Procedure IMPR_RESU with the format 'MED'

1 Goal

To write the result of a calculation in a file with format MED. One describes the whole of the keywords of order IMPR_RESU [U4.91.01] concerning this format of exit only.

One can write with the choice in a file with format MED:

- a grid,
- fields with the nodes,
- fields with the elements.

At the time of the writing of the fields by elements at the points of Gauss, one also writes the localization of the elements of reference (coordinated and weight of the points of Gauss).

MED (Modeling and Data exchanges) is a neutral format of data developed by EDF R & D and the ECA for the data exchanges between computer codes. The data which one can to exchange according to this format are the grids and the fields of results to the nodes and by elements. Files MED are binary and portable files (being pressed on the library HDF5, Hierarchical Dated Format). The writing of results in a file MED allows any other reading, computer code interfaced with MED the results produced by *Code_Aster* via the order IMPR_RESU.

2 Syntax

```
IMPR_RESU     (
#   Syntax of procedure IMPR_RESU to format 'MED'
◊   UNIT   =  links,
◊   FORMAT =  /   'MED',                                        [DEFECT]

◊   PROC0 =   / 'YES',                                          [DEFECT]
              / 'NOT',
◊   IMPR_NOM_VARI    =  /   'YES',                              [DEFECT]
                        /   'NOT',
◊   INFORMATION =    / 1,                                              [DEFECT]
              / 2,

/   LMBOU  =   _F (
    ♦   |  GRID   = my,                                  [grid]
        |  /   RESULT = resu,                            [sd_resultat]

               ◊   /   NOM_CHAM        =   l_nomsymb,          [l_K16]

               ◊   /   NUME_ORDRE      =   lordre,             [l_I]
                   /   NUME_MODE    =   lmode,                 [l_I]
                   /   NOEUD_CMP    =   lnoecmp,               [l_K16]
                   /   NOM_CAS      =   ncas,                  [l_K16]
                   /   ANGLE        =   langl,                 [l_K16]
                   /   /   FREQ     =   lfreq,                 [l_R]
                       /   INST     =   linst,                 [l_R]
                       ◊   |   PRECISION =  /   prec,          [R]
                                            /   1.0D-3,        [DEFECT]
                           |   CRITERION =  /   'RELATIVE',    [DEFECT]
                                            /   'ABSOLUTE',

           /      CHAM_GD   =   chgd,                          [cham_gd]

           ◊   / NOM_CHAM_MED   =   l_nomcham,                 [l_K64]
               / NOM_RESU_MED   =   l_nomresu,                 [K8]

            ◊ CARA_ELEM  = carele,                             [cara_elem]

           ◊   PART   =   /   'REAL',
                          /   'IMAG',
    ◊   INFO_MAILLAGE =  /'YES'
                         /'NOT'                                [DEFECT]
        ),
# To print some fields of "data":
/   CONCEPT   =   _F (
    /   CHAM_MATER   = chmat,                                  [cham_mater]
    /   CARA_ELEM    = carele,                                [cara_elem]
        ◊   REPERE_LOCAL           =   / 'NOT' ,               [DEFECT]
                                       / 'ELEM',
                                       / 'ELNO',
        # if REPERE_LOCAL = 'ELEM' or 'ELNO',
              ♦      MODEL     = Mo                           [model]
    /   LOAD          = charg,                                 [load]
        )
```

3 Operands FORMAT and UNIT, PROC0 and INFORMATION

3.1 Operand FORMAT

The operand FORMAT allows to specify the format of the file where to write the result.
The format 'MED' mean with the procedure IMPR_RESU that the result must be written in a file with format MED. It is the format of writing by default.

3.2 Operand UNIT

Defines in which unit one writes the file med. By default, UNIT = 80 and corresponds to the unit by default of the type rmed in astk.

3.3 Operand PROC0

The operand PROC0 whose value by default is 'YES', allows to restrict the impression on the processor of row 0. If one affects the value to him 'NOT', the impressions will be carried out on all the processors.

3.4 Operand INFORMATION

The keyword INFORMATION when it is equal to 2 makes it possible to obtain information on the impressions carried out by the order.

4 Operand IMPR_NOM_VARI

This keyword is useful in the case of the internal variables. When it is used and that impression of a field **VARI_*** was asked, it is in fact a field **VARI_*_NOMME** who will be printed. This field will have components whose name will be based on the catalogue of the laws of behavior used in calculation. If two laws of behavior have common internal variables, those will be amalgamated in a single component.

5 Keyword factor RESU

This keyword factor makes it possible to specify the results and fields to print.

5.1 Operand GRID

If the result is a grid (operand grid [U4.91.01]), the data deferred in the file result to format MED are:

- the list of the nodes number, name, coordinated,
- the list of the meshs number, name, type, name of the nodes,
- the list of the groups of nodes number, name, many nodes, names of the nodes,
- the list of the groups of meshs number, name, many meshs, names of the meshs.

Foot-note:
In a file MED, there is partition of the nodes and the meshs according to the groups. A partition corresponds to a family MED. In a file MED, the groups are distributed within the families: families of nodes and families of elements are thus found there.

