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Book Description. Obtain the Best Estimate of a Strongly Scattering Object from Limited Scattered Field Data. Introduction to Imaging from Scattered Fields presents an overview of the challenging problem of determining information about an object from measurements of the field scattered from that object. It covers widely used approaches to recover information about the objects and examines the ...

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Obtain the Best Estimate of a Strongly Scattering Object from Limited Scattered Field Data Introduction to Imaging from Scattered Fields presents an overview of the challenging problem of determining information about an object from measurements of the field scattered from that object. It covers widely used approaches to recover information about the objects and examines the assumptions made a priori about the object and the consequences of recovering object information from limited numbers of noisy measurements of the scattered fields. The book explores the strengths and weaknesses of using inverse methods for weak scattering. These methods, including Fourier-based signal and image processing techniques, allow more straightforward inverse algorithms to be exploited based on a simple mapping of scattered field data. The authors also discuss their recent approach based on a nonlinear filtering step in the inverse algorithm. They illustrate how to use this algorithm through numerous two-dimensional electromagnetic scattering examples. MATLAB® code is provided to help readers quickly apply the approach to a wide variety of inverse scattering problems. In later chapters of the book, the authors focus on important and often forgotten overarching constraints associated with exploiting inverse scattering algorithms. They explain how the number of degrees of freedom associated with any given scattering experiment can be found and how this allows one to specify a minimum number of data that should be measured. They also describe how the prior discrete Fourier transform (PDFT) algorithm helps in estimating the properties of an object from scattered field measurements. The PDFT restores stability and improves estimates of the object even with severely limited data (provided it is sufficient to meet a criterion based on the number of degrees of freedom).

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A comprehensive and updated overview of the theory, algorithms and applications of for electromagnetic inverse scattering problems Offers the recent and most important advances in inverse scattering grounded in fundamental theory, algorithms and practical engineering applications Covers the latest, most relevant inverse scattering techniques like signal subspace methods, time reversal, linear sampling, qualitative methods, compressive sensing, and noniterative methods Emphasizes theory, mathematical derivation and physical insights of various inverse scattering problems Written by a leading expert in the field

Diagnostic Ultrasound Imaging provides a unified description of the physical principles of ultrasound imaging, signal processing, systems and measurements. This comprehensive reference is a core resource for both graduate students and engineers in medical ultrasound research and design. With continuing rapid technological development of ultrasound in medical diagnosis, it is a critical subject for biomedical engineers, clinical and healthcare engineers and practitioners, medical physicists, and related professionals in the fields of signal and image processing. The book contains 17 new and updated chapters covering the fundamentals and latest advances in the area, and includes four appendices, 450 figures (60 available in color on the companion website), and almost 1,500 references. In addition to the continual influx of readers entering the field of ultrasound worldwide who need the broad grounding in the core technologies of ultrasound, this book provides those already working in these areas with clear and comprehensive expositions of these key new topics as well as introductions to state-of-the-art innovations in this field. Enables practicing engineers, students and clinical professionals to understand the essential physics and signal processing techniques behind modern imaging systems as well as introducing the latest developments that will shape medical ultrasound in the future Suitable for both newcomers and experienced readers, the practical, progressively organized applied approach is supported by hands-on MATLAB® code and worked examples that enable readers to understand the principles underlying diagnostic and therapeutic ultrasound Covers the new important developments in the use of medical ultrasound: elastography and high-intensity therapeutic ultrasound. Many new developments are comprehensively reviewed and explained, including aberration correction, acoustic measurements, acoustic radiation force imaging, alternate imaging architectures, bioeffects, diagnostic to therapeutic, Fourier transform imaging, multimode imaging, plane wave compounding, research platforms, synthetic aperture, vector Doppler, transient shear wave elastography, ultrafast imaging and Doppler, functional ultrasound and viscoelastic models

The world around us appears as diverse and beautiful as it does owing to the fact that light is scattered. Scattering plays two roles in the intricate process of image formation. First, it is the means by which we perceive an object. An object which does not scatter light cannot be seen. However, scattering also distorts the image observed. Even in relatively pure air, visibility is limited to a range of a few tens of kilometers owing to aerosol and molecular light scattering. It is reduced to tens of meters in conditions of mist or fog. What occurs when we look at an object through a scattering medium? For example, when a point diffuse source is being observed, the radiation undergoes multiple scattering along the path to the photodetector. Therefore, the image produced by a source of this kind (i.e., the irradiance distribution in the image plane) appears as a more or less blurred speck. What we have said so far serves as an introduction to the concept of image transfer theory, or the point spread function .

