

Contents

Part I Celebrating Holography and its Impact over 60 years

The Discovery of Holographic Interferometry, Its Development and Applications	3
Karl A. Stetson	
The Language of Holography	13
James D. Trolinger	
Contributions of Holography to the Advancement of Interferometric Measurements of Surface Topography	23
Peter J. de Groot, Leslie L. Deck, Rong Su, and Wolfgang Osten	
Shearography and Its Applications – A Chronological Review	43
Rajpal Sirohi	
55 Years of Holographic Non-destructive Testing and Experimental Stress Analysis: Is There Still Progress to be Expected?	73
Wolfgang Osten and Giancarlo Pedrini	
Reflections About the Holographic and Non-holographic Acquisition of Surface Topography: Where are the Limits?	89
Gerd Häusler and Florian Willomitzer	

Part II Digital Transition of Holography

Digital Holography in Production: An Overview	101
Markus Fratz, Tobias Seyler, Alexander Bertz, and Daniel Carl	
Snap-shot Topography Measurement via Dual-VCSEL and Dual Wavelength Digital Holographic Interferometry	115
Daniel Claus, Igor Alekseenko, Martin Grabherr, Giancarlo Pedrini, and Raimund Hibst	
Parallax Limitations in Digital Holography: A Phase Space Approach	127
Ulf Schnars and Claas Falldorf	
Resolution Enhancement of Digital Holographic Microscopy via Synthetic Aperture: A Review	135
Peng Gao and Caojin Yuan	
Phase Microscopy and Surface Profilometry by Digital Holography	151
Myung K. Kim	
Integrated Self-Referencing Single Shot Digital Holographic Microscope and Optical Tweezer	163
Subhash Utadiya, Sachin Joshi, Nimit Patel, Chetna Patel, Mugdha Joglekar, Vani Cahhniwal, Timothy O'Connor, Bahram Javidi, and Arun Anand	

Compression Strategies for Digital Holograms in Biomedical and Multimedia Applications	177
Peter Schelkens, Ayyoub Ahar, Antonin Gilles, Raees Kizhakkumkara Muhamad, Thomas J. Naughton, Cristian Perra, Antonio Pinheiro, Piotr Stępień, and Malgorzata Kujawińska	
Digital Holography as Metrology Tool at Micronanoscale for Soft Matter	199
Zhe Wang, Lisa Miccio, Sara Coppola, Vittorio Bianco, Pasquale Memmolo, Volodymyr Tkachenko, Vincenzo Ferraro, Ernesto Di Maio, Pier Luca Maffettone, and Pietro Ferraro	
A Review of Common-Path Off-Axis Digital Holography: Towards High Stable Optical Instrument Manufacturing	225
Jiwei Zhang, Siqing Dai, Chaojie Ma, Teli Xi, Jianglei Di, and Jianlin Zhao	
Machine Learning Techniques Applied to Digital Holography	243
Brad Bazow, Thuc Phan, Thanh Nguyen, Van Lam, Anyu Sun, Lin-Ching Chang, Christopher B. Raub, and George Nehmetallah	
Part III Making of New Optical Components	
Holographic Optics in Planar Optical Systems for Next Generation Small Form Factor Mixed Reality Headsets	277
Bernard C. Kress and Maria Pace	
Hybrid Multimode - Multicore Fibre Based Holographic Endoscope for Deep-Tissue Neurophotonics	309
Yang Du, Sergey Turtaev, Ivo T. Leite, Adrian Lorenz, Jens Kobelke, Katrin Wondraczek, and Tomáš Čížmár	
Integrated Binary Hologram to Monitor Cargo Release from a Drug-Eluting Film	319
Arkady S. Abdurashitov, Pavel I. Proshin, Valery V. Tuchin, and Gleb B. Sukhorukov	
Holography with High-power CW Coherent Terahertz Source: Optical Components, Imaging, and Applications	329
Yulia Choporova, Boris Knyazev, and Vladimir Pavelyev	
Miniaturization of a coherent monocular structured illumination system for future combination with digital holography	347
Andreas Walter Stark, Eugene Wong, Holger Babovsky, Christian Franke, and Richard Kowarschik	
Design of broadband terahertz vector and vortex beams: I. Review of materials and components	355
Nikolay V. Petrov, Bogdan Sokolenko, Maksim S. Kulya, Andrei Gorodetsky, and Aleksey V. Chernykh	
Design of broadband terahertz vector and vortex beams: II. Holographic assessment	375
Nikolay V. Petrov, Bogdan Sokolenko, Maksim S. Kulya, Andrei Gorodetsky, and Aleksey V. Chernykh	
Simulation-based design optimization of the holographic wavefront sensor in closed-loop adaptive optics	389
Andreas Zepp, Szymon Gladysz, Karin Stein, and Wolfgang Osten	

