Operator Theory
Advances and Applications
vol. 100

Metric Constrained Interpolation, Commutant Lifting and Systems

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Springer Basel AG

Metric Constrained Interpolation Commutant Lifting And Systems

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Stationary Systems IX 5 A Nonstationary Filtering Problem Notes to Chapter IX X Reduction Techniques From Nonstationary to Stationary and Vice Versa X 1 Spatial Features X 2 Operator Features Notes to Chapter X XI Proofs of the Nonstationary Interpolation Theorems by Reduction to the Stationary Case XI 1 The Standard Nonstationary Nevanlinna Pick Interpolation Theorem XI 2 The Nons **Metric Constrained Interpolation, Commutant Lifting and Systems** C. Foias,A.E. Frezho,I. Gohberg,M.A. Kaashoek,2012-10-17 This book presents a unified approach for solving both stationary and nonstationary interpolation problems in finite or infinite dimensions based on the commutant lifting theorem from operator theory and the state space method from mathematical system theory Initially the authors planned a number of papers treating nonstationary interpolation problems of Nevanlinna Pick and Nehari type by reducing these nonstationary problems to stationary ones for operator valued functions with operator arguments and using classical commutant lifting techniques This reduction method required us to review and further develop the classical results for the stationary problems in this more general framework Here the system theory turned out to be very useful for setting up the problems and for providing natural state space formulas for describing the solutions In this way our work involved us in a much wider program than original planned The final results of our efforts are presented here The financial support in 1994 from the NWO stimulansprogramma for the Thomas Stieltjes Institute for Mathematics in the Netherlands enabled us to start the research which lead to the present book We also gratefully acknowledge the support from our home institutions Indiana University at Bloomington Purdue University at West Lafayette Tel Aviv University and the Vrije Universiteit at Amsterdam We warmly thank Dr A L Sakhnovich for his carefully reading of a large part of the manuscript Finally Sharon Wise prepared very efficiently and with great care the troff file of this manuscript we are grateful for her excellent typing **Metric Constrained Interpolation, Commutant Lifting and Systems** C. Foias,A.E. Frezho,I. Gohberg,M.A. Kaashoek,2012-12-06 This book presents a unified approach for solving both stationary and nonstationary interpolation problems in finite or infinite dimensions based on the commutant lifting theorem from operator theory and the state space method from mathematical system theory Initially the authors planned a number of papers treating nonstationary interpolation problems of Nevanlinna Pick and Nehari type by reducing these nonstationary problems to stationary ones for operator valued functions with operator arguments and using classical commutant lifting techniques This reduction method required us to review and further develop the classical results for the stationary problems in this more general framework Here the system theory turned out to be very useful for setting up the problems and for providing natural state space formulas for describing the solutions In this way our work involved us in a much wider program than original planned The final results of our efforts are presented here The financial support in 1994 from the NWO stimulansprogramma for the Thomas Stieltjes Institute for Mathematics in the Netherlands enabled us to start the research which lead to the present book We also gratefully acknowledge the support from our home institutions Indiana University at Bloomington Purdue University at West Lafayette Tel Aviv University and the Vrije Universiteit at

Amsterdam We warmly thank Dr A L Sakhnovich for his carefully reading of a large part of the manuscript Finally Sharon Wise prepared very efficiently and with great care the troff file of this manuscript we are grateful for her excellent typing