This is a graduate textbook on the principles of linear inverse problems, methods of their approximate solution, and practical application in imaging. The level of mathematical treatment is kept as low as possible to make the book suitable for a wide range of readers from different backgrounds in science and engineering. Mathematical prerequisites are first courses in analysis, geometry, linear algebra, probability theory, and Fourier analysis. The authors concentrate on presenting easily implementable and fast solution algorithms. With examples and exercises throughout, the book will provide the reader with the appropriate background for a clear understanding of the essence of inverse problems (ill-posedness and its cure) and, consequently, for an intelligent assessment of the rapidly growing literature on these problems.

Passenger screening at commercial airports in the United States has gone through significant changes since the events of September 11, 2001. In response to increased concern over terrorist attacks on aircrafts, the Transportation Security Administration (TSA) has deployed security systems of advanced imaging technology (AIT) to screen passengers at airports. To date (December 2014), TSA has deployed AITs in U.S. airports of two different technologies that use different types of radiation to detect threats: millimeter wave and X-ray backscatter AIT systems. X-ray backscatter AITs were deployed in U.S. airports in 2008 and subsequently removed from all airports by June 2013 due to privacy concerns. TSA is looking to deploy a second-generation X-ray backscatter AIT equipped with privacy software to eliminate production of an image of the person being screened in order to alleviate these concerns. This report reviews previous studies as well as current processes used by the Department of Homeland Security and equipment manufacturers to estimate radiation exposures resulting from backscatter X-ray advanced imaging technology system use in screening air travelers. Airport Passenger Screening Using Backscatter X-Ray Machines examines whether exposures comply with applicable health and safety standards for public and occupational exposures to ionizing radiation and whether system design, operating procedures, and maintenance procedures are appropriate to prevent over exposures of travelers and operators to ionizing radiation. This study aims to address concerns about exposure to radiation from X-ray backscatter AITs raised by Congress, individuals within the scientific community, and others.

Describing and evaluating the basic principles and methods of subsurface sensing and imaging, Introduction to Subsurface Imaging is a clear and comprehensive treatment that links theory to a wide range of real-world applications in medicine, biology, security and geophysical/environmental exploration. It integrates the different sensing techniques (acoustic, electric, electromagnetic, optical, x-ray or particle beams) by unifying the underlying physical and mathematical similarities, and computational and algorithmic methods. Time-domain, spectral and multisensor methods are also covered, whilst all the necessary mathematical, statistical and linear systems tools are given in useful appendices to make the book self-contained. Featuring a logical blend of theory and applications, a wealth of color illustrations, homework problems and numerous case studies, this is suitable for use as both a course text and as a professional reference.

Learn the professional and patient care skills you need for clinical practice! Using a clear and concise format, Introduction to Radiologic Sciences and Patient Care, 6th Edition meets the standards set by the American Society of Radiologic Technologists (ASRT) Curriculum Guide and the American Registry of Radiologic Technologists (ARRT) Task List for certification examinations. Updates on current digital imaging and instrumentation provide you with the important information you need for clinical success. Chapter review questions and lab activities available online and on tear sheets in the text give you easy access to on-the-go learning. Step-by-step procedures presented in boxed lists throughout the text ensure you are well prepared for clinical success. More than 300 photos and line drawings help you understand and visualize patient-care procedures. Back of book review questions provide you with an opportunity for review and greater challenge. NEW and UPDATED! Updates on current digital imaging and instrumentation give you the important information you need for clinical success. NEW! Patient care video clips illustrate how to care for patients of any age. NEW! Chapter review questions and lab activities available online and as tear sheets in the text offer easy access to on-the-go chapter review and lab activities. NEW and UPDATED! Appendices containing practice standards, professional organizations, state licensing agencies, the ARRT code of ethics and patient care partnership prepare you for what you will encounter in the practice environment.

Modern holographic techniques have been successfully applied in many important areas, such as 3-D inspection, 3-D microscopy, metrology, and profilometry, augmented reality, and industrial informatics. This Special Issue covers selected pieces of cutting-edge research works, ranging from low-level acquisition, to high-level analysis, processing, and manipulation of holographic information. The Special Issue also serves as a comprehensive review of existing state-of-the-art techniques in 3-D imaging and 3-D display, as well as broad insights into the future development of these disciplines. The Special Issue contains 25 papers in the field of holography, 3-D imaging, and 3-D display. All the papers underwent substantial peer review under the guidelines of Applied Sciences.

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