NAG Library Function Document

nag_imodwt (c09dbc)

1 Purpose

nag_imodwt (c09dbc) computes the inverse one-dimensional maximal overlap discrete wavelet transform (MODWT) at a single level. The initialization function nag_wfilt (c09aac) must be called first to set up the MODWT options.

2 Specification

```
#include <nag.h>
#include <nagc09.h>
void nag_imodwt (Integer lenc, const double ca[], const double cd[],
     Integer n, double y[], const Integer icomm[], NagError *fail)
```

3 Description

nag_imodwt (c09dbc) performs the inverse operation of nag_modwt (c09dac). That is, given sets of n_c approximation coefficients and detail coefficients, computed by nag_modwt (c09dac) using a MODWT as set up by the initialization function nag_wfilt (c09aac), on a real data array of length n, nag_imodwt (c09dbc) will reconstruct the data array y_i, for $i = 1, 2, \ldots, n$, from which the coefficients were derived.

4 References

Percival D B and Walden A T (2000) *Wavelet Methods for Time Series Analysis* Cambridge University Press

5 Arguments

1: **lenc** – Integer *Input*

On entry: the dimension of the arrays **ca** and **cd**.

Constraint: **lenc** $\geq n_c$, where n_c is the value returned in **nwc** by the call to the initialization function nag_wfilt (c09aac).

2: **ca**[**lenc**] – const double *Input*

On entry: the n_c approximation coefficients, C_a. These will normally be the result of some transformation on the coefficients computed by nag_modwt (c09dac).

3: **cd**[**lenc**] – const double *Input*

On entry: the n_c detail coefficients, C_d. These will normally be the result of some transformation on the coefficients computed by nag_modwt (c09dac).

4: **n** – Integer *Input*

On entry: n, the length of the original data array from which the wavelet coefficients were computed by nag_modwt (c09dac) and the length of the data array **y** that is to be reconstructed by this function.

Constraint: This must be the same as the value **n** passed to the initialization function nag_wfilt (c09aac).

5: **y**[**n**] – double *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 function nag_wfilt (c09aac).

6: **icomm**[**100**] – const Integer *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: **fail** – NagError * *Input/Output*

The NAG error argument (see Section 3.6 in the Essential Introduction).

6 Error Indicators and Warnings

NE_ARRAY_DIM_LEN

On entry, array dimension **lenc** not large enough: **lenc** = ⟨*value*⟩ but must be at least ⟨*value*⟩.

NE_BAD_PARAM

On entry, argument ⟨*value*⟩ had an illegal value.

NE_INITIALIZATION

On entry, **n** is inconsistent with the value passed to the initialization function: **n** = ⟨*value*⟩, **n** should be ⟨*value*⟩.

On entry, the initialization function nag_wfilt (c09aac) has not been called first or it has not been called with **wtrans** = Nag_MODWTSingle, or the communication array **icomm** has become corrupted.

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.

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

Not applicable.

9 Further Comments

None.

10 Example

See Section 10 in nag_modwt (c09dac).