Operator **CALC_FONC_INTERP**

1 Goal

To build a concept of the type `function` or `fonction_c` starting from a function `FORMULA` to 1 or 2 variables. Can be defined real functions with real variables, complex functions with real variables and tablecloths.

One can also produce a new real or complex function, or a tablecloth by interpolating another standard function in the same way (real, complex or a tablecloth).

The use of **CALC_FONC_INTERP** a tabulation of the formula preliminary to calculation allows. Its use is recommended before any transitory and/or nonlinear analysis for reasons of performances.

The operator is not réentrant, it produces a new function or a tablecloth.
2 Syntax

Fr [*] = CALC_FONC_INTERP

   ( ♦ FUNCTION = F                      / [formula]
     / [formule_c]
     / [function]
     / [fonction_c]
     / [tablecloth]

     ◊ NOM_RESU = '/TOUTRESU' ,           [DEFECT]
     / NR ,                               [K8]
     ◊ NOM_PARA = Np,

     ◆ / VALE_PARA = lvale,
     ◆ / LIST_PARA = will lpara ,         [listr8]

     ◊ PROL_DROITE = '/CONSTANT',        [DEFECT]
                        '/LINEAR',
                        '/EXCLUDED' ,
     ◊ PROL_GAUCHE = '/CONSTANT',        [DEFECT]
                        '/LINEAR',
                        '/EXCLUDED' ,
     ◊ Interpol = / 'FLAX',               [DEFECT]
                        / 'LOG',          [l_Kn]

     ◊ NOM_PARA_FONC = npf,

     ◆ / VALE_PARA_FONC = lvalef,
     ◆ / LIST_PARA_FONC = lparaf,         [listr8]

     ◊ PROL_DROITE_FONC = '/CONSTANT',   [DEFECT]
                        '/LINEAR',
                        '/EXCLUDED' ,
     ◊ PROL_GAUCHE_FONC = '/CONSTANT',   [DEFECT]
                        '/LINEAR',
                        '/EXCLUDED' ,
     ◊ INTERPOL_FONC = / 'FLAX',          [DEFECT]
                        / 'LOG',          [l_Kn]

     ◊ INFORMATION = / 1,                [DEFECT]
                        / 2,

     ◊ TITLE = Ti ,                     [l_Kn]
   )

If F is one formula to 1 parameter, [*] = function,
formula with 2 parameters, tablecloth,
formule_c to 1 parameter, fonction_c,
tablecloth, tablecloth,
function, function,
fonction_c, fonction_c.
3 Operands

3.1 Operand FUNCTION

- FUNCTION = F
  
  Name of FORMULA (interpretable function (FORMULA Cf [U4.31.05])).
  This function can be with one or two variables in the case of the real formulas, with a variable only in the case of the complex formulas.

  One can however create a new function respectively (fonction_c, tablecloth) starting from a function (respectively fonction_c, tablecloth) by interpolating the first on a different parameter list. This possibility is primarily used in the macro - orders.

  When the type as starter is one formula and that NOM_PARA_FONC is provided, the structure of produced data is a tablecloth.

  Notice: During the interpolation of a formula with two parameters, one checks coherence between the parameters of the formula and the keywords NOM_PARA and NOM_PARA_FONC. See the example of the paragraph 4.2.

3.2 Operand NOM_RESU

- NOM_RESU = NR
  
  Indicate the name of the result, function thus created is a function whose value is of name NR (8 characters).

3.3 Operand NOM_PARA

- NOM_PARA = NR
  
  Indicate the name of the parameter of the function or tablecloth. By default, the name of the parameter of the formula or provided function is employed.

3.4 Operands VALE_PARA/LISTE_PARA

- / VALE_PARA = lvale,
  
  lvale is the list of the values of the parameter.

- / LIST_PARA = will lpara,
  
  will lpara is the list of the values of the parameter: it is a concept of the type listr8 created previously by the order DEFI_LIST_REEL [U4.34.01].

3.5 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 parameter of the function or tablecloth

  - '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 last definite segment (PROL_DROITE),
  
  - 'EXCLUDED' 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).

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3.6 **Operand Interpol**

◊ **Interpol** =

Type of interpolation of the function enters the values of the variable or type of interpolation of the tablecloth between the values of the parameter. Behind this keyword one expects a parameter list (two at the most).

- `'FLAX'`: linear,
- `'LOG'`: logarithmic curve.

If only one value is given, the interpolation will be identical for the X-coordinates and the ordinates. If two values are given, the first corresponds to the interpolation of the X-coordinates and the second with the interpolation of the ordinates.

3.7 **Operand NOM_PARA_FONC**

◊ **NOM_PARA_FONC** = NR

Indicate the name of the variable of the functions defining the tablecloth. When the type as starter is a formula and that this keyword is indicated, then the structure of data produced is a tablecloth.

