NAG C Library Function Document

nag_zhp_norm (f16udc)

1   Purpose

nag_zhp_norm (f16udc) 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 Hermitian matrix, stored in packed form.

2   Specification

```
void nag_zhp_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 Hermitian matrix, A, in packed storage, nag_zhp_norm (f16udc) 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 $\max\limits_{i,j} |a_{ij}|$ (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: $\mathbf{n} \geq 0$.

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

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

On entry: the n by n Hermitian 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, $\mathbf{n} = \langle value \rangle$.
Constraint: $\mathbf{n} \geq 0$.

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 documents for nag_zppcon (f07guc) and nag_zhpcon (f07puc).