Operator POST_RELEVE_T

1 Goal

To extract from the values of components of fields of sizes and to carry out calculations of moyeborn and from invariants. The values are recorded on nodes, meshs, broken lines connecting of the nodes. They can be the subject, by this same procedure:

- calculations of:
  - averages,
  - resultants and moments of vector fields,
  - invariants of tensorial fields,
  - directional trace of fields,
  - extrema and arithmetic mean on nodes or of the meshs
- of expression in the reference marks TOTAL, ROOM, POLAR, USER or CYLINDRICAL.

POST_RELEVE_T product a concept of the type table, which can be printed using IMPR_TABLE [U4.91.03].

2 General syntax

```
tresu [tabl_sdaster]   =  POST_RELEVE_T(

   ♦  ACTION = _F  (
         ♦  ENTITLE = name  ,                          [K8]
         ♦  OPERATION =   | 'EXTRACTION',              [K16]
                          | 'AVERAGE',
                          | 'EXTREMA',
                          | 'MOYENNE_ARITH',

         ♦  /  case OPERATION = 'EXTRACTION' or 'AVERAGE':

               ♦  GROUP_NO = lgrno,                    [l_gr_noeud]
               ◊  /  ALL =  'YES',
                  /  GROUP_MA= lgrma,                  [l_gr_maille]

            /  case OPERATION = 'EXTREMA' or 'MOYENNE_ARITH':

                  |  ALL =  'YES',
                  |  GROUP_NO = lgrno,                 [l_gr_noeud]
                  |  GROUP_MA= lgrma,                  [l_gr_maille]

          ◊ FORMAT_C =   /  'MODULE',                  [DEFECT]
                         /  'REAL'  ,
                         /  'IMAG'  ,
          ♦ /  CHAM_GD = chpgd,                 /      [cham_no_sdaster]
                                                /      [cham_elem]

            /  RESULT = resu,                   /      [evol_elas]
                                                /      [evol_ther]
                                                /      [evol_noli]
                                                /      [mode_flamb]
                                                /      [dyna_trans]
                                                /      [dyna_harmo]
                                                /      [mode_meca]
                                                /      [mode_stat]
                                                 /     [fourier_elas]
                                                /      [fourier_ther]
                                                /      [mult_elas]
                                                /      [mode_acou]
                                                /      [acou_harmo]
                                                /      [base_modale]

               ♦  NOM_CHAM =   chpsymbo,                      [K16]
               ♦  /  TOUT_ORDRE   =  'YES',
                  /  NUME_ORDRE   =  lordre,                  [l_I]
                  /  LIST_ORDRE   =  lenti,                   [listis]
                  /  NUME_MODE    =  lmode,                   [l_I]
                  /  LIST_MODE    =  lenti,                   [listis]
                  /  NOM_CAS      =  nomcas,                  [K24]
                  /  NOEUD_CMP    =  noeucmp,                 [K24]
                  /  /  FREQ      =  lfreq,                   [l_R]
                     /  LIST_FREQ =  lreel,                   [listr8]
                     /  INST      =  linst,                   [l_R]
                     /  LIST_INST =  lreel,                   [listr8]
```

```
                        ◊  |    PRECISION=/prec,                    [R]
                                        / 1.D-6,                   [DEFECT]
                        ◊  |   'RELATIVE' CRITERE=/,                [DEFECT]
                                       / 'ABSOLUTE',
                    ♦  /   TOUT_CMP =    'YES',
                       /   NOM_CMP   =   lcmp,                     [l_K8]
                           ◊  REFERENCE MARK = /   'TOTAL',
[DEFECT]
                                        /   'POLAR',
                                        /   'LOCAL'  ,
                                            ◊ VECT_Y = (oy1, oy2, oy3), [l_R]
                                        /   'USER',
                                            ♦  ANGL_NAUT = (has, B, c),  [l_R]
                                        /   'CYLINDRICAL',
                                            ♦  ORIGIN = (X, there, Z),   [l_R]
                                            ♦  AXE_Z= (oz1, oz2, oz3),[l_R]
                           |   TRAC_NOR   = 'YES',
                           |   TRAC_DIR   = 'YES',
                               ♦  DIRECTION   =(X, there, [Z]),         [l_R]
                       /   INVARIANT      = 'YES',
                       /   ELEM_PRINCIPAUX= 'YES',
                       /   RESULTANT     =  lcmp,                  [l_K8]
                           ◊   MOMENT      =lcmp,                   [l_K8]
                           ♦   NOT       =   (X, there, [Z]),          [l_R]

                    ◊  MOYE_NOEUD=   /   'YES',                     [DEFECT]
    )                                /   'NOT',
    ◊  TITLE =   title                                  [l_Kn]
)
```

3 Principles of use of POST_RELEVE_T : operand ACTION

The postprocessing carried out by POST_RELEVE_T require the data of three information:

- place,
- object,
- nature.

Each occurrence of the keyword factor ACTION this triplet defines.

place postprocessing indicates a geometrical figure connecting the points of post - treatment. This place is defined in average DU keyword GROUP_NO.

object postprocessing is defined by the choice of a field of size, components and possibly of associated quantities chosen by various keywords.

The fields of size are chosen by one of the keywords:

RESULT and keywords allowing for choice of the fields with the nodes or the fields with the elements of the structure of data result.