5.2 Operand RESULT

The operand RESULT allows to print in a file MED, fields contained in a concept result.

One writes in the file 'MESSAGE' following information:

- operand 'RESULT',
- operand ' NAME_CHAM',
- operand 'NUME_ORDRE',
- name of the field stored in file MED: concatenation of the three preceding operands.

If INFO_MAILLAGE = = 'YES', more detailed information is printed in the file 'MESSAGE' at the time of the writing of the grid MED. One will be able for example to obtain the types of printed meshs, the names of the families MED which are created, etc.

5.3 Operand CARA_ELEM

The operand CARA_ELEM is used for the impression of the fields for under-points. When CARA_ELEM is provided, the fields under-points are printed by adding information in file MED allowing to position the under-points by taking account of the contained information in sd_cara_elem (thickness of a hull, angle of gimlet of a multifibre beam,…).

Note:

It is currently not possible to visualize fields at the under-points on elements PIPE in the module ParaViS of Salomé-Meca. One will be able for the moment to thus use operator IMPR_RESU_SP [U7.05.41] with this intention.

5.4 Operand CHAM_GD

The operand CHAM_GD allows to print in the file a structure of data of the type cham_gd. Concretely, one can thus print with this keyword a map, a field by elements or a field with the nodes.

5.5 Operand NOM_CHAM_MED

The operand NOM_CHAM_MED allows to define the name of field MED. It is a chain of 64 characters. This can be useful in particular when one wishes to print certain components of the field like several fields in same file MED (for example for the visualization of SIRO_ELEM).

5.6 Operand NOM_RESU_MED

The operand NOM_RESU_MED is an alternative to NOM_CHAM_MED concerning the terminology of fields MED. Its use will make it possible not to name fields MED explicitly more, which means that all the fields contained in the result will be printed. Each field name MED will be built to leave:

- character string provided to NOM_RESU_MED (chain of with more the 8 characters),
- reference symbol of the field Aster.

For example:

```
IMPR_RESU = (
    FORMAT = 'MED',
    RESU   = _F ( RESULT     = U,
                  NOM_RESU_MED = 'U_HAUT',
                 GROUP_MA      = 'HIGH',
                  NUME_ORDRE    = 1,)
    )
```

If the result U contains the fields DEPL and SIEF_ELGA, then the order above will produce fields MED:

- ' U_HAUT__DEPL',
- 'U_HAUT__SIEF_ELGA' ,

This can be useful in particular when one wishes to print in same file MED the same field on different groups of meshs.

5.7 Operand PART

It is not possible to write complex fields. This is why it is necessary to choose between the real part (PARTIE=' REEL') and the part complexes (PARTIE=' IMAG').

5.8 Operands NOM_CHAM / NUME_ORDRE / NUME_MODE / NOEUD_CMP / NOM_CAS / ANGLE / FREQ / INST / PRECISION / CRITERION / FILE

Cf document [U4.91.01].

6 Keyword factor CONCEPT

This keyword factor makes it possible to print in a displayable form the quantities affected by the user with the orders AFFE_MATERIAU , AFFE_CARA_ELEM and AFFE_CHAR_MECA .
That makes it possible to check that the rules of overload of the code lead to the assignments wished.

For example:

```
IMPR_RESU (FORMAT=' MED',
           CONCEPT= (
             _F (CHAM_MATER = CHAMPMAT),
             _F (CARA_ELEM  = CARA_ELE),
             _F (LOAD     = CHARG1),
           ))
```

The fields contained in these structures of data are printed in two very different forms:

- The form “with” (easiest to interpret graphically): each component is separately printed like a real number. For example, the thickness of the elements of hull is displayable like a scalar field (scalar map in Salomé).
- The form “B”: one assigns to each mesh a whole code: 1,2,3,… N. The meshs affected by the same code have ALL then their identical components. The “definition” of the codes, i.e. the values of these components is printed in the file message. One can visualize the “codes” like a scalar field, which makes it possible “to see” the zones where “all is constant”.

Form “A” is used systematically for the format “MED”, except for the material field because this field contains the name of affected material on the meshs and this name is not a number.
Form “A” is not programmed with the format “RESULT”.

The form “B” is systematically used for the format “RESULT” and for the material field.

For the form “B”, the correspondence between the affected quantities and the code is given in the file .mess.

For example, for the material field:

```
IMPRESSION OF A FIELD OF CONCEPT: MATERIAL field
NAME OF THE FIELD: CHAMPMAT_CHAMP_MAT
CORRESPONDENCE VALUE <-> CONTAINED:
VALUE =          1.
    X1       = MAT_1
VALUE =          2.
    X1       = MAT_2
VALUE =          3.
    X1       = MAT_3
```

6.1.1 Operand REPERE_LOCAL

If REPERE_LOCAL the value has ‘ELEM‘, the 3 vectors constituting the local reference mark of each element are printed, to be able to be visualized with L’ helps of ParaVis.

