Méthode de Quasi-Réversibilité et Problèmes mal posés *

par Robert LATTES ** et Jacques-Louis LIONS +

- Position du Problème

Soit $A(t)$: $t \in (0,T)$ une famille d'opérateurs non bornés dans un espace d'Hilbert H. On suppose que $A(t) + k\,I$ est, pour k assez grand, uniformément accrétif. Alors le problème suivant est bien posé.

$$\left.\begin{aligned} &A(t)\,u(t) + \frac{d}{dt}\,u(t) = 0 \qquad t \in (0,T) \\ &u(t) \in \text{domaine de } A(t) \\ &u(0) = \xi \qquad \xi \text{ donné dans H} \end{aligned}\right\} \quad (1.1)$$

Soit alors χ , élément de H ; on pose

$$J(\xi) = \| u(T) - \chi \| \quad (1.2)$$

On peut montrer que

$$\inf_{\xi \in H} J(\xi) = 0 \quad (1.3)$$

De sorte que si η est un nombre positif, il existe un élément ξ_η de H tel que :

$$J(\xi_\eta) \leq \eta \quad (1.4)$$

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Methode De Quasi Reversibilite Et Applications

Alexander B. Kurzhanski,Pravin Varaiya

Methode De Quasi Reversibilite Et Applications:

Methode de Quasi-reversibilite' Et Applications Robert Lattès,Jacques-Louis Lions,1967 *Dynamical Systems Method and Applications* Alexander G. Ramm,Nguyen S. Hoang,2013-06-07 Demonstrates the application of DSM to solve a broad range of operator equations The dynamical systems method DSM is a powerful computational method for solving operator equations With this book as their guide readers will master the application of DSM to solve a variety of linear and nonlinear problems as well as ill posed and well posed problems The authors offer a clear step by step systematic development of DSM that enables readers to grasp the method s underlying logic and its numerous applications Dynamical Systems Method and Applications begins with a general introduction and then sets forth the scope of DSM in Part One Part Two introduces the discrepancy principle and Part Three offers examples of numerical applications of DSM to solve a broad range of problems in science and engineering Additional featured topics include General nonlinear operator equations Operators satisfying a spectral assumption Newton type methods without inversion of the derivative Numerical problems arising in applications Stable numerical differentiation Stable solution to ill conditioned linear algebraic systems Throughout the chapters the authors employ the use of figures and tables to help readers grasp and apply new concepts Numerical examples offer original theoretical results based on the solution of practical problems involving ill conditioned linear algebraic systems and stable differentiation of noisy data Written by internationally recognized authorities on the topic Dynamical Systems Method and Applications is an excellent book for courses on numerical analysis dynamical systems operator theory and applied mathematics at the graduate level The book also serves as a valuable resource for professionals in the fields of mathematics physics and engineering Geotechnics Fundamentals and Applications in Construction Rashid Mangushev,Askar Zhussupbekov,Yoshinori Iwasaki,Igor Sakharov,2019-04-29 Geotechnical Fundamentals and Applications in Construction New Materials Structures Technologies and Calculations contains the papers presented at the International Conference on Geotechnical Fundamentals and Applications in Construction New Materials Structures Technologies and Calculations GFAC 2019 Saint Petersburg Russia 6 8 February 2019 The contributions present the latest research findings developments and applications in the areas of geotechnics soil mechanics foundations geological engineering and share experiences in the design of complex geotechnical objects and are grouped in 8 sections Analytical decisions and numerical modeling for foundations Design and construction in geologically hazardous conditions Methods for surveying the features of dispersed rocky soils and structurally unstable soils Exploration territory improvement and reconstruction in conditions of compact urban planning and enterprises etc Construction reconstruction and exploitation of infrastructure facilities in different soil conditions R Condition survey and accident evolution analysis in construction Up to date monitoring techniques in building construction and exploitation Geotechnical Fundamentals and Applications in Construction New Materials Structures Technologies and Calculations collects the state of the art in geotechnology and construction and will be of

interest to academia and professionals in geotechnics soil mechanics foundation engineering and geological engineering

