1 Purpose

nag_zge_norm (f16uac) calculates the value of the 1-norm, the infinity-norm the Frobenius norm, or the maximum absolute value of the elements, of a complex \( m \times n \) matrix.

2 Specification

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

3 Description

Given a complex \( m \times n \) matrix, \( A \), nag_zge_norm (f16uac) 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

The BLAS Technical Forum Standard (2001)  \( \text{www.netlib.org/blas/blast-forum} \)

5 Parameters

1: \( \text{order} \) – Nag_OrderType  
   \( \text{Input} \)
   
   \( \text{On entry:} \) the \( \text{order} \) 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 \( \text{order} = \text{Nag_RowMajor} \). See Section 2.2.1.4 of the Essential Introduction for a more detailed explanation of the use of this parameter.
   
   \( \text{Constraint:} \ \text{order} = \text{Nag_RowMajor} \) or \( \text{Nag_ColMajor} \).

2: \( \text{norm} \) – Nag_NormType  
   \( \text{Input} \)
   
   \( \text{On entry:} \) specifies the value to be returned:
   
   if \( \text{norm} = \text{Nag_OneNorm} \), the 1-norm;
   
   if \( \text{norm} = \text{Nag_InfNorm} \), the infinity-norm;
   
   if \( \text{norm} = \text{Nag_FrobeniusNorm} \), the Frobenius (or Euclidean) norm;
   
   if \( \text{norm} = \text{Nag_MaxNorm} \), the value \( \max_{i,j} |a_{ij}| \) (not a norm).
   
   \( \text{Constraint:} \ \text{norm} = \text{Nag_OneNorm}, \text{Nag_InfNorm}, \text{Nag_FrobeniusNorm} \) or \( \text{Nag_MaxNorm} \).
3: m – Integer
   On entry: m, the number of rows of the matrix A.
   Constraint: m ≥ 0.

4: n – Integer
   On entry: n, the number of columns of the matrix A.
   Constraint: n ≥ 0.

5: a[dim] – const Complex
   Note: the dimension, dim, of the array a must be at least
   max(1, pda × n) when order = Nag_ColMajor and at least
   max(1, pda × m) when order = Nag_RowMajor.
   If order = Nag_ColMajor, the (i, j)th element of the matrix A is stored in
   a[(j - 1) × pda + i - 1] and if order = Nag_RowMajor, the (i, j)th element of the matrix A is stored in
   a[(i - 1) × pda + j - 1].
   On entry: the m by n matrix A.

6: pda – Integer
   On entry: the stride separating matrix row or column elements (depending on the value of order) in
   the array a.
   Constraints:
   if order = Nag_ColMajor, pda ≥ max(1, m);
   if order = Nag_RowMajor, pda ≥ max(1, n).

7: r – double *
   On exit: the value of the norm specified by norm.

8: fail – NagError *
   The NAG error parameter (see the Essential Introduction).

6 Error Indicators and Warnings

NE_INT
   On entry, m = ⟨value⟩.
   Constraint: m ≥ 0.
   On entry, n = ⟨value⟩.
   Constraint: n ≥ 0.
   On entry, pda = ⟨value⟩.
   Constraint: pda ≥ max(1, m).
   On entry, pda = ⟨value⟩.
   Constraint: pda ≥ max(1, n).

NE_BAD_PARAM
   On entry, parameter ⟨value⟩ 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_zgecon (f07auc) and nag_ztrsna (f08qyc).