NAG C Library Function Document

nag_dsy_norm (f16rcc)

1 Purpose

nag_dsy_norm (f16rcc) calculates the value of the 1-norm, the infinity-norm, the Frobenius norm, or the maximum absolute value of the elements, of a real n by n symmetric matrix.

2 Specification

```
void nag_dsy_norm (Nag_OrderType order, Nag_NormType norm, Nag_UploType uplo,
     Integer n, const double a[], Integer pda, double *r, NagError *fail)
```

3 Description

Given a real n by n symmetric matrix, A, nag_dsy_norm (f16rcc) calculates one of the values given by

$$||A||_1 = \max_j \sum_{i=1}^{n} |a_{ij}|,$$

$$||A||_\infty = \max_i \sum_{j=1}^{n} |a_{ij}|,$$

$$||A||_F = \left(\sum_{i=1}^{n} \sum_{j=1}^{n} |a_{ij}|^2 \right)^{1/2},$$

$$\max_{i,j} |a_{ij}|.$$

Note that, since A is symmetric, $||A||_1 = ||A||_\infty$.

4 References

The BLAS Technical Forum Standard (2001) *www.netlib.org/blas/blast-forum*

5 Parameters

1: **order** – Nag_OrderType *Input*

On entry: the **order** parameter specifies the two-dimensional storage scheme being used, i.e., row-major ordering or column-major ordering. C language defined storage is specified by **order** = **Nag_RowMajor**. See Section 2.2.1.4 of the Essential Introduction for a more detailed explanation of the use of this parameter.

Constraint: **order** = **Nag_RowMajor** or **Nag_ColMajor**.

2: **norm** – Nag_NormType *Input*

On entry: specifies the value to be returned:

if **norm** = **Nag_OneNorm**, the 1-norm;

if **norm** = **Nag_InfNorm**, the infinity-norm;

if **norm** = **Nag_FrobeniusNorm**, the Frobenius (or Euclidean) norm;

if **norm** = **Nag_MaxNorm**, the value $\max_{i,j} |a_{ij}|$ (not a norm).

Constraint: **norm** = **Nag_OneNorm**, **Nag_InfNorm**, **Nag_FrobeniusNorm** or **Nag_MaxNorm**.

3: **uplo** – Nag_UploType *Input*

On entry: specifies whether the upper or lower triangular part of A is stored as follows:

if **uplo** $=$ **Nag_Upper**, the upper triangular part of A is stored;

if **uplo** $=$ **Nag_Lower**, the lower triangular part of A is stored.

Constraint: **uplo** $=$ **Nag_Upper** or **Nag_Lower**.

4: **n** – Integer *Input*

On entry: n, the order of the matrix A.

Constraint: **n** ≥ 0.

5: **a**$[dim]$ – const double *Input*

Note: the dimension, dim, of the array **a** must be at least $\max(1, \textbf{pda} \times \textbf{n})$.

If **order** $=$ **Nag_ColMajor**, the (i,j)th element of the matrix A is stored in **a**$[(j-1) \times \textbf{pda} + i - 1]$ and if **order** $=$ **Nag_RowMajor**, the (i,j)th element of the matrix A is stored in **a**$[(i-1) \times \textbf{pda} + j - 1]$.

On entry: the n by n symmetric matrix A. If **uplo** $=$ **Nag_Upper**, the upper triangle of A must be stored and the elements of the array below the diagonal are not referenced; if **uplo** $=$ **Nag_Lower**, the lower triangle of A must be stored and the elements of the array above the diagonal are not referenced.

6: **pda** – Integer *Input*

On entry: the stride separating matrix row or column elements (depending on the value of **order**) in the array **a**.

Constraint: **pda** $\geq \max(1, \textbf{n})$.

7: **r** – double * *Output*

On exit: the value of the norm specified by **norm**.

8: **fail** – NagError * *Input/Output*

The NAG error parameter (see the Essential Introduction).

6 Error Indicators and Warnings

NE_INT

On entry, **n** $= \langle value \rangle$.
Constraint: **n** ≥ 0.

On entry, **pda** $= \langle value \rangle$.
Constraint: **pda** $\geq \max(1, \textbf{n})$.

NE_BAD_PARAM

On entry, parameter $\langle value \rangle$ had an illegal value.

7 Accuracy

The BLAS standard requires accurate implementations which avoid unnecessary over/underflow (see section 2.7 of The BLAS Technical Forum Standard (2001)).

8 Further Comments

None.

9 Example

See Section 9 of the documents for nag_dpocon (f07fgc) and nag_dsycon (f07mgc).