An Operator Perspective on Signals and Systems Arthur Frazho,Wisuwat Bhosri,2009-12-29 In this monograph we combine operator techniques with state space methods to solve factorization spectral estimation and interpolation problems arising in control and signal processing We present both the theory and algorithms with some Matlab code to solve these problems A classical approach to spectral factorization problems in control theory is based on Riccati equations arising in linear quadratic control theory and Kalman ltering One advantage of this approach is that it readily leads to algorithms in the non degenerate case On the other hand this approach does not easily generalize to the nonrational case and it is not always transparent where the Riccati equations are coming from Operator theory has developed some elegant methods to prove the existence of a solution to some of these factorization and spectral estimation problems in a very general setting However these techniques are in general not used to develop computational algorithms In this monograph we will use operator theory with state space methods to derive computational methods to solve factorization sp tral estimation and interpolation problems It is emphasized that our approach is geometric and the algorithms are obtained as a special application of the theory We will present two methods for spectral factorization One method derives al rithms based on nite sections of a certain Toeplitz matrix The other approach uses operator theory to develop the Riccati factorization method Finally we use isometric extension techniques to solve some interpolation problems Linear Operators and Linear Systems Jonathan R. Partington,2004-03-15 Linear systems can be regarded as a causal shift invariant operator on a Hilbert space of signals and by doing so this book presents an introduction to the common ground between operator theory and linear systems theory The book therefore includes material on pure mathematical topics such as Hardy spaces closed operators the gap metric semigroups shift invariant subspaces the commutant lifting theorem and almost periodic functions which would be entirely suitable for a course in functional analysis at the same time the book includes applications to partial differential equations to the stability and stabilization of linear systems to power signal spaces including some recent material not previously available in books and to delay systems treated from an input output point of view Suitable for students of analysis this book also acts as an introduction to a mathematical approach to systems and control for graduate students in departments of applied mathematics or engineering **Harmonic Analysis of Operators on Hilbert Space** Béla Sz Nagy,Ciprian Foias,Hari Bercovici,László Kérchy,2010-08-26 The existence of unitary dilations makes it possible to study arbitrary contractions on a Hilbert space using the tools of harmonic analysis The first edition of this book was an account of the progress done in this direction in 1950 70 Since then this work has influenced many other areas of mathematics most notably interpolation theory and control theory This second edition in addition to revising and amending the original text focuses on further developments of the theory including the study of two operator classes operators whose powers do not converge strongly to zero and

operators whose functional calculus as introduced in Chapter III is not injective For both of these classes a wealth of material on structure classification and invariant subspaces is included in Chapters IX and X Several chapters conclude with a sketch of other developments related with and developing the material of the first edition **Interpolation Theory, Systems Theory and Related Topics** Daniel Alpay,Israel Gohberg,Victor Vinnikov,2012-12-06 This volume is dedicated to Harry Dym a leading expert in operator theory on the occasion of his sixtieth birthday The book opens with an autobiographical sketch a list of publications and a personal account of I Gohberg on his collaboration with Harry Dym The mathematical papers cover Krein space operator theory Schur analysis and interpolation several complex variables and Riemann surfaces matrix theory system theory and differential equations and mathematical physics The book is of interest to a wide audience of pure and applied mathematicians electrical engineers and theoretical physicists *Recent Advances in Robust Control* Andreas Müller,2011-11-21 Robust control has been a topic of active research in the last three decades culminating in H_2 H_ infty and mu design methods followed by research on parametric robustness initially motivated by Kharitonov s theorem the extension to non linear time delay systems and other more recent methods The two volumes of Recent Advances in Robust Control give a selective overview of recent theoretical developments and present selected application examples The volumes comprise 39 contributions covering various theoretical aspects as well as different application areas The first volume covers selected problems in the theory of robust control and its application to robotic and electromechanical systems The second volume is dedicated to special topics in robust control and problem specific solutions Recent Advances in Robust Control will be a valuable reference for those interested in the recent theoretical advances and for researchers working in the broad field of robotics and mechatronics **Nigel J. Kalton Selecta** Fritz Gesztesy,Gilles Godefroy,Loukas Grafakos,Igor Verbitsky,2016-07-05 This book is the first part of a two volume anthology comprising a selection of 49 articles that illustrate the depth breadth and scope of Nigel Kalton s research Each article is accompanied by comments from an expert on the respective topic which serves to situate the article in its proper context to successfully link past present and hopefully future developments of the theory and to help readers grasp the extent of Kalton s accomplishments Kalton s work represents a bridge to the mathematics of tomorrow and this book will help readers to cross it Nigel Kalton 1946 2010 was an extraordinary mathematician who made major contributions to an amazingly diverse range of fields over the course of his career **Matrix Completions, Moments, and Sums of Hermitian Squares** Mihály Bakonyi,Hugo J. Woerdeman,2011-07-18 Intensive research in matrix completions moments and sums of Hermitian squares has yielded a multitude of results in recent decades This book provides a comprehensive account of this quickly developing area of mathematics and applications and gives complete proofs of many recently solved problems With MATLAB codes and more than 200 exercises the book is ideal for a special topics course for graduate or advanced undergraduate students in mathematics or engineering and will also be a valuable resource for researchers Often driven by questions from signal

