NAG Library Function Document

nag_zsy_norm (f16ufc)

1 Purpose

nag_zsy_norm (f16ufc) calculates the value of the 1-norm, the $\infty$-norm, the Frobenius norm or the maximum absolute value of the elements of a complex $n$ by $n$ symmetric matrix.

2 Specification

```c
#include <nag.h>
#include <nagf16.h>

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

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

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

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

or

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

Note that, since $A$ is symmetric, $\|A\|_1 = \|A\|_\infty$.

4 References


5 Arguments

1: order – Nag_OrderType

   Input

   On entry: the order argument 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 3.2.1.3 in the Essential Introduction for a more detailed explanation of the use of this argument.

Constraint: order = Nag_RowMajor or Nag_ColMajor.

2: norm – Nag_NormType

On entry: specifies the value to be returned.

norm = Nag_OneNorm
The 1-norm.

norm = Nag_InfNorm
The \( \infty \)-norm.

norm = Nag_FrobeniusNorm
The Frobenius (or Euclidean) norm.

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

On entry: specifies whether the upper or lower triangular part of \( A \) is stored.

uplo = Nag_Upper
The upper triangular part of \( A \) is stored.

uplo = Nag_Lower
The lower triangular part of \( A \) is stored.

Constraint: uplo = Nag_Upper or Nag_Lower.

4: n – Integer

On entry: \( n \), the order of the matrix \( A \).

If \( n = 0 \), then \( n \) is set to zero.

Constraint: \( n \geq 0 \).

5: a[dim] – const Complex

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

On entry: the \( n \) by \( n \) symmetric matrix \( A \).

If order = Nag_ColMajor, \( A_{ij} \) is stored in \( a[(j-1) \times pda + i - 1] \).

If order = Nag_RowMajor, \( A_{ij} \) is stored in \( a[(i-1) \times pda + j - 1] \).

If uplo = Nag_Upper, the upper triangular part of \( A \) must be stored and the elements of the array below the diagonal are not referenced.

If uplo = Nag_Lower, the lower triangular part of \( A \) must be stored and the elements of the array above the diagonal are not referenced.

6: pda – Integer

On entry: the stride separating row or column elements (depending on the value of order) of the matrix \( A \) in the array \( a \).

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

7: r – double *

On exit: the value of the norm specified by norm.
6 Error Indicators and Warnings

NE_ALLOC_FAIL
Dynamic memory allocation failed.
See Section 3.2.1.2 in the Essential Introduction for further information.

NE_BAD_PARAM
On entry, argument \texttt{value} had an illegal value.

NE_INT
On entry, \( n = \langle \text{value} \rangle \).
Constraint: \( n \geq 0 \).

NE_INT_2
On entry, \( \text{pda} = \langle \text{value} \rangle, n = \langle \text{value} \rangle \).
Constraint: \( \text{pda} \geq \max(1, n) \).

NE_INTERNAL_ERROR
An unexpected error has been triggered by this function. Please contact NAG.
See Section 3.6.6 in the Essential Introduction for further information.

NE_NO_LICENCE
Your licence key may have expired or may not have been installed correctly.
See Section 3.6.5 in the Essential Introduction for further information.

7 Accuracy
The BLAS standard requires accurate implementations which avoid unnecessary over/underflow (see Section 2.7 of Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001)).

8 Parallelism and Performance
Not applicable.

9 Further Comments
None.

10 Example
See Section 10 in nag_zsycon (f07nuc).