Operator DEFI_FONCTION

1 Drank

Définir a real or complex function of a real variable. This operator allows to define, for example, of the characteristic materials function of the temperature, or the boundary conditions which depend on a variable of space or time.

The product concept by this operator is of standard `function`.

2 Syntax

```
F   [function]   =DEFI_FONCTION      (

                 ♦NOM_PARA=np        ,

                 ◊NOM_RESU=          /  "TOUTRESU",              [DEFECT]
                                   /nr ,                         [K8]

                 ♦  /  VALE=lv            ,                     [l_R]
                    /VALE_C            =lv ,                     [l_C]
                    /VALE_PARA         =la ,                     [listr8]
                       ♦VALE_FONC=lo          ,                 [listr8]
                    /ABSCISSE       =labs  ,                     [l_R]
                       ♦ORDONNEE=lord            ,               [l_R]
                    /NOEUD_PARA     =lno   ,                     [l_noeud]
                       ♦MAILLAGE=ma           ,                  [mesh]
                       ♦VALE_Y=ly               ,                   [l_R]

                 ◊PROL_DROITE=       /  "CONSTANT",
                                     /  "LINEAIRE",
                                     /  "EXCLU",                 [DEFAUT]

                 ◊PROL_GAUCHE=       /  "CONSTANT",
                                     /  "LINEAIRE",
                                     /  "EXCLU",                 [DEFAUT]

                 ◊INTERPOL=          |  'LIN',                     [DEFAUT]
                                   | "LOG",
                                   | "NON",

                 ◊INFO=              /  1,                       [DEFAUT]
                                     /2 ,

                 ◊VERIF=             |  'CROISSANT',               [DEFAUT]
                                 |  'NON',

                 ◊TITRE=ti           ,                           [l_Kn]

                                     )
```

3 Opérandes

3.1 Opérande NOM_PARA

♦NOM_PARA = Np

Désigne the name of the parameter (variable or X-coordinate) of the function.
The possible values for Np are:

"ABSC", "AMOR", "DRX", "DRY", "DRZ", "DSP", "DX", "DY", "DZ", "ENDO", "EPAIS", "EPSI", "FREQ", "HYDR", "INST", "META", "NEUT1", "NEUT2", "NORM", "PAD", "PCAP", "PGAZ", "PLIQ", "PORO", "PULS", "PVAP", "SAT", "SECH", "SIGM", "TEMP", "TSEC", "VITE", "X", "Y", "Z"

3.2 Opérande NOM_RESU

◊NOM_RESU = NR

Désigne the name of the result (8 characters). The function thus created is NR = F (Np).

Note:

Certain commands (CALC_FONCTION , DEFI_MATERIAU ...) check the coherence of the names of the parameter and result according to their context. For example, one expects a traction diagram defined by a function of which NOM_PARA='EPSI' and NOM_RESU='SIGM'.

3.3 Operand VALE

/VALE = lv

lv is the list of values (x1, y1,…, xn, yn) with in the order:

- x1, y1 (the first value of the parameter and the corresponding value of the result),
- … ,
- xn, yn (the last value of the parameter and the corresponding value of the result).

Note:

The list lv of values must be described in the order of the X-coordinates (X) increasing.

3.4 Operand VALE_C

/VALE_C = lv

lv is the list of the values (X, there, Z,…, xn, yn, Zn) with:

- xi values of the parameter
- … ,
- yi, zi the real part and the imaginary part of the complex function for this parameter.

3.5 Operands X-COORDINATE / ORDONNEE

/ABSCISSE = labs
/ORDONNEE = Lord

One provides the values of the X-coordinates and the Y-coordinates of the function separately in the shape of lists of actual values (x1, x2,..., xn) for X-COORDINATE and (y1, y2,..., yn) for ORDONNEE. The two lists must have the same cardinal.

3.6 Operand VALE_PARA / VALE_FONC

```
/VALE_PARA     =
/VALE_FONC     = lo
```

Même operation that X-COORDINATE, ORDONNEE except that the lists are provided in the form of concept listr8 produces by DEFI_LIST_REEL [U4.34.01].
VALE_PARA and VALE_FONC must be identical cardinals if not the command stops in error.

3.7 Operand NOEUD_PARA

```
/NOEUD_PARA    = lno
```

lno list of nodes allowing to define the values of the X-coordinates of the function to be defined.
The X-coordinates will be equal to the curvilinear abscisses of the nodes on the curve which they define.

