NAG C Library Function Document

nag_dsp_norm (f16rdc)

1 Purpose

nag_dsp_norm (f16rdc) calculates the value of the 1-norm, the infinity-norm, the Frobenius norm, or the maximum absolute value of the elements, of a real n by n symmetric matrix, stored in packed form.

2 Specification

void nag_dsp_norm (Nag_NormType norm, Nag_UploType uplo, Integer n, const double ap[], double *r, NagError *fail)

3 Description

Given a real n by n symmetric matrix, A, in packed storage, nag_dsp_norm (f16rdc) 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:   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.

2:   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.

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

3: \( n \) – Integer

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

\text{Constraint: } n \geq 0.

4: \( \text{ap}[\text{dim}] \) – const double

\text{Input}

\text{Note: the dimension, dim, of the array ap must be at least max(1, n \times (n + 1)/2).}

On entry: the \( n \) by \( n \) symmetric matrix \( A \), packed by rows or columns. The storage of elements \( a_{ij} \)
depends on the \text{order} and \text{uplo} parameters as follows:

if \text{order} = \text{Nag\_ColMajor} and \text{uplo} = \text{Nag\_Upper},
\( a_{ij} \) is stored in \( \text{ap}[(j - 1) \times j/2 + i - 1] \), for \( i \leq j \);

if \text{order} = \text{Nag\_ColMajor} and \text{uplo} = \text{Nag\_Lower},
\( a_{ij} \) is stored in \( \text{ap}[(2n - j) \times (j - 1)/2 + i - 1] \), for \( i \geq j \);

if \text{order} = \text{Nag\_RowMajor} and \text{uplo} = \text{Nag\_Upper},
\( a_{ij} \) is stored in \( \text{ap}[(2n - i) \times (i - 1)/2 + j - 1] \), for \( i \leq j \);

if \text{order} = \text{Nag\_RowMajor} and \text{uplo} = \text{Nag\_Lower},
\( a_{ij} \) is stored in \( \text{ap}[(i - 1) \times i/2 + j - 1] \), for \( i \geq j \).

5: \( r \) – double *

\text{Output}

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

6: \text{fail} – NagError *

\text{Input/Output}

The NAG error parameter (see the Essential Introduction).

6 \text{ Error Indicators and Warnings}

\text{NE\_INT}

On entry, \( n \) = (value).

\text{Constraint: } n \geq 0.

\text{NE\_BAD\_PARAM}

On entry, parameter (value) had an illegal value.

7 \text{ Accuracy}

The BLAS standard requires accurate implementations which avoid unnecessary over/underflow (see section 2.7 of The BLAS Technical Forum Standard (2001)).

8 \text{ Further Comments}

None.

9 \text{ Example}

See Section 9 of the documents for nag_dppcon (f07gge) and nag_dspcon (f07pgc).