Thermal Infrared Characterization Of Ground Targets And Backgrounds Second Edition Spie Tutorial Texts In Optical Engineering Vol Tt70

From officially sanctioned, high-tech operations to budget spy cameras and cell phone video, this updated and expanded edition of a bestselling handbook reflects the rapid and significant growth of the surveillance industry. The Handbook of Surveillance Technologies, Third Edition is the only comprehensive work to chronicle the background and curre

The choice of available infrared (IR) detectors for insertion into modern IR systems is both large and confusing. The purpose of this volume is to provide a technical database from which rational IR detector selection criteria evolve, and thus clarify the options open to the modern IR system designer. Emphasis concentrates mainly on high-performance IR systems operating in a tactical environment, although there also is discussion of both strategic environments and low- to medium-performance system requirements.

Annotation This tutorial fully explains cathode ray tube (CRT) based displays in a single, easy-to-understand narrative. Detailed explanations and insights into performance properties and safety limits of the various glass melts follow a discussion of the fundamentals. In addition, other topics covered include the architectural differences between color and monochrome, the cathode (electron beam source) as a failure mode for all CRTs, types of cathodes available and their life expectancy. Phosphors, the metrics involved in defining a pixel and how distortions can influence the net results, defining CRT compliance with the DICOM Grayscale Standard Display Function (GSDF), test patterns and how they provide information about display performance, and video cards round out this informative work.

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.

Comprehensive overview of the spectroscopic, mineralogical, and geochemical techniques used in planetary remote sensing.

This tutorial text provides an introduction to basics of bioluminescent methods used for rapid analysis of microbiological safety and quality of food and environmental samples. This book is intended for engineers, scientists, students, and managers involved in the design and/or use of biosafety assays. It discusses the practical aspects of bioluminescent microbiological analysis. Some basic knowledge of biochemistry, microbiology, and biophysics is preferable; however, a brief review of fundamental principles are included that will allow people who are unfamiliar with these disciplines to grasp their basic concepts.

The problems involved in designing optimal infrared (IR) measuring systems under given conditions are commensurately complex. The optical set-up and radiation conditions, the interaction between sensor and irradiation and the sensor itself, determine the operation of the sensor system. Simple calculations for solving these problems without any understanding of the causal relationships are not possible. Thermal Infrared Sensors offers a concise explanation of the basic physical and photometric fundamentals needed for the consideration of these interactions. It depicts the basics of thermal IR sensor systems and explains the manifold causal relationships between the most important effects and influences, describing the relationships between sensor parameters such as thermal and special resolution, and application conditions. This book covers: various types of thermal sensors, like thermoelectric sensor, pyroelectric sensors, microbolometers, micro-Golay cells and bimorphous sensors; basic applications for thermal sensors; noise - a limiting factor for thermal resolution and detectivity - including an outline of the mathematics and noise sources in thermal infrared sensors; the properties of IR sensor systems in conjunction with the measurement environment and application conditions; 60 examples showing calculations of real problems with real numbers, as they occur in many practical applications. This is an essential reference for practicing design and optical engineers and users of infrared sensors and infrared cameras. With this book they will be able to transform the demonstrated solutions to their own problems, find ways to match their commercial IR sensors and cameras to their measurement conditions, and to tailor and optimise sensors and set-ups to particular IR measurement problems. The basic knowledge outlined in this book will give advanced undergraduate and graduate students a thorough grounding in this technology.

This book provides a comprehensive overview of the state of the art in the field of thermal infrared remote sensing. Temperature is one of the most important physical environmental variables monitored by earth observing remote sensing systems. Temperature ranges define the boundaries of habitats on our planet. Thermal hazards endanger our resources and well-being. In this book renowned international experts have contributed chapters on currently available thermal sensors as well as innovative plans for future missions. Further chapters discuss the underlying physics and image processing techniques for analyzing thermal data. Ground-breaking chapters on applications present a wide variety of case studies leading to a deepened understanding of land and sea surface temperature dynamics, urban heat island effects, forest fires, volcanic eruption precursors, underground coal fires, geothermal systems, soil moisture variability, and temperature-based mineral discrimination. ‘Thermal Infrared Remote Sensing: Sensors, Methods, Applications’ is unique because of the large field it spans, the potentials it reveals, and the detail it provides. This book is an indispensable volume for scientists, lecturers, and decision makers interested in thermal infrared technology, methods, and applications.

Thermal Infrared Sensor (TIRS) is a (1) New longwave infrared (10 - 12 micron) sensor for the Landsat Data Continuity Mission, (2) 185 km ground swath; 100 meter pixel size on ground, (3) Pushbroom sensor configuration. Issue of Calibration are: (1) Single detector -- only one calibration, (2) Multiple detectors - unique calibration for each detector -- leads to pixel-to-pixel artifacts. Objectives are: (1) Predict extent of residual striping when viewing a uniform blackbody target through various atmospheres, (2) Determine how different spectral shapes affect the derived surface temperature in a realistic synthetic scene.

Annotation This tutorial explains antenna theory and operation and is intended for students, engineers, and researchers. Basic wire antennas and array antennas are described in detail and other types are introduced, including reflectors, lenses, horns, microstrip, Yagi, and frequency-independent antennas.

