

NAG Library Function Document

nag_imax_val (f16dnc)

1 Purpose

nag_imax_val (f16dnc) computes the largest component of an integer vector, along with the index of that component.

2 Specification

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

void nag_imax_val (Integer n, const Integer x[], Integer incx, Integer *k,
                  Integer *i, NagError *fail)
```

3 Description

nag_imax_val (f16dnc) computes the largest component, i , of an n -element integer vector x , and determines the smallest index, k , such that

$$i = x_k = \max_j x_j.$$

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 | <i>Input</i> |
| | <i>On entry:</i> n , the number of elements in x . | |
| | <i>Constraint:</i> $n \geq 0$. | |
| 2: | x [<i>dim</i>] – const Integer | <i>Input</i> |
| | Note: the dimension, <i>dim</i> , of the array x must be at least $\max(1, 1 + (n - 1) \times \mathbf{incx})$. | |
| | <i>On entry:</i> the vector x . Element x_i is stored in x [($i - 1$) \times incx], for $i = 1, 2, \dots, n$. | |
| 3: | incx – Integer | <i>Input</i> |
| | <i>On entry:</i> the increment in the subscripts of x between successive elements of x . | |
| | <i>Constraint:</i> incx \neq 0. | |
| 4: | k – Integer * | <i>Output</i> |
| | <i>On exit:</i> k , the index, from the set $\{0, \mathbf{incx} , \dots, (n - 1) \times \mathbf{incx} \}$, of the largest component of x . If $n = 0$ on input then k is returned as -1 . | |
| 5: | i – Integer * | <i>Output</i> |
| | <i>On exit:</i> i , the largest component of x . If $n = 0$ on input then i is returned as 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 $\langle value \rangle$ 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

$$x = (1, 10, 11, -2, 9)^T.$$

10.1 Program Text

```

/* nag_imax_val (f16dnc) 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, j, k, n, xlen;
    /* Arrays */
    Integer *x = 0;
    /* Nag Types */
    NagError fail;

    exit_status = 0;
    INIT_FAIL(fail);

```

```

printf("nag_imax_val (f16dnc) 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, Integer)))
  {
    printf("Allocation failure\n");
    exit_status = -1;
    goto END;
  }
}
else
{
  printf("Invalid n\n");
  exit_status = 1;
  goto END;
}

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

/* nag_imax_val (f16dnc).
 * Get maximum value (i) and location of that value (k)
 * of Integer vector */
nag_imax_val(n, x, incx, &k, &i, &fail);

if (fail.code != NE_NOERROR)
{
  printf("Error from nag_imax_val (f16dnc).\n%s\n", fail.message);
  exit_status = 1;
  goto END;
}

/* Print the maximum value */
printf("Maximum element of x is %12ld\n", i);
/* 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_imax_val (f16dnc) Example Program Data
  5  1                                     : n and incx
  1 10 11 -2 9                             : Array x

```

10.3 Program Results

```

nag_imax_val (f16dnc) Example Program Results

Maximum element of x is          11
Index of maximum element of x is  2

```
