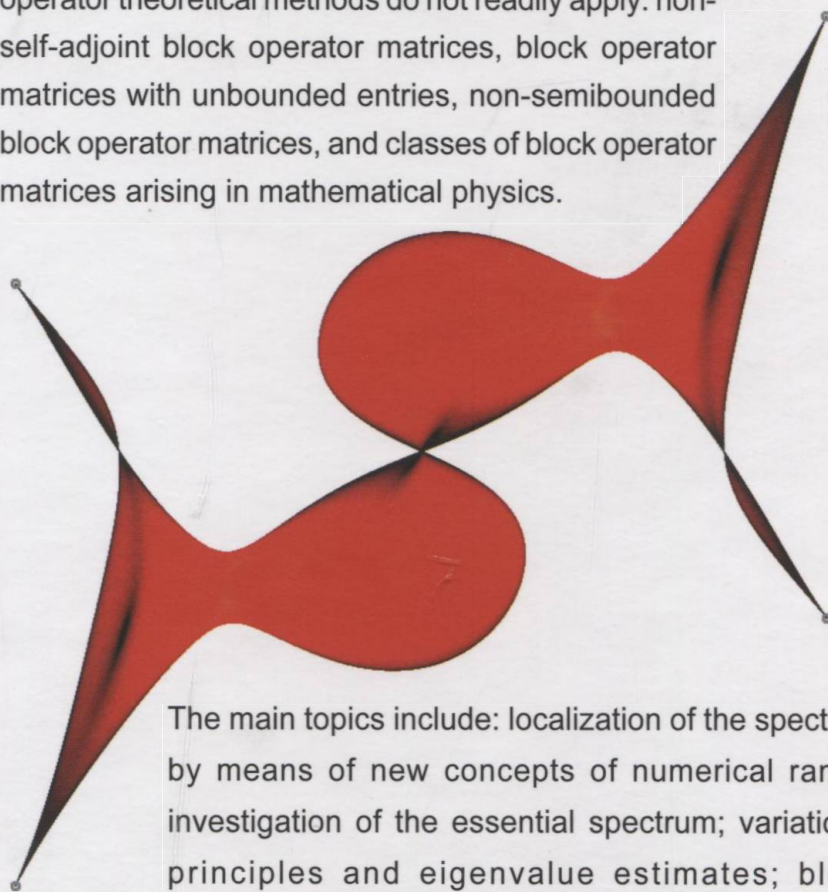


Spectral Theory of Block Operator Matrices and Applications

This book presents a wide panorama of methods to investigate the spectral properties of block operator matrices. Particular emphasis is placed on classes of block operator matrices to which standard operator theoretical methods do not readily apply: non-self-adjoint block operator matrices, block operator matrices with unbounded entries, non-semibounded block operator matrices, and classes of block operator matrices arising in mathematical physics.



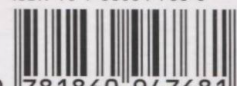
The main topics include: localization of the spectrum by means of new concepts of numerical range; investigation of the essential spectrum; variational principles and eigenvalue estimates; block diagonalization and invariant subspaces; solutions of algebraic Riccati equations; applications to spectral problems from magnetohydrodynamics, fluid mechanics, and quantum mechanics.

Imperial College Press

www.icpress.co.uk

P493 hc

ISBN-13 978-1-86094-768-1
ISBN-10 1-86094-768-9



9 781860 947681

1. Bounded Block Operator Matrices	1
1.1 The quadratic numerical range	1
1.2 Special classes of block operator matrices	11
1.3 Spectral inclusion	18
1.4 Estimates of the resolvent	26
1.5 Corners of the quadratic numerical range	29
1.6 Schur complements and their factorization	35
1.7 Block diagonalization	42
1.8 Spectral supporting subspaces	47
1.9 Variational principles for eigenvalues in gaps	59
1.10 $\mathcal{J}$ -self-adjoint block operator matrices	62
1.11 The block numerical range	70
1.12 Numerical ranges of operator polynomials	82
1.13 Gershgorin's theorem for block operator matrices	86
2. Unbounded Block Operator Matrices	91
2.1 Relative boundedness and relative compactness	91
2.2 Closedness and closability of block operator matrices	99
2.3 Spectrum and resolvent	111
2.4 The essential spectrum	116
2.5 Spectral inclusion	129
2.6 Symmetric and $\mathcal{J}$ -symmetric block operator matrices	142

2.7	Dichotomous block operator matrices and Riccati equations	154
2.8	Block diagonalization and half range completeness	174
2.9	Uniqueness results for solutions of Riccati equations	180
2.10	Variational principles	193
2.11	Eigenvalue estimates	205
3.	Applications in Mathematical Physics	217
3.1	Upper dominant block operator matrices in magnetohydrodynamics	217
3.2	Diagonally dominant block operator matrices in fluid mechanics	222
3.3	Off-diagonally dominant block operator matrices in quantum mechanics	227
	<i>Bibliography</i>	239
	<i>Index</i>	261