NAG Toolbox for MATLAB

e02za

1 Purpose

e02za sorts two-dimensional data into rectangular panels.

2 Syntax

```
[point, ifail] = e02za(lamda, mu, x, y, 'px', px, 'py', py, 'm', m)
```

3 Description

A set of m data points with rectangular Cartesian co-ordinates x_r, y_r are sorted into panels defined by lines parallel to the y and x axes. The intercepts of these lines on the x and y axes are given in **lamda**(i), for $i = 5, 6, \ldots, \mathbf{px} - 4$ and **mu**(j), for $j = 5, 6, \ldots, \mathbf{py} - 4$, respectively. The (sub)program orders the data so that all points in a panel occur before data in succeeding panels, where the panels are numbered from bottom to top and then left to right, with the usual arrangement of axes, as shown in the diagram. Within a panel the points maintain their original order.

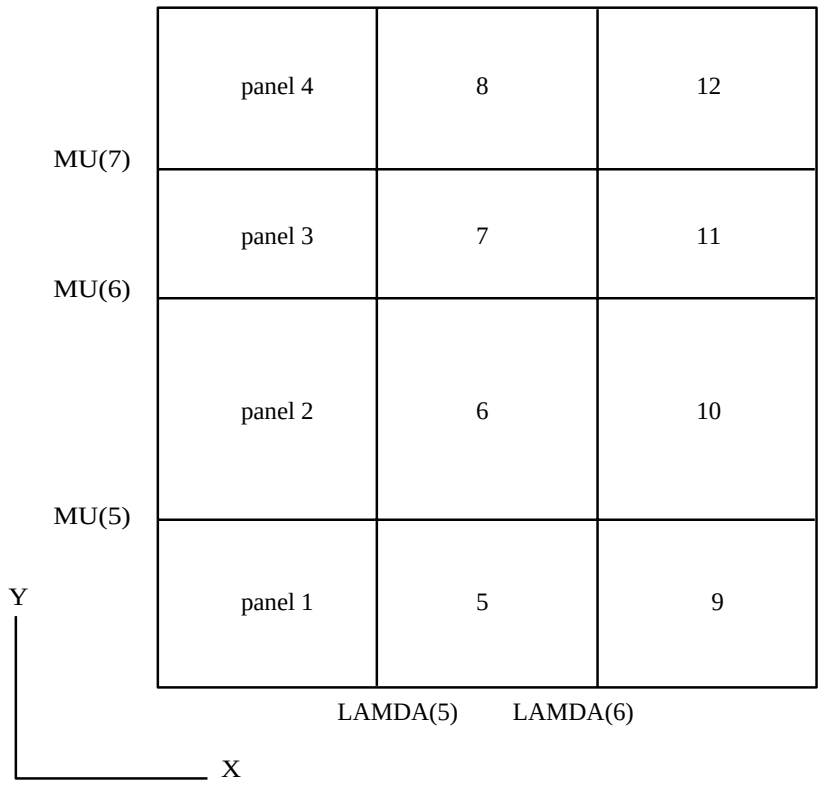

Figure 1

A data point lying exactly on one or more panel sides is taken to be in the highest-numbered panel adjacent to the point. The (sub)program does not physically rearrange the data, but provides the array **point** which contains a linked list for each panel, pointing to the data in that panel. The total number of panels is $(\mathbf{px} - 7) \times (\mathbf{py} - 7)$.

4 References

None.

5 Parameters

5.1 Compulsory Input Parameters

1: **lamda**(**px**) – **double array**

lamda(5) to **lamda**(**px** − 4) must contain, in nondecreasing order, the intercepts on the x axis of the sides of the panels parallel to the y axis.

2: **mu**(**py**) – **double array**

mu(5) to **mu**(**py** − 4) must contain, in nondecreasing order, the intercepts on the y axis of the sides of the panels parallel to the x axis.

3: **x**(**m**) – **double array**

4: **y**(**m**) – **double array**

The co-ordinates of the rth data point (x_r, y_r), for $r = 1, 2, \ldots, m$.

5.2 Optional Input Parameters

1: **px** – **int32 scalar**

2: **py** – **int32 scalar**

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

px and **py** must specify eight more than the number of intercepts on the x axis and y axis, respectively.

Constraint: **px** ≥ 8 and **py** ≥ 8.

3: **m** – **int32 scalar**

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

the number m of data points.

5.3 Input Parameters Omitted from the MATLAB Interface

npoint, adres, nadres

5.4 Output Parameters

1: **point**(**npoint**) – **int32 array**

For $i = 1, 2, \ldots,$ **nadres**, **point**$(m + i) =$ I1 is the index of the first point in panel i, **point**(I1) = I2 is the index of the second point in panel i and so on.

point(In) $= 0$ indicates that **x**(In), **y**(In) was the last point in the panel.

The co-ordinates of points in panel i can be accessed in turn by means of the following instructions:

```
in = point(m+i);
while (in ~= 0)
  xi = x(in);
  yi = y(in);
  .
  .
  .
  in = point(in);
end
```

...

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 $= 1$

The intercepts in the array **lamda**, or in the array **mu**, are not in nondecreasing order.

ifail $= 2$

On entry, **px** < 8,
or **py** < 8,
or **m** ≤ 0,
or **nadres** $\neq$ (**px** $- 7$) $\times$ (**py** $- 7$),
or **npoint** $<$ **m** $+$ (**px** $- 7$) $\times$ (**py** $- 7$).

7 Accuracy

Not applicable.

8 Further Comments

The time taken is approximately proportional to $m \times \log($**nadres**$)$.

This (sub)program was written to sort two dimensional data in the manner required by function e02da. The first 9 parameters of e02za are the same as the parameters in e02da which have the same name.

9 Example

```
lamda = [0;
     0;
     0;
     0;
     1;
     0;
     0;
     0;
     0];
mu = [0;
     0;
     0;
     0;
     0.8;
     1.2;
     0;
     0;
     0;
     0];
x = [0;
     0.7;
     1.44;
     0.21;
     1.01;
     1.84;
     0.71;
     1;
```

```
     0.54;
     1.53];
y = [0.77;
     1.06;
     0.33;
     0.44;
     0.5;
     0.02;
     1.95;
     1.2;
     0.04;
     0.18];
[point, ifail] = e02za(lamda, mu, x, y)
```

```
point =
           4
           0
           5
           9
           6
          10
           0
           0
           0
           0
           1
           2
           7
           3
           0
           8
ifail =
           0
```