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Optical Design Fundamentals for Infrared SystemsMonte Carlo Simulation and Analysis in Modern Optical TolerancingA Practical Guide to Experimental Geometrical OpticsOptical EngineeringPlasmonics and its ApplicationsField Guide to Interferometric Optical TestingHolographic Materials and Optical SystemsLasers & OptronicsIntroduction to Lens DesignPerspectives on Modern Optics and ImagingField Guide to Lens DesignOptomechanical DesignApplication of Zemax Programming LanguageField Guide to IlluminationLaser Focus WorldMolded OpticsAberrations of Optical SystemsAstronomical OpticsModulation Transfer Function in Optical and Electro-optical SystemsOptical Engineering FundamentalsPractical OpticsModern Optical EngineeringEngineered BiomimicryAdvanced Optics Using Aspherical ElementsBasic Optical Engineering for Engineers and ScientistsIntegrated Optomechanical AnalysisNASA Tech BriefsA Practical Guide to Handling Laser Diode BeamsHandbook of Optical DesignIllumination EngineeringQuaternions for Computer GraphicsDesigning Optics Using Code VDevice and Process Technologies for MEMS, Microelectronics and Photonics IIIOptical Engineering of DiamondOptical Methods for Solid MechanicsApplied Optics and Optical EngineeringFundamental Optical DesignHandbook of Iris RecognitionFormalisms for Reuse and Systems IntegrationA Programmer's Guide to ZPL

Optical Design Fundamentals for Infrared Systems

Sir William Rowan Hamilton was a genius, and will be remembered for his significant contributions to physics and mathematics. The Hamiltonian, which is used in quantum physics to describe the total

energy of a system, would have been a major achievement for anyone, but Hamilton also invented quaternions, which paved the way for modern vector analysis. Quaternions are one of the most documented inventions in the history of mathematics, and this book is about their invention, and how they are used to rotate vectors about an arbitrary axis. Apart from introducing the reader to the features of quaternions and their associated algebra, the book provides valuable historical facts that bring the subject alive. Quaternions for Computer Graphics introduces the reader to quaternion algebra by describing concepts of sets, groups, fields and rings. It also includes chapters on imaginary quantities, complex numbers and the complex plane, which are essential to understanding quaternions. The book contains many illustrations and worked examples, which make it essential reading for students, academics, researchers and professional practitioners.

Monte Carlo Simulation and Analysis in Modern Optical Tolerancing

This Spotlight offers a perspective on the role of Monte Carlo simulation in the analysis and tolerancing of optical systems. The book concisely explores two overarching questions: (1) What principles can we adopt from a variety of statistical methods - such as the analysis of variance (ANOVA), "root sum of squares" (RSS), and Monte Carlo simulation - to analyze variability in complex optical systems? (2) When we assign perturbations to component variables (such as tilts and radii of curvatures) subject to arbitrary probability distributions, are the resulting distributions of system parameters (such as EFL, RMS spot size, and MTF) necessarily normal? These questions address the problem of analyzing and managing variability in modern product development, where many functions integrate to produce a complete instrument. By discussing key concepts from optics, multivariable calculus, and statistics, and

applying them to two practical examples in modern technology, this book highlights the role Monte Carlo simulations play in the tolerancing of optical systems that comprise many components of variation.

A Practical Guide to Experimental Geometrical Optics

This book provides all the essential and best elements of Kidger's many courses taught worldwide on lens and optical design. It is written in a direct style that is compact, logical, and to the point--a tutorial in the best sense of the word. "I read my copy late last year and read it straight through, cover to cover. In fact, I read it no less than three times. Its elegant expositions, valuable insights, and up-front espousal of pre-design theory make it an outstanding work. It's in the same league with Conrady and Kingslake." Warren Smith.

Optical Engineering

A distillation of Dr. Wyant's course at University of Arizona, this Field Guide covers the key fundamentals of interferometry, types of interferometers and interferograms, concepts of phase-shifting interferometry, long-wavelength interferometry, testing of aspheric surfaces, measurement of surface microstructure, flat and curved surface testing, and absolute measurements.

