Author(s) : TC
Submitter : C. Letertre
Language : Fortran

Library: KERNLIB
Submitted: 01.08.1969
Revised: 07.03.1989

TC Matrix Manipulation Package

OBSOLETE

Please note that this routine has been obsoleted in CNL 194. Users are advised not to use it any longer and to replace it in older programs. No maintenance for it will take place and it will eventually disappear.

Suggested replacement: `RVADD` (F002), `RMADD` (F003), `RMMLT` (F004)

The routines of `MXPACK` compute the product of two matrices or the product of their transposed matrices and may add or subtract to the resultant matrix a third one, add or subtract one matrix from another, or transfer a matrix, its negative, or a multiple of it, transpose a given matrix, build up a unit matrix, multiply a matrix by a diagonal (from left or from right) and may add the result to another matrix, add to square matrix the multiple of a diagonal matrix, compute the products $\mathbf{X} = \mathbf{ABA}'$ ($\mathbf{A}'$ denotes the transpose of $\mathbf{A}$) and $\mathbf{X} = \mathbf{A}'\mathbf{BA}$. It is assumed that matrices are stored **row-wise without gaps**, contrary to the Fortran convention.

Structure:

`SUBROUTINE` subprograms
User Entry Names: `MXMAD`, `MXMAD1`, `MXMAD2`, `MXMAD3`, `MXMPY`, `MXMPY1`, `MXMPY2`, `MXMPY3`, `MXMUB`, `MXMUB1`, `MXMUB2`, `MXMUB3`, `MXTRP`, `MXUTY`, `MXMLRT`, `MXMLTR`

Usage:

Matrix Multiplication

`CALL MXMPY(A,B,C,NI,NJ,NK)`	$(A_{ij})(B_{jk}) \rightarrow (C_{ik})$
`CALL MXMPY1(A,Q,C,NI,NJ,NK)`	$\mathbf{AQ}' \rightarrow \mathbf{C}$ ($\mathbf{Q}$ is `NK` $\times$ `NJ`)
`CALL MXMPY2(P,B,C,NI,NJ,NK)`	$\mathbf{P}'\mathbf{B} \rightarrow \mathbf{C}$ ($\mathbf{P}$ is `NJ` $\times$ `NI`)
`CALL MXMPY3(P,Q,C,NI,NJ,NK)`	$\mathbf{P}'\mathbf{Q}' \rightarrow \mathbf{C}$

If `NJ` $=$ `0`, $\mathbf{C}$ will be filled with zeros.

Matrix Multiplication and Addition

`CALL MXMAD(A,B,C,NI,NJ,NK)`	$(A_{ij})(B_{jk}) + (C_{ik}) \rightarrow (C_{ik})$
`CALL MXMAD1(A,Q,C,NI,NJ,NK)`	$\mathbf{AQ}' + \mathbf{C} \rightarrow \mathbf{C}$
`CALL MXMAD2(P,B,C,NI,NJ,NK)`	$\mathbf{P}'\mathbf{B} + \mathbf{C} \rightarrow \mathbf{C}$
`CALL MXMAD3(P,Q,C,NI,NJ,NK)`	$\mathbf{P}'\mathbf{Q}' + \mathbf{C} \rightarrow \mathbf{C}$

If `NJ` $=$ `0`, $\mathbf{C}$ will not be changed.

Matrix Multiplication and Subtraction

```
CALL MXMUB(A,B,C,NI,NJ,NK)
```
$(A_{ij})(B_{jk}) - (C_{ik}) \to (C_{ik})$

```
CALL MXMUB1(A,Q,C,NI,NJ,NK)
```
$\mathbf{AQ}' - \mathbf{C} \to \mathbf{C}$

```
CALL MXMUB2(P,B,C,NI,NJ,NK)
```
$\mathbf{P}'\mathbf{B} - \mathbf{C} \to \mathbf{C}$

```
CALL MXMUB3(P,Q,C,NI,NJ,NK)
```
$\mathbf{P}'\mathbf{Q}' - \mathbf{C} \to \mathbf{C}$

If `NJ` $= 0$, $\mathbf{C}$ will be replaced by $-\mathbf{C}$.

Matrix Transposition

```
CALL MXTRP(A,B,NI,NJ)
```
$(A_{ij}) \to (B_{ji})$

Unity Matrix

```
CALL MXUTY(A,NI)
```
$(A_{ii}) = 1;\ (A_{ij}) = 0,\ (i \neq j)$

Matrix Multiplication

```
CALL MXMLRT(A,B,X,M,N)
```
$\mathbf{A}[m \times n]\,\mathbf{B}[n \times n]\,\mathbf{A}'[n \times m] \to \mathbf{X}[m \times m]$

```
CALL MXMLTR(A,B,X,N,M)
```
$\mathbf{A}'[n \times m]\,\mathbf{B}[m \times m]\,\mathbf{A}[m \times n] \to \mathbf{X}[n \times n]$

Notes:

In the formulae above, (A_{ij}) *etc* denotes the ensemble of elements of the matrix $\mathbf{A}$ *etc* with the row index i and the column index j. The Fortran variables `NI`, `NJ` and `NK` specify the dimensions associated with the indices i, j and k. If `DIMENSION A(NJ,NI)` reserves space for the matrix $\mathbf{A}$, then the element A_{ij} is contained in `A(J,I)`.

•