NAG C Library Function Document

nag_zsy_norm (f16ufc)

1 Purpose
nag_zsy_norm (f16ufc) 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.

2 Specification

```c
void nag_zsy_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 \( n \) symmetric matrix, \( A \), nag_zsy_norm (f16ufc) 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

   *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 \( \text{norm} = \text{Nag\_MaxNorm} \), the value \( \max_{i,j} |a_{ij}| \) (not a norm).

**Constraint:** \( \text{norm} = \text{Nag\_OneNorm}, \text{Nag\_InfNorm}, \text{Nag\_FrobeniusNorm} \) or \( \text{Nag\_MaxNorm} \).

3: \( \text{uplo} \) – Nag\_UploType 
   *Input*
   
   On entry: specifies whether the upper or lower triangular part of \( A \) is stored as follows:
   
   - if \( \text{uplo} = \text{Nag\_Upper} \), the upper triangular part of \( A \) is stored;
   - if \( \text{uplo} = \text{Nag\_Lower} \), the lower triangular part of \( A \) is stored.

**Constraint:** \( \text{uplo} = \text{Nag\_Upper} \) or \( \text{Nag\_Lower} \).

4: \( n \) – Integer 
   *Input*
   
   On entry: \( n \), the order of the matrix \( A \).

**Constraint:** \( n \geq 0 \).

5: \( \text{a}[\text{dim}] \) – const Complex 
   *Input*

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

   If \( \text{order} = \text{Nag\_ColMajor} \), the \( (i,j) \)th element of the matrix \( A \) is stored in \( \text{a}[(j-1) \times \text{pda} + i - 1] \) and if \( \text{order} = \text{Nag\_RowMajor} \), the \( (i,j) \)th element of the matrix \( A \) is stored in \( \text{a}[(i-1) \times \text{pda} + j - 1] \).

   On entry: the \( n \) by \( n \) symmetric matrix \( A \). If \( \text{uplo} = \text{Nag\_Upper} \), the upper triangle of \( A \) must be stored and the elements of the array below the diagonal are not referenced; if \( \text{uplo} = \text{Nag\_Lower} \), the lower triangle of \( A \) must be stored and the elements of the array above the diagonal are not referenced.

6: \( \text{pda} \) – Integer 
   *Input*
   
   On entry: the stride separating matrix row or column elements (depending on the value of \( \text{order} \)) in the array \( \text{a} \).

   **Constraint:** \( \text{pda} \geq \max(1, n) \).

7: \( r \) – double * 
   *Output*

   On exit: the value of the norm specified by \( \text{norm} \).

8: \( \text{fail} \) – NagError * 
   *Input/Output*

   The NAG error parameter (see the Essential Introduction).

**6 Error Indicators and Warnings**

**NE\_INT**

On entry, \( n = (\text{value}) \).

Constraint: \( n \geq 0 \).

On entry, \( \text{pda} = (\text{value}) \).

Constraint: \( \text{pda} \geq \max(1, n) \).

**NE\_BAD\_PARAM**

On entry, parameter \( (\text{value}) \) 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 document for nag_zsycon (f07nuc).