1. Record Nr. UNINA9910466167803321

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Titolo	Image reconstruction : applications in medical sciences / / Gengsheng Lawrence Zeng
Pubbl/distr/stampa	Berlin, [Germany] ; ; Boston, [Massachusetts] : , : De Gruyter, , 2017 ©2017
ISBN	3-11-049802-2
Descrizione fisica	1 online resource (240 pages) : illustrations
Collana	De Gruyter Textbook
Disciplina	618
Soggetti	Medical sciences Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Frontmatter -- Preface -- Contents -- 1. Basic principles of tomography -- 2. Parallel-beam image reconstruction -- 3. Fan-beam image reconstruction -- 4. Transmission and emission tomography -- 5. Three-dimensional image reconstruction -- 6. Iterative reconstruction -- 7. MRI reconstruction -- 8. Using FBP to perform iterative reconstruction -- Index
Sommario/riassunto	This book introduces the classical and modern image reconstruction technologies. It covers topics in two-dimensional (2D) parallel-beam and fan-beam imaging, three-dimensional (3D) parallel ray, parallel plane, and cone-beam imaging. Both analytical and iterative methods are presented. The applications in X-ray CT, SPECT (single photon emission computed tomography), PET (positron emission tomography), and MRI (magnetic resonance imaging) are discussed. Contemporary research results in exact region-of-interest (ROI) reconstruction with truncated projections, Katsevich's cone-beam filtered backprojection algorithm, and reconstruction with highly under-sampled data are included. The last chapter of the book is devoted to the techniques of using a fast analytical algorithm to reconstruct an image that is equivalent to an iterative reconstruction. These techniques are the author's most recent research results. This book is intended for students, engineers, and researchers who are interested in medical image reconstruction. Written in a non-mathematical way, this book

provides an easy access to modern mathematical methods in medical imaging. Table of Content:Chapter 1 Basic Principles of Tomography1.1 Tomography1.2 Projection1.3 Image Reconstruction1.4 Backprojection1.5 Mathematical ExpressionsProblemsReferencesChapter 2 Parallel-Beam Image Reconstruction2.1 Fourier Transform2.2 Central Slice Theorem2.3 Reconstruction Algorithms2.4 A Computer Simulation2.5 ROI Reconstruction with Truncated Projections2.6 Mathematical Expressions (The Fourier Transform and Convolution , The Hilbert Transform and the Finite Hilbert Transform , Proof of the Central Slice Theorem, Derivation of the Filtered Backprojection Algorithm , Expression of the Convolution Backprojection Algorithm, Expression of the Radon Inversion Formula ,Derivation of the Backprojection-then-Filtering AlgorithmProblemsReferencesChapter 3 Fan-Beam Image Reconstruction3.1 Fan-Beam Geometry and Point Spread Function3.2 Parallel-Beam to Fan-Beam Algorithm Conversion3.3 Short Scan3.4 Mathematical Expressions (Derivation of a Filtered Backprojection Fan-Beam Algorithm, A Fan-Beam Algorithm Using the Derivative and the Hilbert Transform)ProblemsReferencesChapter 4 Transmission and Emission Tomography4.1 X-Ray Computed Tomography4.2 Positron Emission Tomography and Single Photon Emission Computed Tomography4.3 Attenuation Correction for Emission Tomography4.4 Mathematical ExpressionsProblemsReferencesChapter 5 3D Image Reconstruction5.1 Parallel Line-Integral Data5.2 Parallel Plane-Integral Data5.3 Cone-Beam Data (Feldkamp's Algorithm, Grangeat's Algorithm, Katsevich's Algorithm)5.4 Mathematical Expressions (Backprojection-then-Filtering for Parallel Line-Integral Data, Filtered Backprojection Algorithm for Parallel Line-Integral Data, 3D Radon Inversion Formula, 3D Backprojection-then-Filtering Algorithm for Radon Data, Feldkamp's Algorithm, Tuy's Relationship, Grangeat's Relationship, Katsevich's Algorithm)ProblemsReferencesChapter 6 Iterative Reconstruction6.1 Solving a System of Linear Equations6.2 Algebraic Reconstruction Technique6.3 Gradient Descent Algorithms6.4 Maximum-Likelihood Expectation-Maximization Algorithms6.5 Ordered-Subset Expectation-Maximization Algorithm6.6 Noise Handling (Analytical Methods, Iterative Methods, Iterative Methods)6.7 Noise Modeling as a Likelihood Function6.8 Including Prior Knowledge6.9 Mathematical Expressions (ART, Conjugate Gradient Algorithm, ML-EM, OS-EM, Green's One-Step Late Algorithm, Matched and Unmatched Projector/Backprojector Pairs)6.10 Reconstruction Using Highly Undersampled Data with l0 MinimizationProblemsReferencesChapter 7 MRI Reconstruction7.1 The 'M'7.2 The 'R'7.3 The 'I'; (To Obtain z-Information, x-Information, y-Information)7.4 Mathematical ExpressionsProblemsReferencesIndexing