
Procedure IMPR_MACR_ELEM

1 Goal

To print with the formats `IDEAS` and `MISS_3D` a structure of data `macr_elem_dyna`.

One prints:

- the definition of an interface of connection between a macrostructure and its external environment,
- a modal base (dynamic modes of the macrostructure and static modes resulting either from unit displacements imposed on the interface, or of unit efforts imposed on the interface),
- matrices of mass and rigidity of the macrostructure projected on the preceding modal basis.

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2 Syntax

```
IMPR_MACR_ELEM (
    ♦ MACR_ELEM_DYNA=melem, [macr_elem_dyna]
    ◇ FORMAT=/ 'IDEAS', [DEFECT]
        ◇ UNIT = / 30, [DEFECT]
            / links, [I]
        ◇ VERSION = 5, [DEFECT]
    / 'MISS_3D',
        ◇ UNIT = / 26, [DEFECT]
            / links, [I]
        ◇ SOUS_TITRE = l_st, [l_Kn]
        ◇ / AMOR_REDUIT = lam, [l_R]
            / LIST_AMOR = l_amor, [listr8]
    ♦ GROUP_MA_INTERF = gr_inter, [l_group_ma]
    ◇ GROUP_MA_FLU_STR = gr_flustr, [l_group_ma]
    ◇ GROUP_MA_FLU_SOL = gr_flusol, [l_group_ma]
    ◇ GROUP_MA_SOL_SOL = gr_solsol, [l_group_ma]
    ◇ GROUP_MA_CONTROL = gr_control, [l_group_ma]
    ◇ IMPR_MODE_STAT = / 'YES', [DEFECT]
                    / 'NOT',
    ◇ IMPR_MODE_MECA = / 'YES', [DEFECT]
                    / 'NOT',
    ◇ FORMAT_R = / '1PE12.5', [DEFECT]
                / '1PE16.9',
)
)
```

3 Operands

3.1 Operand MACR_ELEM_DYNA

- ◇ MACR_ELEM_DYNA = melem [macr_elem_dyna]
Name of the concept of the type macr_elem_dyna that one wishes to print in the file.

3.2 FORMAT = 'IDEAS'

- ◇ FORMAT = / 'IDEAS' [DEFECT]

Allows to specify the format of impression. The format 'IDEAS' by default is taken. Currently only L' impression is carried out according to the specifications of version 5. The upward compatibility with the versions of IDEAS is thus assured.

3.2.1 Operand UNIT

- ◇ UNIT = / 30, [DEFECT]
/ links [I]

This keyword makes it possible to define the logical unit of impression in the format 'IDEAS' (30 by default).

3.2.2 Operand VERSION

- ◇ VERSION = / 5, [DEFECT]

This keyword makes it possible to define the version of impression in the format 'IDEAS' (5 by default).

3.3 FORMAT = 'MISS_3D'

- ◇ FORMAT = / 'MISS_3D'

The format 'MISS_3D' is used by the code of dynamics of grounds MISS3D to import structural data coming from Code_Aster (contained dynamic macronutrient which corresponds under the terms of contribution of the structure to the impedance of the total problem of interaction ground-structure). One also prints the grid of the interface ground-structure in his local classification and possibly the modes dynamic and statics reduced to this interface.

For this format one will have to provide the operand GROUP_MA_INTERF and five operands are optional UNIT, SOUS_TITRE, AMOR_REDUIT, IMPR_MODE_STAT and IMPR_MODE_MECA.

3.3.1 Operand UNIT

- ◇ UNIT = / 26, [DEFECT]
/ links [I]

This keyword makes it possible to define the logical unit of impression in the format 'MISS_3D' (26 by default).

3.3.2 Operand SOUS_TITRE

- ◇ SOUS_TITRE = l_st [l_Kn]

Allows the user to give a name to the data transferred in code MISS3D.

3.3.3 Operand AMOR_REDUIT

- ◇ / AMOR_REDUIT = lam [l_R]

```
/ LIST_AMOR = l_amor [listr8]
```

These keywords make it possible to enter a list of depreciation for the dynamic modes. One can thus supplement the terms of the dynamic macronutrient.

3.3.4 Operand GROUP_MA_INTERF

```
◇ GROUP_MA_INTERF = gr_inter [l_group_ma]
```

This keyword, makes it possible to define the list of the groups of surface meshes constitutive of the interface ground-structure. One prints the coordinates of the “Nb_nœuds” nodes of the whole of the interfaces, then the “Nb_elem” elements with their connectivities in the local classification of the whole of the interfaces (1 in “Nb_nœuds”).