Nonlinear Functional Analysis and Its Applications, Part 1 Felix E. Browder,1986 *Mathematical Methods for Industrial Problems* V. Capasso,R. Caselli,2020-05-18 No detailed description available for Mathematical Methods for Industrial Problems *Coefficient Inverse Problems for Parabolic Type Equations and Their Application* P. G. Danilaev,2014-07-24 As a rule many practical problems are studied in a situation when the input data are incomplete For example this is the case for a parabolic partial differential equation describing the non stationary physical process of heat and mass transfer if it contains the unknown thermal conductivity coefficient Such situations arising in physical problems motivated the appearance of the present work In this monograph the author considers numerical solutions of the quasi inversion problems to which the solution of the original coefficient inverse problems are reduced Underground fluid dynamics is taken as a field of practical use of coefficient inverse problems The significance of these problems for this application domain consists in the possibility to determine the physical fields of parameters that characterize the filtration properties of porous media oil strata This provides the possibility of predicting the conditions of oil field development and the effects of the exploitation The research carried out by the author showed that the quasi inversion method can be applied also for solution of interior coefficient inverse problems by reducing them to the problem of continuation of a solution to a parabolic equation This reduction is based on the results of the proofs of the uniqueness theorems for solutions of the corresponding coefficient inverse problems **Methods of Nonlinear Analysis** Richard Bellman,1970-04-01 In this book we study theoretical and practical aspects of computing methods for mathematical modelling of nonlinear systems A number of computing techniques are considered such as methods of operator approximation with any given accuracy operator interpolation techniques including a non Lagrange interpolation methods of system representation subject to constraints associated with concepts of causality memory and stationarity methods of system representation with an accuracy that is the best within a given class of models methods of covariance matrix estimation methods for low rank matrix approximations hybrid methods based on a combination of iterative procedures and best operator approximation andmethods for information compression and filtering under condition that a filter model should satisfy restrictions associated with causality and different types of memory As a result the book represents a blend of new methods in general computational analysis and specific but also generic techniques for study of systems theory ant its particularbranches such as optimal filtering and information compression Best operator approximation Non Lagrange interpolation Generic Karhunen Loeve transform Generalised low rank matrix approximation Optimal data compression Optimal nonlinear filtering **Numerical Methods for Differential Equations, Optimization, and Technological Problems** Sergey Repin,Timo Tiihonen,Tero Tuovinen,2012-10-13 This book contains the results in numerical analysis and optimization presented at the ECCOMAS thematic conference Computational Analysis and Optimization CAO 2011 held in Jyv skyl Finland June 9 11 2011 Both the

conference and this volume are dedicated to Professor Pekka Neittaanm ki on the occasion of his sixtieth birthday It consists of five parts that are closely related to his scientific activities and interests Numerical Methods for Nonlinear Problems Reliable Methods for Computer Simulation Analysis of Noised and Uncertain Data Optimization Methods Mathematical Models Generated by Modern Technological Problems The book also includes a short biography of Professor Neittaanm ki

Dynamical Systems Method for Solving Nonlinear Operator Equations Alexander G. Ramm,2006-09-25 Dynamical Systems Method for Solving Nonlinear Operator Equations is of interest to graduate students in functional analysis numerical analysis and ill posed and inverse problems especially The book presents a general method for solving operator equations especially nonlinear and ill posed It requires a fairly modest background and is essentially self contained All the results are proved in the book and some of the background material is also included The results presented are mostly obtained by the author Contains a systematic development of a novel general method the dynamical systems method DSM for solving operator equations especially nonlinear and ill posed Self contained suitable for wide audience Can be used for various courses for graduate students and partly for undergraduates especially for RUE classes **The method of quasi-reversibility (Méthode de quasi-réversibilité et applications, engl.) Applications to partial differential equations** Robert Lattès,1969 **Computational Methods in Physics** Simon Širca,Martin Horvat,2025-04-01 This textbook provides a compendium of numerical methods to assist physics students and researchers in their daily work It carefully considers error estimates stability and convergence issues the choice of optimal methods and techniques to increase program execution speeds The book supplies numerous examples throughout the chapters that are concluded by more comprehensive problems with a strong physics background Instead of uncritically employing modern black box tools the readers are encouraged to develop a more ponderous and skeptical approach This revised and expanded edition now includes a new chapter on numerical integration and stable differentiation as well as fresh material on optimal filtering integration of gravitational many body problems computation of Poincar maps regularization of orbits singular Sturm Liouville problems techniques for time evolution and spatial treatment of semi infinite domains in spectral methods and phase retrieval It also brings updated discussions of algebraic problems involving sparse matrices and of high resolution schemes for partial differential equations *Dynamics and Control of Trajectory Tubes* Alexander B. Kurzhanski,Pravin Varaiya,2014-10-27 This monograph presents theoretical methods involving the Hamilton Jacobi Bellman formalism in conjunction with set valued techniques of nonlinear analysis to solve significant problems in dynamics and control The emphasis is on issues of reachability feedback control synthesis under complex state constraints hard or double bounds on controls and performance in finite time Guaranteed state estimation output feedback control and hybrid dynamics are also discussed Although the focus is on systems with linear structure the authors indicate how to apply each approach to nonlinear and nonconvex systems The main theoretical results lead to computational schemes based on extensions of

