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Methods of Digital Holography

Methods Of Digital Holography

**Ulf Schnars, Claas Falldorf, John
Watson, Werner Jüptner**



Methods Of Digital Holography:

Methods of Digital Holography Леонид Пинхусович Ярославский, Николай Степанович Мерзляков, 1980-12 Synthesis of holograms Wavefront analysis and simulation Hardware and software **Methods of Digital Holography**, 1980 *New Techniques in Digital Holography* Pascal Picart, 2015-02-23 A state of the art presentation of important advances in the field of digital holography detailing advances related to fundamentals of digital holography in line holography applied to fluid mechanics digital color holography digital holographic microscopy infrared holography special techniques in full field vibrometry and inverse problems in digital holography **Digital Holography** Ulf Schnars, Werner Jüptner, 2005 This highly practical and self contained guidebook explains the principles and major applications of digital hologram recording and numerical reconstruction Digital Holography A special chapter is designated to digital holographic interferometry with applications in deformation and shape measurement and refractive index determination Applications in imaging and microscopy are also described Special techniques such as digital light in flight holography holographic endoscopy information encrypting comparative holography and related techniques of speckle metrology are also treated Digital Holography and Digital Image Processing Leonid Yaroslavsky, 2013-03-14 Digital holography and digital image processing are twins born by computer era They share origin theoretical base methods and algorithms The present book describes these common fundamentals principles methods and algorithms including image and hologram digitization data compression digital transforms and efficient computational algorithms statistical and Monte Carlo methods image restoration and enhancement image reconstruction in tomography and digital holography discrete signal resampling and image geometrical transformations accurate measurements and reliable target localization in images recording and reconstruction of computer generated holograms adaptive and nonlinear filters for sensor signal perfecting and image restoration and enhancement The book combines theory heavily illustrated practical methods and efficient computational algorithms and is written for senior level undergraduate and graduate students researchers and engineers in optics photonics opto electronics and electronic engineering Digital Holographic Microscopy Myung K. Kim, 2011-08-09 Digital holography is an emerging field of new paradigm in general imaging applications The book presents an introduction to the theoretical and numerical principles and reviews the research and development activities in digital holography with emphasis on the microscopy techniques and applications Topics covered include the general theory of diffraction and holography formations and practical instrumentation and experimentation of digital holography Various numerical techniques are described that give rise to the unique and versatile capabilities of digital holography Representative special techniques and applications of digital holography are discussed The book is intended for researchers interested in developing new techniques and exploring new applications of digital holography **Digital Holography and Wavefront Sensing** Ulf Schnars, Claas Falldorf, John Watson, Werner Jüptner, 2014-09-19 This highly practical and self contained guidebook explains the principles and major

applications of digital hologram recording and numerical reconstruction Digital Holography A special chapter is designated to digital holographic interferometry with applications in deformation and shape measurement and refractive index determination Applications in imaging and microscopy are also described Special techniques such as digital light in flight holography holographic endoscopy information encrypting comparative holography and related techniques of speckle metrology are also treated

Advancements in Optical Methods, Digital Image Correlation & Mechanics of Biological Systems and Materials, Volume 2 Chi-Hung Hwang, Gordon A. Shaw, Motoharu Fujigaki, Karen Kasza, Alexander McGhee, 2025-10-02 Advancements in Optical Methods Digital Image Correlation and the Mechanics of Biological Systems and Materials Volume 2 of the Proceedings of the 2024 SEM Annual Conference Exposition on Experimental and Applied Mechanics the second volume of three from the Conference brings together contributions to this important area of research and engineering The collection presents early findings and case studies on fundamental and applied aspects of Experimental Mechanics including papers in the following general technical research areas DIC Methods Its Applications Photoelasticity and Interferometry Applications Micro Optics and Microscopic Systems Multiscale and New Developments in Optical Methods Structure Function and Performance Research in Progress Cellular Biomechanics and Mechanobiology Experimental Techniques in Biological and Biomimetic Systems

