

# Invariant subspace

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- The whole state space  $\mathbb{R}^n$  and the origin are (trivial) invariant subspaces.
- Problem: given a subspace  $\mathcal{W} \subset \mathbb{R}^n$ , compute the **largest invariant subspace** contained in  $\mathcal{W}$ .
- How do we know that there exists a largest invariant subspace? Invariance is closed under summation of subspaces.
- Algorithm:

$$\begin{aligned}\mathcal{V}_0 &= \mathcal{W}, \\ \mathcal{V}_{k+1} &= \mathcal{V}_k \cap A^{-1}\mathcal{V}_k.\end{aligned}$$

# Invariant Subspaces Invariant Subspaces

**Chester Alan Jacewitz**



## **Invariant Subspaces Invariant Subspaces:**

**Lectures on Invariant Subspaces** Henry Helson, 2013-10-22 Lectures on Invariant Subspaces grew out of a series of lectures given at the University of Uppsala in the spring of 1962 and again in Berkeley the following semester Since the subject is rather loosely defined the lecture style seemed appropriate also for this written version The book is written for a graduate student who knows a little but not necessarily very much about analytic functions and about Hilbert space The book contains 11 lectures and begins with a discussion of analytic functions This is followed by lectures covering invariant subspaces individual theorems invariant subspaces in  $L^p$  invariant subspaces in the line and analytic vector functions Subsequent lectures cover vectorial function theory inner functions range functions and factoring of operator functions

**Invariant Subspaces** Heydar Radjavi, Peter Rosenthal, 2012-12-06 In recent years there has been a large amount of work on invariant subspaces motivated by interest in the structure of non self adjoint of the results have been obtained in operators on Hilbert space Some the context of certain general studies the theory of the characteristic operator function initiated by Livsic the study of triangular models by Brodskii and co workers and the unitary dilation theory of Sz Nagy and Foia Other theorems have proofs and interest independent of any particular structure theory Since the leading workers in each of the structure theories have written excellent expositions of their work cf Sz Nagy Foia 1 Brodskii 1 and Gohberg Krein 1 2 in this book we have concentrated on results independent of these theories We hope that we have given a reasonably complete survey of such results and suggest that readers consult the above references for additional information The table of contents indicates the material covered We have restricted ourselves to operators on separable Hilbert space in spite of the fact that most of the theorems are valid in all Hilbert spaces and many hold in Banach spaces as well We felt that this restriction was sensible since it eases the exposition and since the separable Hilbert space case of each of the theorems is generally the most interesting and potentially the most useful case

*Invariant Subspaces of Matrices with Applications* Israel Gohberg, Peter Lancaster, Leiba Rodman, 1986-01-01 This unique book addresses advanced linear algebra from a perspective in which invariant subspaces are the central notion and main tool It contains comprehensive coverage of geometrical algebraic topological and analytic properties of invariant subspaces The text lays clear mathematical foundations for linear systems theory and contains a thorough treatment of analytic perturbation theory for matrix functions Audience appropriate for students instructors and researchers in applied linear algebra linear systems theory and signal processing Its contents are accessible to readers who have had undergraduate level courses in linear algebra and complex function theory

*Projections onto Translation-Invariant Subspaces of  $L^p(G)$*  Haskell P. Rosenthal, 1966 [Invariant Subspaces and Allied Topics](#) Bhuri Singh Yadav, 1990 **Introduction to Operator Theory and Invariant Subspaces** B.

Beauzamy, 1988-10-01 This monograph only requires of the reader a basic knowledge of classical analysis measure theory analytic functions Hilbert spaces functional analysis The book is self contained except for a few technical tools for which

precise references are given Part I starts with finite dimensional spaces and general spectral theory But very soon Chapter III new material is presented leading to new directions for research Open questions are mentioned here Part II concerns compactness and its applications not only spectral theory for compact operators Invariant Subspaces and Lomonosov's Theorem but also duality between the space of nuclear operators and the space of all operators on a Hilbert space a result which is seldom presented Part III contains Algebra Techniques Gelfand's Theory and application to Normal Operators Here again directions for research are indicated Part IV deals with analytic functions and contains a few new developments A simplified operator oriented version is presented Part V presents dilations and extensions Nagy Foias dilation theory and the author's work about  $C_1$  contractions Part VI deals with the Invariant Subspace Problem with positive results and counter examples In general much new material is presented On the Invariant Subspace Problem the level of research is reached both in the positive and negative directions

