Code_Aster

Titre : Opérateur DEFI_NAPPE
Responsable : COURTOIS Mathieu

Version default

Date : 19/04/2018 Page : 1/7
Clé : U4.31.03   Révision :
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Operator DEFI_NAPPE

1   Goal

To define a real function of two real variables. A tablecloth defines NR functions for NR values of a parameter.

This operator allows to define, for example, of the boundary conditions depending on a variable of space and time or two variables of space or data materials (for example of the traction diagrams function of the temperature).

The concept produced by this operator is of type `tablecloth`.

Code_Aster

Version
default

Titre : Opérateur DEFI_NAPPE
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Date : 19/04/2018 Page : 2/7
Clé : U4.31.03   Révision :
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2   Syntax

```
nf [tablecloth] = DEFI_NAPPE

        (   ♦   NOM_PARA =          /   Np ,                    [KN]

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

            ♦   PARA =                  LP ,                    [l_R]

            ◊   PROL_DROITE =       /   'CONSTANT',
                                    /   'LINEAR',
                                    /   'EXCLUDED'    ,          [DEFECT]

            ◊   PROL_GAUCHE =       /   'CONSTANT',
                                    /   'LINEAR',
                                    /   'EXCLUDED'    ,          [DEFECT]

             ◊  Interpol =          |   'FLAX',                 [DEFECT]
                                    |   'LOG',

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

            ◊   VERIF =                 'GROWING',

            ♦ /   FUNCTION =            lf                      [l_fonction]

              / ♦   NOM_PARA_FONC=  npf
                ♦   DEFI_FONCTION=
                    _F ( ♦  VALE  =  lv                         [l_R]
                         ◊  PROL_DROITE =/  'CONSTANT',
                                        /  'LINEAR',
                                        /  'EXCLUDED'   ,    [DEFECT]

                         ◊  PROL_GAUCHE =/  'CONSTANT',
                                        /  'LINEAR',
                                        /  'EXCLUDED'    ,   [DEFECT]

                         ◊ Interpol  =  |  'FLAX',          [DEFECT]
                                        |  'LOG',
                    ),

            ◊   TITLE = Ti,                                     [l_Kn]

        )
```

Code_Aster

Titre : Opérateur DEFI_NAPPE
Responsable : COURTOIS Mathieu

Version
default

Date : 19/04/2018 Page : 3/7
Clé : U4.31.03
Révision   :
f755d7051851

3   Operands

3.1   Operand NOM_PARA

♦   NOM_PARA = Np

Indicate the name of the parameter of the tablecloth (second variable) cf example with [§4.1].

The authorized values are listed are the same ones as in DEFI_FONCTION [U4.31.02].

3.2   Operand NOM_RESU

◊   NOM_RESU = NR

Name of the result, the values of the tablecloth. It must be identical to NOM_RESU of each function composing the tablecloth.

In fact, this operand is not used systematically for checks as coherence, in the execution of the code. These checks of coherence are made by the order CALC_FONCTION [U4.32.04].

3.3   Operand PARA

♦   PARA = LP

List of the values of the parameter characteristic of the tablecloth: para1, para2, … The cardinal of this list must be equal to the number of functions defined then.

3.4   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 tablecloth,
'LINEAR'   for a prolongation along the first definite segment (PROL_GAUCHE) or last definite segment (PROL_DROITE), this prolongation does not take account of a possible interpolation logarithmic curve,
'EXCLUDED'   if the extrapolation of the values apart from the field of definition of the parameter Np 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).

3.5   Operand Interpol

◊   Interpol =

Type of interpolation of the tablecloth: a type for the interpolation of the second variable and for the interpolation between two functions. This is obtained by providing a list of 2 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').*

Code_Aster

Titre : Opérateur DEFI_NAPPE
Responsable : COURTOIS Mathieu

Version
default

Date : 19/04/2018 Page : 4/7
Clé : U4.31.03   Révision :
f755d7051851

3.6 Operand INFORMATION

◊ INFORMATION =

Specify the options of impression on the file `message` (unit 6).

