

PACKAGE ID - 000895MLTPL00 BLOCKSOLVE

KWIC TITLE - Scalable Library for the Parallel Solution of
Sparse Linear Systems

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

COMPLETION DATE - 03/01/1992 **PUBLICATION DATE** - 03/01/1993

DESCRIPTION - BlockSolve is a scalable parallel software library for the solution of large sparse, symmetric systems of linear equations. It runs on a variety of parallel architectures and can easily be ported to others. BlockSolve is primarily intended for the solution of sparse linear systems that arise from physical problems having multiple degrees of freedom at each node point. For example, when the finite element method is used to solve practical problems in structural engineering, each node will typically have anywhere from 3-6 degrees of freedom associated with it. BlockSolve is written to take advantage of problems of this nature; however, it is still reasonably efficient for problems that have only one degree of freedom associated with each node, such as the three-dimensional Poisson problem. It does not require that the matrices have any particular structure other than being sparse and symmetric. BlockSolve is intended to be used within real application codes. It is designed to work best in the context of our experience which indicated that most application codes solve the same linear systems with several different right-hand sides and/or linear systems with the same structure, but different matrix values multiple times.

PACKAGE CONTENTS - Media Directory; Software Abstract; ANL-92/46; Media Includes Source Code, User Guide, Compilation and Linking Instructions, Sample Problem Input Data, Programmer Documentation;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - BlockSolve utilizes the preconditioned conjugate gradient algorithm for the symmetric positive definite matrices and the preconditioned SYMMLQ algorithm for symmetric indefinite matrices. The user has the option of selecting a combination of four preconditioners: a simple diagonal scaling of the matrix, incomplete Cholesky factorization, SSOR, and block Jacobi (where the blocks are the cliques of the graph associated with the sparse matrix.) Diagonally scaling the matrix, whether or not one of the other preconditioners is selected, is recommended.

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COMPUTER - MLT-PLTFM

OPERATING SYSTEMS - Intel NX and Unix; it is largely operating system dependent.

PROGRAMMING LANGUAGES - C

SOFTWARE LIMITATIONS - Each row of the matrix must be a diagonal entry, which may be zero, but must be explicitly represented in the matrix structure. If the matrix is indefinite, it is not possible to solve for a block of vectors simultaneously in the current release. If there is sufficient demand, this feature will be added. BlockSolve does not check for nor catch exceptions associated with floating-point errors.

SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - This is believed to be the only publicly-available software capable of solving general, sparse, symmetric systems of linear equations.

RELATED SOFTWARE - BlockSolve needs access to three other software libraries: LAPACK, BLAS 1, 2, and 3, and the Argonne Chameleon software.

HARDWARE REQS - There is no minimum amount of memory necessary to run the package; this is determined solely by the size of the problem the user passes to BlockSolve.

TIME REQUIREMENTS - The processing time required is determined by the size and type of problem the user passes to BlockSolve.

REFERENCES - Jones, M, Plassmann, P.E., BlockSolve v1.1: Scalable Library Software for the Parallel Solution of Sparse Linear Systems, ANL-92/46, May 1993.

ABSTRACT STATUS - Released AS-IS 8/3/95

SUBJECT CLASS CODE - P

KEYWORDS -

COMPUTER PROGRAM DOCUMENTATION
B CODES
PARALLEL PROCESSING
MATRICES
NUMERICAL SOLUTION
ALGORITHMS

EDB SUBJECT CATEGORIES -
990200

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SOFTWARE ABSTRACT

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DATE 03/08/2002

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SPONSOR - DOE/ER

PACKAGE TYPE - AS - IS