Plasmonics and its Applications

This book provides a brief review of key optics principles, and offers fresh insights and perspectives on the theory and operational principles of a selection of modern optical imaging systems not found in many texts. Practical examples using Zemax's OpticStudio program with lens prescriptions are also provided throughout various relevant sections of the book. Want a "flavor" of the technical

content of this book? Cut and paste the following link to view the section on Gaussian apodization and resolution enhancement (note that content in the printed book are in BLACK & WHITE, as shown in the sample pages): https: //drive.google.com/open?id=1rfC0ByDsl 2ICLCSpoXqmqnYdZbtTT2Hr

Field Guide to Interferometric Optical Testing

This authoritative collection introduces the reader to the state of the art in iris recognition technology. Topics and features: with a Foreword by the “father of iris recognition,” Professor John Daugman of Cambridge University; presents work from an international selection of preeminent researchers, reflecting the uses of iris recognition in many different social contexts; provides viewpoints from researchers in government, industry and academia, highlighting how iris recognition is both a thriving industry and an active research area; surveys previous developments in the field, and covers topics ranging from the low-level (e.g., physics of iris image acquisition) to the high level (e.g., alternative non-Daugman approaches to iris matching); introduces many active and open areas of research in iris recognition, including cross-wavelength matching and iris template aging. This book is an essential resource for anyone wishing to improve their understanding of iris recognition technology.

Holographic Materials and Optical Systems

The process of designing lenses is both an art and a science. While advancements in the field over the past two centuries have done much to transform it from the former category to the latter, much of the lens design process remains encapsulated in the experience and knowledge of industry veterans. This Field Guide provides a working reference for practicing physicists, engineers, and scientists

for deciphering the nuances of basic lens design. The book begins with an outline of the general process before delving into aberrations, basic lens design forms, and optimization. An entire section is devoted to techniques for improving lens performance. Sections on tolerancing, stray light, and optical systems are followed by an appendix covering related topics such as optical materials, nonimaging concepts, designing for sampled imaging, and ray tracing fundamentals.

Lasers & Optronics

This text aims to expose students to the science of optics and optical engineering without the complications of advanced physics and mathematical theory.

Introduction to Lens Design

The content in this Field Guide starts with traditional illumination in imaging systems, followed by the recent advances in computer-aided design of high efficiency nonimaging illumination optics, along with the modern source models that support these techniques. In this title, sections on the illumination of visual displays are included as well as some important topics on architectural illumination.

Perspectives on Modern Optics and Imaging

Field Guide to Lens Design

"This book explains how to design an optical system using the high-end optical design program CODE V. The design process, from lens definition to the description and evaluation of lens errors and onto the improvement of lens performance, will be developed and

illustrated using the program. The text is organized so that readers can (1) reproduce each step of the process including the plots for evaluating lens performance and (2) understand the significance of each step in producing a final design"--

Optomechanical Design

Holographic Materials and Optical Systems covers recent research achievements in the areas of volume holographic optical elements and systems, development of functionalized holographic recording materials, and applications in holographic imaging and metrology. Designs of single and multiplexed volume holographic optical elements for laser beam shaping, combining, and redirection are covered, and their properties are studied theoretically and experimentally. The high impact of holography in imaging and metrology is demonstrated by applications spreading from thickness and surface measurements, through antenna metrology and analyzing high-density gradients in fluid mechanics to characterization of live objects in clinical diagnostics. Novel functionalized materials used in dynamic or permanent holographic recording cover photopolymers, photochromics, photo-thermo-refractive glasses, and hybrid organic-inorganic media.

Application of Zemax Programming Language

This book offers the reader a practical guide to the control and characterization of laser diode beams. Laser diodes are the most widely used lasers, accounting for 50% of the global laser market. Correct handling of laser diode beams is the key to the successful use of laser diodes, and this requires an in-depth understanding of their unique properties. Following a short introduction to the working principles of laser diodes, the book describes the basics of laser diode beams and beam propagation, including Zemax modeling

of a Gaussian beam propagating through a lens. The core of the book is concerned with laser diode beam manipulations: collimating and focusing, circularization and astigmatism correction, coupling into a single mode optical fiber, diffractive optics and beam shaping, and manipulation of multi transverse mode beams. The final chapter of the book covers beam characterization methods, describing the measurement of spatial and spectral properties, including wavelength and linewidth measurement techniques. The book is a significantly revised and expanded version of the title Laser Diode Beam Basics, Manipulations and Characterizations by the same author. New topics introduced in this volume include: laser diode types and working principles, non-paraxial Gaussian beam, Zemax modeling, numerical analysis of a laser diode beam, spectral property characterization methods, and power and energy characterization techniques. The book approaches the subject in a practical way with mathematical content kept to the minimum level required, making the book a convenient reference for laser diode users.

