Macro-order MACRO_EXPANS

1 Goal

Lmacro-order has MACRO_EXPANS allows to carry out the expansion of experimental data on a digital model starting from a base of expansion. It consists of the succession of the operators EXTR_MODE, PROJ_MESU_MODAL, REST_GENE_PHYS, and PROJ_CHAMP.

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.
Copyright 2019 EDF R&D - Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)

2 Syntax

```
MACRO_EXPANS (

        ♦ MODELE_CALCUL = _F (♦ MODEL = modelnum,        [modele_sdaster]

                              ♦ BASE = bases,
[mode_meca]

                              ◊ NUME_MODE  = digital
[l_I]
                              ◊ NUME_ORDRE = numord                [l_I]
                             )

        ♦ MODELE_MESURE = _F ( ♦ MODEL = modelexp,        [modele_sdaster]

                              ♦ MEASUREMENT = my,               /
[mode_meca]
                                                              / [dyna_harmo]

                              ◊ NOM_CHAM =/'DEPL'               [DEFECT]
                                         / 'QUICKLY'
                                         / 'ACCE'
                                         / 'SIEF_NOEU'
                                         / 'EPSI_NOEU'

                              ◊ NUME_MODE = digital
[l_I]
                              ◊ NUME_ORDRE = numord                [l_I]
                             )

        ◊ RESOLUTION = _F (◊ METHOD =/'LU'                      [DEFECT]
                                    / 'SVD'

        # If METHOD = 'SVD' then :
                           ◊ EPS =/0.0                          [DEFECT]
                                  / eps                                [R]

                           ◊ REGUL =/'NOT'                      [DEFECT]
                                    / 'NORM_MIN'
                                    / 'TIK_RELA'

        # If   REGUL! = 'NOT' then :
                           ◊/COEF_PONDER = /0.                  [DEFECT]
                                           /W                        [l_R]
                             / COEF_PONDER_F = w_f           [l_fonction]
                           ),

        ◊ NUME_DDL = num_ddl,                                    [nume_ddl]

        ◊ RESU_NX = res_nx,                                     [mode_meca]

        ◊ RESU_EX = res_ex,                                  /  [mode_meca]
                                                             / [dyna_harmo]

        ◊ RESU_ET = res_et,                                  /  [mode_meca]
```

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.
Copyright 2019 EDF R&D - Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)

```
                                                                / [dyna_harmo]

                  ◊ RESU_RD = res_rd,                           /   [mode_meca]
                                                                / [dyna_harmo]

                  )
```

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.
Copyright 2019 EDF R&D - Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)

3 Operands

3.1 Keyword MODELE_CALCUL

♦ MODELE_CALCUL

Keyword factor gathering the whole of the keywords relating to the base of expansion, in general obtained by calculation (from where the name).

3.1.1 Keyword MODEL

♦ MODEL = modelnum
modele_sdaster indicating the model on which one will extend measurement

3.1.2 Keyword BASE

♦ BASE = bases
mode_meca being used as a basis for the expansion.
The base should not have vectors colinéaires, and the number of modes used must be lower than the number of DDL of measurement (preferably, $N_{modes} << N_{my}$) or else, the system to be solved is under-given, which can lead to a fatal error, and a stop of the code.

3.1.3 Keyword NUME_ORDRE/NUME_MODE

List of the sequence numbers or the modal positions of the modes which one wishes to use for the expansion.

3.2 Keyword MODELE_MESURE

♦ MODELE_MESURE

Keyword factor gathering the whole of the keywords relating to the experimental base which one wishes to extend

3.2.1 Keyword MODEL

♦ MODEL = modelexp
modele_sdaster indicating the model associated with the experimental grid. The knowledge of the nodes is in general enough to determine an experimental grid. The associated model can be then defined in the following way:

```
MODELEXP = AFFE_MODELE (GRID = MAIEXP,
                        AFFE = _F (GROUP_MA = 'SENSORS',
                                   PHENOMENON = 'MECHANICAL',
                                   MODELING = 'DIS_T',),);

CAREXP = AFFE_CARA_ELEM (MODEL = MODELEXP,
                         DISCRETE = _F (GROUP_MA = 'SENSORS',
                                        REFERENCE MARK = 'TOTAL',
                                        CARA = 'K_T_D_N',
                                        VALE = (100.0, 100.0, 100.0,),
                        ),);
```

The value of the stiffnesses given is arbitrary, it is not useful in calculation.

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.
Copyright 2019 EDF R&D - Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)

NB: to use the operator PROJ_CHAMP in the macro one, one needs to generate a nume_ddl associated with this grid. For that, it is moreover necessary to assign one material to the model, to calculate the elementary matrices (rigidity for example) and to create classification with NUME_DDL.

3.2.2 Keyword MEASUREMENT

♦ MEASUREMENT = my
dyna_harmo or *mode_meca* to extend. These data are in general imported of a result of measurement (file .unv) with the operator LIRE_RESU.

3.2.3 Keyword NUME_ORDRE/NUMÉRIQUE_MODE

List of entireties. Allows to select the modes which one wishes to extend.

3.2.4 Keyword NOM_CHAM

♦ . NOM_CHAM = 'DEPL'…
Experimental size to extend.

3.3 Keyword RESOLUTION

Two techniques of resolution are proposed for the opposite problem: Truncated SVD, method LU.
For the SVD, one can choose to truncate the singular values smallest to improve conditioning of the problem (choice of 'eps'), or to use a regularization of the Tikhonov type.
One will be able to refer to the documents [U4.73.01] (Doc. of PROJ_MESU_MODAL) and [R6.03.01] (Doc. of reference on the decomposition in singular values).

3.4 Keyword NUME_DDL

Allows to force classification to be used for the operator PROJ_CHAMP. For more precision, to refer to the documentation of PROJ_CHAMP [U4.72.05].

3.5 Keywords RESU_XX

Keywords RESU_XX pre-délcarer names of the outgoing concepts allow:

- RESU_NX is the truncation of the digital base (keyword BASE under the keyword factor MODELE_CALCUL) with the modes chosen in NUME_MODE,
- RESU_EX is the truncation of the experimental base (keyword MEASUREMENT under the keyword factor MODELE_MESURE) with the modes chosen in NUME_MODE,
- RESU_ET is the result of the expansion,
- RESU_RD is the reprojection on the experimental model of the wide base: it is intéressaant to check if the reprojection of the wide result is comparable to the initial experimental data.

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.
Copyright 2019 EDF R&D - Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)