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
double precision  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 Parameters

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) – ***double precision*** 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) – ***double precision*** 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) – ***double precision*** 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 parameter you should refer to Section 3.3 in the Essential Introduction for details.

On exit: IFAIL $= 0$ unless the routine detects an error (see Section 6).

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 parameter, the recommended value is 0. **When the value -1 or 1 is used it is essential to test the value of IFAIL on exit.**

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, LENC $< n_c$, where n_c is the value returned in NWC by the call to the initialization routine C09AAF.

IFAIL $= 4$

On entry, N is inconsistent with the value passed to the initialization routine C09AAF.

IFAIL $= 6$

On entry, the initialization routine C09AAF has not been called first or it has been called with WTRANS $=$ 'M', or the communication array ICOMM has become corrupted.

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 Further Comments

None.

9 Example

See Section 9 in C09CAF.