

NAG C Library Function Document

nag_zsp_norm (f16ugc)

1 Purpose

nag_zsp_norm (f16ugc) calculates the value of the 1-norm, the infinity-norm, the Frobenius norm, or the maximum absolute value of the elements, of a complex n by n symmetric matrix, stored in packed form.

2 Specification

```
void nag_zsp_norm (Nag_OrderType order, Nag_NormType norm, Nag_UploType uplo,
                  Integer n, const Complex ap[], double *r, NagError *fail)
```

3 Description

Given a complex n by n symmetric matrix, A , in packed storage, nag_zsp_norm (f16ugc) 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: $n \geq 0$.

5: **ap**[*dim*] – const Complex *Input*

Note: the dimension, *dim*, of the array **ap** must be at least $\max(1, n \times (n + 1)/2)$.

On entry: the n by n symmetric matrix A , packed by rows or columns. The storage of elements a_{ij} depends on the **order** and **uplo** parameters as follows:

if **order** = **Nag_ColMajor** and **uplo** = **Nag_Upper**,
 a_{ij} is stored in **ap**[($j - 1$) \times $j/2 + i - 1$], for $i \leq j$;

if **order** = **Nag_ColMajor** and **uplo** = **Nag_Lower**,
 a_{ij} is stored in **ap**[($2n - j$) \times ($j - 1$)/2 + $i - 1$], for $i \geq j$;

if **order** = **Nag_RowMajor** and **uplo** = **Nag_Upper**,
 a_{ij} is stored in **ap**[($2n - i$) \times ($i - 1$)/2 + $j - 1$], for $i \leq j$;

if **order** = **Nag_RowMajor** and **uplo** = **Nag_Lower**,
 a_{ij} is stored in **ap**[($i - 1$) \times $i/2 + j - 1$], for $i \geq j$.

6: **r** – double * *Output*

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

7: **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: $n \geq 0$.

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 document for nag_zspcon (f07quc).
