Code_Aster

Version default

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Responsable : Nicolas SELLENET

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Procedure `IMPR_RESU` with formats "RESULTAT" and "ASTER"

1   Drank

To write the mesh or the results of a computation in a file with format "RESULTAT" or the mesh with format "ASTER".

Currently this procedure makes it possible to write with the choice:

- a mesh,
- fields at nodes (of static displacements, temperatures, eigen modes, modes,…),
- fields by elements with the nodes or Gauss points (of stresses, generalized forces, local variables…).

Procedure `IMPR_RESU` also makes it possible to write a mesh and/or results on a file in sight, in particular of their graphic visualization (cf documents [U7.05.01] (format "IDEAS"), [U7.05.11] (format "CASTEM"), [U7.05.21] (format "MED") and [U7.05.31] (format "ENSIGHT")).

For the concepts of the type result, one can print only part of information, by selecting the fields and the sequence numbers which one wishes to exploit.

For the printings with format "RESULTAT", it is possible to select the topological entities (nodes, meshes, nodes groups and mesh groups) on which one wants to print the results. One can also reduce the number of the information printed by asking for only the printing of certain components, values understood in an interval chosen by the user or of extreme values. One can combine all the possibilities, for example to obtain the maximum value of a component given, on a particular topological entity and in an interval of values chosen by the user.

Format "RESULTAT" should not be used as a basis to store or to exchange results, its format is not fixed.

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2   Syntax

```
IMPR_RESU      (
◊   MODELS = Mo,                                        [model]
◊   UNITE = links,                                      [I]
◊FORMAT  =  "RESULTAT",                                 [DEFAULT]
           /"ASTER",

/RESU   = (_F (
    #Syntaxe   of procedure IMPR_RESU to format "RESULTAT"

    ♦  |   MAILLAGE = MY,                               [mesh]
       |  /CHAM_GD=CH_GD          ,                     [cham_gd]
          /RESULTAT        =RESU ,                      [result]

       # Extraction of a field of variables of resu
          ◊/TOUT_CHAM=/              "OUI',            [DEFAULT]
                                    /"NON",
            /NOM_CHAM              =L_NOMSYMB  ,        [l_K16]

                        ◊/TOUT_ORDRE=' OUI',            [DEFAULT]
            /NUME_ORDRE            =LORDRE   ,          [l_I]
            /LIST_ORDRE            =LENTI   ,           [listis]
            /NUME_MODE             =LMODE   ,           [l_I]
            /NOEUD_CMP             =LNOECMP ,           [l_K16]
            /NOM_CAS              =NCAS ,               [l_K16]
            //ANGLE               =LANGL   ,            [l_R]
              /FREQ               =LFREQ   ,            [l_R]
              /LIST_FREQ          =LREEL   ,            [listr8]
              /INST               =LINST   ,            [l_R]
              /LIST_INST          =LREEL   ,            [listr8]

               ◊ |   PRECISION=/    PREC,               [R]
                                /1.0D-3,                [DEFAULT]
                  |   CRITERE     =   "RELATIF",        [DEFAULT]
                                   /"ABSOLU",

         # Parameters
         ◊/TOUT_PARA=/              "OUI',
                                   /"NON",              [DEFAULT]
           /NOM_PARA       =L_NOMPARA  ,                [l_K16]
         ◊   FORM_TABL=/            "OUI',
                                   /"EXCEL",
                                   /"NON",              [DEFAULT]
       # Selection of the components
                        ◊/TOUT_CMP=' OUI',              [DEFAULT]
           /NOM_CMP            =L_NOMCMP   ,            [l_K8]
       # Selection of topological entities
                        ◊/TOUT=' OUI',                  [DEFAULT]
          /  |   NOEUD=L_NOEU          ,                [l_noeud]
             |   GROUP_NO=L_GRNO       ,                [l_gr_noeud]
             |   MAILLE=L_MAILLE        ,               [l_maille]
             |      GROUP_MA=L_GRMA ,                   [l_gr_maille]
       # Selection on values
       ◊VALE_MAX=/                     "OUI',
                                      /"NON",           [DEFAULT]
       ◊VALE_MIN=/                     "OUI',
```

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```
                                           /"NON",                    [DEFAULT]
              ◊BORNE_SUP=VSUP                      ,                   [R]
              ◊BORNE_INF=VINF                      ,                   [R]

              # Printing of coordinates
              ◊IMPR_COOR=/              "OUI',
                              /"NON",                                  [DEFAULT]

