Optical Engineering

SPIEDigitalLibrary.org/oe

Precision Optical Measurements and Instrumentation for Geometrical and Mechanical Quantities

Kuang-Chao Fan
Rong-Sheng Lu
Lian-Xiang Yang

SPIE

Precision Optical Measurements and Instrumentation for Geometrical and Mechanical Quantities

Kuang-Chao Fan
National Taiwan University
Department of Mechanical Engineering
Taipei, Taiwan 10617
E-mail: fan@ntu.edu.tw

Rong-Sheng Lu
Hefei University of Technology
School of Instrument Science and Optoelectronic Engineering
Hefei, Anhui, 230009, China
E-mail: rslu@hfut.edu.cn

Lian-Xiang Yang
Oakland University
Department of Mechanical Engineering
Rochester, Michigan 48309
E-mail: yang2@oakland.edu

Measurement and instrumentation have long played an important role in production and manufacturing engineering, through supporting both the traditional field of manufacturing and the new field of micro/nanotechnology. Precision measurement and instrumentation have gained much greater prominence in the last decade in the areas of high-precision production and manufacturing, and thus the development of new and improved high-precision processes and machines. Many advanced technology products depend entirely on one or more components being manufactured to tolerances or dimensions in the micro- or even nanotechnology range. This special section serves as a forum to share the latest advances of optical-based precision measurement and instrumentation in high-precision production and manufacturing engineering, and other related fields.

Several of the papers in this special section were presented at the International Symposium on Precision Engineering Measurement and Instrumentation (ISPEMI 2012). Others were submitted in response to the general call for papers. All submissions underwent strict peer review.

This special section comprises thirteen papers that cover microscopic measurement, profile measurement, optical property measurement, vision measurement, optical sensors, and signal processing. Many advanced technologies are introduced, such as the chromatic confocal profilometry for full-field measurement of micro-objects, absolute distance measurement based on a femtosecond pulse laser, fast and accurate shape measurement by structured light, real-time moving body measurement, and microprobes for micro/nanocoordinate measuring machines. We hope that all of these papers can be beneficial to readers of *Optical Engineering* and worldwide researchers.

Kuang-Chao Fan received his PhD in mechanical engineering from the University of Manchester Institute of Science and Technology, Manchester, United Kingdom, in 1984. He has been a professor of mechanical engineering at Naitional Taiwan University (NTU) since August 1989. He was the Chairman of the Institute of Industrial Engineering at NTU, the director of the Tjing Ling Industrial Research Institute, and associate dean of the Engineer College at NTU. Since 2001, he has been the Cheung Kong Scholar at Hefei University of Technology, Hefei, China. His current research interests include manufacturing metrology, precision machining, machine tool technology, micro/nanomeasurements, and optical sensors. He is a fellow of the Society of Manufacturing Engineers (SME).

Rong-Sheng Lu received his PhD in precision instrument and mechanics from Hefei University of Technology, China, in 1998. From 1999 to 2000, he was affiliated with the State Key Lab of Precision Measurement Technology and Instruments, Tianjin University, as a post-doc and then an associate professor. Since 2000, he has been a professor with the School of Instrument Science and Opto-electronics Engineering at Hefei University of Technology. He was a visiting researcher in the Department of Manufacturing Engineering & Engineering Management at the City University of Hong Kong from 2001 to 2002, and in the Department of Mechanical Engineering at Imperial College London, United Kingdom, from 2002 to 2005 and in the School of Computing and Engineering at the University of Huddersfield, United Kingdom, from 2005 to 2006. In May 2006, he came back to Hefei University of Technology. His current research interests include precision measurement technology and instrumentation, machine vision and automated optical inspection, optical image processing, and related fields.

Lian-Xiang Yang received his PhD in mechanical engineering from the University of Kassel, Germany. He is a professor in the Department of Mechanical Engineering at Oakland University, California. Prior to joining Oakland University in 2001, he was an R&D scientist at JDS-Uniphase, Canada, from 2000 to 2001, a senior engineer at Dantec-Ettemeyer AG (currently called Dantec-Dynamics GmbH), Germany, from 1998 to 2000, a research and senior research fellow at the University of Kassel, Germany, from 1991 to 1998, and a lecture and associate professor at Hefei University of Technology, China, from 1986 to 1991. Professor Yang has multidisciplinary research experiences including optical metrology, experimental strain/stress analysis, nondestructive testing, and 3-D photogrammetry. He has been a Changjiang Scholar of Hefei University of Technology since 2008. He is a fellow of SPIE and an associate editor of *Optical Engineering*.