The tree canopy characterization presented herein provided ground and tree canopy data for different types of tree canopies in support of EO-1 reflective and thermal infrared validation studies. These characterization efforts during August and September of 2001 included stem and trunk location surveys, tree structure geometry measurements, meteorology, and leaf area index (LAI) measurements. Measurements were also collected on thermal and reflective spectral properties of leaves, tree bark, leaf litter, soil, and grass. The data presented in this report were used to generate synthetic reflective and thermal infrared scenes and images that were used for the EO-1 Validation Program. The data also were used to evaluate whether the EO-1 ALI reflective channels can be combined with the Landsat-7 ETM+ thermal infrared channel to estimate canopy temperature, and also test the effects of separating the thermal and reflective measurements in time resulting from satellite formation flying.

Spectroscopy--the study of matter using electromagnetic radiation--and its applications as a scientific tool are the focus of this tutorial. Topics covered include the interaction of light with matter, spectrometer fundamentals, quantum mechanics, selection rules, and experimental factors.

Automated/Aided Target Recognition (ATR) systems are being developed for client and next generation attack and reconnaissance helicopters. Part of the development cycle consists of testing and evaluation of the systems at field test facilities within the United States. Preliminary tests of ATR systems have demonstrated a high sensitivity to terrain and environmental conditions. Testers and analysts must therefore have an understanding of the relationship between system performance and terrain/environmental conditions to plan tests and interpret data. To develop an understanding of this relationship, the Environmental Characterization for Target Acquisition (ECTA) Program was initiated. As part of this program, visible and thermal infrared imagery, meteorological data and terrain characterization data were systematically collected from six different U.S. sites for different times of year and times of day. This report describes analysis procedures for evaluating the relationships between the sites' ground-truth measurements and statistical characteristics of

resulting imagery. Results of these analyses are presented and discussed.
This text explains the mutual influences between the physical and dynamic processes in solids and their lasing properties. It provides insight into the physics and engineering of solid state lasers by integrating information from several disciplines, including solid state physics, materials science, photophysics, and dynamic processes in solids. The text discusses approaches to developing new laser materials and includes data tables of basic parameters that can be applied to laser design. Novel materials and techniques used in recent developments are also covered.
Throughout much of machine vision’s early years the infrared imagery has suffered from return on investment despite its advantages over visual counterparts. Recently, the ?scal momentum has switched in favor of both manufacturers and practitioners of infrared technology as a result of today’s rising security and safety challenges and advances in thermographic sensors and their continuous drop in costs. This yielded a great impetus in achieving ever better performance in remote surveillance, object recognition, guidance, noncontact medical measurements, and more. The purpose of this book is to draw attention to recent successful efforts made on merging computer vision applications (nonmilitary only) and nonvisual imagery, as well as to ?ll in the need in the literature for an up-to-date convenient reference on machine vision and infrared technologies. Augmented Perception in Infrared provides a comprehensive review of recent deployment of infrared sensors in modern applications of computer vision, along with in-depth description of the world’s best machine vision algorithms and intel- gent analytics. Its topics encompass many disciplines of machine vision, including remote sensing, automatic target detection and recognition, background modeling and image segmentation, object tracking, face and facial expression recognition, - variant shape characterization, disparate sensors fusion, noncontact physiological measurements, night vision, and target classi?cation. Its application scope includes homeland security, public transportation, surveillance, medical, and military. Mo- over, this book emphasizes the merging of the aforementioned machine perception applications and nonvisual imaging in intensi?ed, near infrared, thermal infrared, laser, polarimetric, and hyperspectral bands.
Adaptive optics systems and components have achieved a level of sophistication and simplicity that goes beyond traditional applications in astronomy and the military and into developments in medicine, manufacturing, and communications. This book was written for those interested in the multidisciplinary technology and those who need a broad-brush explanation without wading through thousands of journal articles. It follows the structure of a one-day tutorial taught by the author, including humor and sidebars of historical material.
Advances in solid state detector arrays, flat panel displays and digital image processing have prompted an increasing variety of sampled imaging products and possibilities. These technology developments provide new opportunities and problems for the design engineer and