              # Choice of the format of writing of the actual values
              ◊        FORMAT_R=/FORMES           ,
                              /  "1PE21.14",                           [DEFAULT]

              ◊SOUS_TITER=L_ST              ,                          [l_Kn]

        #Syntaxe   of procedure IMPR_RESU to format "ASTER"

        ♦  |    MAILLAGE=MA           ,                         /  [mesh]
                                                               /  [squelette]
              ◊SOUS_TITER=L_ST         ,                          [l_Kn]

        )),

    /CONCEPT   = (_F (

        #Pour   to print some fields of "data":
        to #Voir   the explanations in U7.05.21
        #    (functions only for FORMAT=' RESULTAT')

        /CHAM_MATER       = chmat,
        /CARA_ELEM          = caraele,
           ◊        REPERE_LOCAL              =    "OUI' ,
                                            / "NON",           [DEFAULT]
              # if REPERE_LOCAL = "OUI',
                    ♦MODELE=            Mo                     [model]
        /CHARGE            = load,
        )),
    )
```

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3 Typography in documentation `IMPR_RESU`

For understanding the documentation of IMPR_RESU `well`, it should be noted that term "RESULTAT" gathers in *Code_Aster* three rather different notions:

- a kind of concept,
- a kind of file,
- a format of writing.

Indeed, on the one hand, one indicates by result, the quantities produced by an operator of Aster computation producing several fields (evolutionary computation, computation of eigen modes, etc…).

These data (results) are contained in a data structure *Aster* of the generic type said `result`. This generic type is declined under types, for example `mode_meca`, `evol_elas`, etc, whose mode of storage differs somewhat. A concept of the type `result` has only one under type. In documentation *Aster* the names of the types of concept are in small letters `Courier`.

In addition, the results intended for the printing, in particular those resulting from `IMPR_RESU`, are versed in a file indicated by results file (associate with unit 8, standard `resu` in astk). The format of writing associated with this file intended for the printing is also baptized `RESULTAT`.

In short :

result	given resulting from the resolution of the system,
result	generic designation of the type of concept (of data structure) which contains result,
evol_ther mode_meca	name of under type of result of type `result`,
FICHIER	(without quote) designation of the file which contains the results, independently of the format of its contents,
"RESULTAT"	(with quotes) designation of the format (*Aster*) of the file which contains the results.

4 Operands `FORMAT` and `UNITE`

procedure `IMPR_RESU` makes it possible to write a mesh and/or values of results in various formats in sight, in particular, of a graphic visualization [U7.05.01], [U7.05.11], [U7.05.21] and [U7.05.31].

Operand `FORMAT` makes it possible result to specify the format of printing of one.
Format "RESULTAT" is taken by default. It makes it possible to print the mesh and/or the results in form listing.

One specifies in which file the data will be written via key word `UNITE` (cf orders `DEFI_FICHIER`). By default, `UNITE = 8` with format "RESULTAT" and `UNITE = 26` with format "ASTER".

5 Key word `RESU`

This key word factor makes it possible to specify the results to print and the format according to which one wants to print them.

6 Operands `CHAM_GD` and `RESULTAT`

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the values of the computed fields are stored in data structures called fields of variables. These fields of variables can be directly accessible (concept `cham_gd`) or be in a data structure gathering several fields of variables (result concept).

- a field of variables is a data structure which makes it possible to store fields defined in the nodes (`cham_no_*`) or fields defined by elements (`cham_elem_*`). For the fields by elements, one and the distinguishes the fields defined in the nodes from the elements fields defined in Gauss points of the elements,

- a result concept is composed of one or more fields of variables. For example, with each computation step one stores in data structure `result`, the field of variables displacement. This structure is thus indexed by a matric structure of order 2, whose index is, for example, the list of times of computation and the other all the computed fields (displacements, stresses, strains,…).

One reaches in this case a field of variables by specifying the value of a variable of access (sequence number, time, frequency, number of mode…) and a field name ("`DEPL`", "`SIGM_ELNO`", …). There exist several types of result concept: `evol_elas`, `evol_noli`, `mode_meca`,…. A each one corresponds a list of fields and a list of licit variables of access.

In addition, with a result concept is also associated a certain number of complementary results (for example modal generalized mass or participation factors in a modal computation (result concept of the mode_meca `type`)), different for each value from the variable of access. These complementary results are called parameters.

Taking into account data structure `result`, one understands easily that the possibilities of printing which one lays out are those of the fields of variables, supplemented by specific possibilities:

- information on the structure of data (for example: list variables of access, list of the actually calculated fields,…),
- direct access to a field of variables (for example, printing of the field of displacements at time $t=15.$),
- printing of the values of parameters.

Operand `RESULTAT` makes it possible to print the fields contained in a result concept . One can for example choose to print only certain fields (confer the following key word: `NOM_CHAM`) on certain components of some nodes (cf `NOEUD_CMP`).

7   Extraction of a field of variables

7.1   Operands `TOUT_CHAM/NOM_CHAM`

cf document [U4.71.00].

7.2   Operands `TOUT_ORDRE/NUME_ORDRE/LIST_ORDRE/NUME_MODE/INST/LIST_INST/FREQ/LIST_FREQ/NOEUD_CMP/NOM_CAS/ANGLE/accuracy/CRITERE`

cf document [U4.71.00].

8   Parameters

8.1   Operand `TOUT_PARA`

This key word indicates if one wants or not to print all the values of the parameters attached to the concept of the type `result`.

Example:

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```
IMPR_RESU (RESU= (_F (RESULTAT= resu,    TOUT_PARA= "OUI', NUME_ORDRE=
3)))
```