CHAM_GD field of size produced by an operator elementary, or extracted from a concept result by CREA_FIELD [U4.72.04].

components by:

TOUT_CMP

NOM_CMP

and quantities associated by:

INVARIANT

ELEM_PRINCIPAUX

TRAC_NOR

TRAC_DIR and DIRECTION

RESULTANT and, optionally, MOMENT and NOT

nature postprocessing corresponds to the operations: keyword OPERATION

- of extraction of values: 'EXTRACTION'
- of calculation of averages (with the direction integration), of minimum and maximum on an ordered group of nodes : 'AVERAGE'
- of calculation of minimum and maximum on groups or entities: 'EXTREMA'
- of calculation of averages to the arithmetic direction on groups or entities: 'MOYENNE_ARITH'

4 Choice of the place of postprocessing

4.1 OPERATION = 'EXTRACTION' or 'AVERAGE'

4.1.1 Syntax

```
♦ GROUP_NO = lgrno,                [l_gr_noeud]
  ◊  /  ALL = 'YES',
     /  GROUP_MA = lgrma,              [l_gr_maille]
```

4.1.2 Operands GROUP_NO/ALL/GROUP_MA

- The argument of GROUP_NO is a list of groups of nodes. The nodes are treated in the order provided by the user. To reorder the nodes of a list, the order should be used DEFI_GROUP/OPTION = 'NOEUD_ORDO' [U4.22.01]
- The keyword GROUP_MA allows to limit postprocessing to a list of groups of meshs.

ALL = 'YES'returns to the standard case (one considers all the meshs). These keywords are not usable qu' with GROUP_NO.

Note:

It is disadvised using GROUP_MA with the operation AVERAGE except if the elements are segments. Let us recall that the operation AVERAGE calculate sizes according to a length L. For fuller information, it is necessary to refer in the paragraph dedicated to the keyword OPERATION where the quantities calculated using this option are presented.
The keyword TOUT=' OUI' wants to say "all the meshs of the grid" the directly affected nodal elements on the nodes of the grid (AFFE_MODELE/NODE), in addition disadvised, are ignored postprocessing.

4.1.3 Concepts of points of postprocessing and examples

The points of postprocessing are the points of Ω where the components (or quantities derived) are evaluated. The operation of extraction carries out this evaluation.

4.1.4 Example of points of postprocessing specified by the keyword GROUP_NO

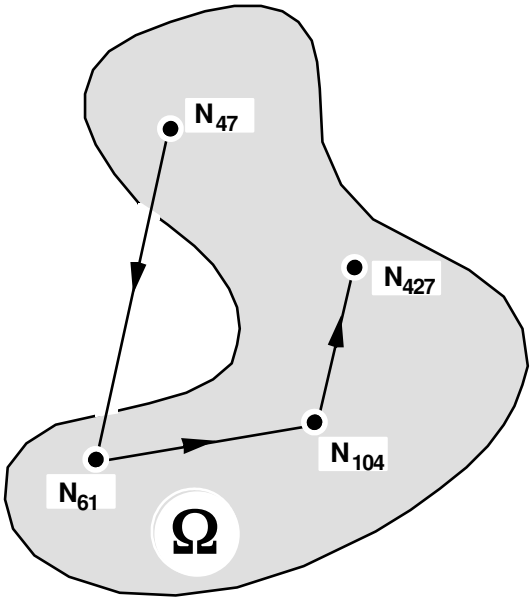

Figure 4.3.3-a

This figure visualize a place of postprocessing built starting from a list of nodes.

The points of postprocessing are the nodes represented, the place of postprocessing is the broken line connecting them according to the order provided by the user, which makes it possible to define a curvilinear X-coordinate. The value extracted on these lines is interpolated linearly between the values recorded on the nodes. Thus it should be noticed that if the operation of postprocessing is a calculation of average, all occurs like if the segment $[N_{47}\ N_{61}]$ was contained entire in Ω .

In this case, the curvilinear X-coordinate is calculated starting from the course of the nodes, such as defined in the list of nodes.

4.2 OPERATION = 'EXTREMA' or 'MOYENNE_ARITH'

4.2.1 Syntax

```
♦    | ALL =  'YES',
     | GROUP_NO = lgrno,                [l_gr_noeud]
     | GROUP_MA =   lgrma,              [l_gr_maille]
```

4.2.2 Operands ALL / GROUP_NO/GROUP_MA

- The argument of GROUP_NO is a list of groups of nodes. The nodes are not ordered.
- The keyword GROUP_MA allows to limit postprocessing to a list of groups of meshs.
- ALL = 'YES'returns to the standard case (one considers all the meshs).

5 Object-choice of postprocessing

These keywords make it possible to define the object of postprocessing. They indicate:

- a field of size: keywords CHAM_GD, RESULT (and its associated keywords),
- a quantity associated with the components with the field: keywords TOUT_CMP, NOM_CMP, INVARIANT, ELEM_PRINCIPAUX, TRAC_NOR, TRAC_DIR, DIRECTION, REFERENCE MARK, NAP, RESULTANT, MOMENT, NOT.