system analyst - this tutorial's intended reader.
Thermal Infrared Characterization of Ground Targets and BackgroundsSPIE Press
This book supplies the optical component and systems designer, and quality assurance engineers and managers with the definitions, measurement principles, and standard metrics used to characterize high-quality specular surfaces. The author covers both the traditional visual methods as well as newer (but not necessarily better) computer-aided techniques and describes the metrics adopted by the new ISO standards, including the setting of form and finish tolerances. Key issues of industry are raised, to help stimulate research and development of new methods and standards that blend the best of the old and new approaches to surface assessment.
\- Preface - List of Figures - List of Tables - List of Acronyms and Abbreviations - Preface - Introduction - Basics of Noncontact Thermal Measurement - Matching the Instrument to the Application - Instruments Overview - Using IR Sensing and Imaging Instruments - Introduction to Applications - Plant Condition Monitoring and Predictive Maintenance - Buildings and Infrastructure - Materials Testing - Product and Process Monitoring Control - Night Vision, Security, and Surveillance - Life Sciences Thermography - Appendix A: Commercial Instrument Performance Characteristics - Appendix B: Manufacturers of IR Sensing and Imaging Instruments - Appendix C: Table of Generic Normal Emissivities of Materials - Appendix D: A Glossary of Terms for the Infrared Thermographer
This text aims to expose students to the science of optics and optical engineering without the complications of advanced physics and mathematical theory.
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.
This tutorial covers infrared design examples in considerable detail, building on principles presented in an earlier text, 'Introduction to Infrared System Design' (SPIE PRESS Vol. TT24). The text explores a range of problems illustrating several design issues, with applications in military, industry, aeronautics, space, and medicine, among others.
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This tutorial explains performance and quality considerations in medical imaging displays. After defining performance requirements for high-fidelity displays, the book introduces the display technologies that are likely to be used in medical imaging workstations.
From electronic wire taps to baby monitors and long-distance video and listening devices, startling changes occur everyday in how we gather, interpret, and

transmit information. An extraordinary range of powerful new technologies has come into existence to meet the requirements of this expanding field. Your search for a comprehensive resourc

Ten years after the publication of Infrared Optics and Zoom Lenses, this text is still the only current publication devoted exclusively to infrared zoom lenses. This updated second edition includes 18 new refractive and reflective infrared zoom systems, bringing the total number of infrared zoom optical systems to 41 systems. Other additions include a section on focal plane arrays and a new closing chapter specifically devoted to applications of infrared zoom lenses. Coverage of wavelength region has been expanded to include the near infrared. Additional topics include an examination of the importance of principal planes, methods for athermalization by means of computer glass substitution, and global optimization techniques for zoom lens design.

Here for the first time is an integrated mathematical view of the physics and numerical modeling of optical projection lithography that efficiently covers the full spectrum of the important concepts. Alfred Wong offers rigorous underpinning, clarity in systematic formulation, physical insight into emerging ideas, as well as a system level view of the parameter tolerances required in manufacturing. Readers with a good working knowledge of calculus can follow the step-by-step development, and technologists can gather general concepts and the key equations that result. Even the casual reader will gain a perspective on the key concepts, which will likely help facilitate dialog among technologists.

The increased interest in imaging spectroscopy has arisen largely for technical reasons. This Tutorial Text first reviews the required background in optics, radiometry, imaging, spectral sensing and focal plane arrays. Then the principles of these subjects are applied to several specific problems to illustrate the way in which such instruments can be designed.

This new edition updates the technologies that deal with the characterization of the thermal infrared radiation contrast between ground targets and backgrounds. Samples have been updated to comply with the current status of technology in sensor systems and countermeasures. New topics on mine detection and polarization have been included, and the section covering multispectral camouflage of personnel has been extended. The basic principles and meteorological parameters are presented, followed by calibration procedures, signature measurements, and data analyses.

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

Radiometry is an essential part of the optical design of virtually every optical instrument, and key to many applications. It is also used to measure the radiation of various objects. This tutorial examines both the techniques of calculating radiative transfer and the measurement of fluxes and radiometric properties of various sorts.

Many applications today require the Fourier-transform (FT) spectrometer to perform close to its limitations, such as taking many quantitative measurements in the visible and in the near infrared wavelength regions. In such cases, the instrument should not be considered as a perfect "black box." Knowing where the limitations of performance arise and which components must be improved are crucial to obtaining repeatable and accurate results. One of the objectives of this book is to help the user identify the instrument's bottleneck.

This book is intended to familiarize the reader with the method of Gaussian matrices and some related tools of optical design. The matrix method provides a means to study an optical system in the paraxial approximation. This text contains new results such as theorems on the design of variable optics, on integrating rods, on the optical layout of prism devices, etc. The results are derived in a step-by-step way so that the reader might apply the methods presented here to resolve design problems with ease.

This text presents several new thin-film design methods that can produce multiple stopbands as well as passbands. It is written for thin-film designers and students with advanced knowledge of multilayer, optical thin-film coatings. The text focuses on coatings that have high reflectance performance requirements in more than one spectral wavelength band or region. Relatively basic exercises are provided for students as well as challenging ones for researchers.

This book provides the reader with the broad range of materials that were discussed in a series of short courses presented at Georgia Tech on the design, fabrication, and testing of diffractive optical elements (DOEs). Although there are not long derivations or detailed methods for specific engineering calculations, the reader should be familiar and comfortable with basic computational techniques. This text is not a 'cookbook' for producing DOEs, but it should provide readers with sufficient information to assess whether this technology would benefit their work, and to understand the requirements for using the concepts and techniques presented by the authors.

This tutorial will help technical professionals in optics determine whether their technologies have potential application in the life sciences. It also is useful as a 'prep class' for more detailed books on biology and biotechnology, filling the gap between fundamental and high-level approaches.

This tutorial explains the human eye, its function, and performance limits from the perspective of an experienced optical engineer and lens designer. It is concise and readable, with examples and data, and is intended for students, practicing engineers, and technology users.