

NAG Toolbox for MATLAB

f11ml

1 Purpose

f11ml computes the 1-norm, the ∞ -norm or the maximum absolute value of the elements of a real, square, sparse matrix which is held in compressed column (Harwell–Boeing) format.

2 Syntax

```
[anorm, ifail] = f11ml(norm_p, n, icolzp, irowix, a)
```

3 Description

f11ml computes various quantities relating to norms of a real, sparse n by n matrix A presented in compressed column (Harwell–Boeing) format.

4 References

None.

5 Parameters

5.1 Compulsory Input Parameters

1: **norm_p** – string

Specifies the value to be returned in **anorm**.

norm_p = '1' or 'O'

The 1-norm $\|A\|_1$ of the matrix is computed, that is $\max_{1 \leq j \leq n} \sum_{i=1}^n |A_{ij}|$.

norm_p = 'I'

The ∞ -norm $\|A\|_\infty$ of the matrix is computed, that is $\max_{1 \leq i \leq n} \sum_{j=1}^n |A_{ij}|$.

norm_p = 'M'

The value $\max_{1 \leq i, j \leq n} |A_{ij}|$ (not a norm).

Constraint: **norm_p** = '1', 'O', 'I' or 'M'.

2: **n** – int32 scalar

n , the order of the matrix A .

Constraint: $n \geq 0$.

3: **icolzp**(*) – int32 array

Note: the dimension of the array **icolzp** must be at least $n + 1$.

icolzp(i) contains the index in A of the start of a new column. See Section 2.1.3 in the F11 Chapter Introduction.

4: **irowix(*) – int32 array**

Note: the dimension of the array **irowix** must be at least **icolzp(n + 1) – 1**, the number of nonzeros of the sparse matrix *A*.

The row index array of the sparse matrix *A*.

5: **a(*) – double array**

Note: the dimension of the array **a** must be at least **icolzp(n + 1) – 1**, the number of nonzeros of the sparse matrix *A*.

The array of nonzero values in the sparse matrix *A*.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters1: **anorm – double scalar**

The computed quantity relating the matrix.

2: **ifail – int32 scalar**

0 unless the function detects an error (see Section 6).

6 Error Indicators and Warnings

Errors or warnings detected by the function:

ifail = 1

On entry, **norm_p** $\neq$ '1', 'O', 'I' or 'M',
or **n** < 0.

ifail = 301

Unable to allocate required internal workspace.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

```
norm_p = '1';
n = int32(5);
icolzp = [int32(1);
          int32(3);
          int32(5);
          int32(7);
```

```
        int32(9);
        int32(12)];
irowix = [int32(1);
        int32(3);
        int32(1);
        int32(5);
        int32(2);
        int32(3);
        int32(2);
        int32(4);
        int32(3);
        int32(4);
        int32(5)];
a = [2;
    4;
    1;
   -2;
    1;
    1;
   -1;
    1;
    1;
    2;
    3];
[anorm, ifail] = f11ml(norm_p, n, icolzp, irowix, a)

anorm =
    6
ifail =
    0
```