Resolution Improvement Methods Applied to Digital Holography Daniel Claus, 2010 This thesis discusses the creation acquisition and processing of digital holograms Several techniques to improve the optical resolution have been investigated and developed The optical resolution of numerically reconstructed digital holograms is restricted by both the sampling frequency and the overall sensor size of the digital camera chip used This thesis explores the limitations on the optical resolution of the holograms obtained A typical sensor size and sampling frequency for digital holograms is 10 mm and 100 lp mm respectively whereas holographic plates used for optical holography can be more than a meter in size and have a sampling frequency of 3000 lp mm In order to take full advantage of the benefits digital holography offers such as fast image acquisition and direct phase accessibility the problem of reduced resolution needs to be overcome Three resolution improvement methods have been developed in the scope of this PhD thesis Prior to implementing the resolution improvement methods different holographic setups have been analyzed using the Space bandwidth product SBP to calculate the information distribution both in the recording and reconstruction process The first resolution improvement method is based on the synthetic aperture method In this manner an increased sensor area can be obtained resulting in a larger numerical aperture NA A larger NA enables a more detailed reconstruction The problem encountered in doing this is that an increased optical resolution results in a smaller depth of field This has been overcome in this thesis by applying the extended depth of field method As a result a high resolution in focus reconstruction of all longitudinal object regions is obtained Moreover the extended depth of field method allows a topological mapping of the object The second resolution improvement method is based on sampling the interference pattern

with sub pixel accuracy This was carried out on a CMOS sensor and implemented by moving the light sensitive pixel area into the dead zone in a 4x4 grid to cover whole the pixel area As a result the sensor s sampling frequency is doubled The increased sampling frequency permits a reduction of the recording distance which results in an increased optical resolution of the reconstructed hologram The third and novel approach described in this thesis has been to increase the optical resolution stored in a digital hologram by the combination of the synthetic aperture and the sub pixel sampling method By analogy with the Fresnel The resolution improvement methods have been demonstrated both for lens less digital holography and digital holographic microscopy

Digital Holography: Techniques and Applications Liangcai Cao,Zeev Zalevsky,Jianglei Di,Peng Gao,2022-11-16

Digital Holography Pascal Picart,Jun-chang Li,2013-01-24 This book presents a substantial description of the principles and applications of digital holography The first part of the book deals with mathematical basics and the linear filtering theory necessary to approach the topic The next part describes the fundamentals of diffraction theory and exhaustively details the numerical computation of diffracted fields using FFT algorithms A thorough presentation of the principles of holography and digital holography including digital color holography is proposed in the third part A special section is devoted to the algorithms and methods for the numerical reconstruction of holograms There is also a chapter devoted to digital holographic interferometry with applications in holographic microscopy quantitative phase contrast imaging multidimensional deformation investigations surface shape measurements fluid mechanics refractive index investigations synthetic aperture imaging and information encrypting Keys so as to understand the differences between digital holography and speckle interferometry and examples of software for hologram reconstructions are also treated in brief

Introduction to Modern Digital Holography Ting-Chung Poon,Jung-Ping Liu,2014-01-23 Get up to speed with digital holography with this concise and straightforward introduction to modern techniques and conventions Building up from the basic principles of optics this book describes key techniques in digital holography such as phase shifting holography low coherence holography diffraction tomographic holography and optical scanning holography discussing their practical applications and accompanied by all the theory necessary to understand the underlying principles at work A further chapter covers advanced techniques for producing computer generated holograms Extensive Matlab code is integrated with the text throughout and available for download online illustrating both theoretical results and practical considerations such as aliasing zero padding and sampling Accompanied by end of chapter problems and an online solutions manual for instructors this is an indispensable resource for students researchers and engineers in the fields of optical image processing and digital holography

Digital Holography and Three-Dimensional Display Ting-Chung Poon,2006-09-01 Digital or electronic holography and its application to 3 D display is one of the formidable problems of evolving areas of high technology that has been receiving great attention in recent years Indeed the Holy Grail for 3 D display is the realization of life size interactive 3 D displays Obviously we are not there yet but advances in 3 D display allow us to make important steps towards the Holy

Grail The theme of this book is to organize a collection of key chapters that covers digital holography and 3 D display techniques so as to provide the reader with the state of the art developments in these important areas around the world

Advancements in Optical Methods, Digital Image Correlation & Micro-and Nanomechanics, Volume 4

