

NAG Library Routine Document

F16JNF (BLAS_DMAX_VAL)

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of *bold italicised* terms and other implementation-dependent details.

1 Purpose

F16JNF (BLAS_DMAX_VAL) computes the largest component of a real vector, along with the index of that component.

2 Specification

```
SUBROUTINE F16JNF (N, X, INCX, K, R)
  INTEGER          N, INCX, K
  REAL (KIND=nag_wp) X(1+(N-1)*ABS(INCX)), R
```

The routine may be called by its BLAST name *blas_dmax_val*.

3 Description

F16JNF (BLAS_DMAX_VAL) 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 | <i>Input</i> |
| | <i>On entry:</i> n , the number of elements in x . | |
| 2: | $X(1 + (N - 1) \times INCX)$ – REAL (KIND=nag_wp) array | <i>Input</i> |
| | <i>On entry:</i> the n -element vector x . | |
| | If $INCX > 0$, x_i must be stored in $X((i - 1) \times INCX + 1)$, for $i = 1, 2, \dots, N$. | |
| | If $INCX < 0$, x_i must be stored in $X((N - i) \times INCX + 1)$, for $i = 1, 2, \dots, N$. | |
| | Intermediate elements of X are not referenced. If $N = 0$, X is not referenced. | |
| 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 $\{1, 2, \dots, N\}$, of the largest component of x . If $N \leq 0$ on input then K is returned as 0. | |

5: R – REAL (KIND=nag_wp)

Output

On exit: r , the largest component of x . If $N \leq 0$ on input then R is returned as 0.0.

6 Error Indicators and Warnings

If $INCX = 0$, an error message is printed and program execution is terminated.

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

F16JNF (BLAS_DMAX_VAL) is not threaded in any implementation.

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

```

Program f16jnfe

!      F16JNF Example Program Text

!      Mark 26 Release. NAG Copyright 2016.

!      .. Use Statements ..
!      Use nag_library, Only: blas_dmax_val, nag_wp
!      .. Implicit None Statement ..
!      Implicit None
!      .. Parameters ..
!      Integer, Parameter          :: nin = 5, nout = 6
!      .. Local Scalars ..
!      Real (Kind=nag_wp)          :: r
!      Integer                     :: i, incx, ix, k, n
!      .. Local Arrays ..
!      Real (Kind=nag_wp), Allocatable :: x(:)
!      .. Intrinsic Procedures ..
!      Intrinsic                   :: abs
!      .. Executable Statements ..
!      Write (nout,*) 'F16JNF Example Program Results'

!      Skip heading in data file
!      Read (nin,*)

!      Read (nin,*) n, incx
!      Allocate (x(1+(n-1)*abs(incx)))

!      Read the vector x and store forwards or backwards
!      as determined by incx.
!      If (incx>0) Then
!         ix = 1
!      Else
!         ix = 1 - (n-1)*incx
!      End If

```

```

      Do i = 1, n
        Read (nin,*) x(ix)
        ix = ix + incx
      End Do

!      Find k = argmax(x) and r = max(x).

      Call blas_dmax_val(n,x,incx,k,r)

      Write (nout,*)
      Write (nout,99999) k
      Write (nout,99998) r

99999 Format (1X,'Index of largest component of x is',I3)
99998 Format (1X,'Largest component of x is',F12.5)
      End Program f16jnfe

```

10.2 Program Data

F16JNF Example Program Data

```

5      1                                : n and incx
1.0
10.0
11.0
-2.0
9.0                                    : Vector x

```

10.3 Program Results

F16JNF Example Program Results

```

Index of largest component of x is 3
Largest component of x is      11.00000

```
