1. Record Nr. UNINA9910820734603321

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Titolo	Acoustical imaging [[electronic resource]] : techniques and applications for engineers / / Woon Siong Gan
Pubbl/distr/stampa	Chichester, West Sussex, U.K., : Wiley, 2012
ISBN	1-5231-2337-0 1-119-94171-7 1-280-59268-0 9786613622518 1-119-94108-3 1-119-94107-5
Edizione	[1st ed.]
Descrizione fisica	1 online resource (437 p.)
Classificazione	TEC006000
Disciplina	620.2/8
Soggetti	Acoustic imaging Sound-waves - Scattering
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	ACOUSTICAL IMAGING; Contents; About the Author; Foreword; 1 Introduction; References; 2 Physics of Acoustics and Acoustical Imaging; 2.1 Introduction; 2.2 Sound Propagation in Solids; 2.2.1 Derivation of Linear Wave Equation of Motion and its Solutions; 2.2.2 Symmetries in Linear Acoustic Wave Equations and the New Stress Field Equation; 2.3 Use of Gauge Potential Theory to Solve Acoustic Wave Equations; 2.4 Propagation of Finite Wave Amplitude Sound Wave in Solids; 2.4.1 Higher-Order Elasticity Theory; 2.4.2 Nonlinear Effects; 2.4.3 Derivation of the Nonlinear Acoustic Equation of Motion 2.4.4 Solutions of the Higher-Order Acoustics Equations of Motion2.5 Nonlinear Effects Due to Energy Absorption; 2.5.1 Energy Absorption Due to Thermal Conductivity; 2.5.2 Energy Absorption Due to Dislocation; 2.6 Gauge Theory Formulation of Sound Propagation in Solids; 2.6.1 Introduction of a Covariant Derivative in the Infinitesimal Amplitude Sound Wave Equation; 2.6.2 Introduction of Covariant Derivative to the Large Amplitude Sound Wave Equation; References; 3 Signal Processing; 3.1 Mathematical Tools in Signal Processing and

Image Processing; 3.1.1 Matrix Theory
3.1.2 Some Properties of Matrices3.1.3 Fourier Transformation; 3.1.4 The Z-Transform; 3.2 Image Enhancement; 3.2.1 Spatial Low-Pass, High-Pass and Band-Pass Filtering; 3.2.2 Magnification and Interpolation (Zooming); 3.2.3 Replication; 3.2.4 Linear Interpolation; 3.2.5 Transform Operation; 3.3 Image Sampling and Quantization; 3.3.1 Sampling versus Replication; 3.3.2 Reconstruction of the Image from its Samples; 3.3.3 Nyquist Rate; 3.3.4 Sampling Theorem; 3.3.5 Examples of Application of Two-Dimensional Sampling Theory; 3.3.6 Sampling Theorem for Radom Fields
3.3.7 Practical Limitation in Sampling and Reconstruction3.3.8 Image Quantization; 3.4 Stochastic Modelling of Images; 3.4.1 Autoregressive Models; 3.4.2 Properties of AR Models; 3.4.3 Moving Average Model; 3.5 Beamforming; 3.5.1 Principles of Beamforming; 3.5.2 Sonar Beamforming Requirements; 3.6 Finite-Element Method; 3.6.1 Introduction; 3.6.2 Applications; 3.7 Boundary Element Method; 3.7.1 Comparison to Other Methods; References; 4 Common Methodologies of Acoustical Imaging; 4.1 Introduction; 4.2 Tomography; 4.2.1 The Born Approximation; 4.2.2 The Rytov Approximation
4.2.3 The Fourier Diffraction Theorem4.2.4 Reconstruction and Backpropagation Algorithm; 4.3 Holography; 4.3.1 Liquid Surface Method; 4.4 Pulse-Echo and Transmission Modes; 4.4.1 C-Scan Method; 4.4.2 B-Scan Method; 4.5 Acoustic Microscopy; References; 5 Time-Reversal Acoustics and Superresolution; 5.1 Introduction; 5.2 Theory of Time-Reversal Acoustics; 5.2.1 Time-Reversal Acoustics and Superresolution; 5.3 Application of TR to Medical Ultrasound Imaging; 5.4 Application of Time-Reversal Acoustics to Ultrasonic Nondestructive Testing
5.4.1 Theory of Time-Reversal Acoustics for Liquid-Solid Interface

Sommario/riassunto

"Acoustical Imaging starts with an introduction to the basic theories and principles of acoustics and acoustical imaging, then progresses to discuss its varied applications: nondestructive testing, medical imaging, underwater imaging and SONAR and geophysical exploration. The author draws together the different technologies, highlighting the similarities between topic areas and their common underlying theory. Some advanced topics are also described such as nonlinear acoustical imaging and its application in nondestructive testing, application of chaos theory to acoustical imaging, statistical treatment of acoustical imaging and negative refraction"--