NAG C Library Function Document

nag_zgb_norm (f16ubc)

1 Purpose

nag_zgb_norm (f16ubc) calculates the value of the 1-norm, the infinity-norm, the Frobenius norm, or the maximum absolute value of the elements, of a complex $m$ by $n$ band matrix.

2 Specification

```c
void nag_zgb_norm (Nag_OrderType order, Nag_NormType norm, Integer m, Integer n,   Integer kl, Integer ku, const Complex ab[], Integer pdab, double *r,   NagError *fail)
```

3 Description

Given a complex $m$ by $n$ band matrix, $A$, nag_zgb_norm (f16ubc) calculates one of the values given by

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

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

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

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

4 References


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`. 
m – Integer

On entry: m, the number of rows of the matrix A.
Constraint: m \geq 0.

n – Integer

On entry: n, the number of columns of the matrix A.
Constraint: n \geq 0.

kl – Integer

On entry: kl, the number of sub-diagonals within the band of A.
Constraint: kl \geq 0.

ku – Integer

On entry: ku, the number of super-diagonals within the band of A.
Constraint: ku \geq 0.

ab[dim] – const Complex

Note: the dimension, dim, of the array ab must be at least max(1, pdab \times n) when order = Nag_ColMajor and at least max(1, pdab \times m) when order = Nag_RowMajor.

On entry: the m by n matrix A. This is stored as a notional two-dimensional array with row elements or column elements stored contiguously. The storage of elements a_{ij}, for i = 1, \ldots, m and j = \max(1, i - k_l), \ldots, \min(n, i + k_u), depends on the order parameter as follows:
- if order = Nag_ColMajor, a_{ij} is stored as ab[(j - 1) \times pdab + kl + ku + i - j];
- if order = Nag_RowMajor, a_{ij} is stored as ab[(i - 1) \times pdab + kl + j - i].

pdab – Integer

On entry: the stride separating row or column elements (depending on the value of order) of the matrix A in the array ab.
Constraint: pdab \geq kl + ku + 1.

r – double *

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

fail – NagError *

The NAG error parameter (see the Essential Introduction).

6 Error Indicators and Warnings

NE_INT

On entry, m = \langle value \rangle.
Constraint: m \geq 0.

On entry, n = \langle value \rangle.
Constraint: n \geq 0.

On entry, kl = \langle value \rangle.
Constraint: kl \geq 0.

On entry, ku = \langle value \rangle.
Constraint: ku \geq 0.
On entry, \( p\text{dab} = \langle \text{value} \rangle \).
Constraint: \( p\text{dab} \geq k_l + k_u + 1 \).

**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

None.