One prints in the results file the values of all the parameters but only for the third computation step of a result concept of the mode_meca `type` :

Printing of the parameters of the concept `resu` for sequence number 3:

```
                        NOM_MODE3
                        FREQ1.09787E+4
                        OMEGA24.75843E+09
                        AMOR_REDUIT0.00000E+00
                        ERREUR2.76853E-10
                        MASS_GENE1.50009E-07
                        RIGI_GENE7.13806E+02
                        ........
                        ........
                        NORMESANS_CMP           : LAGR
```

8.2 Operand NOM_PARA

This key word makes it possible to choose a list of symbolic names of parameters among all the possible ones.

Key words TOUT_PARA and NOM_PARA cannot be used simultaneously.

Example:

```
IMPR_RESU (RESU= (_F ( RESULTAT= resu,
                       NOM_PARA= ("NORM"), NUME_ORDRE= 3)))
```

One prints in the results file the value of the parameter of name "NORMALIZES" but only for the third computation step of a result concept of the mode_meca `type`:

Printing of the parameters of the concept `resu` for sequence number 3:

```
                        NORMESANS_CMP           : LAGR
```

8.3 Operand FORM_TABL

This key word makes it possible to choose the format of printing of the values of the parameters. Either in the form of a table of which each line is restricted with 80 characters (FORM_TABL = "OUI'), or in the form of a table of which each line can reach 2000 characters (FORM_TABL = "EXCEL"), or in the form of a list (a parameter by line) (FORM_TABL = "NON").

By defaults the parameters are printed in the form of a table.

Example:

```
1/FORMES_TABL = "OUI'

                        NUME_ORDRENUME_MODEITER_QRITER_BATHE
            FREQOMEGA2AMOR_REDUIT
                        MASS_GENERIGI_GENEAMOR_GENE
                  MASS_EFFE_DYMASS_EFFE_DZFACT_PARTICI_DX
            FACT_PARTICI_DZMASS_EFFE_UN_DXMASS_EFFE_UN_DY
         NORMEMETHODE

2/FORMES_TABL = "EXCEL"

                        NUME_ORDRENUME_MODEITER_QRITER_BATHE ...
```

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9 Selection on the components

Another way reduce the volume of the printings is to print only the values of certain components (for example that displacement following the axis X : component DX).

9.1 Operand TOUT_CMP

This key word makes it possible to indicate that one wishes to print all the components of the field.

9.2 Operand NOM_CMP

This key word makes it possible to choose the list of the components cham_gd or of all the fields of the result concept which one wishes to print.

Key words TOUT_CMP and NOM_CMP cannot be used simultaneously.

These components are described in the specific documentation of the elements.

10 Selection of the topological entities

In order to reduce the volume of the printings, it is sometimes necessary to print only part of result. With this intention one can print a field at nodes only in some nodes, or a field by element that in certain elements.

10.1 Operand TOUT

This key word indicates that one wishes to print the field on all the structure (all the nodes for a field at nodes, all elements for a field by element).

10.2 Operand NOEUD

This key word makes it possible to indicate the list of the nodes on which one wishes to print a cham_no. If this key word is used in the case of the printing of a cham_elem, he is ignored, and the cham_elem is printed in all meshes specified in addition.

10.3 Operand GROUP_NO

This key word makes it possible to indicate the list of the nodes groups on which one wishes to print a cham_no. If this key word is used in the case of the printing of a cham_elem, he is ignored, and the cham_elem is printed in all meshes, specified in addition.

