

NAG Toolbox for MATLAB

m01dz

1 Purpose

m01dz ranks arbitrary data according to a user-supplied comparison function.

2 Syntax

```
[irank, ifail] = m01dz(compar, m1, m2)
```

3 Description

m01dz is a general purpose function for ranking arbitrary data. m01dz does not access the data directly; instead it calls user-supplied logical function **compar** to determine the relative ordering of any two data items. The data items are identified simply by an integer in the range **m1** to **m2**.

m01dz 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.

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: **compar** – string containing name of m-file

compar must specify the relative ordering of any two data items; it must return **true** if item **ii** must come strictly **after** item **j** in the rank ordering.

Its specification is:

```
[result] = compar(ii, j)
```

Input Parameters

- 1: **ii** – int32 scalar

- 2: **j** – int32 scalar

ii and **j** identify the data items to be compared.

Output Parameters

- 1: **result** – logical scalar

The result of the function.

2: **m1** – int32 scalar

3: **m2** – int32 scalar

m1 and **m2** must specify the range of data items to be ranked, and the range of ranks to be assigned. Specifically, m01dz ranks the data items identified by integers in the range **m1** to **m2**, and assigns ranks in the range **m1** to **m2** which are stored in elements **m1** to **m2** of **irank**.

Constraint: $0 < \mathbf{m1} \leq \mathbf{m2}$.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **irank(m2)** – int32 array

Elements **m1** to **m2** of **irank** contain the ranks of the data items **m1** to **m2**. Note that the ranks are in the range **m1** to **m2**: thus, if item i is first in the rank ordering, **irank**(i) contains **m1**.

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 **m1** < 1,
or **m1** > **m2**.

7 Accuracy

Not applicable.

8 Further Comments

The average time taken by the function is approximately proportional to $n \times \log n$, where $n = \mathbf{m2} - \mathbf{m1} + 1$; it will usually be dominated by the time taken in user-supplied logical function **compar**.

9 Example

```
m01dz_compar.m

function [result] = compar(i,j)
    iv = [int32(2), int32(1), int32(-1), int32(0), int32(2), int32(-2),
    ...
          int32(0), int32(1), int32(1), int32(-1), int32(1), int32(2)];
    rv = [3.0, 4.0, 6.0, 5.0, 2.0, 7.0, 4.0, 3.0, 5.0, 2.0, 0.0, 1.0];
    if (iv(i) ~= iv(j))
```

```
    result = iv(i) > iv(j);  
elseif (iv(i) < 0)  
    result = rv(i) < rv(j);  
elseif (iv(i) > 0)  
    result = rv(i) > rv(j);  
else  
    result = i < j;  
end
```

```
m1 = int32(1);  
m2 = int32(12);  
[irank, ifail] = m01dz('m01dz_compar', m1, m2)
```

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