

Holographic Interferometry

Yuri I. Ostrovsky, Valeri P. Shchepinov, Victor V. Yakovlev

Holographic Interferometry:

Interferometry by Holography Y.I. Ostrovsky, M.M. Butusov, G.V. Ostrovskaya, 2013-04-17 This book is an introduction to holographic interferometry a field of holography having a great number of important and practically useful ap plications It is intended for special ists working in the field of optics and holography and also for students of the relevant specialities At present a greater and greater number of mechanica 1 engi neers tur bine designers testers of diverse equipment biologists crystallographers and so on have to do with holographic interferometry. To allow these spe cialists who are comparatively far from optics to master the subject too the main content of the book is preceded by an introductory chapter treating the fundamental concepts of the interference of light optical interferometry holography and holographic interferometry The following chapters deal with the fundamentals of the theory of ho lographic interferometry and of experimental equipment The authors have set themselves the task of sharing their more than ten year of experience of work in the field of holographic interferometry with their readers In this connection the questions which they dealt with directly are con sidered in somewhat greater detail as a rule than those with which they have become acquainted only from publications on the subject A sufficiently detailed although far from complete bibliography gives any interested reader an opportunity to improve his knowledge of this field Holographic Interferometry Pramod K. Rastogi, 2013-04-17 Holographic Interferometry provides a valuable and up to date source of information in the rapidly expanding field The eight specialists contributions cover the principles and methods currently in use The scope of the book has been limited to the study of opaque object and ample space has been devoted to a comprehensive treatment of the phenomena of fringe formation with a particular emphasis on the quantitative evaluation of the holographic interference fringe patterns. The emergence of computer aided fringe analysis and phase shifting techniques have simplified considerably the quantative real time measurements of object shapes and deformations The last two chapters provide a reasonably detailed overview of full field holographic methods for the measurement of shapes displacements dervatives difference displacements and vibrations **Holographic Interferometry** Gregory R. Toker, 2017-12-19 Transparent in the visible range phase objects can be studied in the optical range using holographic interferometry Typically the holograms are recorded on high resolving power holographic photo materials but a lower spatial resolution is sufficient for successful research in many scientific applications Holographic Interferometry A Mach Zehnder Approach offers practical guidance to research scientists and engineers using Mach Zehnder holographic interferometry methods to study phase objects in the laboratory The Mach Zehnder approach allows the use of standard photographic film and electronic CCD CMOS sensors with low resolving power making it a simpler and more affordable option for testing many types of phase objects This book demonstrates how to use standard photographic film for the optical recording and reconstruction of Mach Zehnder holograms It also illustrates techniques for using CCD CMOS cameras to digitally record Mach Zehnder holograms interferograms of transparent objects Bringing together original research and

information scattered throughout existing literature this book focuses on the holographic reference beam and shearing interferometry methods In particular it looks at how these methods and optical schemes can be directly applied to testing aerodynamic flows as well as to plasmas shocks and waves in noncoherent laser matter interactions Numerous reconstructed and classic interferograms deflectograms and Schlierengrams illustrate the material helping readers develop and design their own optimal optical scheme and choose applicable details to apply the approach Describing methods in a mathematically simple and accessible way this book is also suitable for graduate students in the fields of aerospace engineering and optics as well as those in laser thermal and plasma physics Holographic Interferometry in Experimental Mechanics Yuri I. Ostrovsky, Valeri P. Shchepinov, Victor V. Yakovley, 2013-06-29 This monograph deals with diverse applications of holographic interferome try in experimental solid mechanics Holographic interferometry has experienced a development of twenty years It has enjoyed success and suffered some disappointments mainly due to early overestimation of its potential At present development of holo graphic interferometry is progressing primarily as a technique for quantita tive measurements This is what motivated us to write this book to analyze the quantitative methods of holographic interferometry. The fringe patterns obtained in holographic interferometry are graphically descriptive. In the general case however because they contain infor mation on the total vectors of displacement for points on the surface of a stressed body the interpretation of these interferograms is much more complicated than in typical conventional interferometry In addition the high sensitivity of the method imposes new requirements on the loading of the objects understudy New approaches to designing loading fixtures are needed in many cases to ensure the desired loading conditions. The wealth of information obtained in holographic interferometry necessitates the use of modern computational mathematics Therefore practical implementation of the various methods of holographic interferometry must overcome sub stantial difficulties requiring adequate knowledge in diverse areas of science such as coherent optics laser technology mechanics and applied mathe matics Experimental methods play a significant role in solid mechanics **Holographic and Speckle Interferometry** Robert Jones, Catherine Wykes, 1989-01-26 Holographic and speckle interferometry are optical techniques which use lasers to make non contracting field view measurements at a sensitivity of the wavelength of light on optically rough i e non mirrored surfaces They may be used to measure static or dynamic displacements the shape of objects and refractive index variations of transparent media As such these techniques have been applied to the solution of a wide range of problems in strain and vibrational analysis non destructive testing NDT component inspection and design analysis and fluid flow visualisation This book provides a self contained unified theoretical analysis of the basic principles and associated opto electronic techniques for example Electronic Speckle Pattern Interferometry In addition a detailed discussion of experimental design and practical application to the solution of physical problems is presented In this new edition the authors have taken the opportunity to include a much more coherent description of more than twenty individual case studies that are representative of the main

