<<计算反演问题中的优化与正则化方法>>

图书基本信息

书名：<<计算反演问题中的优化与正则化方法及其应用>>

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前言

This volume contains the papers presented by invited speakers of the first inter-national workshop "Optimization and Regularization for Computational Inverse Problems and Applications". The workshop was organized under the auspices of the Chinese Academy of Sciences in the Institute of Geology and Geophysics, located in Beijing, the capital of China, and held during July 21-25, 2008, just before the opening of the Olympic Games. The workshop was sponsored by the National Natural Science Foundation of China, China-Russia Cooperative Re-search Project RFBR-07-01-92103-NFSC and the National "973" Key Basic Re-search Developments Program of China. The main goal of the workshop was to teach about 60 young Chinese participants （mostly geophysicists） how to solveinverse and ill-posed problems using optimization procedures. Eminent specialists from China, Russia （partially sponsored by the Russian Foundation of Basic Research）, USA and Austria were invited to present their lectures. Some of them could not participate personally but all invited speakers found a possibility to write papers especially for this publication.The book covers many directions in the modern theory of inverse and ill-posed problems the variational approach, iterative methods, using a prioriin formation for constructing regularizing algorithms, etc. But the most important for the papers is to show how these methods can be applied to effectively solving of practical problems in geophysics, astrophysics, vibrational spectroscopy, and image processing. This issue should encourage specialists in the inverse problems field not only to investigate mathematical methods and propose new approaches but also to apply them to processing of real experimental data. I would like to wish all of them great successes！

内容概要

Optimization and Regularization for Computational Inverse Problems and Applications focuses on advances in inversion theory and recent developments with practical applications, particularly emphasizing the combination of optimization and regularization for solving inverse problems. This book covers both the methods, including standard regularization theory, Fejer processes for linear and nonlinear problems, the balancing principle, extrapolated regularization, nonstandard regularization, nonlinear gradient method, the nonmonotone gradient method, subspace method and Lie group method; and the practical applications, such as the reconstruction problem for inverse scattering, molecular spectra data processing, quantitative remote sensing inversion, seismic inversion using the Lie group method, and the gravitational lensing problem. Scientists, researchers and engineers, as well as graduate students engaged in applied mathematics, engineering, geophysics, medical science, image processing, remote sensing and atmospheric science will benefit from this book.

作者简介

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书籍目录

章节摘录

插图：Indeed, if we introduce a very limited set of parameters （and thus create a very "rigid" model）, we are likely to fail achieving a good fit between experimental and calculated data. On the other hand, if a model is very flexible（that is, contains too many adjustable parameters）, we are likely to find a wide variety of solutions that all satisfy the experiment. Even if we employ the concept of a regularized solution, there must exist some kind of optimal parameter set that would correspond to the available experimental data. As for the force fielddetermination, it is a common knowledge that （except for a limited set of smallor very symmetrical molecules） we never have enough data to restore a complete force field. The ED data usually provides only a small additional data on force field , so as a rule we are in the situation when there exists a wide range of force fields compatible with spectroscopic experiment. Among the ways to reduce theambiguity of the force fields, we could mention the following:1. Introducing model assumptions based on general ideas of molecular structure （e.g. valence force field, etc.）: these will result in neglecting some force constants, fixing the others, and/or introducing model potentials that would be allowed to generate force matrix depending on a small number of parameters.2. Transferring some force field parameters from similar fragments in related molecules and assuming they are not likely to be significantly changed in a different environment.

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