Field Guide to Illumination

Handbook of Optical Design, Third Edition covers the fundamental principles of geometric optics and their application to lens design in one volume. It incorporates classic aspects of lens design along with important modern methods, tools, and instruments, including contemporary astronomical telescopes, Gaussian beams, and computer lens design. Written by respected researchers, the book has been extensively classroom-tested and developed in their lens design courses. This well-illustrated handbook clearly and concisely explains the intricacies of optical system design and evaluation. It also discusses component selection, optimization, and integration for the development of effective optical apparatus. The authors analyze the performance of a wide range of optical materials, components, and systems, from simple magnifiers to complex lenses used in

photography, ophthalmology, telescopes, microscopes, and projection systems. Throughout, the book includes a wealth of design examples, illustrations, and equations, most of which are derived from basic principles. Appendices supply additional background information. What's New in This Edition Improved figures, including 32 now in color Updates throughout, reflecting advances in the field New material on Buchdahl high-order aberrations Expanded and improved coverage of the calculation of wavefront aberrations based on optical path An updated list of optical materials in the appendix A clearer, more detailed description of primary aberrations References to important new publications Optical system design examples updated to include newly available glasses 25 new design examples This comprehensive book combines basic theory and practical details for the design of optical systems. It is an invaluable reference for optical students as well as scientists and engineers working with optical instrumentation.

Laser Focus World

Engineered Biomimicry covers a broad range of research topics in the emerging discipline of biomimicry. Biologically inspired science and technology, using the principles of math and physics, has led to the development of products as ubiquitous as VelcroTM (modeled after the spiny hooks on plant seeds and fruits). Readers will learn to take ideas and concepts like this from nature, implement them in research, and understand and explain diverse phenomena and their related functions. From bioinspired computing and medical products to biomimetic applications like artificial muscles, MEMS, textiles and vision sensors, Engineered Biomimicry explores a wide range of technologies informed by living natural systems. Engineered Biomimicry helps physicists, engineers and material scientists seek solutions in nature to the most pressing technical problems of our

times, while providing a solid understanding of the important role of biophysics. Some physical applications include adhesion superhydrophobicity and self-cleaning, structural coloration, photonic devices, biomaterials and composite materials, sensor systems, robotics and locomotion, and ultra-lightweight structures. Explores biomimicry, a fast-growing, cross-disciplinary field in which researchers study biological activities in nature to make critical advancements in science and engineering Introduces bioinspiration, biomimetics, and bioreplication, and provides biological background and practical applications for each Cutting-edge topics include bio-inspired robotics, microflyers, surface modification and more

Molded Optics

Applied Optics and Optical Engineering, Volume VI is an 11-chapter text that covers the principles and design of some optical devices and systems. The first three chapters deal with the principles, mode of operation, and application of several types of lasers, such as solid-state, gas, and semiconductor diode lasers. These topics are followed by the presentation of the physics and engineering of acousto-optic systems and coherent light valves. A chapter provides the fundamental considerations of the principles of scanning devices and systems, including the light beam, the scanning motions and patterns, and optical, mechanical, and electronic engineering considerations. The discussion then shifts to the potential applications of coherent optical processing techniques in mapping and the infrared detectors to the optical engineer. The remaining chapters examine the principles and applications of optical holography, image intensifiers, and fiber optics. This book is of great benefit to applied scientists and engineers who are interested in the conceptualization and design of new instruments and systems of coherent optics.

Aberrations of Optical Systems

Publishes papers reporting on research and development in optical science and engineering and the practical applications of known optical science, engineering, and technology.

Astronomical Optics

Modulation Transfer Function in Optical and Electro-optical Systems

Global electro-optic technology and markets.

Optical Engineering Fundamentals

"Coverage of each topic includes examples and problems, all of which are original and derived from realistic applications, such as optical configuration for automatic inspection in industry, surveying systems, robot navigation, X-ray imaging, computerized radiography, microscopy vision and measurements, laser Doppler technique and flow study, non-contact measurement of temperature, acousto-optical scanners, spectral analysis, and more."--BOOK JACKET.

Practical Optics

A revised version of a text which was first published in 1966. The book is designed as a general reference book for engineers and assumes a broad knowledge of current optical systems and their design. Additional topics include fibre optics, thin films and CAD systems.

