
Operator EXTR_MODE

1 Goal

To extract selectively from the modes of the structures of data modal. The modes are selected according to a criterion of value of modal parameter higher than a certain threshold, then are concaténés in only one final structure of data.

One can also print in the file MESSAGE a summary table on the office pluralities of the unit effective modal masses or the generalized masses of the modes selected.

Product a structure of data of the type `mode_meca` or `mode_gene` according to the type of the modes as starter.

2 Syntax

```

resu_mod [*] = EXTR_MODE (
    ♦ FILTRE_MODE= _F (
        ♦ MODE = MOD / [mode_gene]
                    / [mode_meca]
                    / [mode_meca_c]
        ♦ / NUME_MODE = l_mode [l_I]
          / NUME_MODE_EXCLU = l_mod_ex [l_I]
          / NUME_ORDRE = l_ordre [l_I]
          / TOUT_ORDRE = / 'YES'
                    / 'NOT'
          / ♦ FREQ_MIN = f_min [R]
            ♦ FREQ_MAX = f_max [R]
            ◊ PRECISION = / prec [R]
                    / 0,001 [DEFECT]
          / ◊ CRIT_EXTR = / 'MASS_GENE'
                        / 'MASS_EFFE'
                        / 'MASS_EFFE_UN' [DEFECT]
                    / ◊ THRESHOLD = rseuil [R]
                    / ◊ SEUIL_X = rseuil [R]
                    / ◊ SEUIL_Y = rseuil [R]
                    / ◊ SEUIL_Z = rseuil [R]
        )
    ◊ IMPRESSION= _F (
        ◊ OFFICE_PLURALITY = / 'YES' [DEFECT]
                    / 'NOT' [DEFECT]
        ◊ CRIT_EXTR = / 'MASS_EFFE_UN' [DEFECT]
                    / 'MASS_GENE' [DEFECT]
    )
    ◊ TITLE = title [l_Kn]
);

```

If MOD is of type [mode_gene] then resu_mod is of type [mode_gene]
 If MOD is of type [mode_meca] then resu_mod is of type [mode_meca]
 If MOD is of type [mode_meca_c] then resu_mod is of type [mode_meca_c].

3 Operands

3.1 Keyword **FILTRE_MODE**

One repeats this keyword as many times as there are structures of data of the type `mode_meca_*` or `mode_gene` to filter and with concaténer.

3.2 Operand **MODE**

Name of the structure of data `mode_meca_*` or `mode_gene` with sorting and concaténer with the others.

3.3 Filtering of the modes

To filter the modes, three possibilities are offered to the user.

3.3.1 Operands **NUME_MODE / NUME_ORDRE / TOUT_ORDRE**

List of the sequence numbers or the modal positions of the modes which one wishes to preserve.

3.3.2 Operands **NUME_MODE_EXCLU**

List of the modal positions of the modes which one wishes to remove.

3.3.3 Operands **FREQ_MIN / FREQ_MAX / PRECISION**

One keeps all the modes which correspond to frequencies understood enters `f_min` and `f_max` with the relative precision `prec`. One must have `f_min` lower than `f_max`.

3.3.4 Operand **CRIT_EXTR**

Choice of the parameter which is used as criterion for the filtering of the modes. The parameters are defined in the reference material [R5.01.03].

If the criterion is 'MASS_EFFE_UN' or 'MASS_EFFE' a mode will be retained as soon as one of its unit effective modal masses, or not, directional is higher than a threshold fixed by the user.

If the criterion is 'MASS_GENE' a mode will be retained as soon as the report of the mass generalized on the sum of the generalized masses of the modes of the filtered structure is higher than a threshold fixed by the user.

These criteria have a direction only for the structures of data of the type `mode_meca_*`.

3.3.5 Operands **THRESHOLD, SEUIL_X, SEUIL_Y, SEUIL_Z**

Limiting value of the criterion below which one considers that one can filter the mode.

This value, in the case of the parameters currently taken into account, is an adimensional relative value.