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

3.7 Operand VERIF

◊ VERIF =

The operator DEFI_TABLECLOTH reorder the values of the parameters Np in the ascending order. If VERIF is worth 'GROWING' the operator stops the execution if the values of the parameter Np were not given in this order.

3.8 Definition of the functions of the tablecloth

Two modes of definition of the tablecloth are possible:

• starting from a list of existing functions [§3.8.1],
• by directly defining the various functions of the tablecloth [§3.8.2].

3.8.1 Operand FUNCTION

FUNCTION = lf

List of concepts of the type `function` created by orders DEFI_FUNCTION [U4.31.02], DEFI_CONSTANT [U4.31.01], CALC_FONC_INTERP [U4.32.01],…

lf is the list of the names of concepts of the type `function` corresponding to the values of the parameter.

All the functions of the list must have the same name of variable (NOM_PARA of DEFI_FONCTION, that we will call npf) and to have the same name NR for name of result.

nf is a tablecloth of the variable of name Np and of the variable of name npf and whose value is of name NR.

3.8.2 Direct definition of the functions

3.8.2.1 Operand NOM_PARA_FONC

♦ NOM_PARA_FONC = npf

Name of the parameter characteristic of the functions constituting the tablecloth.

The authorized values are listed are the same ones as for NOM_PARA.

3.8.2.2 Keyword DEFI_FONCTION

DEFI_FONCTION =

Direct definition of the functions constituting the tablecloth.

Code_Aster

Version
default

Titre : Opérateur DEFI_NAPPE
Responsable : COURTOIS Mathieu

Date : 19/04/2018 Page : 5/7
Clé : U4.31.03   Révision   :
f755d7051851

3.8.2.3 Operand VALE

♦   VALE = lv
lv is the list of value (X_1, there$_1$,…, X_N, there$_N$) with in the order:
X_1, there$_1$ (the first value of the parameter and the corresponding value of the result),
…
X_N, there$_N$ (the last value of the parameter and the corresponding value of the result).

3.8.2.4 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 last definite segment (PROL_DROITE),
'EXCLUDED'   if the extrapolation of the values apart from the field of definition of the parameter npf 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).
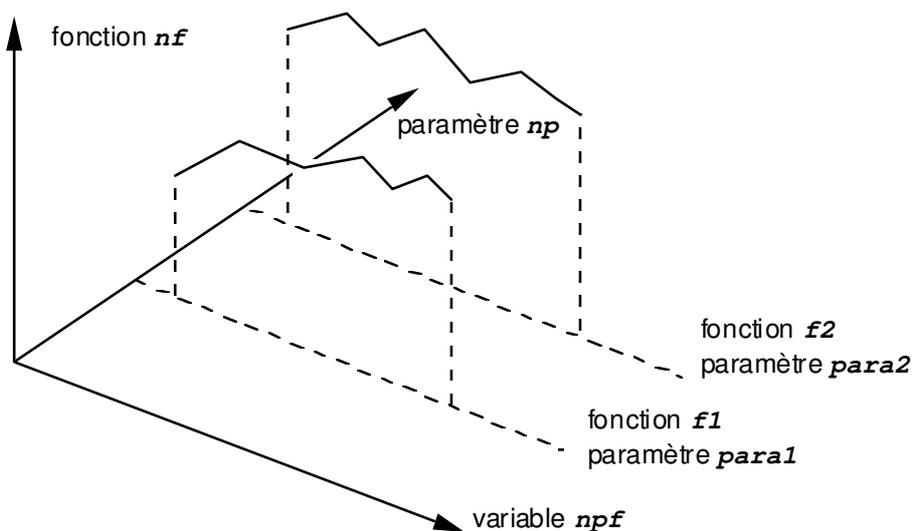
3.8.2.5 Operand Interpol

◊   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 X-coordinates and for the interpolation of the ordinates of the function. This is obtained by providing a list of texts among:

          INTERPOL = ('FLAX', 'LOG')

'FLAX'   linear,
:

'LOG' :   logarithmic curve,

'NOT' :   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, 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').