5.1 Field of size

5.1.1 Syntax

```
♦  /   CHAM_GD = chpgd,
   /   RESULT = resu,
   ♦   NOM_CHAM = chpsymbo,                              [K16]
   ♦   /   TOUT_ORDRE = 'YES',
       /   NUME_ORDRE = lordre,                          [l_I]
       /   LIST_ORDRE = lenti,                           [listis]
       /   NUME_MODE  = lmode,                           [l_I]
       /   LIST_MODE  = lenti,                           [listis]
       /   NOM_CAS    = nomcas,                          [K24]
        / /   FREQ =       lfreq,                        [l_R]
          / LIST_FREQ =  lreel,                          [listr8]
         /   INST      =  linst,                         [l_R]
          / LIST_INST =  lreel,                          [listr8]
          ◊ |   PRECISION   =    / prec,                 [R]
                                 / 1.D-6,                [DEFECT]
         ◊   |   CRITERION =   / 'RELATIVE',                [DEFECT]
                               / 'ABSOLUTE',
◊  FORMAT_C =    /   'MODULE',                           [DEFECT]
                 /   'REAL'  ,
                 /   'IMAG'  ,
```

5.1.2 Operand CHAM_GD

The argument of CHAM_GD is the name of a concept of the type cham_no_* or cham_elem_*.

5.1.3 Operands RESULT / NOM_CHAM / TOUT_ORDRE / NUME_ORDRE / LIST_ORDRE / NUME_MODE / LIST_MODE / NOM_CAS / FREQ / LIST_FREQ / INST / LIST_INST / PRECISION / CRITERION

See [U4.71.00].

5.1.4 Operand FORMAT_C

In the case of the complex fields, one can extract:

/	'MODULE'	the module
/	'REAL'	the real part
/	'IMAG'	the imaginary part

5.2 Components of the field and derived quantities

For the vectors and the tensors of order 2, it is possible to ask the evaluation of the components in a reference mark and to derive from the quantities obtained by contracted product. Keywords REFERENCE MARK, TRAC_NOR, TRAC_DIR and DIRECTION allow to define these quantities.

5.2.1 Syntax

```
♦  /  TOUT_CMP =    'YES',
   /  NOM_CMP   =  lcmp,                          [l_K8]
      ◊  /  REFERENCE MARK = /  'TOTAL',             [DEFECT]
                             /  'POLAR',
                             /  'LOCAL'  ,
                              ◊ VECT_Y = (oy1, oy2, oy3),  [l_R]
                             /  'USER',
                                ♦  ANGL_NAUT = (has, B, c), [l_R]
                             /  'CYLINDRICAL',
                                ♦  ORIGIN = (X, there, Z),[l_R]
                                ♦  AXE_Z= (oz1, oz2, oz3), [l_R]
      ◊  /  TRAC_NOR       = 'YES',
         /  TRAC_DIR       = 'YES',
            ♦  DIRECTION   = (X, there, [Z]),        [l_R]
   /  INVARIANT      = 'YES',
   /  ELEM_PRINCIPAUX= 'YES',
   /  RESULTANT     =  lcmp,                        [l_K8]
      ◊  MOMENT      = lcmp,                        [l_K8]
      ♦  NOT       =   (X, there, [Z]),               [l_R]
```

5.2.2 Operand TOUT_CMP

/ TOUT_CMP

This keyword admits for argument only the text 'YES' and selects all the components defined in the catalogue of the sizes for the size relating to the fields specified by the keywords RESULT and CHAM_GD.

5.2.3 Operands NOM_CMP

Allows to define the components of the size of the treated field:

/ NOM_CMP : the components are introduced by name

5.2.4 Operand REFERENCE MARK

/ REFERENCE MARK

The choice of a reference mark allows among the following reference marks:

- reference mark TOTAL : Cartesian reference mark of definition of the grid,
- reference mark POLAR : standard polar reference mark of the plan (OXY) (order of the components: (r, θ),
- reference mark ROOM : reference mark of the plan made up of the tangent and normal vectors (in this order) instead of postprocessing. The normal vector is defined in each point of post - treatment like average of the normals on the right and on the left.

Definition of the normal instead of postprocessing.

In each point of postprocessing the normal is defined like average of the normals on the right and on the left.

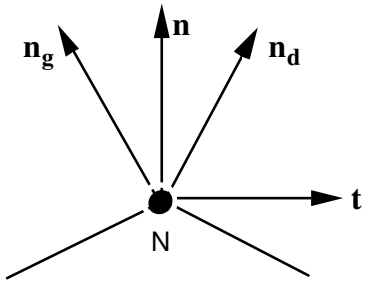

Figure 5.2.4-a

The tangent vector is obtained by a rotation of $-\pi/2$ starting from the normal vector.

In the case of the reference mark ROOM and of a line 3D, it will be necessary to provide:

```
VECT_Y = (oy1, oy2, oy3)
```

Coordinates of a vector whose projection on the orthogonal level with the directing axis of the line will be taken as the normal with the line. The order of the components in a local reference mark is (t, n, k).

