**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**

```c
#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**


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_ALLOC_FAIL
    Dynamic memory allocation failed.
    See Section 3.2.1.2 in the Essential Introduction for further information.

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.
    An unexpected error has been triggered by this function. Please contact NAG.
    See Section 3.6.6 in the Essential Introduction for further information.

NE_NO_LICENCE
    Your licence key may have expired or may not have been installed correctly.
    See Section 3.6.5 in the Essential Introduction 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

Not applicable.
9 Further Comments
None.

10 Example
See Section 10 in nag_modwt (c09dac).