

NAG Library Routine Document

F06QXF

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of *bold italicised* terms and other implementation-dependent details.

1 Purpose

F06QXF applies a sequence of plane rotations to a real rectangular matrix.

2 Specification

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SUBROUTINE F06QXF (SIDE, PIVOT, DIRECT, M, N, K1, K2, C, S, A, LDA)
INTEGER           M, N, K1, K2, LDA
REAL (KIND=nag_wp) C(K2-1), S(K2-1), A(LDA,*)
CHARACTER(1)     SIDE, PIVOT, DIRECT
```

3 Description

F06QXF performs the transformation

$$A \leftarrow PA \quad \text{or} \quad A \leftarrow AP^T,$$

where A is an m by n real matrix and P is a real orthogonal matrix, defined as a sequence of plane rotations, P_k , applied in planes k_1 to k_2 .

The 2 by 2 plane rotation part of P_k is assumed to have the form

$$\begin{pmatrix} c_k & s_k \\ -s_k & c_k \end{pmatrix}.$$

4 References

None.

5 Arguments

- 1: SIDE – CHARACTER(1) *Input*
On entry: specifies whether A is operated on from the left or the right.
 SIDE = 'L'
 A is pre-multiplied from the left.
 SIDE = 'R'
 A is post-multiplied from the right.
Constraint: SIDE = 'L' or 'R'.
- 2: PIVOT – CHARACTER(1) *Input*
On entry: specifies the plane rotated by P_k .
 PIVOT = 'V' (variable pivot)
 P_k rotates the $(k, k + 1)$ plane.
 PIVOT = 'T' (top pivot)
 P_k rotates the $(k_1, k + 1)$ plane.

- PIVOT = 'B' (bottom pivot)
 P_k rotates the (k, k_2) plane.
 Constraint: PIVOT = 'V', 'T' or 'B'.
- 3: DIRECT – CHARACTER(1) *Input*
On entry: specifies the sequence direction.
 DIRECT = 'F' (forward sequence)
 $P = P_{k_2-1} \cdots P_{k_1+1} P_{k_1}$.
 DIRECT = 'B' (backward sequence)
 $P = P_{k_1} P_{k_1+1} \cdots P_{k_2-1}$.
 Constraint: DIRECT = 'F' or 'B'.
- 4: M – INTEGER *Input*
On entry: m , the number of rows of the matrix A .
 If $M < 1$, an immediate return is effected.
 Constraint: $M \geq 0$.
- 5: N – INTEGER *Input*
On entry: n , the number of columns of the matrix A .
 If $N < 1$, an immediate return is effected.
 Constraint: $N \geq 0$.
- 6: K1 – INTEGER *Input*
 7: K2 – INTEGER *Input*
On entry: the values k_1 and k_2 .
 If $K1 < 1$ or $K2 \leq K1$, or SIDE = 'L' and $K2 > M$, or SIDE = 'R' and $K2 > N$, an immediate return is effected.
- 8: C(K2 – 1) – REAL (KIND=nag_wp) array *Input*
On entry: $C(k)$ must hold c_k , the cosine of the rotation P_k , for $k = k_1, \dots, k_2 - 1$.
- 9: S(K2 – 1) – REAL (KIND=nag_wp) array *Input*
On entry: $S(k)$ must hold s_k , the sine of the rotation P_k , for $k = k_1, \dots, k_2 - 1$.
- 10: A(LDA, *) – REAL (KIND=nag_wp) array *Input/Output*
Note: the second dimension of the array A must be at least N .
On entry: the m by n matrix A .
On exit: the transformed matrix A .
- 11: LDA – INTEGER *Input*
On entry: the first dimension of the array A as declared in the (sub)program from which F06QXF is called.
 Constraint: $LDA \geq \max(1, M)$.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

F06QXF is not threaded in any implementation.

9 Further Comments

None.

10 Example

None.