### **Invariant Subspaces and Other Topics**

Apostol,Douglas,Nagy,Voiculescu,2013-11-21 The annual Operator Theory conferences in Timișoara are conceived as a means to promote cooperation and exchange of information between specialists in all areas of Operator Theory The present volume consist of papers contributed by the participants of the 1981 Conference Since many of these papers contain results on the invariant subspace problem or are related to the role of invariant subspaces in the study of operators or operator systems we thought it appropriate to mention this in the title of the volume though the other topics have a wide range As in past years special sessions concerning other fields of Functional Analysis were organized at the 1981 Conference but contributions to these sessions are not included in the present volume The research contracts of the Department of Mathematics of INCREST with the National Council for Sciences and Technology of Romania provided the means for developing the research activity in Functional Analysis these contracts constitute the generous framework for these meetings We want also to acknowledge the support of INCREST and the excellent organizing job done by our host University of Timișoara Professor Dumitru Gașpar and Professor Mircea Răchig are among those people in Timișoara who contributed in an essential way to the success of the meeting

Invariant Subspaces 1969 Paul Richard Halmos,1969

### **Weakly Stationary Random**

**Fields, Invariant Subspaces and Applications** Vidyadhar S. Mandrekar,David A. Redett,2017-11-20 The first book to examine weakly stationary random fields and their connections with invariant subspaces an area associated with functional analysis It reviews current literature presents central issues and most important results within the area For advanced Ph D students researchers especially those conducting research on Gaussian theory

Invariant Subspaces of Matrices with Applications Israel Gohberg,Peter Lancaster,Leiba Rodman,2006-03-01 This unique book addresses advanced linear algebra using invariant subspaces as the central notion and main tool It comprehensively covers geometrical algebraic topological and analytic properties of invariant subspaces laying clear mathematical foundations for linear systems theory with a thorough treatment of analytic perturbation theory for matrix functions

*Modern Approaches to the Invariant-Subspace*

*Problem* Isabelle Chalendar, Jonathan R. Partington, 2011-08-18 One of the major unsolved problems in operator theory is the fifty year old invariant subspace problem which asks whether every bounded linear operator on a Hilbert space has a nontrivial closed invariant subspace This book presents some of the major results in the area including many that were derived within the past few years and cannot be found in other books Beginning with a preliminary chapter containing the necessary pure mathematical background the authors present a variety of powerful techniques including the use of the operator valued Poisson kernel various forms of the functional calculus Hardy spaces fixed point theorems minimal vectors universal operators and moment sequences The subject is presented at a level accessible to postgraduate students as well as established researchers It will be of particular interest to those who study linear operators and also to those who work in other areas of pure mathematics

*Invariant Subspaces of Hardy Classes on Infinitely Connected Open Surfaces* Charles W. Neville, 1975

*Invariant Subspaces on the Torus* Chester Alan Jacewitz, 1970

**Lecture on Invariant Subspaces** Henry Helson, 1964

Invariant Subspaces Henry J. Ricardo, 1972

On Chains of Invariant Subspaces José Barriá-Sánchez, 1974

Invariant Subspaces for Linear Operators Allen Richard Bernstein, 1965

**Advances in Invariant Subspaces and Other Results of Operator Theory** Arsene, 2013-11-11 The annual Operator Theory conferences organized by the Department of Mathematics of INC REST and the University of Timi oara are intended to promote cooperation and exchange of information between specialists in all areas of operator theory This volume consists of papers contributed by the participants of the 1984 Conference They reflect a great variety of topics dealt with by the modern operator theory including very recent advances in the invariant subspace problem subalgebras of operator algebras hyponormal Hankel and other special classes of operators spectral decompositions aspects of dilation theory and so on The research contracts of the Department of Mathematics of INCREST with the National Council for Science and Technology of Romania provided the means for developing the research activity in mathematics they represent the generous framework of these meetings too It is our pleasure to acknowledge the financial support of UNESCO which also contributed to the success of this meeting We are indebted to Professor Israel Gohberg for including these Proceedings in the OT Series and for valuable advice in the editing process Birkhauser Verlag was very cooperative in publishing this volume Mariana Bota Camelia Minculescu and Rodica Stoenescu dealt with the difficult task of typing the whole manuscript using a Rank Xerox 860 word processor we thank them for the excellent job they did

**Lectures on Linear Algebra** I. M. Gelfand, 1989-01-01 Prominent Russian mathematician s concise well written exposition considers  $n$  dimensional spaces linear and bilinear forms linear transformations canonical form of an arbitrary linear transformation and an introduction to tensors While not designed as an introductory text the book s well chosen topics brevity of presentation and the author s reputation will recommend it to all students teachers and mathematicians working in this sector

**Some Results on Invariant Subspaces** Vasile Lauric, 1997

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