3.8 Operands PROL_DROITE and PROL_GAUCHE

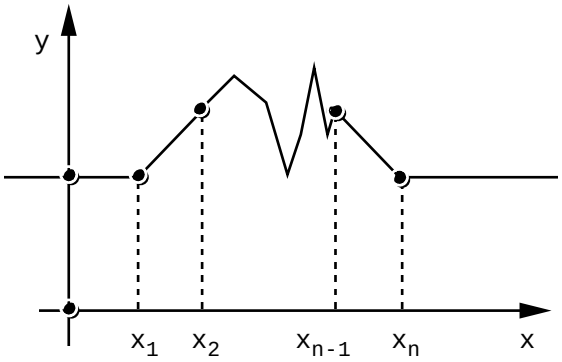
◊PROL_DROITE and PROL_GAUCHE =

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

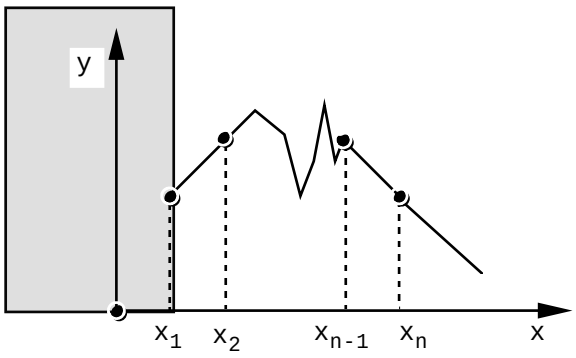
- "CONSTANT" for a prolongation with the last (or first) value of the function,
- "LINEAIRE" for a prolongation along the first definite segment (PROL_GAUCHE) or last definite segment (PROL_DROITE),
- "EXCLU" if the extrapolation of the values apart from the field of definition of the parameter is prohibited (in this case if a computation 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 = "LINEAIRE", PROL_GAUCHE = "EXCLU"



Note:

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

3.9 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 = ("LIN", "LOG")

"LIN" : linear,

"LOG" : logarithmic curve,

"NON" : one does not interpolate (and thus the program will stop if one asks for the value of the function for a value of the parameter where it was not defined).

Note:

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

3.10 Operand INFO

◊INFO = Précise options of printing on file MESSAGE.

1: no the printing (default choice)

2: printing of the parameters plus the list of the first 10 values in the order ascending of the parameter

3.11 Opérande VERIF

◊VERIF =

operator DEFI_ FONCTION checks that the values of the X-coordinates are strictly increasing. If it is not the case, an error is started. This is the behavior by defect, VERIF is worth "CROISSANT".
The user has the possibility of not making this checking by indicating VERIF='NON'. In this case, the function is reordered by increasing X-coordinates. An alarm is emitted if the X-coordinates of the function were not increasing.
On the other hand, the X-coordinates must imperatively be strictly monotonous.

3.12 Operand TITRATES

◊TITRE = Ti

Titrates attached to the product concept by this operator [U4.03.01].

3.13 Operands MESH and VALE_Y

these two key words should be informed if one defines the function starting from NOEUD_PARA.

MESH = my

Nom of the mesh associated with the list with node lno.

VALE_Y = lv

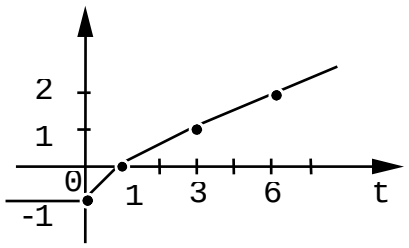
Liste of the values of the Y-coordinates of the function to be defined.

4 Definition of a function depending on time

4.1 Function and variables entered in the form of Définition

realities of a function (linear by pieces) depends on time (parameter INST).

```
EX_1 = DEFI_FONCTION  (
              NOM_PARA='INST',
              VALE = (  0. ,-1.,
                        1. , 0.,
                        3. , 1.,
                        6. , 2., ),
            PROL_GAUCHE='CONSTANT',
            PROL_DROITE='LINEAIRE',
                      )
```



4.2 Function and variables entered in the form of concepts listr8

It is possible to define this function using concepts of the listr8 type created via operator DEFI_LIST_REEL [U4.34.01]:

```
X-COORDINATE = DEFI_LIST_REEL  ( DEBUT = 0. ,
                 INTERVALLE =  (_F (JUSQU_A = 1. , NOMBRE = 1,),
                                _F (JUSQU_A = 3. , NOMBRE = 1,),
                                _F (JUSQU_A = 6. , NOMBRE = 1,),)
                            )
ORDONNEE = DEFI_LIST_REEL   ( DEBUT = -1. ,
                 INTERVALLE =  (_F (JUSQU_A = 0. , NOMBRE = 1,),
                                _F (JUSQU_A = 1. , NOMBRE = 1,),
                                _F (JUSQU_A = 2. , NOMBRE = 1,),)
                            )
EX_2 = DEFI_FONCTION     ( NOM_PARA    = "INST",
                           VALE_PARA   = X-COORDINATE,
                           VALE_FONC   = ORDONNEE,
                           PROL_DROITE = "CONSTANT",
                           PROL_GAUCHE = "LINEAIRE",
                         )
```

Note:

This example is obviously quite intricate to define the function suggested.
We wanted only to highlight the principle of use of the possibility offered.
The aforementioned becomes interesting when one uses functions defined in a large number of points.
Another reason to use the definition by DEFI_LIST_REEL is when the lists are necessary like argument for another operator: (list of times of an evolutionary computation THER_LINEAIRE, DYNA_LINE_TRAN, …), this avoids the duplication of information then.