

NAG Toolbox for MATLAB

m01dj

1 Purpose

m01dj ranks the columns of a matrix of double numbers in ascending or descending order.

2 Syntax

```
[irank, ifail] = m01dj(rm, m1, m2, n1, order, 'n2', n2)
```

3 Description

m01dj ranks columns **n1** to **n2** of a matrix, using the data in rows **m1** to **m2** of those columns. The ordering is determined by first ranking the data in row **m1**, then ranking any tied columns according to the data in row **m1** + 1, and so on up to row **m2**.

m01dj uses a variant of list-merging, as described by Knuth 1973, pp 165-166. The function takes advantage of natural ordering in the data, and uses a simple list insertion in a preparatory pass to generate ordered lists of length at least 10. The ranking is stable: equal columns preserve their ordering in the input data.

4 References

Knuth D E 1973 *The Art of Computer Programming (Volume 3)* (2nd Edition) Addison–Wesley

5 Parameters

5.1 Compulsory Input Parameters

- 1: **rm(ldm,n2) – double array**

ldm, the first dimension of the array, must be at least **m2**.

Rows **m1** to **m2** of columns **n1** to **n2** of **rm** must contain double data to be ranked.

- 2: **m1 – int32 scalar**

The index of the first row of **rm** to be used.

Constraint: **m1** > 0.

- 3: **m2 – int32 scalar**

The index of the last row of **rm** to be used.

Constraint: **m2** ≥ **m1**.

- 4: **n1 – int32 scalar**

The index of the first column of **rm** to be ranked.

Constraint: **n1** > 0.

- 5: **order – string**

If **order** = 'A', the columns will be ranked in ascending (i.e., nondecreasing) order.

If **order** = 'D', into descending order.

Constraint: **order** = 'A' or 'D'.

5.2 Optional Input Parameters

1: **n2** – int32 scalar

Default: The dimension of the arrays **irank**, **rm**. (An error is raised if these dimensions are not equal.)

the index of the last column of **rm** to be ranked.

Constraint: $n2 \geq n1$.

5.3 Input Parameters Omitted from the MATLAB Interface

ldm

5.4 Output Parameters

1: **irank(n2)** – int32 array

Elements **n1** to **n2** of **irank** contain the ranks of the corresponding columns of **rm**. Note that the ranks are in the range **n1** to **n2**: thus, if the *i*th column of **rm** is the first in the rank order, **irank(i)** is set to **n1**.

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, **m2** < 1,
or **n2** < 1,
or **m1** < 1,
or **m1** > **m2**,
or **n1** < 1,
or **n1** > **n2**,
or **ldm** < **m2**.

ifail = 2

On entry, **order** is not 'A' or 'D'.

7 Accuracy

Not applicable.

8 Further Comments

The average time taken by the function is approximately proportional to $n \times \log n$, where $n = n2 - n1 + 1$.

9 Example

```
rm = [5, 4, 3, 2, 2, 1, 9, 4, 4, 2, 2, 1;
      3, 8, 2, 5, 5, 6, 9, 8, 9, 5, 4, 1;
      9, 1, 6, 1, 2, 4, 8, 1, 2, 2, 6, 2];
m1 = int32(1);
m2 = int32(3);
```

```
n1 = int32(1);  
order = 'Ascending';  
[irank, ifail] = m01dj(rm, m1, m2, n1, order)
```

```
irank =  
      11  
       8  
       7  
       4  
       5  
       2  
      12  
       9  
      10  
       6  
       3  
       1  
  
ifail =  
      0
```