ellipsoidal calculus that provide complete solutions to the problems These computational schemes in turn yield software tools that can be applied effectively to high dimensional systems Ellipsoidal Techniques for Problems of Dynamics and Control Theory and Computation will interest graduate and senior undergraduate students as well as researchers and practitioners interested in control theory its applications and its computational realizations **Ill-Posed Problems in Natural Sciences** Andrei N. Tikhonov,2020-05-18 No detailed description available for Ill Posed Problems in Natural Sciences Advances in Inverse Problems for Partial Differential Equations Dinh-Liem Nguyen,Loc Hoang Nguyen,Thi-Phong Nguyen,2023-04-12 This volume contains the proceedings of two AMS Special Sessions Recent Developments on Analysis and Computation for Inverse Problems for PDEs virtually held on March 13 14 2021 and Recent Advances in Inverse Problems for Partial Differential Equations virtually held on October 23 24 2021 The papers in this volume focus on new results on numerical methods for various inverse problems arising in electrical impedance tomography inverse scattering in radar and optics problems reconstruction of initial conditions control of acoustic fields and stock price forecasting The authors studied iterative and non iterative approaches such as optimization based globally convergent sampling and machine learning based methods The volume provides an interesting source on advances in computational inverse problems for partial differential equations

Sobolev Spaces of Infinite Order and Differential Equations Julii A. Dubinskii,1986-12-31 Regularization of Ill-Posed Problems by Iteration Methods S.F. Gilyazov,N.L. Gol'dman,2013-04-17 Iteration regularization i e utilization of iteration methods of any form for the stable approximate solution of ill posed problems is one of the most important but still insufficiently developed topics of the new theory of ill posed problems In this monograph a general approach to the justification of iteration regulari zation algorithms is developed which allows us to consider linear and nonlinear methods from unified positions Regularization algorithms are the classical iterative methods steepest descent methods conjugate direction methods gradient projection methods etc complemented by the stopping rule depending on level of errors in input data They are investigated for solving linear and nonlinear operator equations in Hilbert spaces Great attention is given to the choice of iteration index as the regularization parameter and to estimates of errors of approximate solutions Stabilizing properties such as smoothness and shape constraints imposed on the solution are used On the basis of these investigations we propose and establish efficient regularization algorithms for stable numerical solution of a wide class of ill posed problems In particular descriptive regularization algorithms utilizing a priori information about the qualitative behavior of the sought solution and ensuring a substantial saving in computational costs are considered for model and applied problems in nonlinear thermophysics The results of calculations for important applications in various technical fields a continuous casting the treatment of materials and perfection of heat protective systems using laser and composite technologies are given

Moment Theory and Some Inverse Problems in Potential Theory and Heat Conduction Dang D. Ang,Rudolf Gorenflo,Vy K. Le,Dang D. Trong,2004-10-13 Moment Theory is not a new subject however in classical treatments the ill

posedness of the problem is not taken into account hence this monograph Assuming a true solution to be uniquely determined by a sequence of moments given as integrals of which only finitely many are inaccurately given the authors describe and analyze several regularization methods and derive stability estimates Mathematically the task often consists in the reconstruction of an analytic or harmonic function as is natural from concrete applications discussed e g inverse heat conduction problems Cauchy s problem for the Laplace equation gravimetry The book can be used in a graduate or upper undergraduate course in Inverse Problems or as supplementary reading for a course on Applied Partial Differential Equations

Recent Advances In Numerical Methods And Applications Ii - Proceedings Of The Fourth International Conference Panayot S Vassilevski,Blagovest H Sendov,Oleg P Iliev,Mikhail S Kaschiev,Svetozar D Margenov,1999-07-05 This volume contains the proceedings of the 4th International Conference on Numerical Methods and Applications The major topics covered include general finite difference finite volume finite element and boundary element methods general numerical linear algebra and parallel computations numerical methods for nonlinear problems and multiscale methods multigrid and domain decomposition methods CFD computations mathematical modeling in structural mechanics and environmental and engineering applications The volume reflects the current research trends in the specified areas of numerical methods and their applications Generalized Calculus with Applications to Matter and Forces Luis Manuel Braga de Costa Campos,2014-04-18 Combining mathematical theory physical principles and engineering problems Generalized Calculus with Applications to Matter and Forces examines generalized functions including the Heaviside unit jump and the Dirac unit impulse and its derivatives of all orders in one and several dimensions The text introduces the two main approaches to genera Theory and Applications of Some New Classes of Integral Equations Alexander G. Ramm,2012-12-06 This book is intended for numerical examples showing the practical utility of these formulas two sided variational estimates for the pol arizability tensor and some open problems such as working out a standard program for calculating the capacitance and polarizability of bodies of arbitrary shape and numerical calculation of multiple integrals with weak singularities Readers interested in nonlinear vibration theory will find a new method for qualitative study of stationary regimes in the general one loop passive nonlinear network including stabil ity in the large convergence and an iterative process for calculation the stationary regime No assumptions concerning the smallness of the nonlinearity or the filter property of the linear one port are made New results in the theory of nonlinear operator equations form the basis for the study

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