NAG Library Function Document

nag_sparse_nsym_basic_diagnostic (f11bfc)

1 Purpose

nag_sparse_nsym_basic_diagnostic (f11bfc) is the third in a suite of three functions for the iterative solution of a real general (nonsymmetric) system of simultaneous linear equations (see Golub and Van Loan (1996)). nag_sparse_nsym_basic_diagnostic (f11bfc) returns information about the computations during an iteration and/or after this has been completed. The first function of the suite, nag_sparse_nsym_basic_setup (f11bdc), is a setup function; the second function, nag_sparse_nsym_basic_solver (f11bec), is the iterative solver itself.

These three functions are suitable for the solution of large sparse general (nonsymmetric) systems of equations.

2 Specification

```
#include <nag.h>
#include <nagf11.h>
void nag_sparse_nsym_basic_diagnostic (Integer *itn, double *stplhs,
    double *stprhs, double *anorm, double *sigmax, const double work[],
    Integer lwork, NagError *fail)
```

3 Description

nag_sparse_nsym_basic_diagnostic (f11bfc) returns information about the solution process. It can be called either during a monitoring step of nag_sparse_nsym_basic_solver (f11bec) or after nag_sparse_nsym_basic_solver (f11bec) has completed its tasks. Calling nag_sparse_nsym_basic_diagnostic (f11bfc) at any other time will result in an error condition being raised.

For further information you should read the documentation for nag_sparse_nsym_basic_setup (f11bdc) and nag_sparse_nsym_basic_solver (f11bec).

4 References

Golub G H and Van Loan C F (1996) *Matrix Computations* (3rd Edition) Johns Hopkins University Press, Baltimore

5 Arguments

1:   **itn** – Integer *   *Output*

   On exit: the number of iterations carried out by nag_sparse_nsym_basic_solver (f11bec).

2:   **stplhs** – double *   *Output*

   On exit: the current value of the left-hand side of the termination criterion used by nag_sparse_nsym_basic_solver (f11bec).

3:   **stprhs** – double *   *Output*

   On exit: the current value of the right-hand side of the termination criterion used by nag_sparse_nsym_basic_solver (f11bec).

4:    **anorm** – double * *Output*

On exit: if **iterm** $= 1$ in the previous call to nag_sparse_nsym_basic_setup (f11bdc), then **anorm** contains $\|A\|_p$, where $p = 1$, 2 or ∞, either supplied or, in the case of 1 or ∞, estimated by nag_sparse_nsym_basic_solver (f11bec); otherwise **anorm** $= 0.0$.

5:    **sigmax** – double * *Output*

On exit: if **iterm** $= 2$ in the previous call to nag_sparse_nsym_basic_setup (f11bdc), the current estimate of the largest singular value $\sigma_1(\bar{A})$ of the preconditioned iteration matrix, either when it has been supplied to nag_sparse_nsym_basic_setup (f11bdc) or it has been estimated by nag_sparse_nsym_basic_solver (f11bec) (see also Sections 3 and 5 in nag_sparse_nsym_basic_setup (f11bdc)); otherwise, **sigmax** $= 0.0$ is returned.

6:    **work**[**lwork**] – const double *Communication Array*

On entry: the array **work** as returned by nag_sparse_nsym_basic_solver (f11bec) (see also Sections 3 and 5 in nag_sparse_nsym_basic_solver (f11bec)).

7:    **lwork** – Integer *Input*

On entry: the dimension of the array **work** (see also Section 5 in nag_sparse_nsym_basic_setup (f11bdc)).

Constraint: **lwork** ≥ 100.

Note: although the minimum value of **lwork** ensures the correct functioning of nag_sparse_nsym_basic_diagnostic (f11bfc), a larger value is required by the iterative solver nag_sparse_nsym_basic_solver (f11bec) (see also Section 5 in nag_sparse_nsym_basic_setup (f11bdc)).

8:    **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, **lwork** $= \langle value \rangle$.
Constraint: **lwork** ≥ 100.

NE_INTERNAL_ERROR

An internal error has occurred in this function. Check the function call and any array sizes. If the call is correct then please contact NAG for assistance.

NE_OUT_OF_SEQUENCE

nag_sparse_nsym_basic_diagnostic (f11bfc) has been called out of sequence.

7   Accuracy

Not applicable.

8   Parallelism and Performance

Not applicable.

9   Further Comments

None.

10   Example

See Section 10 in nag_sparse_nsym_basic_setup (f11bdc).