study on the effect of transmissive reflective film on focused ultrasonic sound pressure measurement by optical measurement method** [12059-110]
- 12059 1T **Discussion on ultrasonic optical method and verification of the influence of pellicle placed on water surface on sound field** [12059-111]
- 12059 1U **Distance accuracy measurement of the industrial robot based on multi-station method of the laser tracer** [12059-112]
- 12059 1V **Lithium battery surface defect detection based on the YOLOv3 detection algorithm** [12059-114]
- 12059 1W **Impact localization on composites based on dynamic calibration of fiber Bragg grating sensors** [12059-115]
- 12059 1X **Step structure characterization using a metrological AFM rig based on nano measuring machine** [12059-119]
- 12059 1Y **An analysis of triangulation reconstruction based on 3D point cloud with geometric features** [12059-121]
- 12059 1Z **Stability detection of melt pool in laser cladding based on enhanced mask R-CNN** [12059-122]
- 12059 20 **Research on defect detection algorithm of monocrystalline silicon cell based on domain adaptation** [12059-123]
- 12059 21 **A path planning method for real time correction of image distortion in atomic force microscope** [12059-124]
- 12059 22 **An electric vehicle charging pile fault diagnosis system using Borderline-SMOTE and LightGBM** [12059-125]

- 12059 23 **Improved faster R-CNN algorithm for defect detection of electromagnetic luminescence**
[12059-127]
- 12059 24 **Development of an orthodontic mechanics test platform based on a six-axial force/moment sensor** [12059-128]