Example of use:

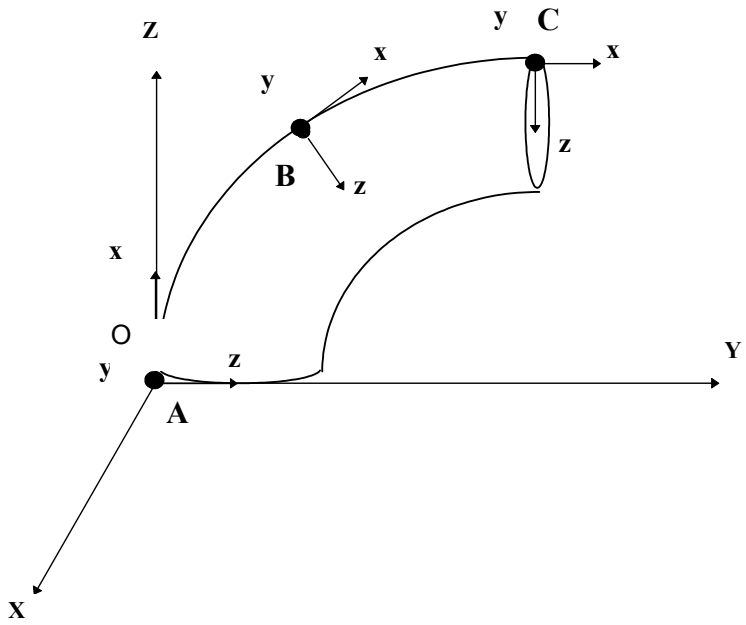

Figure 5.2.4-b

One wants to make an extraction on the line ABC according to the definite local reference mark above (local axis there in the total direction OX).

Here, one can find a vector constant in any point of the line to define the vector `VECT_Y = (1. , 0. , 0.)`.

This is possible because in any point this vector is already in the orthogonal plan with the line.

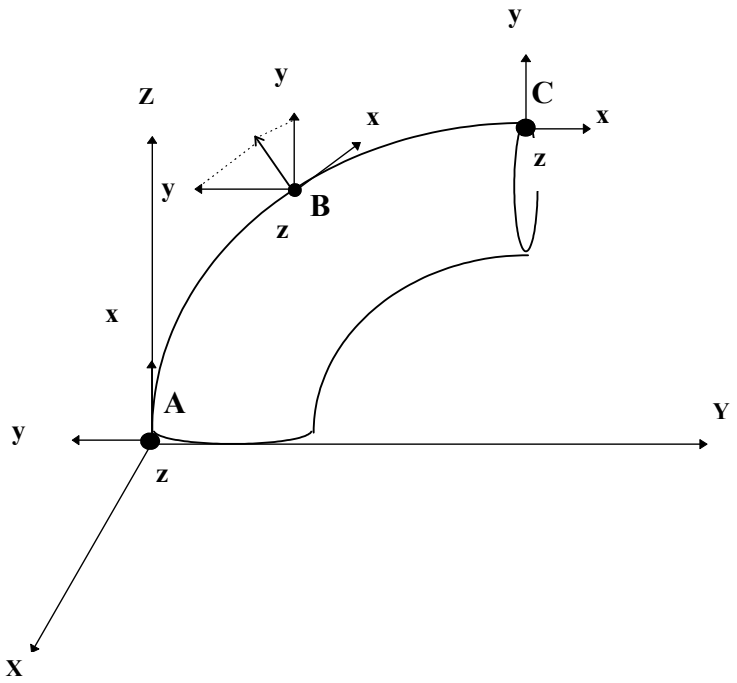

Figure 5.2.4-c

So on the other hand, one wishes to have the local axis z in the total direction OX [Figure 5.2.4-c], the vector VECT_Y will depend on the point considered:

$(0.,0.,1.)$ is appropriate except in A (where $(0.,-1.,0.)$ is appropriate)
$(0.,-1.0.)$ is appropriate except in C (where $(0.,0.,1.)$ is appropriate)

It will thus be necessary in this case to cut out the line in two pieces (AB and BC) and to define one VECT_Y different on each piece.

- reference mark USER : defined by the data of 3 nautical angles (in degrees):

  ANGL_NAUT = (has, B, C)

- reference mark CYLINDRICAL defined by:

  ORIGIN = (X, there, Z) coordinates of the origin O reference mark
  AXE_Z= (oz1, oz2, oz3) coordinates of a vector defining the axis Oz (axis of the cylinder).
  The order of the components in a cylindrical reference mark is (r,z,θ).

5.2.5 Operand TRAC_NOR

/ TRAC_NOR: only for modelings 2D and 3D.

Determination of the normal trace of a vector or a tensor of order 2: it is the typical case of the directional trace obtained when the direction u be identified with the normal n instead of post - treatment.

5.2.6 Operands TRAC_DIR/DIRECTION

/ TRAC_DIR: only for modelings 2D and 3D.
♦ DIRECTION

Determination of the directional trace of a vector $\boldsymbol{v}=(v_i)$ or of a tensor of order 2 $\boldsymbol{\sigma}=(\sigma_i)$ in the direction $\boldsymbol{u}=(u_i)$; i.e. scalar $v_k u_k$ or of the vector $\sigma_{ik} u_k$.

Direction u is defined by means of the keyword DIRECTION whose arguments are the components of the vector u data in the order X,Y,Z and evaluated in the total reference mark. If this list contains only two values then, conventionally, the component according to Z vector u is regarded as worthless.