Ming-Tzer Lin, Cosme Furlong, Chi-Hung Hwang, Mohammad Naraghi, 2025-08-07 Advancements in Optical Methods Digital Image Correlation Micro and Nanomechanics Volume 4 of the Proceedings of the 2022 SEM Annual Conference Exposition on Experimental and Applied Mechanics the fourth volume of six from the Conference brings together contributions to this important area of research and engineering The collection presents early findings and case studies on a wide range of optical methods ranging from traditional photoelasticity and interferometry to more recent DIC and DVC techniques and includes papers in the following general technical research areas DIC Methods Its Applications Photoelasticity and Interferometry Applications Micro Optics and Microscopic Systems Multiscale and New Developments in Optical Methods Extreme Nanomechanics In Situ Nanomechanics Expanding Boundaries in Metrology Micro and Nanoscale Deformation MEMS for Actuation Sensing and Characterization 1D 2D Materials **Ultra-Realistic Imaging** Hans Bjelkhagen, David Brotherton-Ratcliffe, 2013-05-20 Ultra high resolution holograms are now finding commercial and industrial applications in such areas as holographic maps 3D medical imaging and consumer devices Ultra Realistic Imaging Advanced Techniques in Analogue and Digital Colour Holography brings together a comprehensive discussion of key methods that enable holography to be used as a technique of ultra realistic imaging After a historical review of progress in holography the book Discusses CW recording lasers pulsed holography lasers and reviews optical designs for many of the principal laser types with emphasis on attaining the parameters necessary for digital and analogue holography Gives a full review of current photosensitive materials for colour holography Covers modern methods of analogue holography and digital holographic printing Introduces mathematical and geometrical notation for horizontal parallax only holograms and practical computational algorithms for the full parallax case Reviews systems and the image processing algorithms required to convert the raw image data to the format required by digital printers Develops the physical theory of the holographic grating and the hologram Provides an up to date review of illumination sources including LED and laser diode sources Written by leaders in dynamic holography this handbook provides complete coverage of real time colour holographic processes including applications The book covers not only the optics and theory behind such holographic systems but also laser technologies recording devices data acquisition and processing techniques materials for reproduction and current and developing applications *Introduction to Digital Holography* Leonid Yaroslavsky, Jaakko Astola, 2018-02-22 This Book is a collection of comprehensive and cutting edge book articles written by leading experts on digital signal and image processing in general and specifically book written by one of pioneers of digital holography one of the foremost branches of the image sciences and modern information technology It covers all the basic aspects of digital synthesis and numerical reconstruction of holograms beginning from digital holographic

transforms going on to fast numerical algorithms for reconstruction of digitally recorded holograms and then to computer generated holograms and their applications in hybrid digital optical image processing and 3D visualization and communication. It also offers a comprehensive review of image digital processing methods most relevant to digital holography. The volume appears at an appropriate time i.e. while the field of optics is mutating from micro to nano and advanced optical technologies are becoming digital. It is written for researchers and advanced graduate and PhD students in the field of optics, photonics, electrical engineering and biomedical engineering and related branches of experimental physics and natural sciences and should prove to be of great value to them. It can also be used as a text book for one semester course.

Handbook of Holographic Interferometry Thomas Kreis, 2006-04-20. 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.

Introduction to Modern Digital Holography Ting-Chung Poon, 2014. Get up to speed with digital holography with this concise and straightforward introduction to modern techniques and conventions. Building up from the basic principles of optics, this book describes key techniques in digital holography such as phase shifting holography, low coherence holography, diffraction tomographic holography and optical scanning holography, discussing their practical applications and accompanied by all the theory necessary to understand the underlying principles at work. A further chapter covers advanced techniques for producing computer generated holograms.

Optical Inspection of Microsystems Wolfgang Osten, 2018-10-03. Where conventional testing and inspection techniques fail at the micro scale, optical techniques provide a fast, robust and relatively inexpensive alternative for investigating the properties and quality of microsystems. Speed, reliability and cost are critical factors in the continued scale up of microsystems technology across many industries and optical techniques are in a unique position to satisfy modern commercial and industrial demands. Optical Inspection of Microsystems is the first comprehensive up to date survey of the most important and widely used full field optical metrology and inspection technologies. Under the guidance of accomplished researcher Wolfgang Osten, expert contributors from industrial and academic institutions around the world share their expertise and experience with techniques such as image correlation, light scattering, scanning probe microscopy, confocal microscopy, fringe projection, grid and moiré techniques, interference microscopy, laser Doppler vibrometry, holography, speckle metrology and spectroscopy. They also examine modern approaches to data acquisition and processing. The book emphasizes the evaluation of various properties to increase reliability and promote a consistent approach to optical testing. Numerous practical examples and illustrations reinforce the concepts. Supplying advanced tools for microsystem manufacturing and characterization.

enables you to reach toward a higher level of quality and reliability in modern micro scale applications **Experimental**
Mechanics in Nano and Biotechnology Soon Bok Lee, Yun Jae Kim, 2006-12-01 Proceedings of the International
Conference on Experimental Mechanics ICEM 2006 the 5th Asian Conference Mechanics ACEM 5 September 26 29 2006 Jeju
Korea

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