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Interferometry XVI: Techniques and Analysis

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Editors

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Contents

SESSION 3 SPATIAL STRUCTURES AND ABERRATIONS

SESSION 4 CALIBRATION TECHNIQUES

SESSION 5 FRINGE ANALYSIS

Conference Committee

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Yukitoshi Otani, Utsunomiya University (Japan)
Jannick P. Rolland, University of Rochester (United States)
Manuel Servin, Centro de Investigaciones en Óptica, A.C. (Mexico)
H. Philip Stahl, NASA Marshall Space Flight Center (United States)
Mitsuo Takeda, The University of Electro-Communications (Japan)

Benito Vazquez Dorrío, Universidade de Vigo (Spain)
Wei Wang, Heriot-Watt University (United Kingdom)
Song Zhang, Iowa State University (United States)

Session Chairs

1 On the Fringe
Katherine Creath, 4D Technology Corporation (United States), Optineering (United States) and The University of Arizona (United States)

2 Optical Coherence Tomography
Jannick P. Rolland, University of Rochester (United States)

3 Spatial Structures and Aberrations
Brent C. Bergner, Spectrum Scientific, Inc. (United States)

4 Calibration Techniques
Michael B. North Morris, 4D Technology Corporation (United States)

5 Fringe Analysis
Yukitoshi Otani, Utsunomiya University (Japan)

6 Unwrapping Techniques
Benito Vazquez Dorrío, Universidade de Vigo (Spain)

7 Specular and Translucent Object Measurement
Jan Burke, Bremer Institut für angewandte Strahltechnik GmbH (Germany)

8 Digital Holography
Ulf Griesmann, National Institute of Standards and Technology (United States)

9 Strain and Shape Measurement
Joanna Schmit, Bruker Nano Surfaces Division (United States)

Introduction

We thank SPIE, the program committee, the authors, and everyone attending this sixteenth Interferometry conference. SPIE continues to provide this productive forum for us to exchange ideas and share our latest research in interferometry and related fields. Like students before a big test, authors often find themselves anxious before presenting at a conference: Have I thought of everything? What if someone asks a question I cannot answer? However, these meetings are not exams; rather, they are the equivalent of coming to our colleagues, lab book in hand, and asking "what do you think about this", only on a global scale, involving the worldwide community. These meetings are, in part, about hearing the questions we cannot answer – not yet. In this regard, we are all forever students. From the technical nitty-gritty to the megatrends, we come together to explain what works and discuss what does not, hearing from old friends and making some new ones. We find inspiration and clever ideas to admire and build on; sometimes we discover links we would not have considered by ourselves, and always leave with new ideas and a renewed sense of purpose and enthusiasm.

Interferometry XVI continues the Interferometry series and consists of two complementary conferences, one dedicated to Techniques and Analysis and the other to Applications. This two-part structure reflects the fact that on the one hand there is still a lot of research to do, and on the other hand, the discipline has matured enough to have spawned a large number of techniques that are of vital use to the optics industry. Far from being an exhausted discipline, optics is recognized around the world as being one of the major research disciplines of the future, with new phenomena constantly requiring new metrology.

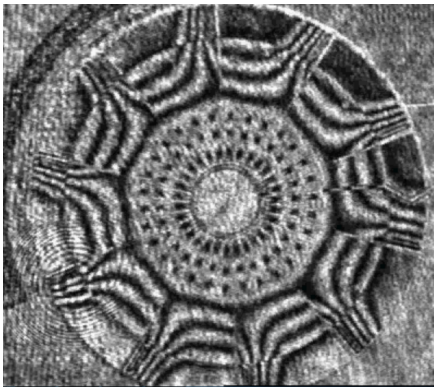
The first conference presents recent developments mostly in fringe analysis, interferometric or otherwise, for measurements of various natural and man-made objects and materials and their parameters. The second conference presents the application of such techniques to a wide range of tasks and systems. The proceedings of the two conferences comprising Interferometry XVI are published in two separate volumes *Interferometry XVI: Techniques and Analysis*, Proceedings of SPIE Vol. 8493, and *Interferometry XVI: Applications*, Proceedings of SPIE Vol. 8494. Although the contributions deal with very recent results and are therefore sometimes preliminary in nature, these proceedings are peer-reviewed to ensure a high scientific standard.

The demand for reliable measurements of increasingly complex devices pushes optical metrology to innovate and develop better techniques. Everywhere we look – from the semiconductor industry and optoelectronics, where devices keep on shrinking, to space sciences, where instruments of unprecedented size are under development and construction, to the biosciences, where the optical materials and detection methods are sometimes difficult to model and understand – we need to see more detail in space and time than we currently can. Incredible optical solutions have been developed in response to these challenges, and amazing metrology has been created to validate them. This process continues as do the challenges.

This conference on Interferometric Techniques and Analysis highlights developments in optical coherence tomography, spatial characterization and its errors, calibration techniques, advanced fringe analysis and phase unwrapping, digital holography and strain and shape measurement. We also have contributions to the metrology of material properties and small-object geometries, and numerous one-of-a-kind solutions for very specific problems, bearing witness to the versatility of light as a measurement tool.

Once again, the authors, from 15 countries and five continents, have brought a large number of inspiring papers to this forum, which we are very pleased to present in this book. It contains 47 papers presented at the SPIE 57th Annual Meeting in San Diego on August 12-16, 2012. Thirty-seven of these papers were presented orally.

During our last conference in 2010, we had a fun time at the Fringe Art competition, choosing our favorite fringe patterns from those brought along by attendees. The favorite fringe pattern, selected by the attendees, was a fringe pattern submitted by Conrad Wells from ITT Exelis Inc., USA. This image shows modeled results for the James Webb Space Telescope wave front test, the unique contours are due to the gravity sag of the primary mirror 18 segments in the optical axis vertical configuration.



The second fringe pattern, selected by the attendees, was a fringe pattern movie submitted by Christophe Gorecki from FEMTO-ST, France. These are Bessel fringes captured for the higher modes of out-of-plane resonant motion of silicon membrane in thin layer excited by PZT. The fringe patterns displayed ranged from everyday observations to intricate phenomena on the microscale. This is testimony to the fact that with a suitably trained (some might say deviant) eye and mind, it is possible to see fringe patterns almost anywhere. Beautiful and interesting images appeal to our human curiosity and our sense of wonder. During the Interferometry XVI conference, we have continued this tradition of celebrating beauty in science, and the favorite fringe pattern will be presented in the Interferometry XVII proceedings.

Until then, may the Fringe be with you.

Joanna Schmit
Katherine Creath
Catherine Towers
Jan Burke