5.2.7 Operand INVARIANT

Postprocessing of a tensor of constraint or deformation of order 2 partners to the principal directions of the tensor:

TRACE $Tr(\sigma)=\sum_{i=1}^{2ou3}\sigma_{ii}$

VON_MIS $VM(\sigma)=\sqrt{\sum_{i=1}^{2ou3}\frac{3}{2}\left(\sigma_{ij}-\frac{1}{3}Tr(\sigma)\delta_{ij}\right)^2}$

TRESCA $TR(\sigma)=max\left(\left|\lambda_i-\lambda_j\right|\right)$ with λ_i eigenvalues of σ

DETER $DET(\sigma)=déterminant\ de\ \sigma$

5.2.8 Operand ELEM_PRINCIPAUX

/ ELEM_PRINCIPAUX

Determination of the principal values of a tensor 2×2 or 3×3 of order 2. They are arranged in the order ascending their values.

5.2.9 Operands RESULTANT / MOMENT / NOT

Determination of the resultant and the moment of a field of torque on the place of post - treatment. RESULTANT can be used only if OPERATION=' EXTRACTION'.

By means of computer, these keywords can apply to any field of size but so that the results have a physical direction, one will have to limit oneself to the fields of nodal forces and nodal reactions.

In this last case, 2 possibilities arise:

- the user wants to calculate the resultant of certain components of the field: he will enter behind the keyword RESULTANT a list of components to be taken among $\left\{'DX','DY'\right\}$ in 2D and $\left\{'DX','DY','DZ'\right\}$ in 3D or structural elements (the resultant of components of rotations not having a physical direction),
- the user wants to calculate the resultant and the moment of certain components of the field: he will enter behind the keyword RESULTANT and MOMENT 2 lists of the same components length to be taken among

formula $\left\{'DX','DY','DZ'\right\}$	behind the keyword RESULTANT
formula $\left\{'DRX','DRY','DRZ'\right\}$	behind the keyword MOMENT

Moreover, it will introduce behind the keyword NOT the list of the coordinates of the point by report to which the moment is evaluated.

If one notes P this point and M_i the points of postprocessing, the evaluated quantities will be:

- Resultant: $\mathbf{F}=\sum_i \mathbf{F}_i=\sum_i \left(FX_{M_i}, FY_{M_i}, FZ_{M_i}\right)$
- Moment: $\mathbf{m}=\sum_i \left(P\vec{M}_i \wedge \mathbf{F}_i\right)+\sum_i \mathbf{m}_i^c$

where $\mathbf{m}_i^c$ indicate the list of the concentrated moments corresponding to the components of rotation introduced by the keyword MOMENT, relevant only in the case of elements of structure (beams, hulls, discrete).

Note:

1) In continuous mediums, one should not introduce behind MOMENT components of translation which would be regarded as concentrated moments and thus summoned with the true moments.
2) The calculation of RESULTANT and/or of MOMENT is carried out by a sum on a set of nodes. This sum has direction only if all the nodal forces (or moments) are expressed in the same reference mark. That wants to say that the keyword REFERENCE MARK can only take as value 'GLOBAL' or 'USER'.

6 Nature of postprocessing

6.1 Operand OPERATION

♦ OPERATION =

| 'EXTRACTION'

The operation extraction of a field of size makes it possible to recover the values of one or more components or quantities derived from these components at the points of the place of postprocessing.

In the case of an extraction on one cham_elem, the values of the components extracted from this field are calculated as follows:

- If the place of postprocessing is determined by the keyword GROUP_NO, for each node the components are realised on all the elements contributing in this node,

Note:

The moyennations with the nodes of computed fields in local reference marks are licit only if the angles between these reference marks are weak. In the contrary case, they do not have a direction.

If the place of postprocessing is defined by GROUP_NO = $(GN1, GN2, GN3, GN4, GN5)$, the values are realised on all the elements of the grid above.

If the place of postprocessing is defined as being the segment of origin $N1$ and of end $N5$, the values will be realised on the hatched elements.

In the case of quadratic elements (presence of nodes mediums), the average with the nodes tops can lead to more important weights of certain elements (function of cutting) compared to the nodes mediums which realise on 2 elements (thus of the same weight). One can thus be in the presence of oscillations between the values at the tops and the mediums.

| 'AVERAGE'

This operation is limited to 6 components of field at the same time. Being given a scalar field U (typically a component of a size), the operation 'AVERAGE' calculate the following quantities (L indicating the length of the place of post - treatment C considered):

MOMENT_0 = $\frac{1}{L}\int_c U(s)\,ds$

MOMENT_1 = $\frac{12}{L^2}\int_c U(s)\left(s-\frac{L}{2}\right)ds$

MINIMUM = $\underset{c}{Min}\,U$

MAXIMUM = $\underset{c}{Max}\,U$

MOYE_INT = MOMENT_0 - ½ MOMENT_1

MOYE_EXT = MOMENT_0 + ½ MOMENT_1

It is important that the place of postprocessing is traversed in a direction. If a group of nodes is used, one will take care to reorder the nodes, by using the order DEFI_GROUP OPTION 'NOEUD_ORDO', [U4.22.01]. Thus, L' X-coordinate curvilinear is defined since the node origin of the group, while following the broken line consisted the nodes.

