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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"--