Operator DEFI_INTE_SPEC

1 Goal

To define a matrix of spectral concentration (one also says: matrix interspectrale).
The terms of the matrix are defined by:

- constants (white vibration),
- existing complex functions,
- the analytical formula of KANAI-TAJIMI.

Product a structure of data of the type interspectre.

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2 Syntax

```
intsp  [interspectre] = DEFI_INTE_SPEC

(      ◊  DIMENSION =                      /  1          [DEFECT]
                                           /  N          [I]

       ◊  PAR_FONCTION =_F (
                        ♦  /  NUME_ORDRE_I =  I          [I]
                              NUME_ORDRE_J =  J          [I]
                           /  NOEUD_I   =  nd_i          [node]
                              NOEUD_J   =  nd_j          [node]
                              NOM_CMP_I =  ncmp_i        [KN]
                              NOM_CMP_J =  ncmp_j        [KN]
                        ♦  FUNCTION  =fonct              [fonction_c]
                            )
       ◊  KANAI_TAJIMI =_F (
                        ♦  /  NUME_ORDRE_I =  I          [I]
                              NUME_ORDRE_J =  J          [I]
                           /  NOEUD_I   =  nd_i          [node]
                              NOEUD_J   =  nd_j          [node]
                              NOM_CMP_I =  ncmp_i        [KN]
                              NOM_CMP_J =  ncmp_j        [KN]

                        ◊  FREQ_MIN  =  /  0.            [DEFECT]
                                        /  fmin          [R]
                        ◊  FREQ_MAX  =  /  100.          [DEFECT]
                                        /  fmax          [R]
                        ◊  NOT       =  /  1.            [DEFECT]
                                        /  not           [R]

                        ◊  /  VALE_R    =  valr          [R]
                           /  VALE_C    =  valc          [C]
                        ◊  AMOR_REDUIT= /  0.60          [DEFECT]
                                        /  amor          [R]
                        ◊  FREQ_MOY  =  /  5.            [DEFECT]
                                        /  fmoy          [R]

                        ◊  Interpol  =   |  'FLAX'       [DEFECT]
                                         |  'LOG'
                        ◊  PROL_GAUCHE= /  'EXCLUDED'       [DEFECT]
                                        /  'CONSTANT'
                                        /  'LINEAR'
                        ◊  PROL_DROITE= /  'EXCLUDED'       [DEFECT]
                                        /  'CONSTANT'
                                        /  'LINEAR'
                           )
```

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```
        ◊   CONSTANT =_F (
                    ♦   /   NUME_ORDRE_I =   I           [I]
                            NUME_ORDRE_J =   J           [I]
                        /   NOEUD_I    =   nd_i          [node]
                            NOEUD_J    =   nd_j          [node]
                            NOM_CMP_I =   ncmp_i         [KN]
                            NOM_CMP_J =   ncmp_j         [KN]

                    ◊   FREQ_MIN   =   /   0.            [DEFECT]
                                       /   fmin          [R]
                    ◊   FREQ_MAX   =   /   100.          [DEFECT]
                                       /   fmax          [R]
                    ◊   NOT        =   /   1.            [DEFECT]
                                       /   not           [R]

                    ◊   /   VALE_R     =   /   1.        [DEFECT]
                                           /   valr      [R]
                        /   VALE_C     =   valc          [C]

                    ◊   Interpol       =    |  'FLAX'    [DEFECT]
                                            |  'LOG'
                    ◊   PROL_GAUCHE    =   /   'EXCLUDED'    [DEFECT]
                                           /   'CONSTANT'
                                           /   'LINEAR'
                    ◊   PROL_DROITE    =   /   'EXCLUDED'    [DEFECT]
                                           /   'CONSTANT'
                                           /   'LINEAR'
                    )

        ◊   TITLE  =          title                      [l_Kn]
        ◊   INFORMATION   =          /   1                       [DEFECT]
                          /   2
)
```


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3 Operands

3.1 Operand DIMENSION

◊ `DIMENSION = N`

Dimension of the matrix of spectral concentration, stored in a table of interspectres (`tabl_intsp`).

3.2 Keyword PAR_FONCTION

♦ ˜ `PAR_FONCTION =`

Keyword factor, makes it possible to define a term (`I`, `J`) matrix interspectrale starting from concepts of the type `function_C` already definite.

3.2.1 Operands NUME_ORDRE_I, NUME_ORDRE_J