The integrals above are evaluated while supposing U linear between two nodes. Thus, while noting U_i values of the field to the nodes (numbered by $i=1,\ldots,N$) of X-coordinate s_i, one a:

$$\text{MOMENT\_0}=\frac{1}{2(s_N-s_1)}\sum_{i=1}^{N-1}(s_{i+1}-s_i)(U_i+U_{i+1})$$

$$\text{MOMENT\_1}=\frac{2}{(s_N-s_1)^2}\sum_{i=1}^{N-1}(s_{i+1}-s_i)\left(U_i(s_{i+1}+2s_i)+U_{i+1}(2s_{i+1}+s_i)\right)$$
$$-\frac{3}{(s_N-s_1)}\sum_{i=1}^{N-1}(s_{i+1}-s_i)(U_i+U_{i+1})$$

| 'EXTREMA'

calculate them MIN, MAX, MINI_ABS, MAXI_ABS of a field possibly reduces on a list of nodes or of meshs, on all the components or a list of components.

6.1 Operand MOYE_NOEUD

Keyword allowing for choice of an impression detailed or realised in a point. This keyword is significant only for the sizes of the type cham_elem and for the operation EXTRACTION.

MOYE_NOEUD = 'YES'

For each point of postprocessing, the displayed value of a component or a deducted quantity is obtained like average of the values given by each convergent mesh in this point. The way of making the average is the same one as for the fields calculated by CALC_CHAMP [U4.81.04].

MOYE_NOEUD = 'NOT'

The list of the values obtained for each convergent mesh at the point of postprocessing is displayed.

7 Operands of access and impression of the contents of the tables created by POST_RELEVE_T

7.1 Principles of addressing of the contents of the tables

The statements of values are arranged in concepts of the type table. The tables are Bi - subscripted. The first index is the parameter, this one is defined by the operator according to the action considered (see [Table 7.4-a]). The second index is the variable, this one is defined by the user. The variables can be the names of the nodes, the names of the components.

7.2 Operand ENTITLE

♦ ENTITLE = matable [K8]

Name of the table of statements of values.

7.3 Operand TITLE

◊ TITLE = title

Title which one wants to give to the table of statements of values. For more details, to see [U4.03.01].

7.4 Definition of the parameters and the variables

With the impression on the file RESULT, each parameter is printed on a column, the printed variables being line by line.

Keywords	Parameters	Variables
OPERATION = 'AVERAGE' (keywords TOUT_CMP, NOM_CMP) (example [§9.2.2])	MOMENT_0 MOMENT_1 MINIMUM MAXIMUM MOYE_INT MOYE_EXT	Names of the components
OPERATION = 'MOYENNE_ARITH' (keywords TOUT_CMP, NOM_CMP)	AVERAGE	Names of the components
OPERATION = 'EXTREMA' (keywords TOUT_CMP, NOM_CMP)	VALE	Names of the components
OPERATION = 'EXTRACTION' (keyword IMPR_NOEUD = 'YES')	-	Names of GROUP_NO
OPERATION = 'EXTRACTION' (keyword IMPR_NOEUD = 'NOT')	-	Names of GROUP_NO concaténés with the names of the meshs
TOUT_CMP NOM_CMP (examples [§9.1] and [§9.2.1])	ABSC_CURV COOR_X COOR_Y COOR_Z follow-up of the name of the components	-
NOM_CMP TRAC_NOR TRAC_DIR (examples [§9.3] and [§9.4])	ABSC_CURV COOR_X COOR_Y COOR_Z DIR_1 DIR_2 DIR_3	-
INVARIANT (example [§9.5])	ABSC_CURV COOR_X COOR_Y COOR_Z VON_MIS TRESCA TRACE DETER	-
ELEM_PRINCIPAUX (example [§9.6])	ABSC_CURV COOR_X COOR_Y COOR_Z VAL_PR_1 VAL_PR_2 VAL_PR_3	-
RESULTANT MOMENT (examples [§9.7] and [§9.8])	Names of the components	-

Keywords	Parameters	Variables
REFERENCE MARK = 'POLAR' (example [§9.9])	ABSC_CURV COOR_X COOR_Y COOR_Z follow-up of the name of the components	-
REFERENCE MARK = 'CYLINDRICAL'	ABSC_CURV COOR_X COOR_Y COOR_Z follow-up of the name of the components	

Table 7.4-a

For the significance of the parameter ABSC_CURV, to see §4.1.5 and §4.1.6
For the reference marks POLAR and CYLINDRICAL, the significance of the components is:
DX : ray r , DY : ordinate on the axis of the cylinder z , DZ : angle θ (see U2.07.01 §2 and §5.2)

For the expression of the constraints in cylindrical reference mark one makes the following correspondences:

Constraints in Cartesian reference mark		Constraints in cylindrical reference mark
vector	X	R
	Y	Z
	Z	θ
tensor	XX	RR
	YY	ZZ
	ZZ	$\theta\theta$
	XY	RZ
	XZ	$R\theta$
	YZ	$Z\theta$

8 Phase of checking

It is checked that the headings all are different.

8.1 During the execution

This phase checks the coherence of the arguments between them. It relates to all the occurrences of the keyword factor ACTION. One distinguishes 2 groups from checks.

first group is common to the arguments of the keyword CHAM_GD and RESULT (which is excluded mutually) and is reduced to the following checks:

- acceptability of the components:
  it is checked that the required components are quite present at the catalogue of description of the size to treat,

second group is specific to the keyword RESULT, and is reduced to the checks:

- checking of the acceptability of the field symbolic system:
  one makes sure that the field symbolic system argument of the keyword NOM_CHAM exist well for the type of concept result argument of the keyword RESULT,
- existence of at least a structure of data for the field symbolic system to treat.