3.8 **Operands VALE_PARA_FONC/LISTE_PARA_FONC**

◊ / **VALE_PARA_FONC** = lvale,

lvale is the list of the values of the variable of the functions defining the tablecloth.

◊ / **LISTE_PARA_FONC** = will lpara,

will lpara is the list of the values of the variable of the functions defining the tablecloth: it is a concept of the type listr8 created previously by the order DEFI_LIST_REEL [U4.34.01].

3.9 **Operands PROL_DROITE_FONC and PROL_GAUCHE_FONC**

◊ **PROL_DROITE_FONC** and **PROL_GAUCHE_FONC** =

Define the type of prolongation on the right (on the left) of the field of definition of the variable of the functions of the tablecloth: ‘CONSTANT’, ‘LINEAR’, ‘EXCLUDED’ the same direction has as previously.

3.10 **Operand INTERPOL_FONC**

◊ **INTERPOL_FONC** =

Type of interpolation of the functions between the values of the variable of the functions defining the tablecloth. Behind this keyword one expects a parameter list (two at the most).

Operation is identical to Interpol.

3.11 **Operand INFORMATION**

◊ **INFORMATION** =

Specify the options of impression on the file MESSAGE.

1: pas d’impression (option by default)
2: impression of the parameters plus the list of the first 10 values in the order ascending of the parameter

3.12 **Operand TITLE**

◊ **TITLE** = Ti

Title attached to the concept produced by this operator [U4.03.01].
4 Examples

4.1 Case of a function

4.1.1 To define the function FORMULA sin (T)

\[
\text{IF} = \text{FORMULA (NOM\_PARA = 'INST',}
\text{VALE = 'sin (INST)')}
\]

4.1.2 Tabuler sin (T) starting from a list of realities

\[
\begin{align*}
\text{DEPI} &= 2.\pi \\
\text{PAS0} &= \text{DEPI}/200. \\
\text{LI1} &= \text{DEFI\_LIST\_REAL} (\text{BEGINNING} = 0, \text{INTERVALLE}_F (\text{JUSQU\_A} = \text{DEPI}, \text{PAS} = \text{PAS0}),)
\end{align*}
\]

\[
\text{SI1} = \text{CALC\_FONC\_INTERP (FONCTION = IF, LIST\_PARA} = \text{LI1, NOM\_RESU = 'DEPL',}
\text{PROL\_GAUCHE = 'EXCLU', PROL\_DROITE = 'CONSTANT',}
\text{INTERPOL = 'LIN', TITRE = 'FUNCTION SINUS'})
\]

4.1.3 Tabuler sin (T) starting from a list of values

\[
\begin{align*}
\text{LI2} &= (0.0, 0.01, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, 0.10) \\
\text{SI2} &= \text{CALC\_FONC\_INTERP (FUNCTION = IF, VALE\_PARA} = \text{LI2,}
\text{NOM\_PARA} = 'INST',
\text{PROL\_GAUCHE = 'EXCLUDED', PROL\_DROITE = 'EXCLUDED',}
\text{INTERPOL = 'FLAX', TITLE = 'FUNCTION SINE'})
\end{align*}
\]

4.2 Case of a tablecloth

4.2.1 To define the function FORMULA sin (Omega * T)

\[
\text{IF} = \text{FORMULA (NOM\_PARA = ('FREQ', 'INST'),}
\text{VALE = 'sin (2*\pi*FREQ*INST)')}
\]

4.2.2 Tabuler sin (Omega * T) starting from a list of moments

The parameter of the tablecloth is 'FREQ', the variable of the functions defining the tablecloth is 'INST'. One checks in CALC\_FONC\_INTERP that the first parameter of the formula is the same one as NOM\_PARA, and that the second parameter of the formula is identical to NOM\_PARA\_FONC.

\[
\begin{align*}
\text{LI\_FREQ} &= \text{DEFI\_LIST\_REAL (BEGINNING} = 10, \text{INTERVALLE}_F (\text{JUSQU\_A} = 100, \text{PAS} = 10),) \\
\text{LI\_INST} &= \text{DEFI\_LIST\_REAL (BEGINNING} = 0, \text{INTERVALLE}_F (\text{JUSQU\_A} = 100, \text{PAS} = 1),)
\end{align*}
\]

\[
\text{SI1} = \text{CALC\_FONC\_INTERP (FUNCTION = IF,}
\text{NOM\_RESU} = 'DEPL',
\text{NOM\_PARA\_FONC} = 'INST',
\text{LIST\_PARA\_FONC} = \text{LI\_INST}
\text{PROL\_GAUCHE\_FONC} = 'EXCLU',
\text{PROL\_DROITE\_FONC} = 'CONSTANT',
\text{INTERPOL\_FONC} = 'LIN',
\text{NOM\_PARA} = 'FREQ')
\]
LIST_PARA = LI_FREQ
PROL_GAUCHE=' LINEAIRE',
PROL_DROITE=' LINEAIRE',
INTERPOL=' LIN',
TITRE=' FUNCTION SINUS',)