Procedure `IMPR_RESU` with the format ‘GMSH’

1 Goal

To write a field of size or a concept result with the format ‘GMSH’.

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

- fields with the nodes (of displacements, temperatures, clean modes, static modes…),
- fields by elements with the nodes (of constraints, generalized efforts, internal variables…).

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.

It is possible to select the topological entities (meshes or groups of meshes) on which one wants to print the results.

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2 Syntax

```
IMPR_RESU (  
    ◦ MODEL = Mo,              [model]  
    ◦ UNIT = / links,        / 37   [DEFECT]  
    ◦ FORMAT = / 'GMSH',     
    ◦ RESU = _F (            
        ◦ / GRID = my,       / [grid]  
        ◦ / CHAM_GD = ch_gd,    
        ◦ / RESULT = resu,     
            ◦ / TOUT_CHAM = '/YES',   [DEFECT]  
            ◦ / NOT',         
            ◦ / NOM_CHAM = l_nomsymb, [l_K16]  
            ◦ / TOUT_ORDRE = 'YES',  [DEFECT]  
            ◦ / NUME_ORDRE = lordre,  [l I]  
            ◦ / LIST_ORDRE = lenti,   [llistis]  
            ◦ / NUME_MODE = lmode,    [l I]  
            ◦ / NOEU_D_CMP = lnoecmp, [l_K16]  
            ◦ / NOM_CAS = ncas,      [l_K16]  
            ◦ / ANGLE = langl,       [l_K16]  
            ◦ / FREQ = lfreq,       [l R]  
            ◦ / LIST_FREQ = lreel,   [listr8]  
            ◦ / INST = linst,       [l R]  
            ◦ / LIST_INST = lreel,   [listr8]  
            ◦ | PRECISION = / prec,   [R]  
                ◦ / 1.0D-3,   [DEFECT]  
                ◦ | CRITERION = / 'RELATIVE', [DEFECT]  
                ◦ / 'ABSOLUTE',  
                 # Selection of the topological entities and the components  
                 ◦ / MESH = l_maille,    [l_maille]  
                 / GROUP_MA = l_gr_maille,  
                 ◦ TYPE_CHAM = / 'SCALAR', [DEFECT]  
                 ◦ NOM_CMP = lnomcmp, [l_K8]  
                     ◦ / 'VECT_3D',  
                     ◦ / 'TENS_2D',  
                     ◦ / 'VECT_2D',  
                     ◦ / 'TENS_3D',  
                     ◦ NOM_CMP = lnomcmp, [l_K8]  ) ,  
                 ◦ PART = / 'REAL',  
                     ◦ / 'IMAG',  
                     ◦ VERSION = / 1.2,       [DEFECT]  
                         ◦ / 1.0,             [R]  
                 ) ;
```

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3 Keyword **RESU**

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

3.1 **Operand GRID**

This operand makes it possible to choose the grid which one wishes to print. The simultaneous impression of the grid and fields is impossible.

3.2 **Selection of the data to be printed**

The values of the computed fields are stored in structures of data called fields of size. These fields of size can be directly accessible (concept CHAM_GD) or to be in a structure of data gathering several fields of size (concept result).

- A field of size is a structure of data which makes it possible to store fields defined in the nodes (cham_no_*) or of the fields defined by elements (cham_elem_*). For the fields by elements, one distinguishes the fields defined in the nodes from the elements and the fields defined in the points of GAUSS of the elements.
- A concept result is composed of one or more fields of size. For example, with each step of calculation one stores in the structure of data result, the field of size displacement. This structure is thus a matric structure of order 2, whose index is, for example, the list of the moments of calculation and the other the whole of the computed fields (displacements, constraints, deformations,...).

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

Taking into account the structure of data result, one understands easily that the possibilities of impression which one lays out are those of the fields of size, supplemented by specific possibilities.

**Caution**

One cannot print in the same file it GRID and it RESULTAT/CHAM_GD, GMSH cannot read such a file. The order thus stops if the two keywords are present.

3.2.1 **Operand CHAM_GD**

For CHAM_NO, the components of the field to the nodes are burst in a vector field gathering the components DX, DY, DZ and in as many scalar fields there are other components.

**Example** : In the case of a field with the nodes of size DEPL and whose modeling is of standard beam, one writes:

- 1 vector field (gathering the whole of the components of translation),
- 3 scalar fields (a field per degree of rotation).

