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Nota di contenuto	Tomography; Table of Contents; Preface; Notation; Chapter 1. Introduction to Tomography; 1.1. Introduction; 1.2. Observing contrasts; 1.3. Localization in space and time; 1.4. Image reconstruction; 1.5. Application domains; 1.6. Bibliography; Part 1. Image Reconstruction; Chapter 2. Analytical Methods; 2.1. Introduction; 2.2. 2D Radon transform in parallel-beam geometry; 2.2.1. Definition and concept of sinogram; 2.2.2. Fourier slice theorem and data sufficiency condition; 2.2.3. Inversion by filtered backprojection; 2.2.4. Choice of filter; 2.2.5. Frequency-distance principle 2.3. 2D Radon transform in fan-beam geometry2.3.1. Definition; 2.3.2. Rebinning to parallel data; 2.3.3. Reconstruction by filtered backprojection; 2.3.4. Fast acquisitions; 2.3.5. 3D helical tomography in fan-beam geometry with a single line detector; 2.4. 3D X-ray transform in parallel-beam geometry; 2.4.1. Definition; 2.4.2. Fourier slice theorem and data sufficiency conditions; 2.4.3. Inversion by filtered backprojection; 2.5. 3D Radon transform; 2.5.1. Definition; 2.5.2. Fourier slice theorem; 2.5.3. Inversion by filtered backprojection; 2.6. 3D positron emission tomography

2.6.1. Definitions; 2.6.2. Approximate reconstruction by rebinning to transverse slices; 2.6.3. Direct reconstruction by filtered backprojection; 2.7. X-ray tomography in cone-beam geometry; 2.7.1. Definition; 2.7.2. Connection to the derivative of the 3D Radon transform and data sufficiency condition; 2.7.3. Approximate inversion by rebinning to transverse slices; 2.7.4. Approximate inversion by filtered backprojection; 2.7.5. Inversion by rebinning in Radon space; 2.7.6. Katsevich algorithm for helical cone-beam reconstruction; 2.8. Dynamic tomography; 2.8.1. Definition; 2.8.2. 2D dynamic Radon transform; 2.8.3. Dynamic X-ray transform in divergent geometry; 2.8.4. Inversion; 2.9. Bibliography; Chapter 3. Sampling Conditions in Tomography; 3.1. Sampling of functions in \mathbb{R}^n ; 3.1.1. Periodic functions, integrable functions, Fourier transforms; 3.1.2. Poisson summation formula and sampling of bandlimited functions; 3.1.3. Sampling of essentially bandlimited functions; 3.1.4. Efficient sampling; 3.1.5. Generalization to periodic functions in their first variables; 3.2. Sampling of the 2D Radon transform; 3.2.1. Essential support of the 2D Radon transform; 3.2.2. Sampling conditions and efficient sampling; 3.2.3. Generalizations; 3.2.3.1. Vector tomography; 3.2.3.2. Generalized, rotation invariant Radon transform; 3.2.3.3. Exponential and attenuated Radon transform; 3.3. Sampling in 3D tomography; 3.3.1. Introduction; 3.3.2. Sampling of the X-ray transform; 3.3.3. Numerical results on the sampling of the cone-beam transform; 3.4. Bibliography; Chapter 4. Discrete Methods; 4.1. Introduction; 4.2. Discrete models; 4.3. Algebraic methods; 4.3.1. Case of overdetermination by the data; 4.3.1.1. Algebraic methods based on quadratic minimization; 4.3.1.2. Algorithms

Sommario/riassunto

The principle of tomography is to explore the structure and composition of objects non-destructively along spatial and temporal dimensions, using penetrating radiation, such as X- and gamma-rays, or waves, such as electromagnetic and acoustic waves. Based on computer-assisted image reconstruction, tomography provides maps of parameters that characterize the emission of the employed radiation or waves, or their interaction with the examined objects, for one or several cross-sections. Thus, it gives access to the inner structure of inert objects and living organisms in their full complexity. In