10.4 Operand NETS

This key word makes it possible to indicate the list of meshes on which one wishes to print a cham_elem. For a cham_no, it makes it possible to indicate the list of the nodes, tops of meshes to which one wishes to print the cham_no.

10.5 Operand GROUP_MA

This key word makes it possible to indicate the list of the mesh groups on which one wishes to print a cham_elem. For a cham_no, it makes it possible to indicate the list of the nodes, tops of meshes to which one wishes to print the cham_no.

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11   Selection on the values

It is also interesting to print only the extreme values of all or certain components, on whole or part of structure.

11.1   Operand `VALE_MAX`

This key word indicates that one wishes to print the maximum value of each component of the field, possibly in a given interval specified by arguments `BORNE_SUP` and/or `BORNE_INF`.

11.2   Operand `VALE_MIN`

This key word indicates that one wishes to print the minimal value of each component of the field, possibly in a given interval specified by arguments `BORNE_SUP` and/or `BORNE_INF`.

11.3   Operand `BORNE_SUP`

This key word indicates the higher limit of the interval on which one wishes to print the field. One prints all the values of the field lower than this higher limit.

11.4   Operand `BORNE_INF`

This key word indicates the lower limit of the interval on which one wishes to print the field. One prints the values of the field higher than this lower limit.

12   Printing of the coordinates: operand `IMPR_COOR`

This key word makes it possible to specify if one wishes to print the coordinates of a node at the time of the writing of `a cham_no` to format "`RESULTAT`".

13   Operand `FORMAT_R`

```
◊FORMAT_R=/FORMES              ,
             /   "1PE21.14"              [DEFAULT]
```
Makes it possible to specify the format of writing of the actual values to format "`RESULTAT`".

14   Notice

In *Aster*, it exists `cham_elem` with under points (as well for `cham_elem` with the nodes as for `cham_elem` with Gauss points). Format "`RESULTAT`", IMPR_RESU allows the printing of the `cham_elem` with under points.

If same `a cham_elem` has under points on some meshes and not on others, the printing of the `cham_elem` will be done in two times:

- initially printing of `the cham_elem` on all meshes on which there is not under points,
- then printing of `the cham_elem` on all meshes on which there is under points.

A specific format is used for each one of these printings.

15   Operand `SOUS_TITRE`

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This argument makes it possible to print under title of comment, for more details to consult the document [U4.03.01].

The SOUS_TITRE by default is:

- for a cham_gd

    - for a cham_no
      SOUS_TITRE =   ("Field at nodes")
    - for a cham_elem
      SOUS_TITRE =   ("FIELD PAR ELEMENT &LOC (cham_elem)")

      Example: "FIELD PAR ELEMENT WITH Gauss points"

- for result

    - for a cham_no
    SOUS_TITRE =
        ("Field at nodes",
            "OF Symbolic name &NOM_SYMB (Result cham_no) &RL",
            "NUMERO D '' ORDRE &NUM_ORDRE (Result cham_no)",
            "&ACCES (Result cham_no)")

    Example of printing:

            FIELD AT NODES OF SYMBOLIC NAME DEPL
            SEQUENCE NUMBER: 2 NUME_MODE: 3
            FREQ: 5.52739E+00

    - for a cham_elem
    SOUS_TITRE =
        ("FIELD PAR ELEMENT &LOC (Result cham_elem)",
            "OF Symbolic name &NOM_SYMB (Result cham_elem) &RL",
            "NUMERO D '' ORDRE &NUM_ORDRE (Result cham_elem)",
            "&ACCES (Result cham_elem)")

    Example of printing:

            FIELD PAR ELEMENT WITH THE NODES OF SYMBOLIC NAME
            EPSI_ELNO SEQUENCE NUMBER: 1 INST:
            0.00000E+00

16   Printing of mesh: operands MAILLAGE / MODELS

This argument makes it possible to print the mesh with FORMAT = "ASTER" and/or "RESULTAT". One then finds the format used for LIRE_MAILLAGE [U4.21.01] and defined in [U3.01.00].

By default, one prints all the mesh.

Concept of the model type is optional in the majority of the printings. However, it can be used in the case of the printing of a mesh to formats "ASTER" and/or "RESULTAT", in order to print only the part of the mesh of which meshes are affected in the model.

If one chooses format "ASTER", the mesh is written in a file of the .mail type which can then be read again by LIRE_MAILLAGE.

If one chooses format "RESULTAT", the mesh is written, by default, in the file .resu and cannot be read again by LIRE_MAILLAGE such as it is because the file .resu contains titles in addition, under titles and possibly of other information.