Special Session I

Special Session Basic Information:

专栏题目 **Session Title**	中文：数字全息技术及其应用 英文：Digital holography and its applications in industrial inspection

专栏介绍和征稿主题
Introduction and topics

中文：数字全息（Digital Holography，DH） 是一种利用数字相机和计算机采集并处理全息图的技术，能够完整获取光波的幅度与相位信息。通过相位图像的重建，数字全息可实现对物体三维表面形貌、厚度分布以及折射率变化的定量测量。

近年来，围绕数字全息的关键性能指标——如空间分辨率、成像速度、相位精度和测量范围提升——已开展了大量研究工作。同时，数字全息在概念和方法层面也经历了显著的发展，衍生出多种创新方向，包括非相干数字全息、压缩数字全息、散射介质数字全息以及基于纠缠的量子全息等。与此同时，图像处理算法，尤其是机器学习与深度学习技术的引入，也为全息图的分析与解译带来了新的突破。

目前，数字全息已成为多种工业应用中不可或缺的精密测量工具，广泛用于三维表面形貌、厚度、振动、应变/应力、折射率分布的表征，以及制造全过程中的原位与实时过程监测。

英文：Digital holography (DH) is a technique that captures and processes holograms using digital cameras and computers, thereby providing complete information about an optical wave—including both its amplitude and phase. Significantly, the reconstructed phase image enables quantitative measurement of an object’s three-dimensional surface topography, thickness distribution, and refractive index variations. Extensive efforts have been made to improve key performance parameters of DH, including spatial resolution, imaging speed, phase accuracy, and measurement range. The field of DH has also undergone substantial conceptual evolution, giving rise to several innovative branches such as incoherent DH, compressive DH, scattering-medium DH, and entanglement-based quantum holography. Concurrently, advances in image processing algorithms—particularly machine learning and deep learning—have introduced further breakthroughs in hologram analysis and interpretation. To date, DH is recognized as an essential measurement tool across a variety of industrial applications. It is widely employed for characterizing 3D surfaces, thickness, vibration, strain/stress, and refractive index distributions, as well as for in situ and real-time monitoring of processes throughout the manufacturing cycle.

The core of this session relates to the latest development of DH and its application in industrial inspection. Submissions are solicited on, but not limited to, the following topics:

- Advances in Digital Holographic Techniques
- 3D Imaging Systems
- Compressive Holography
- Deep learning in Digital Holography
- Digital Holographic Microscopy/Tomography
- Holographic Lithography
- Ptychography/Fourier Ptychography
- Polarization Holography
- Incoherent Holography
- Optical Information Processing
- Phase retrieval
- Digital Holography in LIDAR and related Remote Sensing Techniques

- Digital Holography for Industrial Inspection
- Metrology and Profilometry
- 3D refractive Index Mapping with DH
- Vibration and Elasticity Measurement with DH

Special Session Chair(s):

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Organizer's Brief Biography

Dr. Chao Zuo is now a professor and doctoral supervisor at the School of Electronic and Optical Engineering, Nanjing University of Science and Technology (NJUST). He received his B.S. from Zijin College, Nanjing University of Science and Technology. Then he served as a research assistant at the Centre for Optical and Laser Engineering (COLE), Nanyang Technological University (NTU), Singapore, from 2012 to 2013. In 2014, he received his Ph.D. from NJUST. In 2014 and 2016, he was exceptionally promoted to associate professor and professor of NJUST, respectively. Now he is the principal investigator of the Smart Computational Imaging Laboratory (SCILab: http://www.scilaboratory.com) at NJUST whose research interest focuses on computational bio-imaging, noninterferometic phase retrieval, optical information processing, and high-speed 3D optical sensing. He has published over 180 peer-reviewed journals with more than 10,000 citations according to Google Scholar. He is a member of several professional organizations and also a reviewer for many prestigious peer-review journals (>30) in optical sciences-related fields.

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Organizer's Brief Biography

Prof. Dr. Peng Gao studied Physics and received his Ph.D. at the Xi'an Institute of Optics and Precision Mechanics (XIOPM), CAS, in 2011. He was a "Humboldt Fellow" in University Stuttgart (2012-2014) and Marie-Curie Fellow (IEF) in KIT (2014-2018). His group focuses on developing super-resolution optical microscopy and quantitative phase microscopy techniques for biology. So far, he has authored over 100 peer-reviewed papers published in journals, including Nat. Photonics, Adv. Opt. Photon. Some of his publications were highlighted by tens of international media, such as Science Daily, Physics News, and so on. He is currently one of the associate editors of Optics and Laser Technology (OLT) and Frontiers in Physics.

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Organizer's Brief Biography

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Prof. Dr. Jianglei Di is now a professor at Guangdong University of Technology. He received his BS degree in applied physics in 2004, MS degree in optics in 2007, and PhD degree in optical engineering in 2012 from Northwestern Polytechnical University. His research interests include computational imaging, intelligent perception, and system-level applications. He has authored 120+ peer-reviewed journal articles (h-index 29, >3000 citations via Google Scholar) and secured 30 granted Chinese invention patents. As a Senior Member of OPTICA, SPIE, and IEEE, he serves on the editorial boards of Optics and Lasers in Engineering (OLEN) and Journal of Quantum Electronics.

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Prof. Dr. Caojin Yuan is now a professor and doctoral supervisor at School of Physics and Technology, Nanjing Normal University. She received her PhD degree in optical engineering in 2008 from Nankai University. She was a "Humboldt Fellow" in University Stuttgart from 2009 to 2011. Her current research interests include quantitative phase imaging and optical field manipulation. So far, she has authored over 90 peer-reviewed papers published in journals. She is currently one of the associate editors of Results in optics.