Part IV Wide Field of Applications

A Review of the Dual-Wavelength Technique for Phase Imaging and 3D Topography	407
Haowen Zhou, Mallik M. R. Hussain, and Partha P. Banerjee	
Multi-positional Image-Based Vibration Measurement by Holographic Image Replication	429
Simon Hartlieb, Michael Ringkowski, Tobias Haist, Oliver Sawodny, and Wolfgang Osten	
Melt Pool Monitoring in Laser Beam Melting with Two-Wavelength Holographic Imaging	439
Matthieu Piniard, Beatrice Sorrente, Gilles Hug, and Pascal Picart	
A Symmetry Concept and Significance of Fringe Patterns as a Direct Diagnostic Tool in Artwork Conservation	451
Vivi Tornari	
Holography in the Invisible. From the Thermal Infrared to the Terahertz Waves: Outstanding Applications and Fundamental Limits	473
Marc Georges, Yuchen Zhao, and Jean-François Vandenrijt	
Investigation of human organoid retina with digital holographic transmission matrix measurements	487
Nektarios Koukourakis, Felix Wagner, Stefan Rothe, Mike O. Karl, and Jürgen W. Czarske	
Variable shearing holography with applications to phase imaging and metrology	503
Prithiviraj Shanmugam, Alyson Light, Avery Turley, and Konstantinos Falaggis	
Ultra-high speed holographic shape and displacement measurements in the hearing sciences	521
Haimi Tang, Pavel Psota, John J. Rosowski, Cosme Furlong, and Jeffrey Tao Cheng	
The Application of Digital Holography for Accurate Three-Dimensional Localisation of Mosquito-Bednet Interaction	535
Matthew L. Hall, Katherine Gleave, Angela Hughes, Philip J. McCall, Catherine E. Towers, and David P. Towers	
In-process Monitoring in Laser Grooving with Line-Shaped Femtosecond Pulses Using Optical Coherence Tomography	551
Satoshi Hasegawa, Masatoshi Fujimoto, Toshihisa Atsumi, and Yoshio Hayasaki	
Iterative Projection Meets Sparsity Regularization: Towards Practical Single-Shot Quantitative Phase Imaging with In-line Holography	561
Yunhui Gao and Liangcai Cao	
Shaping Singular Optical Coherence with Coherence Holography	579
Wei Wang and Mitsuo Takeda	
Part V Perspectives of Holographic Technologies	
Holography, and the Future of 3D Display	593
Pierre-Alexandre Blanche	

Holographic Augmented Reality Display with Conical Holographic Optical Element for Wide Viewing Zone	607
Yusuke Sando, Kazuo Satoh, Daisuke Barada, and Toyohiko Yatagai	
The State-of-the-Art in Computer Generated Holography for 3D Display	617
David Blinder, Tobias Birnbaum, Tomoyoshi Ito, and Tomoyoshi Shimobaba	
Holographic Techniques for Augmented Reality and Virtual Reality Near-Eye Displays	647
Jae-Hyeung Park and ByoungHo Lee	
Holographic 3D Imaging Through Random Media: Methodologies and Challenges	661
Mitsuo Takeda, Wolfgang Osten, and Eriko Watanabe	
Review of Engineering Techniques in Chaotic Coded Aperture Imagers	675
Vijayakumar Anand, Joseph Rosen, and Saulius Juodkazis	
Deep Holography	689
Guohai Situ	
Index	713