

PACKAGE ID - 000178I037000 LINPACK

KWIC TITLE - Simultaneous Linear Algebraic Equations

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LIMITATION CODE - UNL **AUDIENCE CODE** - UNL

COMPLETION DATE - 11/01/1988 **PUBLICATION DATE** - 05/02/1982

DESCRIPTION - LINPACK is a collection of FORTRAN subroutines which analyze and solve various classes of systems of simultaneous linear algebraic equations. The collection deals with general, banded, symmetric indefinite, symmetric positive definite, triangular, and tridiagonal square matrices, as well as with least squares problems and the QR and singular value decompositions of rectangular matrices. A subroutine-naming convention is employed in which each subroutine name consists of five letters which represent a coded specification (TXXYY) of the computation done by that subroutine. The first letter, T, indicates the matrix data type. Standard FORTRAN allows the use of three such types: S REAL, D DOUBLE PRECISION, and C COMPLEX. In addition, some FORTRAN systems allow a double-precision complex type: Z COMPLEX*16. The second and third letters of the subroutine name, XX, indicate the form of the matrix or its decomposition: GE General, GB General band, PO Positive definite, PP Positive definite packed, PB Positive definite band, SI Symmetric indefinite, SP Symmetric indefinite packed, HI Hermitian indefinite, HP Hermitian indefinite packed, TR Triangular, GT General tridiagonal, PT Positive definite tridiagonal, CH Cholesky decomposition, QR Orthogonal-triangular decomposition, SV Singular value decomposition. The final two letters, YY, indicate the computation done by the particular subroutine: FA Factor, CO Factor and estimate condition, SL Solve, DI Determinant and/or inverse and/or inertia, DC Decompose, UD Update, DD Downdate, EX Exchange. The LINPACK package also includes a set of routines to perform basic vector operations called the Basic Linear Algebra Subprograms (BLAS).

PACKAGE CONTENTS - Media Directory; Software Abstract; LINPACK User's Guide;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 CD Rom

METHOD OF SOLUTION - Gaussian elimination, Cholesky decomposition, QR, and singular value decomposition methods are used.

COMPUTER - IBM370

OPERATING SYSTEMS - OS/360; OS/370

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PROGRAMMING LANGUAGES - FORTRAN

SOFTWARE LIMITATIONS - There are no subroutines for general sparse matrices or for iterative methods for very large problems.

SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - The LINPACK subroutines contain no machine-dependent constants, input or output statements, character manipulations, COMMON or EQUIVALENCE statements, nor mixed-mode arithmetic. All subroutines except those with names beginning with Z use the portable subset of ANSI FORTRAN. The LINPACK project supports this software in the sense that detailed information on the testing procedures is available, and reports of poor or incorrect performance in conventional FORTRAN operating environments will gain immediate attention from the developers.

OTHER PROG/OPER SYS INFO - The test drivers call a subroutine TRAPS to set the number of underflows permitted. The call is TRAPS (I1,I2,I3,I4,I5) where I1 should be set to zero, I2 is the number of floating-point overflows permitted, I3 is the number of floating-point underflows permitted, I4 is the number of fixed-point divides by zero permitted, and I5 is the number of floating-point divides by zero permitted. Each installation will have to provide a subroutine TRAPS, which in turn, should call the local error handling routine which should be set to permit a large number of underflows (5000). If the error-handling procedures are determined by the operating system control language this will have to be set appropriately and a dummy subroutine TRAPS supplied. TRAPS is the standard routine used in WATFIV. On the IBM360,370 the routine is ERRSET. The sample problems, or testing aids, have been run at various computer installations using a variety of compiler and operating systems.

HARDWARE REQS - The entire coefficient matrix will usually be stored in the computer memory, although there are provisions for band matrices and for row-by-row processing of large rectangular matrices. 240K bytes of storage are required for execution of a typical sample problem on the IBM360,370 system.

TIME REQUIREMENTS - Running time varies with problem size. NESC executed each test case in about 8 seconds on an IBM370/195 and DEC STATION 3100.

REFERENCES - J.J. Dongarra, J.R. Bunch, C.B. Moler, G.W. Stewart, LINPACK User's Guide, Society for Industrial and Applied Mathematics, Philadelphia, Pennsylvania, 1979\ J.J. Dongarra and G.W. Stewart, LINPACK Working Note 15: LINPACK-A Package for Solving Linear Systems, ANL-82-30, May 1982; J.J. Dongarra and C.B. Moler, LINPACK Working Note 13: Implementation Guide for LINPACK, ANL-80-105, October 1980; Chuck L. Lawson, Richard J. Hanson, David

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REFERENCES - (CONT) R. Kincaid, and Fred T. Krough, Basic Linear Algebra Subprograms for FORTRAN Usage, SAND77-0898, October 1977 (also published in Association for Computing Machinery, Transactions on Mathematical Software, Vol. 5, No. 3, pp. 308- 323, September 1979).

ABSTRACT STATUS - Abstract first distributed February 1979. LINPACK submitted January 1979, revised March 1979, sample problems executed by NESC January 1979 on an IBM370/195 and an IBM3033.

SUBJECT CLASS CODE - P

KEYWORDS -

L CODES
COMPUTER PROGRAM DOCUMENTATION
MATRICES
FORTRAN
ITERATIVE METHODS
ALGEBRA

EDB SUBJECT CATEGORIES -
990200

SPONSOR - DOE/ER

PACKAGE TYPE - TESTED