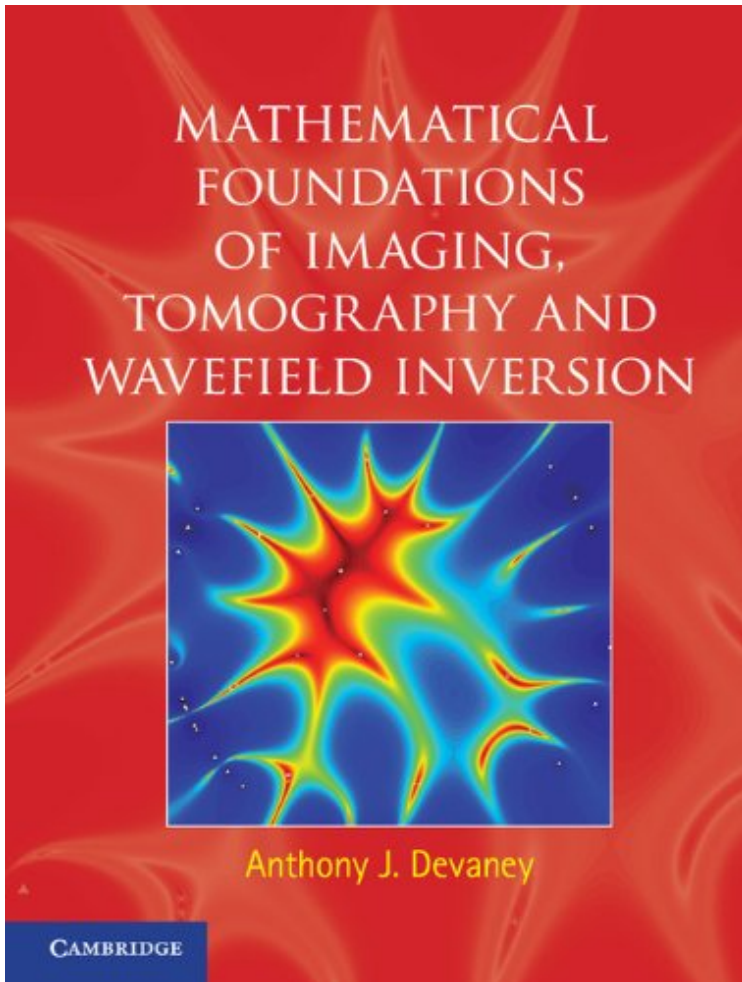


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Mathematical Foundations of Imaging, Tomography and Wavefield Inversion



Par Anthony J. Devaney
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Description :

Prsentation de l'diteurInverse problems are of interest and importance across many branches of physics, mathematics, engineering and medical imaging. In this text, the foundations of imaging and wavefield inversion are presented in a clear and systematic way. The necessary theory is gradually developed throughout the book, progressing from simple wave equation based models to vector wave models. By combining theory with numerous MATLAB based examples, the author promotes a complete understanding of the material and establishes a basis for real world applications. Key topics of discussion include the derivation of solutions to the inhomogeneous and homogeneous Helmholtz equations using Green function techniques; the propagation and scattering of waves in homogeneous and inhomogeneous backgrounds; and the concept of field time reversal. Bridging the gap between mathematics and physics, this multidisciplinary book will appeal to graduate students and researchers alike. Additional resources including MATLAB codes and solutions are available online at www.cambridge.org/9780521119740.Revue de presse'I believe Tony

Devaney has produced a masterpiece - a text that will be a standard and a 'classic'. He has struck a perfect balance between the mathematical structures and the physical reality of the wave setting. Devaney's writing is very clear and the reader can hear that his knowledge is not just mathematical or formal, but based on actual experience with systems and signals. This work will stand the test of time in my view and serves the nation.' Richard Albanese, Director of the Mathematics Products Division, Brooks Air Force, San Antonio

Professor Devaney's new book is a welcome contribution to the field of imaging and inverse scattering. Written by one of the leading practitioners in the field, it is unique in that it presents the basic underlying theory of linearized inverse scattering in a clear and comprehensive manner while only requiring a prerequisite of analytic function theory and linear algebra. In particular, this book is not only an excellent introductory textbook for graduate students in mathematics, physics or engineering but can also serve as a valuable reference source for experts in the field. I highly recommend Professor Devaney's new book to beginners and experts alike!' David Colton, Unidel Professor, University of Delaware

Finally we have a book that collects together and explains the mathematical foundations of imaging based on wave propagation! This book will be indispensable for students and researchers who encounter inverse scattering problems and inverse source problems in medical imaging, nondestructive evaluation, seismic prospecting, and radar and microwave imaging. We owe [Professor] Devaney a great debt for writing this immensely useful book.' Margaret Cheney, Rensselaer Polytechnic Institute

An outstanding text on the foundations of the theory of imaging and wavefield inversion by a leading expert in these fields.' Emil Wolf, Wilson Professor of Optical Physics, University of Rochester

I have found this monograph by Professor Tony Devaney on the foundations of imaging and linearized inverse scattering, to be one of the best scientific books I have read in years. It provides a clear understanding of the physics of the problem through a careful yet elegant and fluent mathematical treatment. Then, having gained the necessary physical insight of the physics, the Fourier based representation is replaced by the much more powerful singular value decomposition that provides a uniform framework for treating virtually all of the linearized inverse problems. By combining theory with MATLAB-based examples, the author promotes a complete understanding of the material and provides a basis for real-world applications. The book is highly recommended as a textbook for graduate courses and as a reference for researchers working in the general areas of computational inverse scattering.' Ehud Heyman, Tel Aviv University

This book contains a wealth of valuable material on forward and inverse problems encountered in propagation, radiation, and scattering of waves presented in a concise, rigorous, and comprehensive manner. The primary emphasis is on the mathematical foundation of the subject, but the material is also of great interest in a variety of different applications. The book is a must for students and researchers in the field, and will serve well as a graduate text.' Jakob Stamnes, University of Bergen

Presentation de l'auteur

Inverse problems are of interest and importance across many branches of physics, mathematics, engineering and medical imaging. In this text, the foundations of imaging and wavefield inversion are presented in a clear and systematic way. The necessary theory is gradually developed throughout the book, progressing from simple wave equation based models to vector wave models. By combining theory with numerous MATLAB based examples, the author promotes a complete understanding of the material and establishes a basis for real world applications. Key topics of discussion include the derivation of solutions to the inhomogeneous and homogeneous Helmholtz equations using Green function techniques; the propagation and scattering of waves in homogeneous and inhomogeneous backgrounds; and the concept of field time reversal. Bridging the gap between mathematics and physics, this multidisciplinary book will appeal to graduate students and researchers alike. Additional resources including MATLAB codes and solutions are available online at

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