Introduction to the mathematics of medical imaging

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Abstrak

At the heart of every medical imaging technology is a sophisticated mathematical model of the measurement process and an algorithm to reconstruct an image from the measured data. This book provides a firm foundation in the mathematical tools used to model the measurements and derive the reconstruction algorithms used in most imaging modalities in current use. In the process, it also covers many important analytic concepts, and techniques used in Fourier analysis, integral equations, sampling theory, and noise analysis.

This text uses X-ray computed tomography as a "pedagogical machine" to illustrate important ideas and incorporates extensive discussions of background material making the more advanced mathematical topics accessible to readers with a less formal mathematical education. The mathematical concepts are illuminated with over 200 illustrations and numerous exercises.

New to the second edition are a chapter on magnetic resonance imaging (MRI), a revised section on the relationship between the continuum and discrete Fourier transforms, a new section on Grangreat formula, an improved description of the gridding method, and a new section on noise analysis in MRI.