uses to which the techniques are put The Bibliography has also been brought up to date 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 Holographic Interferometry Charles M. Vest, 1979-02-15 A unified comprehensive self contained treatment of theory practice and application including related coherent optical techniques Emphasizes quantitative evaluation of holographic interferograms of both opaque and transparent objects explaining how tools such as the laser and holography are being applied to present day measurement problems Applies clear simple physical reasoning to present practical information and data circumvents complicated mathematics wherever possible Includes over 700 cited references numerous line drawings and photographs and several useful tables and equations relating optical data Holographic Interferometry in Experimental Mechanics Yuri I. Ostrovsky, Valeri P. to physical properties Shchepinov, Victor V. Yakovlev, 1991-04-15 This monograph deals with diverse applications of holographic interferome try in experimental solid mechanics Holographic interferometry has experienced a development of twenty years It has enjoyed success and suffered some disappointments mainly due to early overestimation of its potential At present development of holo graphic interferometry is progressing primarily as a technique for quantita tive measurements. This is what motivated us to write this book to analyze the quantitative methods of holographic interferometry. The fringe patterns obtained in holographic interferometry are graphically descriptive. In the general case however because they contain information on the total vectors of displacement for points on the surface of a stressed body the interpretation of these interferograms is much more complicated than in typical conventional interferometry In addition the high sensitivity of the method imposes new requirements on the loading of the objects under study New approaches to designing loading fixtures are needed in many cases to ensure the desired loading conditions The wealth of information obtained in holographic interferometry necessitates the use of modern computational mathematics Therefore practical implementation of the various methods of holographic interferometry must overcome sub stantial difficulties requiring adequate knowledge in diverse areas of science such as coherent optics laser technology mechanics and applied mathe matics Experimental methods play a significant role in solid mechanics Quantitative Applications of Holographic Interferometry to Wind-tunnel Testing Tse-Fou Zien, William C. Ragsdale, W. Charles Spring, 1974 Holographic interferometry was successfully applied to a large scale wind tunel 40 cm x 40 cm test section experiment on a three dimensional flow field The laser interferometer was set up in a schlieren bench with a pulsed ruby laser as the light source Both the object beam and the reference beam were collimated The conventional double exposure off axis operation was used to produce interferograms Holographic Interferometry W. Schumann, M.

Dubas, 2013-06-29 This small book intends to build a bridge between the aspects of Optics and of Mechanics that are involved in the application of holographie interferometry to deformation analysis of opaque bodies As such it follows in some way the footsteps of the late Prof H Favre who already in 1927 proposed to use interferometry for deformation measurements refer to his thesis Sur une nouveHe methode optique de determination des tensions interieures Many a concept also originates from the research and lectures of Prof W Prager in continuum mechanies Profs D C Drucker and C Mylonas in experimental mechanics Prof C R Steele in sheH theory and Prof W Lukosz in physical optics Further stimulation arose in dis cussions about holography with Profs R D ndliker I Der Hovanesian and H Tiziani as weH as with Drs B Ineiehen and F M Mottier The contribution of Drs W W thrich P Bohler and G Teichmann must also be acknowledged the latter more particularly for rendering valuable assistance on the delieate points of tensor calculus as we'll as in the drawing of the figures FuH gratitude must also be expressed to those who made the publication of this book possible Dr D MacAdam who openheartedly accepted it in his series Dr H Lotsch and the collab orators of Springer Verlag Mr P Hagnauer who revised the original text and Mrs L Wehrli whose patience was tried in carefully typing the manuscript which Mr F Dufour read over again Holography Prakash Chandra Mehta, Dr V V Rampal, 1993 This is a comprehensive book on the fundamental aspects of lasers and holography It represents a self contained treatment of the basic and state of the art topics on the two subjects in a single volume The book covers the latest technological and scientific developments and major advances that have taken place in the last decade and includes recent applications in medicine information processing interconnects and nondestructive testing It is intended to fill the need of both researchers and graduate students for a single source book containing the necessary and relevant material in the areas of lasers and holography Selected Papers on Holographic Interferometry R. S. Sirohi, 2001 Applications of holographic interferometry are so vast that they are limited only by the imagination of the researchers This collection represents a variety of HI applications from micro crack detection in ancient paintings to holographic testing of A Technique for Measuring In-plane Displacements by Holographic Interferometry Frank D. nuclear technology Adams, Richard R. Corwin, 1972 An experimental technique for measuring in plane displacements from a single hologram is described The method is based upon imaging the entire wave reflected from a single point and recorded on a hologram Experimental results are presented Application and limitations of the technique are discussed Holography and <u>Deformation Analysis</u> W. Schumann, J.-P. Zürcher, D. Cuche, 2013-04-17 In this book series on Optical Sciences holography has been the subject of three previous volumes In particular Vol 16 written by one of us W S and Dr M Dubas treated holographic interferometry of opaque bodies from the standpoint of deformation analysis However the fundamental principles of holography are developed there only briefly in preparation for a discussion of interference fringe modifications This new volume in the series is intended to consider in detail many topics which were previously omitted such as the deformation or distortion of holo graphic images the theory of volume holograms composite or multiplex holo graphy holographic

