

TABLE OF CONTENTS

SECTION 1

INTRODUCTION.	1
1. Organization of the guide	2
2. Accuracy of the EISPACK subroutines	4

SECTION 2

HOW TO USE EISPACK.	5
1. Recommended basic paths in EISPACK.	8
1.1 All eigenvalues and corresponding eigenvectors of a real symmetric band matrix	13
1.2 All eigenvalues of a real symmetric band matrix	15
1.3 Some eigenvalues and corresponding eigenvectors of a real symmetric band matrix	17
1.4 Some eigenvalues of a real symmetric band matrix.	20
1.5 All eigenvalues and corresponding eigenvectors of a generalized real symmetric matrix system	22
1.6 All eigenvalues of a generalized real symmetric matrix system.	24
1.7 Some eigenvalues and corresponding eigenvectors of a generalized real symmetric matrix system	26
1.8 Some eigenvalues of a generalized real symmetric matrix system.	28
1.9 All eigenvalues and corresponding eigenvectors of a generalized real matrix system	30
1.10 All eigenvalues of a generalized real matrix system	32
2. Variations of the recommended EISPACK paths	34
2.1 The QR algorithm for real symmetric band matrices	35
2.2 Variants of the real symmetric generalized eigenproblem	37

3.	Additional information and examples	40
3.1	The representation of the eigenvalues of a generalized real matrix system	41
3.2	Unpacking the eigenvectors of a generalized real matrix system.	43
3.3	The EPS1 parameter.	45
3.4	Possible ill-condition of the generalized real symmetric eigenproblem paths	48
3.5	Higher degree eigenvalue problems	49
3.6	The use of BANDV in solving band systems of linear equations	51
3.7	Additional facilities of the EISPACK control program	52
3.8	Non-zero values of IERR	58
3.9	Examples illustrating the use of the EISPACK subroutines and the control program	60
4.	Singular Value Decomposition with EISPACK	69
4.1	The Singular Value Decomposition and rank estimation.	70
4.2	Subroutines SVD and MINFIT.	72
4.3	The pseudo-inverse of a rectangular matrix.	74
4.4	Least squares solutions of minimal norm	75
4.5	Homogeneous linear equations.	76
SECTION 3		
VALIDATION OF EISPACK		77

SECTION 4		
EXECUTION TIMES FOR EISPACK		80
1.	Tables of execution times	81
2.	Repeatability and reliability of the measured execution times . . .	121
3.	Dependence of the execution times upon the matrix system.	122

4. Extrapolation of timing results to other machines and compilers . . .	124
5. Timing considerations for band problems and singular value decomposition.	126
6. The sample matrices for the timing results.	129

SECTION 5

CERTIFICATION AND AVAILABILITY OF EISPACK	131
---	-----

SECTION 6

DIFFERENCES BETWEEN THE EISPACK SUBROUTINES AND THE HANDBOOK ALGOL PROCEDURES	133
--	-----

SECTION 7

DOCUMENTATION AND SOURCE LISTINGS	135
1. EISPACK subroutines	137
2. EISPACK control program.	314