Operator COMB_FOURIER

1 Goal

To recombine the modes of FOURIER of a structure of data result in particular directions. The modes are produced for a model 'AXIS_FOURIER' by the macro order MACRO_ELAS_MULT [U4.51.02].

This is possible for displacements, the reactions, the fields of strains and stresses in elasticity and for the fields of temperature and flow in thermics.

The structure of data produced is of type comb_fourier.

2 Syntax

```
comb [comb_fourier] = COMB_FOURIER   (

                      ♦  RESULT =   resu   ,                /[fourier_elas]
                                                               /[fourier_ther]
                      ♦  NOM_CHAM  =   |   'DEPL'
                                       |   'REAC_NODA'
                                       |   'SIEF_ELGA'
                                       |   'EPSI_ELNO'
                                       |   'SIGM_ELNO',
                                       |   'TEMP' ,
                                       |   'FLUX_ELNO' ,

                      ♦  ANGLE     =   langl,                  [l_R]

                                       )
```

3 Operands

Recall:

The recombination of FOURIER on displacements is written:

$$u(\theta)=\sum_{l=0}^{N}\left[\underbrace{\begin{pmatrix}\cos l\,\theta & 0 & 0\\ 0 & \cos l\,\theta & 0\\ 0 & 0 & -\sin l\,\theta\end{pmatrix}}_{A^s}u_l^s+\underbrace{\begin{pmatrix}\sin l\,\theta & 0 & 0\\ 0 & \sin l\,\theta & 0\\ 0 & 0 & \cos l\,\theta\end{pmatrix}}_{A^a}u_l^a\right]$$

A symmetrical harmonic is thus recombined with the matrix A^s , an antisymmetric harmonic with the matrix A^a .

The recombination of FOURIER on the strains and the stresses is written:

$$\varepsilon(\theta)=\sum_{l=0}^{N}\left(\begin{bmatrix}\cos l\,\theta\, I_4 & 0_{4,2}\\ 0_{2,4} & -\sin l\,\theta\, I_2\end{bmatrix}\varepsilon_l^s+\begin{bmatrix}\sin l\,\theta\, I_4 & 0_{4,2}\\ 0_{2,4} & \cos l\,\theta\, I_2\end{bmatrix}\varepsilon_l^a\right)$$

3.1 Operand RESULT

♦ RESULT = resu,

Name of the concept of the type fourier_elas or fourier_ther from which one will recombine the modes.

3.2 Operand NOM_CHAM

♦ NOM_CHAM = nomsymb,

Reference symbol of the recombined fields.

3.3 Operand ANGLE

♦ ANGLE = langl,

Angle (S) in degrees of (or of) the section (S) where place the recombination of FOURIER takes.

4 Example

The example below carries out a calculation on 2 harmonics of Fourier by MACRO_ELAS_MULT, enriches the concept of the type RESULT by CALC_CHAMP before recombining the computed fields by COMB_FOURIER.

Calculation Fourier on the first two symmetrical harmonics

```
resu  =  MACRO_ELAS_MULT (MODEL          = Mo,
                          CHAM_MATER      = cm,
                          CHAR_MECA_GLOBAL= bloqu,
                          CAS_CHARGE= (
                            _F (MODE_FOURIER = 1,
                                TYPE_MODE    = 'SYME',
                                CHAR_MECA    = CH,
                                SOUS_TITRE   = 'mode Fourier 1 SYME'),
                            _F (MODE_FOURIER = 2,
                                TYPE_MODE    = 'SYME',
                                CHAR_MECA    = CH,
                                SOUS_TITRE   = 'mode Fourier 2 SYME'),),
                         )
```

Calculation of the constraints and the nodal reactions by CALC_CHAMP

```
resu = CALC_CHAMP (reuse = resu,
                   RESULT = resu,
                   CONSTRAINT = 'SIGM_ELNO',
                   FORCE = 'REAC_NODA',
```

Recombination of Fourier on displacements, reactions and forced for 45° and 135°

```
angl1 =  45.
angl2 = 135.

co_four = COMB_FOURIER (RESULT = resu,
                        NOM_CHAM = ('DEPL', 'REAC_NODA', 'SIGM_ELNO'),
                        ANGLE = (angl1, angl2),);
```