One can apply the same threshold in all the directions (keyword `THRESHOLD`) or to differentiate the thresholds according to the directions `X`, `Y` or `Z` (`SEUIL_X`, `SEUIL_Y`, `SEUIL_Z`)

3.4 Keyword **IMPRESSION**

This keyword makes it possible to print a table of office plurality of certain parameters. These parameters can be different from those selected in the keywords `FILTRE_MODE`.

3.4.1 Operand `OFFICE_PLURALITY`

Impression or not impression of the office pluralities of the modal parameter retained by `CRIT_EXTR` for the structure of data result `resu_mod`.

3.4.2 Operand `CRIT_EXTR`

Choice of the parameter of impression for which one carries out the operation of office plurality. If the criterion is `'MASS_EFFE_UN'` (unit effective mass), the values of the parameters separately are cumulated `'MASS_EFFE_UN_DX'`, `'MASS_EFFE_UN_DY'`, `'MASSE_EFFE_UN_DZ'` (unit effective modal mass in the D^* direction) of the extracted modes.

If the criterion is `'MASS_GENE'` the values of the parameter are cumulated `MASS_GENE` (generalized mass) of the extracted modes.

The parameters mentioned in this paragraph are more precisely defined in the reference material [R5.01.03].

3.5 Keyword `TITLE`

Title attached to the concept produced by this operator [U4.03.01].

4 Execution

It is checked that the parameter for which one carries out filtering exists well in the structure of data input `MOD`. If this parameter is not indicated, one leaves in fatal error. On the other hand, for the keyword `IMPRESSION`, if parameters `MASS_EFFE_UN_*` are not informed, one emits only one alarm.

At exit, the produced concept `resu_mod` does not have to be empty, if not one leaves in fatal error.

It is also checked that all the concepts `mode_meca_*` or `mode_gene` are in the same way standard and as they come from the same initial problem (same matrices).

After having filtered the interesting modes, one checks that they have a whole a different modal position. In the contrary case, one transmits a message of alarm. To remove these duplicated modes, the order should be re-used `EXTR_MODE` and to activate the operand `NUME_MODE_EXCLU`.

To date, one does not check only the structures of data of the type `mode_meca_*` correspond to the same standard.

5 Examples of impression

If the keyword factor `IMPRESSION` is present, the operator `EXTR_MODE` writing in the file `MESSAGE` a certain number of paramètrres on the extracted modes.

Example of impression, with the keyword `CRIT_EXTR=' MASS_EFFE_UN'` and `CUMUL=' OUI '` :

```
-----  
CONCEPT MODESX   OF TYPE MODE_MECA   RESULTING FROM L OPERATOR EXTR_MODE
```

NUME_ORDRE	NUME_MODE	FREQUENCY	MASS_EFFE_UN_DX	CUMUL_DX	MR. WITH S S.E.	E F
1	1	2.66902D-01	4.12685D-02	4.12685D-02		
2	11	6.49621D+01	1.18667D-01	1.59935D-01		
3	19	2.56692D+02	1.02927D-02	1.70228D-01		

F E C T I O C	U N R I T WITH I R E		
MASS_EFFE_UN_DY	CUMUL_DY	MASS_EFFE_UN_DZ	CUMUL_DZ
2.22156D-25	2.22156D-25	3.80903D-01	3.80903D-01
4.69363D-25	6.91519D-25	3.11195D-03	3.84015D-01
4.22168D-27	6.95741D-25	7.06977D-03	3.91085D-01

NUME_ORDRE is the position of the mode in the structure of data, it NUME_MODE is the modal position in the spectrum (cf operator CALC_MODES [U4.52.02]).

FREQUENCY is the Eigen frequency of the mode.

MASS_EFFE_UN_D* is the unit effective modal mass in the direction * (* = X or Y or Z).

These sizes are defined in the reference material [R5.01.03].

CUMUL_* are the cumulated sums of the unit effective masses by direction.

