NAG C Library Chapter Introduction

f16 – NAG Interface to BLAS

Contents

1 Scope of the Chapter

This chapter is concerned with basic linear algebra functions which perform elementary algebraic operations involving vectors and matrices.

2 Background to the Problems

The functions in this chapter follow the specification of The BLAS Technical Forum Standard (2001). They are called extensively as auxiliaries by functions in other chapters of the NAG Library, especially in the linear algebra chapters. They are intended to be useful building-blocks for users of the Library who are developing their own applications.

The vector functions are referred to as **Level-1** BLAS functions, the matrix-vector and matrix functions as **Level-2** BLAS functions, and the matrix-matrix functions as **Level-3** BLAS functions. The terminology reflects the number of operations involved, so for example a Level-2 function involves $0(n^2)$ operations, for vectors and matrices of order n.

In many implementations of the NAG Library, the functions in this chapter serve as interfaces to an efficient machine-specific implementation of the BLAS, usually provided by the vendor of the machine. Such implementations are stringently tested before being used with the NAG Library, to ensure that they correctly meet the specifications of the BLAS, and that they return the desired accuracy.

3 Recommendations on Choice and Use of Available Functions

The functions in this chapter make available only some of the Basic Linear Algebra Subprograms which carry out the low level operations required by linear algebra applications. These will not normally be needed by the general user. The purpose of each function is described by its individual document.

It should be noted that, in some cases, The BLAS Technical Forum Standard (2001) extends the functionality of earlier BLAS specifications. For example, nag_daxpby (f16ecc) carrying out the operation

$$y \leftarrow \alpha x + y$$

is replaced by nag_daxpby (f16ecc) which performs the operation

$$y \leftarrow \alpha x + \beta y.$$

The operator arguments **conj**, **diag**, **norm**, **order**, **side**, **trans** and **uplo** are defined as enumeration types.

The **order** argument allows for 2D arrays to be supplied in either row or column ordering. The precise meaning of this for the packed and banded matrix storage schemes which are used by some of the functions in this chapter is described in the f07 Chapter Introduction and the f08 Chapter Introduction.

Invalid values of arguments cause an error message to be returned via the NAG error handler **fail**.

Note that only a small subset of BLAS is presented at this mark. The full set of BLAS will be documented at Mark 8.

4 Index

Hermitian band matrix ..... nag_zhb_norm (f16uec)
Hermitian matrix ..... nag_zhe_norm (f16ucc)
Hermitian matrix, packed form ..... nag_zhp_norm (f16udc)
symmetric matrix ..... nag_zsy_norm (f16ufc)
symmetric matrix, packed form ..... nag_zsp_norm (f16ugc)
matrix initialisation ..... nag_zge_load (f16thc)
rank-2 update:
matrix copy, rectangular or trapezoidal ..... nag_zge_copy (f16tfc)
solution of a system of equations:
triangular matrix ..... nag_ztrsv (f16sjc)
Real matrix and vector(s):
compute a norm or the element of largest absolute value:
band matrix ..... nag_dgb_norm (f16rbc)
general matrix ..... nag_dge_norm (f16rac)
matrix initialisation ..... nag_dge_load (f16qhc)
symmetric band matrix ..... nag_dsb_norm (f16rec)
symmetric matrix ..... nag_dsy_norm (f16rcc)
symmetric matrix, packed form ..... nag_dsp_norm (f16rdc)
rank-2 update:
matrix copy, rectangular or trapezoidal ..... nag_dge_copy (f16qfc)
solution of a system of equations:
triangular matrix ..... nag_dtrsv (f16pjc)
Level 3 (Matrix-matrix) operations:
Complex matrices:
solution of triangular systems of equations ..... nag_ztrsm (f16zjc)
Real matrices:
solution of triangular systems of equations ..... nag_dtrsm (f16yjc)

5 Functions Withdrawn or Scheduled for Withdrawal

None.

6 References

The BLAS Technical Forum Standard (2001) *www.netlib.org/blas/blast-forum*