NAG Library Function Document

nag_dmax_val (f16jnc)

1 Purpose

nag_dmax_val (f16jnc) computes the largest component of a real vector, along with the index of that component.

2 Specification

```
#include <nag.h>
#include <nagf16.h>
```

```
void nag_dmax_val (Integer n, const double x[], Integer incx, Integer *k,
     double *r, NagError *fail)
```

3 Description

nag_dmax_val (f16jnc) computes the largest component, r, of an n-element real vector x, and determines the smallest index, k, such that

$$r = x_k = \max_j x_j.$$

4 References

Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001) *Basic Linear Algebra Subprograms Technical (BLAST) Forum Standard* University of Tennessee, Knoxville, Tennessee http://www.netlib.org/blas/blast-forum/blas-report.pdf

5 Arguments

1: **n** – Integer *Input*

On entry: n, the number of elements in x.

Constraint: $\mathbf{n} \geq 0$.

2: **x**[*dim*] – const double *Input*

Note: the dimension, *dim*, of the array **x** must be at least $\max(1, 1 + (\mathbf{n} - 1) \times |\mathbf{incx}|)$.

On entry: the vector x. Element x_i is stored in $\mathbf{x}[(i - 1) \times |\mathbf{incx}|]$, for $i = 1, 2, \ldots, n$.

3: **incx** – Integer *Input*

On entry: the increment in the subscripts of **x** between successive elements of x.

Constraint: $\mathbf{incx} \neq 0$.

4: **k** – Integer * *Output*

On exit: k, the index, from the set $\{0, |\mathbf{incx}|, \ldots, (\mathbf{n} - 1) \times |\mathbf{incx}|\}$, of the largest component of x. If $\mathbf{n} = 0$ on input then **k** is returned as -1.

5: **r** – double * *Output*

On exit: r, the largest component of x. If $\mathbf{n} = 0$ on input then **r** is returned as 0.0.

6: **fail** – NagError * *Input/Output*

The NAG error argument (see Section 3.6 in the Essential Introduction).

6 Error Indicators and Warnings

NE_BAD_PARAM

On entry, argument ⟨*value*⟩ had an illegal value.

NE_INT

On entry, **incx** $= \langle value \rangle$.
Constraint: **incx** $\neq 0$.

On entry, **n** $= \langle value \rangle$.
Constraint: **n** ≥ 0.

7 Accuracy

The BLAS standard requires accurate implementations which avoid unnecessary over/underflow (see Section 2.7 of Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001)).

8 Parallelism and Performance

Not applicable.

9 Further Comments

None.

10 Example

This example computes the largest component and index of that component for the vector

$$x = (1, 10, 11, -2, 9)^{\mathrm{T}}.$$

10.1 Program Text

```
/* nag_dmax_val (f16jnc) Example Program.
 *
 * Copyright 2005 Numerical Algorithms Group.
 *
 * Mark 9, 2009.
 */

#include <stdio.h>
#include <nag.h>
#include <nag_stdlib.h>
#include <nagf16.h>

int main(void)
{
  /* Scalars */
  Integer  exit_status, i, incx, k, n, xlen;
  double   r;
  /* Arrays */
  double   *x = 0;
  /* Nag Types */
  NagError fail;

  exit_status = 0;
  INIT_FAIL(fail);
  printf("nag_dmax_val (f16jnc) Example Program Results\n\n");

  /* Skip heading in data file */
  scanf("%*[^\n] ");

  /* Read the number of elements and the increment */
  scanf("%ld%ld%*[^\n] ", &n, &incx);

  xlen = MAX(1, 1 + (n - 1)*ABS(incx));

  if (n > 0)
    {
      /* Allocate memory */
      if (!(x = NAG_ALLOC(xlen, double)))
        {
          printf("Allocation failure\n");
          exit_status = -1;
          goto END;
        }
    }
  else
    {
      printf("Invalid n\n");
      exit_status = 1;
      goto END;
    }

  /* Input vector x */
  for (i = 0; i < xlen; i = i + incx)
    scanf("%lf", &x[i]);
  scanf("%*[^\n] ");

  /* nag_dmax_val (f16jnc).
   * Get maximum value (r) and location of that value (k)
   * of double array */
  nag_dmax_val(n, x, incx, &k, &r, &fail);

  if (fail.code != NE_NOERROR)
    {
      printf("Error from nag_dmax_val (f16jnc).\n%s\n", fail.message);
      exit_status = 1;
      goto END;
    }

  /* Print the maximum value */
  printf("Maximum element of x is %12.5f\n", r);
  /* Print its location */
  printf("Index of maximum element of x is %3ld\n", k);

 END:
  NAG_FREE(x);

  return exit_status;
}
```

10.2 Program Data

```
nag_dmax_val (f16jnc) Example Program Data
  5   1                                                    : n and incx
  1.0   10.0   11.0   -2.0   9.0                           : Array x
```

10.3 Program Results

```
nag_dmax_val (f16jnc) Example Program Results

Maximum element of x is     11.00000
Index of maximum element of x is   2
```