1. Record Nr. UNINA9910132202003321

Autore	Servin Manuel
Titolo	Fringe pattern analysis for optical metrology : theory, algorithms, and applications / / Manuel Servin, J. Antonio Quiroga, and J. Moises Padilla
Pubbl/distr/stampa	Weinheim, Germany : , : Wiley-VCH Verlag GmbH & Co. KGaA, , 2014 ©2014
ISBN	3-527-68110-8 3-527-68107-8 3-527-68108-6
Descrizione fisica	1 online resource (345 p.)
Disciplina	621.36
Soggetti	Diffraction patterns - Data processing Image processing - Data processing
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 and index.
Nota di contenuto	Fringe Pattern Analysis for Optical Metrology; Contents; Preface; List of Symbols and Acronyms; Chapter 1 Digital Linear Systems; 1.1 Introduction to Digital Phase Demodulation in Optical Metrology; 1.1.1 Fringe Pattern Demodulation as an Ill-Posed Inverse Problem; 1.1.2 Adding a priori Information to the Fringe Pattern: Carriers; 1.1.3 Classification of Phase Demodulation Methods in Digital Interferometry; 1.2 Digital Sampling; 1.2.1 Signal Classification; 1.2.2 Commonly Used Functions; 1.2.3 Impulse Sampling; 1.2.4 Nyquist-Shannon Sampling Theorem; 1.3 Linear Time-Invariant (LTI) Systems 1.3.1 Definition and Properties1.3.2 Impulse Response of LTI Systems; 1.3.3 Stability Criterion: Bounded-Input Bounded-Output; 1.4 Z-Transform Analysis of Digital Linear Systems; 1.4.1 Definition and Properties; 1.4.2 Region of Convergence (ROC); 1.4.3 Poles and Zeros of a Z-Transform; 1.4.4 Inverse Z-Transform; 1.4.5 Transfer Function of an LTI System in the Z-Domain; 1.4.6 Stability Evaluation by Means of the Z-Transform; 1.5 Fourier Analysis of Digital LTI Systems; 1.5.1 Definition and Properties of the Fourier Transform; 1.5.2 Discrete-Time Fourier Transform (DTFT) 1.5.3 Relation Between the DTFT and the Z-Transform1.5.4 Spectral

Interpretation of the Sampling Theorem; 1.5.5 Aliasing: Sub-Nyquist Sampling; 1.5.6 Frequency Transfer Function (FTF) of an LTI System; 1.5.7 Stability Evaluation in the Fourier Domain; 1.6 Convolution-Based One-Dimensional (1D) Linear Filters; 1.6.1 One-Dimensional Finite Impulse Response (FIR) Filters; 1.6.2 One-Dimensional Infinite Impulse Response (IIR) Filters; 1.7 Convolution-Based two-dimensional (2D) Linear Filters; 1.7.1 Two-Dimensional (2D) Fourier and Z-Transforms; 1.7.2 Stability Analysis of 2D Linear Filters
1.8 Regularized Spatial Linear Filtering Techniques1.8.1 Classical Regularization for Low-Pass Filtering; 1.8.2 Spectral Response of 2D Regularized Low-Pass Filters; 1.9 Stochastic Processes; 1.9.1 Definitions and Basic Concepts; 1.9.2 Ergodic Stochastic Processes; 1.9.3 LTI System Response to Stochastic Signals; 1.9.4 Power Spectral Density (PSD) of a Stochastic Signal; 1.10 Summary and Conclusions; Chapter 2 Synchronous Temporal Interferometry; 2.1 Introduction; 2.1.1 Historical Review of the Theory of Phase-Shifting Algorithms (PSAs); 2.2 Temporal Carrier Interferometric Signal
2.3 Quadrature Linear Filters for Temporal Phase Estimation2.3.1 Linear PSAs Using Real-Valued Low-Pass Filtering; 2.4 The Minimum Three-Step PSA; 2.4.1 Algebraic Derivation of the Minimum Three-Step PSA; 2.4.2 Spectral FTF Analysis of the Minimum Three-Step PSA; 2.5 Least-Squares PSAs; 2.5.1 Temporal-to-Spatial Carrier Conversion: Squeezing Interferometry; 2.6 Detuning Analysis in Phase-Shifting Interferometry (PSI); 2.7 Noise in Temporal PSI; 2.7.1 Phase Estimation with Additive Random Noise; 2.7.2 Noise Rejection in N-Step Least-Squares (LS) PSAs 2.7.3 Noise Rejection of Linear Tunable PSAs

Sommario/riassunto

The main objective of this book is to present the basic theoretical principles and practical applications for the classical interferometric techniques and the most advanced methods in the field of modern fringe pattern analysis applied to optical metrology. A major novelty of this work is the presentation of a unified theoretical framework based on the Fourier description of phase shifting interferometry using the Frequency Transfer Function (FTF) along with the theory of Stochastic Process for the straightforward analysis and synthesis of phase shifting algorithms with desired properties such