At the conclusion of the phase of checking, in production run the following alternative arises:

- all occurrences of ACTION are correct and the operations are launched,

- at least an occurrence of ACTION is incorrect, then an error message fatal is produced with stop of the order. Information informs about the nature of the errors and the means of correcting them.

8.2 During the treatment

A new filter of checking is presented but never causes the stop of the order. This filter is reduced to the following checks:

- existence of the structure of data indicated by CHAM_GD or RESULT and one of the keywords giving access in a structure of data RESULT.
  In the event of failure a message is transmitted and the following occurrence is treated,
- in the case of a calculation of tensorial invariants, one checks that the object of the treatment indicates well a tensor of order 2,
- in the case of a calculation of average or a request for extraction of values, one checks that the components to be treated were indeed calculated on the place of the post - treatment. In the event of failure of this checking, a message details the components nonavailable according to the meshs or nodes of the place of post - treatment.

If this last filter does not detect any impossibility of calculation, postprocessing is launched and the results are inserted in the table.

9 Examples

The examples which follow apply to the same physical problem (case test SHLV100G).

9.1 Keywords 'EXTRACTION' 'AVERAGE' 'EXTREMA' 'MOYENNE_ARITH'

9.1.1 'EXTRACTION'

9.1.1.1 Orders

```
#  extraction of the CMP of the tensor of the constraints on a list of nodes
#
   t2 = POST_RELEVE_T (ACTION = _F (
                          ENTITLE  = 'ex_2',
                          GROUP_NO     =
                                ('GN1', 'GN347', 'GN21', 'GN432', 'GN39',
'GN229'),
                          CHAM_GD   = SIGMA,
                          NOM_CMP   = ('SIXX', 'SIYY', 'SIZZ', 'SIXY'),
                          OPERATION = 'EXTRACTION'    )  )
```

9.1.1.2 Result

```
--- POST_TRAITEMENT NUMBER: 1 - FIELD NUMBER          : 1

 FIELD BY ELEMENT WITH THE NODES

 EXTRACTION  TENSOR FORCED
 TOTAL REFERENCE MARK

 CHEMIN DE NOEUDS

  T2 CONCEPT OF THE TYPE TABL_POST_RELE CALCULATES FROM THE CONCEPT SIGMA
    TABLE: EX_2     EXIT OF THE T2 TABLE

        ABSC_CURV    COOR_X       COOR_Y       COOR_Z       SIXX         SIYY         SIZZ         SIXY
 N1    0.00000E+00  1.00000E-01  0.00000E+00  0.00000E+00 -9.96843E-01 1.66549E+00  2.00595E-01 -2.97371E-04
 N347  1.00000E-01  2.00000E-01  0.00000E+00  0.00000E+00 -2.39383E-04 6.67596E-01  2.00207E-01 -2.65146E-05
 N21   2.14214E-01  9.23880E-02  3.82683E-02  0.00000E+00 -6.06951E-01 1.27563E+00  2.00603E-01 -9.41280E-01
 N432  3.14214E-01  1.84776E-01  7.65367E-02  0.00000E+00  9.75617E-02 5.69793E-01  2.00206E-01 -2.36114E-01
 N39   4.28428E-01  7.07107E-02  7.07107E-02  0.00000E+00  3.34029E-01 3.34628E-01  2.00597E-01 -1.33117E+00
 N229  5.28428E-01  1.41421E-01  1.41421E-01  0.00000E+00  3.33660E-01 3.33711E-01  2.00211E-01 -3.33924E-01
```

9.1.2 'AVERAGE'

9.1.2.1 Orders

```
#  average of the CMP of the tensor of the constraints on a list of nodes
#
   T3 = POST_RELEVE_T (ACTION=_F (ENTITLES  = 'ex_3',
                          NODE     = ('N1', 'N347', 'N21', 'N432', 'N39',
'N229'),
                          CHAM_GD   = SIGMA,
                          NOM_CMP   = ('SIXX', 'SIYY', 'SIZZ', 'SIXY'),
                          OPERATION = 'AVERAGE',      ) ,)
```

9.1.2.2 Result

```
 --- POST_TRAITEMENT NUMBER: 1 - FIELD NUMBER          : 1

 FIELD BY ELEMENT WITH THE NODES

 AVERAGE  TENSOR FORCED
 TOTAL REFERENCE MARK

 CHEMIN RELIANT LES NOEUDS:

 N1       N347     N21      N432     N39      N229

  CONCEPT T3 OF THE TYPE TABL_POST_RELE CALCULATES FROM THE CONCEPT SIGMA
```

TABLE: EX_3 EXIT OF TABLE T3

	MOMENT_0	MOMENT_1	MINIMUN	MAXIMUN	MOYE_INT	MOYE_EXT
SIXX	-9.83430E-02	1.17015E+00	-9.96843E-01	3.34029E-01	-6.83419E-01	4.86733E-01
SIYY	7.66354E-01	-1.17020E+00	3.33711E-01	1.66549E+00	1.35145E+00	1.81254E-01
SIZZ	2.00403E-01	-1.44941E-05	2.00206E-01	2.00603E-01	2.00411E-01	2.00396E-01
SIXY	-5.40089E-01	-1.03327E+00	-1.33117E+00	-2.65146E-05	-2.34562E-02	-1.05672E+00