interferometry of transparent media time dependent effects holographic contouring and applications of fringe modifications to the deformation of opaque bodies In addition these and other subjects will be treated with the same unifying concept developed in Vol 16 but with an additional emphasis on those features that have their origins in classical optics especially the small wavelength approach the coupled wave theory and the Seidel aberrations Since the field of holography and its various applications is growing rapidly it is impossible to be comprehensive in a single book Every effort has beep made to avoid unnecessary duplication of Vol 16 For example displace ment and fringe localization problems are only briefly discussed while some modification techniques e.g. sandwich holography are not included When needed however the reader is directly referred to complementary publications

Holographic Interferometry Thomas Kreis,1996-04-11 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

Optical Methods of Measurement Rajpal Sirohi, 2018-09-03 Optical Methods of Measurement Wholefield Techniques Second Edition provides a comprehensive collection of wholefield optical measurement techniques for engineering applications Along with the reorganization of contents this edition includes a new chapter on optical interference new material on nondiffracting and singular beams and their applications and updated bibliography and additional reading sections The book explores the propagation of laser beams metrological applications of phase singular beams various detectors such as CCD and CMOS devices and recording materials It also covers interference diffraction and digital fringe pattern measurement techniques with special emphasis on phase measurement interferometry and algorithms The remainder of the book focuses on theory experimental arrangements and applications of wholefield techniques The author discusses digital hologram interferometry digital speckle photography digital speckle pattern interferometry Talbot interferometry and holophotoelasticity This updated book compiles the major wholefield methods of measurement in one volume It provides a solid understanding of the techniques by describing the physics behind them In addition the examples given illustrate how the techniques solve measurement problems Waves And Optics N. Singh, 2023-10-30 Wave optics also called physical optics deals with studying various phenomena such as polarization diffraction interference and other occurrences where ray approximation of geometric optics cannot be done Thus the section of optics that deals with the behavior of light and its wave characteristics is said to be wave optics. The book has been divided into 16 chapters superposition of collinear harmonic oscillators superposition of two perpendicular harmonic oscillations wave motion general wave motion in a string velocity of waves fluids sound wave optics interference interferometers diffraction theory Fraunhofer diffraction Fresnel diffraction polarization laser and holography Optical Holography P. Hariharan, 1996-07-13 This 1996 book is an expanded edition

of one of the best known introductions to optical holography Optical Holography Pierre-Alexandre Blanche, 2019-10-23 Optical Holography Materials Theory and Applications provides researchers the fundamentals of holography through diffraction optics and an overview of the most relevant materials and applications ranging from computer holograms to holographic data storage Dr Pierre Blanche leads a team of thought leaders in academia and industry in this practical reference for researchers and engineers in the field of holography This book presents all the information readers need in order to understand how holographic techniques can be applied to a variety of applications the benefits of those techniques and the materials that enable these technologies Researchers and engineers will gain comprehensive knowledge on how to select the best holographic techniques for their needs Covers current applications of holographic techniques in areas such as 3D television solar concentration non destructive testing and data storage Describes holographic recording materials and their most relevant applications Provides the fundamentals of holography and diffraction optics **Experimental Mechanics** of Solids Cesar A. Sciammarella, Federico M. Sciammarella, 2012-04-30 Experimental solid mechanics is the study of materials to determine their physical properties This study might include performing a stress analysis or measuring the extent of displacement shape strain and stress which a material suffers under controlled conditions In the last few years there have been remarkable developments in experimental techniques that measure shape displacement and strains and these sorts of experiments are increasingly conducted using computational techniques Experimental Mechanics of Solids is a comprehensive introduction to the topics technologies and methods of experimental mechanics of solids It begins by establishing the fundamentals of continuum mechanics explaining key areas such as the equations used stresses and strains and two and three dimensional problems Having laid down the foundations of the topic the book then moves on to look at specific techniques and technologies with emphasis on the most recent developments such as optics and image processing Most of the current computational methods as well as practical ones are included to ensure that the book provides information essential to the reader in practical or research applications Key features Presents widely used and accepted methodologies that are based on research and development work of the lead author Systematically works through the topics and theories of experimental mechanics including detailed treatments of the Moire Speckle and holographic optical methods Includes illustrations and diagrams to illuminate the topic clearly for the reader Provides a comprehensive introduction to the topic and also acts as a quick reference guide This comprehensive book forms an invaluable resource for graduate students and is also a point of reference for researchers and practitioners in structural and materials engineering

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