

NAG Library Routine Document

F06QMF

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

F06QMF performs an orthogonal similarity transformation (as a sequence of plane rotations) of a real symmetric matrix.

2 Specification

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SUBROUTINE F06QMF (UPLO, PIVOT, DIRECT, N, K1, K2, C, S, A, LDA)
  INTEGER          N, K1, K2, LDA
  REAL (KIND=nag_wp) C(*), S(*), A(LDA,*)
  CHARACTER(1)    UPLO, PIVOT, DIRECT
```

3 Description

F06QMF performs the transformation

$$A \leftarrow PAP^T$$

where A is an n by n real symmetric 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: UPLO – CHARACTER(1) *Input*
On entry: specifies whether the upper or lower triangular part of A is stored.
 UPLO = 'U'
 The upper triangular part of A is stored.
 UPLO = 'L'
 The lower triangular part of A is stored.
Constraint: UPLO = 'U' or 'L'.
- 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: N – INTEGER *Input*
On entry: n , the order of the matrix A .
Constraint: $N \geq 0$.
- 5: K1 – INTEGER *Input*
 6: K2 – INTEGER *Input*
On entry: the values k_1 and k_2 .
 If $K1 < 1$ or $K2 \leq K1$ or $K2 > N$, an immediate return is effected.
- 7: C(*) – REAL (KIND=nag_wp) array *Input*
Note: the dimension of the array C must be at least $K2 - K1$.
On entry: $C(k)$ must hold c_k , the cosine of the rotation P_k , for $k = k_1, \dots, k_2 - 1$.
- 8: S(*) – REAL (KIND=nag_wp) array *Input*
Note: the dimension of the array S must be at least $K2 - K1$.
On entry: $S(k)$ must hold s_k , the sine of the rotation P_k , for $k = k_1, \dots, k_2 - 1$.
- 9: A(LDA,*) – REAL (KIND=nag_wp) array *Input/Output*
Note: the second dimension of the array A must be at least $\max(1, N)$.
On entry: the n by n symmetric matrix A .
 If UPLO = 'U', the upper triangular part of A must be stored and the elements of the array below the diagonal are not referenced.
 If UPLO = 'L', the lower triangular part of A must be stored and the elements of the array above the diagonal are not referenced.
On exit: the transformed matrix A .
- 10: LDA – INTEGER *Input*
On entry: the first dimension of the array A as declared in the (sub)program from which F06QMF is called.
Constraint: $LDA \geq \max(1, N)$.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

F06QMF is not threaded in any implementation.

9 Further Comments

None.

10 Example

None.