If REPERE_LOCAL the value has 'ELNO', the 3 vectors constituting the local reference mark of each element are recorded in the form of field with the nodes, to be able to be then used in the computer of ParaVis in combination with D' other fields with the nodes. In this case no other information coming from the concept CARA_ELEM is not recorded in the file.

When REPERE_LOCAL=' ELNO' it is thus possible to combine the local vectors with the components of the internal fields of efforts. That makes it possible to visualize the vectors efforts in 3D, like carrying out an animation of their evolution during moments of calculation. To carry out this action several elementary operations are to be realized in ParaVis:

- To open the file MED containing the reference marks:
  on REPE - > Filter "ELNO Points" - > Filter "Merge blocks"
- To open the file MED containing the fields:
  on EFGE_ELNO - > Filter "ELNO Points" - > Filter "Merge blocks"
- selection of the 2 "Merge blocks" then "Suspends Attributes"

In "Calculator" one has access to the vectors of REPE and with the components of the fields.
The vector effort (NR, Vy, Vz) is calculated in the following way:

$Fint$ = CAREL___.REPLC_1∗xxxxxxxxEFGE_ELNO_N +
CAREL___.REPLC_2∗xxxxxxxxEFGE_ELNO_VY +
CAREL___.REPLC_3∗xxxxxxxxEFGE_ELNO_VZ

where 'xxxxxxxx' indicate the name of the concept result, produced by *Code_Aster*.

The vector Moment (MT, My, Mz) is calculated in the following way:

$Mint$ = CAREL___.REPLC_1∗xxxxxxxxEFGE_ELNO_MT +
CAREL___.REPLC_2∗xxxxxxxxEFGE_ELNO_MFY +
CAREL___.REPLC_3∗xxxxxxxxEFGE_ELNO_MFZ

where 'xxxxxxxx' indicate the name of the concept result, produced by *Code_Aster*.

6.2 Fields being able to be visualized

CHAM_MATER:
Material field

CARA_ELEM:
General characteristics of the bars
Characteristics géom. bars
General characteristics of the beams
Characteristics géom. beams
Wire specifications
Characteristics of the curved beams
Characteristics of the "fluid" beams
Characteristics of the discrete elements K_*
Characteristics of the discrete elements M_*
Characteristics of the discrete elements A_*
Characteristics géom. hulls
Orientation of the elements 2D and 3D
Orientation of the hulls and the beams

LOAD :
Loading of GRAVITY
Loading of ROTATION
Loading of PRES_REP
Loading of voluminal forces in 3D
Loading of surface forces in 3D
Loading of linear forces in 3D
Loading of surface forces in 2D

Loading of linear forces in 2D
Loading of forces distributed for the hulls
Loading of PRE_EPSI
Loading of FORCE_ELEC
Loading of FLUX_THM_REP
Loading ofIMPE_FACE
Loading ofONDE_FLUI

7 Example

```
IMPR_RESU = (
    FORMAT = 'MED',
    RESU   = _F ( RESULT    = REMEZERO,
           NOM_CHAM  = 'ERME_ELEM',
           NUME_ORDRE    = 3,)
    )
```

Execution of the order IMPR_RESU following posting in the file will cause 'MESSAGE' :

```
RESULT                  :  REMEZERO
FIELD                   :  ERME_ELEM
NUME_ORDRE              :  3
    ==> NAME MED        :  REMEZEROERME_ELEM
```

Example of use of NOM_CHAM_MED for the impression of SIRO_ELEM :

```
IMPR_RESU (FORMAT=' MED',
           RESU= (
                 _F (RESULTAT=RESUNL,
                    NOM_CHAM= ('SIRO_ELEM',),
                    NOM_CHAM_MED= ('RESUNL__SIRO_ELEM_NORMAL'),
                    NOM_CMP= ('SIG_NX', 'SIG_NY', 'SIG_NZ', 'SIG_N',),
                    GROUP_MA=' PRES',),
                 _F (RESULTAT=RESUNL,
                    NOM_CHAM= ('SIRO_ELEM',),
                    NOM_CHAM_MED= ('RESUNL__SIRO_ELEM_TANGENT'),
                    NOM_CMP= ('SIG_TX', 'SIG_TY', 'SIG_TZ',),
                    GROUP_MA=' PRES',),
                 _F (RESULTAT=RESUNL,
                    NOM_CHAM= ('SIRO_ELEM',),
                    NOM_CHAM_MED= ('RESUNL__SIRO_ELEM_T1'),
                              NOM_CMP= ('SIG_T1X', 'SIG_T1Y', 'SIG_T1Z',
'SIG_T1',),
                    GROUP_MA=' PRES',),
                 _F (RESULTAT=RESUNL,
                    NOM_CHAM= ('SIRO_ELEM',),
                    NOM_CHAM_MED= ('RESUNL__SIRO_ELEM_T2'),
                              NOM_CMP= ('SIG_T2X', 'SIG_T2Y', 'SIG_T2Z',
'SIG_T2',),
                    GROUP_MA=' PRES',),
                    ),);
```