

Operator MAC_MODES

1 Drank

operator `MAC_MODES` allows to calculate a matrix of correlation between two modal bases. The coefficient of correlation between two vectors of this base is all the more close to 1 these two vectors are colinéaires.

It also makes it possible to calculate the difference between two modal bases by means of energy criterion IERI (Indicating Energy of Regularity of Interface). This criterion is all the more close to 0 the two vectors are very close.

It also makes it possible to calculate the generalized matrix relating to the matrix of seized weighting as starter.

Product a concept of the `table_sdaster` type.

Contents

1But1.....
2Syntaxe3.....
3Opérandes4.....
3.1Généralités4.....
3.2Opérande BASE_1/BASE_24.....
3.3Opérande IERI4.....
3.4Opérande MATR_ASSE5.....
3.5Opérande TITRE5.....
3.6Opérande INFO5.....

2 Syntax

```
mac [table_sdaster] = MAC_MODES

(  ◆BASE_1      = base_1 ,                               / [mode_meca]
                                     / [mode_meca_c]
                                     / [mode_flamb]
    ◆BASE_2      = base_2 ,                               / [mode_meca]
                                     / [mode_meca_c]
                                     / [mode_flamb]

    ◇IERI      =          `OUI'                          [kN]

    ◇MATR_ASSE  = matr,                                   / [matr_asse_depl_r]
                                     / [matr_asse_depl_c]

    ◇TITER     =          "tit"                           [kN]

    ◇INFO      =/1          ,                             [DEFAULT]
                /2 ,

)
```

3 Operands

3.1 General information

the matrix of MAC (**Modal Criterion Insurance**) indicate the correlation between two lists of vectors. It is often used to check the orthogonality of two modal bases (experimental or numerical).

2rd line, j-ième column of the matrix of MAC is defined by the following relation:

$$MAC_{ij} = \frac{(\Phi_i^H W \Phi_j)^2}{(\Phi_i^H W \Phi_i)(\Phi_j^H W \Phi_j)}$$

Where: Φ_i is the 2rd vector of the first base,

Φ_j is the j-ième vector of the second base,

W is a matrix of weighting,

the exhibitor H indicates transposed combined.

This matrix of MAC is diagonal if the two bases are formed by the modal vectors resulting from the same structure and if the matrix of weighting is equal to the mass matrix or of stiffness of structure considered. One then speaks about the orthogonality of the eigen modes compared to the mass matrix or stiffness. The formula $\Phi_i^H W \Phi_j$ corresponds at the end of the stiffness matrix (or mass) generalized if the matrix of weighting is equal to the stiffness matrix (or of mass).

Criterion IERI (**Energy Indicator of Regularity d'Interface**) is an energy indicator making it possible to calculate the difference between two vectors. It is defined by the following relation:

$$IERI_{ij} = \frac{\left((\Phi_i - \Phi_j)^H W (\Phi_i - \Phi_j) \right)^2}{(\Phi_i^H W \Phi_i)^2 + (\Phi_j^H W \Phi_j)^2}$$

The matrix of weighting is either the mass matrix, or the stiffness matrix of structure considered.

This criterion IERI tends towards 0 if the two vectors are very close.

3.2 Operand BASE_1/BASE_2

◆BASE_1 = base_1

◆BASE_2 = base_2

Name of the modal concepts (mode_meca, mode_meca_c, mode_flamb) to compare. In general, one compares a numerical modal base resulting from a computation (by MODE_ITER_SIMULT for example) and an experimental modal base, imported by LIRE_RESU. The two bases must be defined on the same model and have same classification.

3.3 Operand IERI

◇IERI = "YES"

This operand is used to specify that one wants to calculate criterion IERI. In this case, operand `MATR_ASSE` must be indicated. It is necessary to associate a mass matrix or a stiffness matrix to him.

3.4 Operand `MATR_ASSE`

◇`MATR_ASSE` = `matr`

Operand indicating an assembled matrix used like weighting.

`matr` is the matrix of weighting which one applies to the basic vectors. It must have same classification as `base1` and `base2`. One chooses usually the mass matrix or the stiffness matrix like stamps weighting.

If this operand is not indicated, the matrix of selected weighting is equal to the matrix identity.

This matrix of weighting is compulsory for the computation of criterion IERI.

3.5 Operand `TITER`

◇`TITER` = "tit"

optional Name to give to the array.

3.6 Operand `INFO`

◇`INFO` = 1 or 2

the matrix of MAC or IERI and the generalized matrix is displayed in the form of table in the message file if `INFO` = 2.

The name of the parameter of the array of output, associated with the generalized matrix is `Y1_W_Y2`. This generalized matrix is calculated if the basic vectors are of real type.