NAG C Library Function Document

nag_zhe_norm (f16ucc)

1 Purpose

nag_zhe_norm (f16ucc) 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.

2 Specification

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

3 Description

Given a complex $n$ by $n$ Hermitian matrix, $A$, nag_zhe_norm (f16ucc) 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


5 Parameters

1:  order – Nag_OrderType  

   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  

   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;

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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: a[dim] – const Complex

*Input*

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

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

*On entry:* the $n$ by $n$ Hermitian 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:** $pda \geq \max(1, n)$.

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, $n = \langle \text{value} \rangle$.

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

On entry, $pda = \langle \text{value} \rangle$.

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

**NE_BAD_PARAM**

On entry, parameter $\langle \text{value} \rangle$ 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_zpocon (f07fuc) and nag_zhecon (f07muc).