9.1.3 'EXTREMA'

9.1.3.1 Orders

```
#  extrema of dx displacements and drz
#
   T3 = POST_RELEVE_T (ACTION=_F (
                        ENTITLE  = 'DEPL',
                        RESULT     =RESU1,
                        NOM_CHAM   = 'DEPL',
                        NOM_CMP    = ('DX', 'DRZ',),
                        OPERATION = 'EXTREMA',      ) ,)
```

9.1.3.2 Result

ENTITLE	RESU	NOM_CHAM	NUME_ORDRE	EXTREMA	NODE	CMP	VALE
DEPL	RESU1	DEPL	1	MAX	D	DX	3.47E-03
DEPL	RESU1	DEPL	1	MIN	D	DRZ	-6.27E-03
DEPL	RESU1	DEPL	1	MAXI_ABS	D	DRZ	6.27E-03
DEPL	RESU1	DEPL	1	MINI_ABS	With	DX	8.99E-22

9.1.4 'MOYENNE_ARITH'

9.1.4.1 Orders

```
#  average of dx displacements and dz on nodes
#
   t4 = POST_RELEVE_T (ACTION=_F (
                        ENTITLE  = 'DEPL',
                        RESULT     =RESU1,
                        NOM_CHAM   = 'DEPL',
                        GROUP_NO   = ('GNAB',),
                        GROUP_NO   = ('IT, 'OF,),
                              NOM_CMP    = ('DX', 'DZ',),
                        OPERATION = 'MOYENNE_ARITH',      ) ,)
```

9.1.4.2 Result

ENTITLE	RESU	NOM_CHAM	NUME_ORDRE	CMP	AVERAGE
DEPL	RESU1	DEPL	1	DX	9.47536E-04
DEPL	RESU1	DEPL	1	DZ	0.00000E+00

9.2 Operand RESULTANT

9.2.1 Orders

```
   # calculation of the resultants of the CMP quoted on a group_no
   T8 =   POST_RELEVE_T (ACTION = _F (
             RESULT =  resu,
             NOM_CHAM  =   'FORC_NODA',
             ENTITLE   =   'RESULTING',
             REFERENCE MARK      =   'TOTAL',
             OPERATION =   'EXTRACTION',
             GROUP_NO  =   'known',
             RESULTANTE= ('DX', 'DY', 'DZ')))
```

9.2.2 Result

```
   ---POST_TRAITEMENT NUMBER: 1 - FIELD NUMBER      :  1
```

```
   NUME_ORDRE             :  1
   FIELD WITH THE NODES OF REFERENCE SYMBOL FORC_NODA
   NUMBER OF ODRDRE: 1 INST: 0.00000E+00

   RESULTANTE_MOMENT   DISPLACEMENTS
   TOTAL REFERENCE MARK

   CHEMIN RELIANT LES NOEUDS:
   N69  N70   N71  N87   N88  N89   N97    N98

   T8 CONCEPT OF TABL_POST_RELE CALCULATES FROM CONCEPT RESU   TABLE:
   RESULTAN_1          EXIT OF THE T8 TABLE                INST:
0.00000E+00
   RESULTANT -1.000000000E+01 -2.724281611E-11 7.218027734E-11
```

9.3 Operands MOMENT and NOT

9.3.1 Orders

```
#  calculation of the resultants and the moments of the CMP quoted on a
group_no
   T9 =   POST_RELEVE_T (ACTION = _F
          (  RESULT =  resu,              NOM_CHAM=' FORC_NODA',
             ENTITLE   =  'RESULTANTE-MOMENT',
             REFERENCE MARK      =  'TOTAL',            OPERATION =
'EXTRACTION',
             GROUP_NO  =  'known',
             MOMENT    =  ('DRX', 'DRY MARTINI', 'DRZ'),   POINT= (0. ,
0. , 0.),)
          )
```

9.3.2 Result

```
   ---POST_TRAITEMENT NUMBER: 1 - FIELD NUMBER       :  1
   NUME_ORDRE             :  1
   FIELD WITH THE NODES OF REFERENCE SYMBOL FORC_NODA
   NUMBER OF ODRDRE: 1 INST: 0.00000E+00

   RESULTANTE_MOMENT DISPLACEMENTS
   MOMENT COMPARED TO THE POINT:   0.00000E+00   0.00000E+00       0.00000E+00
   TOTAL REFERENCE MARK

   CHEMIN RELIANT LES NOEUDS:
   N69    N70    N71    N87    N88    N89    N97    N98

   T9 CONCEPT OF THE TYPE TABL_POST_RELE CALCULATES FROM CONCEPT RESU COUNTS:
   RESULTAN_1        EXIT OF THE T9 TABLE              INST: 0.00000E+00
                        RESULT_X         RESULT_Y       RESULT_Z       MOMENT_X
   RESULTANT  -1.000000000E+01  -2.724281611E-11  7.218027734E-11  -9.744077883E-
12
   RESULTANT  -2.000000000E+00  -3.000000000E+00
```