1. Record Nr. UNINA9910144710203321

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Titolo	Handbook of holographic interferometry [[electronic resource]] : optical and digital methods / / Thomas Kreis
Pubbl/distr/stampa	Weinheim, : Wiley-VCH, c2005
ISBN	1-280-52008-6 9786610520084 3-527-60415-4 3-527-60492-8
Descrizione fisica	1 online resource (556 p.)
Disciplina	621.3675
Soggetti	Holographic interferometry Civil engineering Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references (p. [463]-511) and indexes.
Nota di contenuto	Handbook of Holographic Interferometry Optical and Digital Methods; Contents; Preface; 1 Introduction; 1.1 Scope of the Book; 1.2 Historical Developments; 1.3 Holographic Interferometry as a Measurement Tool; 2 Optical Foundations of Holography; 2.1 Light Waves; 2.1.1 Solutions of the Wave Equation; 2.1.2 Intensity; 2.2 Interference of Light; 2.2.1 Interference of Two Waves with Equal Frequency; 2.2.2 Interference of Two Waves with Different Frequencies; 2.2.3 Interference of Two Waves with Different Amplitudes; 2.3 Coherence; 2.3.1 Temporal Coherence; 2.3.2 Spatial Coherence 2.4 Scalar Diffraction Theory2.4.1 Fresnel-Kirchhoff Diffraction Formula; 2.4.2 Fresnel Approximation; 2.4.3 Fraunhofer Approximation; 2.4.4 Thin Lens; 2.4.5 Propagation of Light Waves as a Linear System; 2.5 Speckles; 2.5.1 Statistics of Speckle Intensity and Phase; 2.5.2 Speckle Size; 2.6 Holographic Recording and Optical Reconstruction; 2.6.1 Hologram Recording; 2.6.2 Optical Reconstruction of a Wave Field; 2.6.3 Holographic Imaging Equations; 2.6.4 Types of Holograms; 2.7 Elements of the Holographic Setup; 2.7.1 Laser; 2.7.2 Recording Media; 2.7.3 Optical Components

2.7.4 Beam Modulating Components2.8 CCD- and CMOS-Arrays; 2.8.1 CCD Concept; 2.8.2 CCD Array Performance Parameters; 2.8.3 CMOS Image Sensors; 2.8.4 Spatial Sampling with CCD-Arrays; 2.8.5 Color Still Cameras; 3 Digital Recording and Numerical Reconstruction of Wave Fields; 3.1 Digital Recording of Holograms; 3.1.1 CCD Recording and Sampling; 3.1.2 Reduction of the Imaging Angle; 3.1.3 Reference Waves; 3.2 Numerical Reconstruction by the Fresnel Transform; 3.2.1 Wave Field Reconstruction by the Finite Discrete Fresnel Transform; 3.2.2 Real and Virtual Image
3.2.3 Digital Fourier Transform Holography3.2.4 The D.C.-Term of the Fresnel Transform; 3.2.5 Suppression of the D.C.-Term; 3.2.6 Suppression of the Twin Image; 3.2.7 Variation of the Reference Wave; 3.2.8 Anamorphic Correction; 3.3 Numerical Reconstruction by the Convolution Approach; 3.3.1 The Diffraction Integral as a Convolution; 3.3.2 Size of the Image Field; 3.3.3 Shifting of the Image Field; 3.3.4 Scaling of the Image Field; 3.4 Further Numerical Reconstruction Methods; 3.4.1 Phase-Shifting Digital Holography; 3.4.2 Local Amplitude and Phase Retrieval
3.4.3 Wavelet Approach to Numerical Reconstruction3.4.4 Comparison of Reconstruction Methods; 3.4.5 Hologram Recording Using Consumer Cameras; 3.5 Wave-Optics Analysis of Digital Holography; 3.5.1 Frequency Analysis of Digital Holography with Reconstruction by Fresnel Transform; 3.5.2 Frequency Analysis of Digital Holography with Reconstruction by Convolution; 3.5.3 The Transfer Function as a Filter; 3.6 Non-Interferometric Applications of Digital Holography; 3.6.1 Particle Analysis by Digital Holography; 3.6.2 Microscopy by Digital Holography; 3.6.3 Data Encryption with Digital Holography
4 Holographic Interferometry

Sommario/riassunto

The book presents the principles and methods of holographic interferometry - a coherent-optical measurement technique for deformation and stress analysis, for the determination of refractive-index distributions, or applied to non-destructive testing. Emphasis of the book is on the quantitative computer-aided evaluation of the holographic interferograms. Based upon wave-optics the evaluation methods, their implementation in computer-algorithms, and their applications in engineering are described.