Modern Optical Engineering

This tutorial introduces the theory and applications of MTF, used to specify the image quality achieved by an imaging system. It covers basic linear systems theory and the relationship between impulse response, resolution, MTF, OTF, PTF, and CTF. Practical measurement and testing issues are discussed.

Engineered Biomimicry

Advanced Optics Using Aspherical Elements

The practical, popular 1995 tutorial has been thoroughly revised and updated, reflecting developments in technology and applications during the past decade. New chapters address wave aberrations, thermal effects, design examples, and diamond turning.

Basic Optical Engineering for Engineers and Scientists

This tutorial presents optomechanical modeling techniques to effectively design and analyze high-performance optical systems. It discusses thermal and structural modeling methods that use finite-element analysis to predict the integrity and performance of optical elements and optical support structures. Includes accompanying CD-ROM with examples.

Integrated Optomechanical Analysis

Unique within the field for being written in a tutorial style, this textbook adopts a step-by-step approach to the background needed for understanding a wide range of full-field optical measurement

techniques in solid mechanics. This method familiarizes readers with the essentials of imaging and full-field optical measurement techniques, helping them to identify the appropriate techniques and in assessing measurement systems. In addition, readers learn the appropriate rules of thumb as a guide to better experimental performance from the applied techniques. Rather than presenting an exhaustive overview on the subject, each chapter provides a concise introduction to the concepts and principles, integrates solved problems within the text, summarizes the essence at the end, and includes unsolved problems. With its coverage of topics also relevant for industry, this text is aimed at graduate students, researchers, and engineers involved in non-destructive testing for acoustics, mechanics, medicine, diagnosis on artwork and construction, and civil engineering.

NASA Tech Briefs

A concise, yet deep introduction to geometrical optics, developing the practical skills and research techniques routinely used in modern laboratories. Suitable for both students and self-learners, this accessible text teaches readers how to build their own optical laboratory, and design and perform optical experiments.

A Practical Guide to Handling Laser Diode Beams

Although the subject of optical design as a branch of applied physics is over one hundred years old, the use of aberration theory has changed considerably. Aberrations of Optical Systems covers elementary optics and aberration theory of various optical systems, including the use of nonaxially symmetric systems and diffractive optical elements in complex designs, such as head-up displays and the increasing use of scanning systems with laser illumination. The book provides the complete range of mathematical tools, formulae,

and derivations needed for understanding the process of optical design and for planning optical design programs. While the treatment is mainly based on geometrical optics, some excursions into physical optics are made, particularly in connection with the problems of optical tolerances.

Handbook of Optical Design

Reuse and integration are defined as synergistic concepts, where reuse addresses how to minimize redundancy in the creation of components; while, integration focuses on component composition. Integration supports reuse and vice versa. These related concepts support the design of software and systems for maximizing performance while minimizing cost. Knowledge, like data, is subject to reuse; and, each can be interpreted as the other. This means that inherent complexity, a measure of the potential utility of a system, is directly proportional to the extent to which it maximizes reuse and integration. Formal methods can provide an appropriate context for the rigorous handling of these synergistic concepts. Furthermore, formal languages allow for non ambiguous model specification; and, formal verification techniques provide support for insuring the validity of reuse and integration mechanisms. This edited book includes 12 high quality research papers written by experts in formal aspects of reuse and integration to cover the most recent advances in the field. These papers are extended versions of some of the best papers, which were presented at the IEEE International Conference on Information Reuse and Integration and the IEEE International Workshop on Formal Methods Integration - both of which were held in San Francisco in August 2014.

Illumination Engineering

Modern optical systems rely on leading-edge production

technologies, especially when using aspherical optical elements. Due to the inherent complexity of aspheres, all efforts to push the technological limits are risky. Thus, to minimize risk, clear decisions based on a good understanding of technology are indispensable. This compendium is written as an optical technology reference book for development and production engineers. With contributions from worldwide experts, this book aids in mitigating the risk in adopting new asphere production technologies.