3.3.5 Operand IMPR_MODE_STAT

```
◇ IMPR_MODE_STAT = / 'YES' [DEFECT]  
/ 'NOT'
```

This keyword possibly allows (if ‘YES’) D’ to print the static modes reduced to the interface. That proves to be necessary for the 6 modes of rigid bodies. In this case, the macronutrient is based on a dynamic interface of type CRAIGB reduced to a point with a rigid connection of the interface (keyword LIAISON_SOLIDE of AFFE_CHAR_MECA [U4.44.01]).

3.3.6 Operand IMPR_MODE_MECA

```
◇ IMPR_MODE_MECA = / 'YES' [DEFECT]  
/ 'NOT'
```

This keyword possibly allows (if ‘YES’) D’ to print the dynamic modes reduced to the interface.

3.3.7 Operand FORMAT_R

```
◇ FORMAT_R = / '1PE12.5' [DEFECT]  
/ '1PE16.9'
```

This keyword gives the format of impression of the real numbers used during the impression of the impedances of structure which one assembles with the impedances of ground in MISS3D.

3.3.8 Operands GROUP_MA_FLU_STR/GROUP_MA_FLU_SOL/GROUP_MA_SOL_SOL

```
◇ GROUP_MA_FLU_STR= gr_flustr [l_group_ma]  
◇ GROUP_MA_FLU_SOL= gr_flusol [l_group_ma]  
◇ GROUP_MA_SOL_SOL= gr_solsol [l_group_ma]
```

In the case of an interaction ground-fluid-structure, these keywords make it possible to supplement the list of the groups of surface meshes respectively made up of the interfaces fluid structure, fluid-ground and free ground.

In this case, one supplements the impression of their elements with their connectivities in the local classification of the whole of the interfaces (1 with “Nb-nodes”) (including the interface ground-structure).

3.3.9 Operand GROUP_MA_CONTROL

```
◇ GROUP_MA_CONTROL= gr_control [l_group_ma]
```

This keyword makes it possible to introduce groups of specific meshes POI1 in order to model by Code_Aster check-points in the part of ground modelled by MISS3D. That then makes it possible to operate any postprocessing on their nodes by operators of Code_Aster after recovery of the evolution calculated by CALC_MISS.

That thus requires for these check-points:

- to introduce them into the grid like isolated nodes,
- to affect a modeling to them `DIS_T` by `AFFE_MODELE`,
- to impose blockings to them in `'DX'`, `'DY'`, `'DZ'` by `AFFE_CHAR_MECA`,

An illustrative example is given in the case test ZZZZ108C.

In this case, one supplements the impression of these specific elements with their connectivity with only one node in the local classification of the whole of the interfaces (1 with "Nb-nodes") (including the nodes of the modelled check-points).

4 Example of impression of data to format MISS3D

One gives in the example below the principal orders which allow the chaining between Code_Aster and MISS3D codes it, and which illustrates the use of the order IMPR_MACR_ELEM in this context.

```
#
# calculation of the modes
#
mode = CALC_MODES (MATR_RIGI= rigidity,
                  MATR_MASS= masses,
                  CALC_FREQ=_F (NMAX_FREQ= 30),
                  );

#
# calculation of the dynamic macronutrient
#
interdyn = DEFI_INTERF_DYNA ( NUME_DDL= nume_ddl,
                             INTERFACE= ( NAME = 'RIGHT',
                                           TYPE = 'CRAIGB',
                                           NOEUD= 'N98'
                                         )
                             );
bamo = DEFI_BASE_MODALE ( CLASSIQUE=_F ( INTERF_DYNA = interdyn,
                                          MODE_MECA = mode,
                                          NMAX_MODE = 30
                                        )
                        );
mael = MACR_ELEM_DYNA ( BASE_MODALE= bamo, OPTION= 'CLASSICAL' );
fo1 = DEFI_FONCTION ( NOM_PARA= 'FREQ',
                     VALE= (0. , 1. , 100. , 1. ) );

#
# reading of the accélérogramme of ground acce
#
ACCE = DEFI_FONCTION ( NOM_PARA = 'INST',
                      VALE = ( 0.00000E+00, 1.1940E-03,
                                - - - - -
                              )
                      );

#
# preprocessing of MISS3D
#
# (grid and impedances of interface)

IMPR_MACR_ELEM ( MACR_ELEM_DYNA = mael,
                 FORMAT = 'MISS_3D',
                 SOUS_TITRE = 'RIGID CIVAUX',
                 IMPR_MODE_STAT = 'YES',
                 IMPR_MODE_MECA = 'NOT',
                 AMOR_REDUIT = ( 0.07 ),
                 GROUP_MA_INTERF = ('SRADIER')
                 );
```