NAG Library Routine Document

C09CBF

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

C09CBF computes the inverse one-dimensional discrete wavelet transform (DWT) at a single level. The initialization routine C09AAF must be called first to set up the DWT options.

2 Specification

```
SUBROUTINE C09CBF (LENC, CA, CD, N, Y, ICOMM, IFAIL)
INTEGER            LENC, N, ICOMM(100), IFAIL
REAL (KIND=nag_wp) CA(LENC), CD(LENC), Y(N)
```

3 Description

C09CBF performs the inverse operation of C09CAF. That is, given sets of n_c approximation coefficients and detail coefficients, computed by C09CAF using a DWT as set up by the initialization routine C09AAF, on a real data array of length n, C09CBF will reconstruct the data array y_i, for $i = 1, 2, \ldots, n$, from which the coefficients were derived.

4 References

None.

5 Arguments

1: LENC – INTEGER *Input*

On entry: the dimension of the arrays CA and CD as declared in the (sub)program from which C09CBF is called.

Constraint: LENC $\geq n_c$, where n_c is the value returned in NWC by the call to the initialization routine C09AAF.

2: CA(LENC) – REAL (KIND=nag_wp) array *Input*

On entry: the n_c approximation coefficients, C_a. These will normally be the result of some transformation on the coefficients computed by C09CAF.

3: CD(LENC) – REAL (KIND=nag_wp) array *Input*

On entry: the n_c detail coefficients, C_d. These will normally be the result of some transformation on the coefficients computed by C09CAF.

4: N – INTEGER *Input*

On entry: n, the length of the original data array from which the wavelet coefficients were computed by C09CAF and the length of the data array Y that is to be reconstructed by this routine.

Constraint: This must be the same as the value N passed to the initialization routine C09AAF.

5: Y(N) – REAL (KIND=nag_wp) array *Output*

On exit: the reconstructed data based on approximation and detail coefficients C_a and C_d and the transform options supplied to the initialization routine C09AAF.

6: ICOMM(100) – INTEGER array *Communication Array*

On entry: contains details of the discrete wavelet transform and the problem dimension and, possibly, additional information on the previously computed forward transform.

7: IFAIL – INTEGER *Input/Output*

On entry: IFAIL must be set to 0, -1 or 1. If you are unfamiliar with this argument you should refer to Section 3.4 in How to Use the NAG Library and its Documentation for details.

For environments where it might be inappropriate to halt program execution when an error is detected, the value -1 or 1 is recommended. If the output of error messages is undesirable, then the value 1 is recommended. Otherwise, if you are not familiar with this argument, the recommended value is 0. **When the value -1 or 1 is used it is essential to test the value of IFAIL on exit.**

On exit: IFAIL $= 0$ unless the routine detects an error or a warning has been flagged (see Section 6).

6 Error Indicators and Warnings

If on entry IFAIL $= 0$ or -1, explanatory error messages are output on the current error message unit (as defined by X04AAF).

Errors or warnings detected by the routine:

IFAIL $= 1$

On entry, array dimension LENC not large enough: LENC $= \langle value \rangle$ but must be at least $\langle value \rangle$.

IFAIL $= 4$

On entry, N is inconsistent with the value passed to the initialization routine: N $= \langle value \rangle$, N should be $\langle value \rangle$.

IFAIL $= 6$

Either the initialization routine has not been called first or array ICOMM has been corrupted.

Either the initialization routine was called with WTRANS = 'M' or array ICOMM has been corrupted.

IFAIL $= -99$

An unexpected error has been triggered by this routine. Please contact NAG.

See Section 3.9 in How to Use the NAG Library and its Documentation for further information.

IFAIL $= -399$

Your licence key may have expired or may not have been installed correctly.

See Section 3.8 in How to Use the NAG Library and its Documentation for further information.

IFAIL $= -999$

Dynamic memory allocation failed.

See Section 3.7 in How to Use the NAG Library and its Documentation for further information.

7 Accuracy

The accuracy of the wavelet transform depends only on the floating-point operations used in the convolution and downsampling and should thus be close to ***machine precision***.

8 Parallelism and Performance

C09CBF is not threaded in any implementation.

9 Further Comments

None.

10 Example

See Section 10 in C09CAF.