Quaternions for Computer Graphics

ZPL is a new array programming language for science and engineering computation. Designed for fast execution on both sequential and parallel computers, it is intended to replace languages such as Fortran and C. This guide provides a complete introduction to ZPL. It assumes that the reader is experienced with an imperative language such as C, Fortran, or Pascal. Though precise and thorough, it does not attempt to be a complete reference manual, but rather it illustrates typical ZPL usage and explains in an intuitive manner how the constructs work. The emphasis is on teaching the reader to be a ZPL programmer. Scientific computations are used as examples throughout, and a list of common features is printed on the inside back cover for easy reference.

Designing Optics Using Code V

While several available texts discuss molded plastic optics, none provide information on all classes of molded optics. Filling this gap, Molded Optics: Design and Manufacture presents detailed descriptions of molded plastic, glass, and infrared optics. Since an understanding of the manufacturing process is necessary to develop cost-effective, producible designs, the book extensively covers various manufacturing methods, design guidelines, trade-offs, best

practices, and testing of critical parameters. It also discusses topics that often arise when designing systems with molded optics, such as mitigating stray light and mating systems by eye. The first three chapters of the book focus on subjects important to the design of systems using molded optics: optical design, visual optics, and stray light. Following these background chapters, the text provides in-depth information on the design and manufacture of molded plastic optics, molded glass optics, and molded infrared optics. The final chapter on testing emphasizes the special characteristics of molded optics. Experts in their particular areas, the authors draw on their considerable knowledge and real-world experiences to give a thorough account of the design and manufacture of molded plastic, glass, and infrared optics. The book will help readers improve their ability to develop systems that employ molded optics.

Device and Process Technologies for MEMS, Microelectronics and Photonics III

Optical Engineering of Diamond

Optical Methods for Solid Mechanics

Written by a recognized expert in the field, this clearly presented, well-illustrated book provides both advanced level students and professionals with an authoritative, thorough presentation of the characteristics, including advantages and limitations, of telescopes and spectrographic instruments used by astronomers of today. Written by a recognized expert in the field Provides both advanced level students and professionals with an authoritative, thorough presentation of the characteristics, including advantages and limitations, of telescopes and spectrographic instruments used by

astronomers of today

Applied Optics and Optical Engineering

Fundamental Optical Design

Zemax is widely used in optical designs because it is powerful, flexible, easy to learn, and cost-effective. Besides many standard functions, Zemax also provides a tool called Zemax Programming Language (ZPL). This tool allows people to extend the standard functions of Zemax to meet their special needs. However, the learning process is usually not smooth, sometimes even quite frustrating. This book intends to help readers to learn ZPL quicker and easier. The examples and plots in this book are based on Zemax version 13, but the basic idea should remain the same for different versions of Zemax software. Since Zemax is continuously developing, we encourage readers to refer to official Zemax User's Manual for the updates on ZPL.

Handbook of Iris Recognition

This is the first comprehensive book on the engineering of diamond optical devices. Written by 39 experts in the field, it gives readers an up-to-date review of the properties of optical quality synthetic diamond (single crystal and nanodiamond) and the nascent field of diamond optical device engineering. Application areas covered in detail in this book include quantum information processing, high performance lasers and light sources, and bioimaging. It provides scientists, engineers and physicists with a valuable and practical resource for the design and development of diamond-based optical devices.

Formalisms for Reuse and Systems Integration

Plasmonics is a rapidly developing field that combines fundamental research and applications ranging from areas such as physics to engineering, chemistry, biology, medicine, food sciences, and the environmental sciences. Plasmonics appeared in the 1950s with the discovery of surface plasmon polaritons. Plasmonics then went through a novel propulsion in the mid-1970s, when surface-enhanced Raman scattering was discovered. Nevertheless, it is in this last decade that a very significant explosion of plasmonics and its applications has occurred. Thus, this book provides a snapshot of the current advances in these various areas of plasmonics and its applications, such as engineering, sensing, surface-enhanced fluorescence, catalysis, and photovoltaic devices.

A Programmer's Guide to ZPL

This book brings together experts in the field who present material on a number of important and growing topics including lighting, displays, solar concentrators. The first chapter provides an overview of the field of nonimagin and illumination optics. Included in this chapter are terminology, units, definitions, and descriptions of the optical components used in illumination systems. The next two chapters provide material within the theoretical domain, including etendue, etendue squeezing, and the skew invariant. The remaining chapters focus on growing applications. This entire field of nonimaging optics is an evolving field, and the editor plans to update the technological progress every two to three years. The editor, John Koshel, is one of the most prominent leading experts in this field, and he is the right expert to perform the task.