

# NAG Library Function Document

## nag\_idwt (c09cbc)

### 1 Purpose

nag\_idwt (c09cbc) computes the inverse one-dimensional discrete wavelet transform (DWT) at a single level. The initialization function nag\_wfilt (c09aac) must be called first to set up the DWT options.

### 2 Specification

```
#include <nag.h>
#include <nagc09.h>

void nag_idwt (Integer lenc, const double ca[], const double cd[], Integer n,
              double y[], const Integer icomm[], NagError *fail)
```

### 3 Description

nag\_idwt (c09cbc) performs the inverse operation of nag\_dwt (c09cac). That is, given sets of  $n_c$  approximation coefficients and detail coefficients, computed by nag\_dwt (c09cac) using a DWT as set up by the initialization function nag\_wfilt (c09aac), on a real data array of length  $n$ , nag\_idwt (c09cbc) will reconstruct the data array  $y_i$ , for  $i = 1, 2, \dots, n$ , 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**.  
*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\_dwt (c09cac).
- 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\_dwt (c09cac).
- 4: **n** – Integer *Input*  
*On entry:*  $n$ , the length of the original data array from which the wavelet coefficients were computed by nag\_dwt (c09cac) 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\_ALLOC\_FAIL

Dynamic memory allocation failed.

### NE\_ARRAY\_DIM\_LEN

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

### NE\_BAD\_PARAM

On entry, argument  $\langle value \rangle$  had an illegal value.

### NE\_INITIALIZATION

Either the initialization function has not been called first or array **icomm** has been corrupted.

Either the initialization function was called with **wtrans** = Nag\_MultiLevel or array **icomm** has been corrupted.

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

### 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\_dwt (c09cac).