```
NUME_ORDRE_I =   I
NUME_ORDRE_J =   J
```

Couples indices (line, column) of the matrix on which one will affect a function.

These operands are excluded with the operands `NOEUD_I NOEUD_J NOM_CMP_I NOM_CMP_J`.

3.2.2 Operands NOEUD_I, NOEUD_J, NOM_CMP_I, NOM_CMP_J

```
NOEUD_I   =  nd_i         [node]
NOEUD_J   =  nd_j         [node]
NOM_CMP_I =  ncmp_i       [KN]
NOM_CMP_J =  ncmp_j       [KN]
```

These operands correspond to the names of the nodes and the components (line, column) of the matrix where one will affect a function.

These operands are excluded with the operands `NUME_ORDRE_I NUME_ORDRE_J`.

3.2.3 Operand FUNCTION

♦ `FUNCTION: fonct`

`fonct` is a concept of the type `fonction_c`.

3.3 Keyword KANAI_KAJIMI

˜ `KANAI_TAJIMI =`

Keyword factor, makes it possible to define a function spectral concentration by using the model of Kanai and Tajimi. This function of spectral concentration corresponds to that of a filtered white vibration [bib2].

One gives the three parameters of the spectral concentration of the model of KANAI_TAJIMI: damping, frequency and level.

3.3.1 Operands NUME_ORDRE_I, NUME_ORDRE_J

```
NUME_ORDRE_I =   I
NUME_ORDRE_J =   J
```

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Couples indices (line, column) of the matrix interspectrale. Not having model of spectral coherence, the model of Kanai-Tajimi only makes it possible to create auto--spectra. It is thus necessary to choose I = J (in general, one will choose n=1 and i=j=1 here).
These operands are excluded with the operands NOEUD_I NOEUD_J NOM_CMP_I NOM_CMP_J.

3.3.2 Operands NOEUD_I, NOEUD_J, NOM_CMP_I, NOM_CMP_J

```
NOEUD_I   =  nd_i        [node]
NOEUD_J   =  nd_j        [node]
NOM_CMP_I =  ncmp_i      [KN]
NOM_CMP_J =  ncmp_j      [KN]
```

These operands correspond to the names of the nodes and the components (line, column) of the matrix where one will affect a function. In the case of the model of Kanai-Tajimi, one chooses NOEUD_I = NOEUD_J and NOM_CMP_I = NOM_CMP_J.

These operands are excluded with the operands NUME_ORDRE_I NUME_ORDRE_J.

3.3.3 Operands AMOR_REDUIT/FREQ_MOY/VALE_R/VALE_C

```
◊ AMOR_REDUIT  =  amor
◊ FREQ_MOY     =  fmoy
◊ / VALE_R     =  valr
  / VALE_C     =  valc
```

fmoy and amor are the Eigen frequency and the reduced damping of the filter. The level can be given in the complex or real form.

3.3.4 Operands INTERPOL/PROL_GAUCHE/PROL_DROITE

One gives for each function the classical parameters which condition the interpolation and the extrapolation of the produced function. The possibilities as well as the values by default are recalled on page 2.

```
◊ Interpol
◊ PROL_GAUCHE
◊ PROL_DROITE
```

For more details to see them [§3.4] and [§3.5].

3.3.5 Operands FREQ_MIN/FREQ_MAX/PAS

One gives the parameters of the frequential discretization.

