

PACKAGE SPECIFICATION

HSL ARCHIVE

Warning: Subroutine MC04 performs functions which are adequately treated by routines in other standard subroutine libraries (for example, LAPACK). The use of this routine is not recommended, and it may be removed from future releases of this library.

1 SUMMARY

To transform by Householders method, a **real symmetric matrix to a tri-diagonal matrix** which has the same eigenvalues, i.e. given an m × m symmetric matrix $\mathbf{A}=\mathbf{A}^{T}$ with eigenvalues λ defined by $\mathbf{A}\mathbf{x}=\lambda\mathbf{x}$, transforms A to the matrix

$$\mathbf{T} = \begin{bmatrix} \alpha_1 & \beta_2 \\ \beta_2 & \alpha_2 & \beta_3 \\ & \beta_3 & \alpha_3 & \beta_4 \\ & * & * & * \\ & & & \beta_{m-1} & \alpha_{m-1} & \beta_m \\ & & & & & & \beta_m & \alpha_m \end{bmatrix}$$

such that $Tu = \lambda u$ defines the same eigenvalues.

ATTRIBUTES — Version: 1.0.0. Types: MC04B; MC04BD. Original date: February 1966. Origin: J.K.Reid, Harwell.

2 HOW TO USE THE PACKAGE

2.1 The argument list

The single precision version

CALL MC04B(A, ALPHA, BETA, M, IA, WORK)

The double precision version

CALL MC04BD(A, ALPHA, BETA, M, IA, WORK)

A is a REAL (DOUBLE PRECISION in the D version) two dimensional array of first dimension IA in which the user must set the elements of the real symmetric matrix $\mathbf{A} = \{a_{ij}\}$.

Only the lower triangle elements A(I,J), $I \ge J$ need be set and these are not overwritten by the subroutine. The elements of the upper triangle are used as work space and will contain information on return.

- ALPHA is a REAL (DOUBLE PRECISION in the D version) array of length at least *m* and is set by the subroutine to the diagonal elements α_i , i=1,2,...,m of the tri-diagonal matrix **T**.
- BETA is a REAL (DOUBLE PRECISION in the D version) array of length at least *m* which is set by the subroutine to the off-diagonal elements β_i , i=2,3,...,m of the tri-diagonal matrix **T**.
- M is an INTEGER variable which must be set by the user to *m* the order of the matrix.
- IA is an INTEGER variable which must be set by the user to the first dimension of the array A.
- WORK is a REAL (DOUBLE PRECISION in the D version) array of length at least *m* which is used by the subroutine as workspace.

3 GENERAL INFORMATION

Use of common: None.

Workspace: See argument WORK.

Other routines called directly: None.

Input/output: None.

4 METHOD

The method is that of Householder described in J.H.Wilkinson, Numerische Mathematik, December 1962.