Example of impression, with the keyword CRIT_EXTR=' MASS_GENE' and CUMUL=' OUI':

CONCEPT	MODESX	OF TYPE	MODE_MECA	RESULTING FROM L	OPERATOR	EXTR_MODE
NUME_ORDRE	NUME_MODE	MASS	GENERALISEE	FREQUENCY	MASS_GENE	CUMUL_MASS_GENE
1	1	2.66902D-01	1.00000D+00	1.00000D+00		
2	11	6.49621D+01	1.00000D+00	2.00000D+00		
3	19	2.56692D+02	1.00000D+00	3.00000D+00		

MASS_GENE is the generalized mass of the mode, defined in the reference material [R5.01.03].

CUMUL_MASS_GENE is the cumulated sum of the generalized masses.

6 Example of use

Here an example presenting the various possibilities of the order EXTR_MODE for a modal analysis realized by 5 searches for successive modes:

Calculation of the total mass of stucture (for checking)

```
massestr = POST_ELEM (... MASS_INER = (...));
```

Calculation of the first 17 frequencies (NUME_ORDRE from 1 to 17; NUME_MODE from 1 with 17)

```
model = CALC_MODES ( MATR_RIGI = rigidity,  
                    MATR_MASS = mass,  
                    OPTION = 'PLUS_PETITE',  
                    CALC_FREQ = _F (NMAX_FREQ = 17));
```

```
mode1      =  NORM_MODE      (  MODE = mode1, reuse = mode1,
                               =  'TRAN_ROTA NORMALIZES'
                               );
```

Calculation of other frequencies (NUME_ORDRE from 1 to 5; NUME_MODE from 18 with 22)

```
mode2 =  CALC_MODES (  MATR_RIGI = rigidity,
                      MATR_MASS = mass,
                      OPTION = 'BAND',
                      CALC_FREQ = _F (  FREQ = (20. , 25.)),
                      );
```

```
mode2      =  NORM_MODE      (  MODE = mode2,
                               reuse = mode2,
                               =  'TRAN_ROTA NORMALIZES'
                               );
```

Calculation of other frequencies (NUME_ORDRE from 1 to 6; NUME_MODE from 23 with 28)

```
mode3 =  CALC_MODES (MATR_RIGI = rigidity,
                      MATR_MASS = mass,
                      OPTION = 'BAND',
                      CALC_FREQ  = _F (  FREQ = (25. 30.)),
                      );
```

```
mode3      =  NORM_MODE      (  MODE = mode3,
                               reuse = mode3,
                               =  ' TRAN_ROTA' NORMALIZES,
                               );
```

Calculation of other frequencies (NUME_ORDRE from 1 to 3; NUME_MODE from 28 with 30)

```
mode4 =  CALC_MODES (MATR_RIGI = rigidity,
                      MATR_MASS = mass,
                      OPTION = 'BAND',
                      CALC_FREQ = _F (  FREQ = (29. , 32.)),
                      );
```

```
mode4      =  NORM_MODE      (  MODE = mode4,
                               reuse = mode4,
                               =  ' TRAN_ROTA' NORMALIZES,
                               );
```

Calculation of other frequencies (NUME_ORDRE from 1 to 6; NUME_MODE from 31 with 34)

```
mode5 =  CALC_MODES (MATR_RIGI = rigidity,
                      MATR_MASS = mass,
                      OPTION = 'BAND',
                      CALC_FREQ = _F (  FREQ = (32. , 35.)),
                      );
```

```
mode5      =  NORM_MODE      (  MODE = mode5,
                               reuse = mode5,
                               =  'TRAN_ROTA NORMALIZES'
                               );
```

Extraction of the modes

```
mode =  EXTR_MODE      (  FILTRE_MODE = _F (  MODE = mode1,
```

```
TOUT_ORDRE = 'YES' ),  
( MODE = mode2,  
  NUME_MODE = (18,19,20,21,22) )  
( MODE = mode3,  
  FREQ_MIN = 25. ,  
  FREQ_MAX = 30. ),  
( MODE = mode4,  
  NUME_MODE_EXCLU = 28 ),  
( MODE = mode5,  
  CRITERION = 'MASS_EFFE_UN',  
  THRESHOLD = 0,005 ),  
  IMPRESSION =_F ( OFFICE_PLURALITY = 'YES' )  
) ;
```