```
◊ FREQ_MIN  =  fmin
◊ FREQ_MAX  =  fmax
◊ NOT       =  not
```

3.3.6 Operands PROL_DROITE and PROL_GAUCHE

◊ PROL_DROITE and PROL_GAUCHE =

Define the type of prolongation on the right (on the left) of the field of definition of the variable:

- 'CONSTANT' for a prolongation with the last (or first) value of the function,
- 'LINEAR' for a prolongation along the first definite segment (PROL_GAUCHE) or of the last definite segment (PROL_DROITE),

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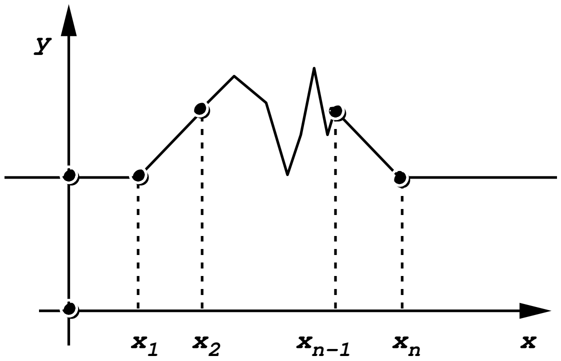
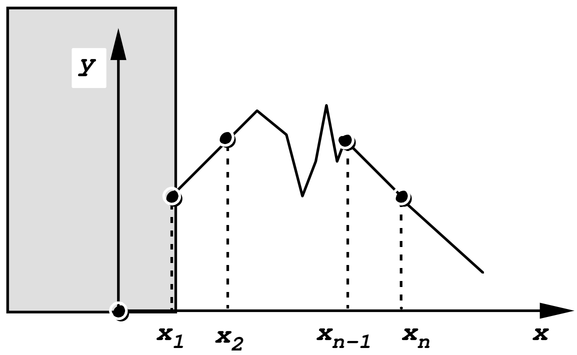
- `'EXCLUDED'` if the extrapolation of the values apart from the field of definition of the parameter is prohibited (in this case if a calculation requires a value of the function out of field of definition, the code will stop in fatal error).

For example:

- `PROL_DROITE = 'CONSTANT', PROL_GAUCHE = 'CONSTANT'`



- `PROL_DROITE = 'LINEAR', PROL_GAUCHE = 'EXCLUDED'`



Note:

The type of prolongation and interpolation are independent one of the other.

3.3.7 Operand `Interpol`

◊ `Interpol =`

Type of interpolation of the function enters the values of the field of definition of the function: a type for the interpolation of the parameter and for the interpolation of the function. This is obtained by providing a list of texts among:

```
INTERPOL = ('FLAX', 'LOG')
```

`'FLAX'` : linear,

`'LOG'` : logarithmic curve,

Note:

If only one value is specified, she is taken into account at the same time by the interpolation of the parameter and the function. `INTERPOL = 'LOG'` *is equivalent to (* `'LOG', 'LOG')` *.*

3.4 Keyword `CONSTANT`

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◊ `CONSTANT =`

Keyword factor which allows to define a function of spectral concentration corresponding to a white vibration with band (constant spectral concentration on the waveband considered).

All the keywords under this keyword factor have the same direction as for the keyword factor `KANAI_TAJIMI` except `AMOR` and `FREQ_MOY` who do not have a direction here.

3.5 Operand `TITLE`

◊ `TITLE = title`

`title` is the title of calculation to be printed at the top of the results. See [U4.03.01].

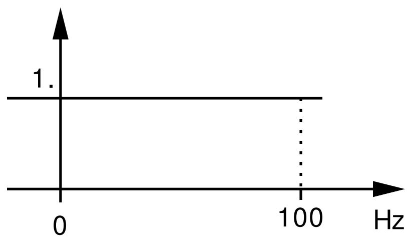
3.6 Operand `INFORMATION`

◊ `INFORMATION =`

1 : pas d' impression.
2 : impression of the characteristics of the definite matrix interspectrale.

4 Example

In the example below one defines a function of spectral concentration (in terms of interspectre it is about a matrix 1 X 1) with constant value:




```
INTEREXC = DEFI_INTE_SPEC     (
             DIMENSION=1,
             INFO=2,
             CONSTANT=_F (
                    NUME_ORDRE_I=1,
                   NUME_ORDRE_J=1,
                   FREQ_MIN=0.,
                   FREQ_MAX=100.,
                   PAS=1.,
                   PROL_GAUCHE=' CONSTANT',
                   PROL_DROITE=' CONSTANT',
                   INTERPOL=' LIN',
                   VALE_C= ('IH', 1. , 0.),
                          ),
                                    ) ;
```

To define the interspectre of a white vibration filtered by an oscillator represented by the filter of KANAI - TAJIMI:

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```
INTKTJ1 = DEFI_INTE_SPEC  (
      DIMENSION=1,
      INFO=2,
      KANAI_TAJIMI=_F (
              NUME_ORDRE_I=1,
             NUME_ORDRE_J=1,
       FREQ_MOY=15.,
      AMOR=0.05,
             VALE_R=1.,
             INTERPOL=' LIN',
             PROL_GAUCHE=' CONSTANT',
             PROL_DROITE=' CONSTANT',
             FREQ_MIN=0.,
             FREQ_MAX=30.,
             PAS=5.,
                        ),
                            ) ;
```

The 3 parameters of the filter were given:
1) damping = 0.05,
2) frequency = 15. Hz,
3) level = 1.

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5 Bibliography

1) J.S. BENDAT, J. WILEGSON: "Spectral engineering application of correlation and analysis".

2) C. DUVAL "Dynamic response under random excitations in *Code_Aster* : theoretical principles and examples of use". Note DER HP-61/92-148

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