Code_Aster

Titre : Opérateur DEFI_NAPPE
Responsable : COURTOIS Mathieu

Version default

Date : 19/04/2018 Page : 6/7
Clé : U4.31.03   Révision :
f755d7051851

3.9 Operand **TITLE**

◊   TITLE = Ti

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

3.10 Evaluation of a tablecloth

That is to say a tablecloth N whose parameter is NOM_PARA= y and composed of functions of which NOM_PARA_FONC= x, values NOM_RESU= $z = f(x)$.
To evaluate $N(x, y)$:

* One seeks i such as $y_i \le y < y_{i+1}$,
* The two functions are evaluated f_i and f_{i+1} in x. For that, one uses the prolongations and the types of interpolation of each function (defined in the order DEFI_FONCTION or under the keyword factor DEFI_FONCTION of DEFI_NAPPE).
* One evaluates then $N(x, y)$ while interpolating starting from the values (y_i, y_{i+1}) and $(f_i(x), f_{i+1}(x))$. One then uses the prolongations and types of interpolation defined by the simple keywords PROL_GAUCHE, PROL_DROITE, Interpol of DEFI_NAPPE.

One would write:
```
tablecloth = DEFI_NAPPE ( NOM_PARA = 'there',
                NOM_RESU = 'Z',
                NOM_PARA_FONC = 'X',
                Interpol = (has, b),
                DEFI_FONCTION = (_F ( VALE=…,
                                      Interpol = (C, d),),
                               other functions…),)
```
The types of interpolation used are:
* C between two values X,
* D when one evaluates the functions in X,
* has between two values of there,
* B between two different functions (evaluated in X).

4   Examples

4.1 Definition of the tablecloth after definition of the function

```
FCT2 = DEFI_FONCTION       (NOM_PARA = 'EPSI', PROL_DROITE ='LINEAR',
                                              PROL_GAUCHE ='LINEAR',
                           VALE = (1.25E-5,  3.75,  3.75E-5,  7.5,),  )

FCT3 = DEFI_FONCTION       (NOM_PARA = 'EPSI', PROL_DROITE ='LINEAR',
                                              PROL_GAUCHE ='LINEAR',
                           VALE = (1.25E-5,  2.50,  3.75E-5,  5.0,),  )

SIG =     DEFI_NAPPE       (NOM_PARA = 'TEMP', PROL_DROITE ='CONSTANT',
                                              PROL_GAUCHE ='CONSTANT',
                           PARA =            (20.0, 30.0,),
                           FUNCTION =        (FCT3, FCT2,),        )
```

4.2 Direct definition of the tablecloth and the constitutive functions

Code_Aster

Version default

Titre : Opérateur DEFI_NAPPE
Responsable : COURTOIS Mathieu

Date : 19/04/2018 Page : 7/7
Clé : U4.31.03   Révision :
f755d7051851

```
        FCT2 = DEFI_NAPPE  (   NOM_PARA = 'TEMP',      PROL_DROITE ='CONSTANT',
                                                       PROL_GAUCHE ='CONSTANT',
                            PARA =              (20.0, 30.0,),
                            NOM_PARA_FONC =           'EPSI',
                            DEFI_FONCTION =       (
                                   _F (PROL_DROITE =  'LINEAR',
                                       PROL_GAUCHE =  'LINEAR',
                                       VALE = (1.25E-5, 3.75,3.75E-5, 7.5,),
                                             ),

                                   _F (PROL_DROITE =   'LINEAR',
                                       PROL_GAUCHE =   'LINEAR',
                                       VALE = (1.25E-5, 2.5,3.75E-5, 5.0,),
                                             ),
                                  ),
                            )
```