For CHAM_ELEM, one prints only the fields by elements with the nodes (_ELNO_). A field by elements with the nodes is burst in as many scalar fields there are components.
Notice

When one writes a result with format GMSH, the title of the fields, which appears in GMSH, is made up by the name of the Aster result + the name of the field + the component.

Example: RESU DEPL_DX: the component ‘DX’ field ‘DEPL’ result ‘RESU’

If a derived field is written, one intercalates the name of the significant parameter by report to which one derives, between the name of the result and the name of the field.

Example: RESU PS1 DEPL_DX: the derivative compared to ‘PS1’ component ‘DX’ field ‘DEPL’ result ‘RESU’.

3.2.2 Operand RESULT

The operand RESULT allows to print the fields contained in a concept result. One can for example choose to print only certain fields (cf the keyword: NOM_CHAM).

The concept result is written field of size by field of size as described in [§4.1].

4 Choice of the fields to be printed

4.1 Operands TOUT_CHAM/NOM_CHAM

Cf document [U4.71.00].

4.2 Operands TOUT_ORDRE/NUME_ORDRE/LIST_ORDRE/NUME_MODE/INST/LIST_INST/FREQ/LIST_FREQ/NOEUD_CMP/NOM_CAS/ANGLE/PRECISION/C RITERION

Cf document [U4.71.00].

5 Selection of the geometrical zones and the components

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

This selection which one will note “selection on topological entities” is possible with the format ‘GMSH’.

5.1 Operand MESH

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

5.2 Operand GROUP_MA

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

5.3 Operand TYPE_CHAM

GMSH because it is able to visualize vectors and tensors; it is thus possible to visualize the other things that each component independently. This operand makes it possible to choose the type of
field to be printed ('VECT_2D', 'VECT_3D', 'SCALAR', 'TENS_2D' or 'TENS_3D'). The value by
default is 'SCALAR'.

5.4 **Operand NOM_CMP**

This operand makes it possible to choose the list of the components which one wishes to print
according to the type of selected field.
If one chose to print scalar fields it is not necessary to inform NOM_CMP, in this case, each component
will be printed independently from/to each other.

5.5 **Operand PART**

One cannot print complex fields with format GMSH, it is thus necessary, for such fields, to select the
part REALITY or IMAGinaire to be printed.

6 **Operand VERSION**

Meshs accepted by GMSH (in postprocessing) are, since the version 1.35, the meshs of the type POI1,
SEG2, TRIA3, QUAD4, TETRA4, HEXA8, PENTA6, PYRAM5, which corresponds to:

\[
\text{VERSION} = \text{'}1.2\text{'} \quad \text{who is the value by default}
\]

If one requires to visualize the fields with an old version of GMSH or if one wishes to cut all the
meshs in POI1, SEG2, TRIA3 and TETRA4, one uses VERSION = '1.0'.

To be able to visualize the sights with GMSH, the grid is modified to have only meshs GMSH. Currently,
meshs PYRAM13 are not treated.

• SEG3 is broken up into 2 SEG2,
• SEG4 is broken up into 3 SEG2,
• TRIA6 is broken up into 4 TRIA3,
• TRIA7 is broken up into 4 TRIA3,
• QUAD4 is broken up into 2 TRIA3 (cut out only if VERSION=' 1.0 '),
• QUAD8 is broken up into 6 TRIA3,
• QUAD9 is broken up into 6 TRIA3,
• TETRA10 is broken up into 8 TETRA4,
• PENTA6 is broken up into 3 TETRA4 (cut out only if VERSION=' 1.0 ')
• PENTA15 is broken up into 16 TETRA4,
• PYRAM5 is broken up into 2 TETRA4 (cut out only if VERSION=' 1.0 ')
• HEXA8 is broken up into 6 TETRA4 (cut out only if VERSION=' 1.0 ')
• HEXA20 is broken up of 24 TETRA4,
• HEXA27 is broken up into 48 TETRA4.

Notice 1

| TRIA7 (respectively QUAD9) is cut out like TRIA6 (resp. QUAD8) because the central node
does not carry a degree of freedom of displacement in modeling COQUES_3D. |

Notice 2

| With the recent versions of GMSH (>1.60), one could avoid cutting out the elements. The choice
is not available in Code_Aster because it is possible to read format MED in GMSH
since version 2.0. |

7 **Operand UNIT**
UNIT allows to choose on which file the results will be written. By default, \texttt{UNIT = 37} with the format ‘GMSH’.

One can thus print results on different files with each order \texttt{IMPR\_RESU}. The natural suffix of the files of post treatment GMSH is \texttt{.pos} and the usual logical unit (by default in astk) is 37.