processing control theory and quantum information the subject of this book has inspired mathematicians from many subdisciplines including linear algebra operator theory measure theory and complex function theory In turn the applications are being pursued by researchers in areas such as electrical engineering computer science and physics The book is self contained has many examples and for the most part requires only a basic background in undergraduate mathematics primarily linear algebra and some complex analysis The book also includes an extensive discussion of the literature with close to 600 references from books and journals from a wide variety of disciplines **Systems, Approximation, Singular Integral Operators, and Related Topics** Alexander A. Borichev,Nikolai K. Nikolski,2012-12-06 This book is devoted to some topical problems and applications of operator theory and its interplay with modern complex analysis It consists of 20 selected survey papers that represent updated mainly plenary addresses to the IWOTA 2000 conference held at Bordeaux from June 13 to 16 2000 The main subjects of the volume include spectral analysis of periodic differential operators and delay equations stabilizing controllers Fourier multipliers multivariable operator theory model theory commutant lifting theorems coisometric realizations Hankel operators and forms operator algebras the Bellman function approach in singular integrals and harmonic analysis singular integral operators and integral representations approximation in holomorphic spaces These subjects are unified by the common operator theoretic approach and the systematic use of modern function theory techniques *Dynamical Systems, Control, Coding, Computer Vision* Giorgio Picci,D.S. Gilliam,2012-12-06 This book is a collection of essays devoted in part to new research direc tions in systems networks and control theory and in part to the growing interaction of these disciplines with new sectors of engineering and applied sciences like coding computer vision and hybrid systems These are new areas of rapid growth and of increasing importance in modern technology The essays written by world leading experts in the field reproduce and expand the plenary and minicoursejminisymposia invited lectures which were delivered at the Mathematical Theory of Networks and Systems Sym posium MTNS 98 held in Padova Italy on July 6 10 1998 Systems control and networks theory has permeated the development of much of present day technology The impact has been visible in the past fifty years through the dramatic expansion and achievements of the aerospace and avionics industry through process control and factory au tomation robotics communication signals analysis and synthesis and more recently even finance to name just the most visible applications The theory has developed from the early phase of its history when the ba sic tools were elementary complex analysis Laplace transform and linear differential equations to present day where the mathematics ranges widely from functional analysis PDE s abstract algebra stochastic processes and differential geometry Irrespective of the particular tools however the ba sic unifying paradigms of feedback stability optimal control and recursive filtering have remained the bulk of the field and continue to be the basic motivation for the theory coming from the real world **Contributions to Operator Theory in Spaces with an Indefinite Metric** Aad Dijksma,Israel Gohberg,Marinus A. Kaashoek,Reinhard Mennicken,2012-12-06 This volume is dedicated to Heinz Langer a

leading expert in spectral analysis and its applications in particular to operators in spaces with an indefinite metric on the occasion of his 60th birthday The book begins with his biography and list of publications It contains a selection of research papers most of which are devoted to spectral analysis of operators or operator pencils with applications to ordinary and partial differential equations Other papers deal with time varying systems interpolation and factorization problems and topics from mathematical physics About half of the papers contain further developments in the theory of operators in spaces with an indefinite metric and treat new applications The book is of interest to a wide audience of pure and applied mathematicians

Noncommutative Function-Theoretic Operator Theory and Applications Joseph A. Ball,Vladimir Bolotnikov,2021-12-16 This concise volume shows how ideas from function and systems theory lead to new insights for noncommutative multivariable operator theory *Operator Theory, Analysis and the State Space Approach* Harm Bart,Sanne ter Horst,André C.M. Ran,Hugo J. Woerdeman,2018-12-30 This volume is dedicated to Rien Kaashoek on the occasion of his 80th birthday and celebrates his many contributions to the field of operator theory during more than fifty years In the first part of the volume biographical information and personal accounts on the life of Rien Kaashoek are presented Eighteen research papers by friends and colleagues of Rien Kaashoek are included in the second part Contributions by J Agler Z A Lykova N J Young J A Ball G J Groenewald S ter Horst H Bart T Ehrhardt B Silbermann J M Bogoya S M Grudsky I S Malysheva A B ttcher E Wegert Z Zhou Y Eidelman I Haimovici A E Frazho A C M Ran B Fritzsche B Kirstein C Madler J J Jaftha D B Janse van Rensburg P Junghanns R Kaiser J Nemcova M Petreczky J H van Schuppen L Plevnik P Semrl A Sakhnovich F O Speck S Sremac H J Woerdeman H Wolkowicz and N Vasilevski *Recent Developments in Operator Theory, Mathematical Physics and Complex Analysis* Daniel Alpay,Jussi Behrndt,Fabrizio Colombo,Irene Sabadini,Daniele C. Struppa,2023-04-11 This book features a collection of papers by plenary semi plenary and invited contributors at IWOTA2021 held at Chapman University in hybrid format in August 2021 The topics span areas of current research in operator theory mathematical physics and complex analysis **Operator Theory, Functional Analysis and Applications** M. Amélia Bastos,Luís Castro,Alexei Yu. Karlovich,2021-03-31 This book presents 30 articles on the topic areas discussed at the 30th International Workshop on Operator Theory and its Applications held in Lisbon in July 2019 The contributions include both expository essays and original research papers reflecting recent advances in the traditional IWOTA areas and emerging adjacent fields as well as the applications of Operator Theory and Functional Analysis The topics range from C algebras and Banach algebras Sturm Liouville theory integrable systems dilation theory frame theory Toeplitz Hankel and singular integral operators to questions from lattice group and matrix theories complex analysis harmonic analysis and function spaces Given its scope the book is chiefly intended for researchers and graduate students in the areas of Operator Theory Functional Analysis their applications and adjacent fields **Structured Matrices and Polynomials** Victor Y. Pan,2012-12-06 Structured matrices serve as a natural bridge between the areas of algebraic computations with

polynomials and numerical matrix computations allowing cross fertilization of both fields This book covers most fundamental numerical and algebraic computations with Toeplitz Hankel Vandermonde Cauchy and other popular structured matrices Throughout the computations the matrices are represented by their compressed images called displacements enabling both a unified treatment of various matrix structures and dramatic saving of computer time and memory The resulting superfast algorithms allow further dramatic parallel acceleration using FFT and fast sine and cosine transforms Included are specific applications to other fields in particular superfast solutions to various fundamental problems of computer algebra the tangential Nevanlinna Pick and matrix Nehari problems The primary intended readership for this work includes researchers algorithm designers and advanced graduate students in the fields of computations with structured matrices computer algebra and numerical rational interpolation The book goes beyond research frontiers and apart from very recent research articles includes yet unpublished results To serve a wider audience the presentation unfolds systematically and is written in a user friendly engaging style Only some preliminary knowledge of the fundamentals of linear algebra is required This makes the material accessible to graduate students and new researchers who wish to study the rapidly exploding area of computations with structured matrices and polynomials Examples tables figures exercises extensive bibliography and index lend this text to classroom use or self study **Toeplitz Matrices and Operators** Nikolaï Nikolski,2020-01-02 A friendly introduction to Toeplitz theory and its applications throughout modern functional analysis *Convolution Operators and Factorization of Almost Periodic Matrix Functions* Albrecht Böttcher,Yuri I. Karlovich,Ilya M. Spitkovsky,2012-12-06 Many problems of the engineering sciences physics and mathematics lead to con volution equations and their various modifications Convolution equations on a half line can be studied by having recourse to the methods and results of the theory of Toeplitz and Wiener Hopf operators Convolutions by integrable kernels have continuous symbols and the Cauchy singular integral operator is the most prominent example of a convolution operator with a piecewise continuous symbol The Fredholm theory of Toeplitz and Wiener Hopf operators with continuous and piecewise continuous matrix symbols is well presented in a series of classical and recent monographs Symbols beyond piecewise continuous symbols have discontinuities of oscillating type Such symbols emerge very naturally For example difference operators are nothing but convolution operators with almost periodic symbols the operator defined by A

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