Operator NUME_DDL_GENE

1 Goal

To number the degrees of freedom of the total structure starting from classification of the substructures.

Within the framework of a calculation using the methods of dynamic under-structuring (analyzes modal or harmonic), the operator NUME_DDL_GENE the bijection defines enters, on the one hand, the numbers of the generalized degrees of freedom of each substructure and the numbers of the degrees of freedom of connection of each connection and, on the other hand, the numbers of the final degrees of freedom (i.e. indices of line or column of the generalized matrices). Classification being realized, the operator built according to the mode of storage “line of sky” tables of addressing necessary to the effective storage of the terms of the generalized matrices assembled with this classification. A line storage of full or diagonal sky is possible to calculate a full added matrix or to solve a transitory problem on modal basis resulting from a concept of the type mode_meca.

Product a structure of data of the type nume_ddl_gene.

2 Syntax

```
nu_gene [nume_ddl_gene]=  NUME_DDL_GENE (

# If MODELE_GENE:
          |  ◊  MODELE_GENE   =  mo_gene,                    [modele_gene]
             ◊  STORAGE       =  /   'LIGN_CIEL',           [DEFECT]
                                 /   'FULL',
             ◊  METHOD    =  /   'CLASSICAL',           [DEFECT]
                                 /   'ELIMINATES',
                                 /   'INITIAL',

# If BASE:
          |  ◊  BASE          =  base,                  /   [mode_gene]
                                                        /   [mode_meca]
             ◊  STORAGE       =  /   'FULL',               [DEFECT]
                                 /   'DIAG',
             ◊  NB_VECT       =  /   nbvect,
                                 /   9999,                 [DEFECT]

                                       )
```

3 Operands

3.1 Operand MODELE_GENE

◊ MODELE_GENE = mo_gene

Name of the concept of the type modele_gene product by the operator DEFI_MODELE_GENE [U4.65.02] from which classification is carried out.

3.2 Operand METHOD

◊ METHOD =

/'CLASSICAL' Built a generalized classification allowing the taking into account of the equations of connections by the method of the double multipliers of Lagrange [R4.06.02].

/'ELIMINATES' Built a generalized classification allowing the taking into account of the equations of connections by the method of elimination of the constraints [R4.06.02].

/'INITIAL' Initialize classification for the operators generalized in order to allow the construction of a classification of size controllable per python. Matrices (built with ASSE_MATR_GENE) and vectors (built with ASSE_VECT_GENE) of size adapted, but are initialized to zero.

3.3 Storage of the matrices

◊ STORAGE =

Choice of a mode of storage of the matrices which one will assemble with this classification. 3 options are available:

/'LIGN_CIEL' storage "line of sky" per blocks, the assembled matrix will be stored block of columns per block of columns from the 1er term likely to be nonnull for each column.

In the assembled matrix, a term $A(i,j)$ is likely to be nonnull if and only if the degree of freedom i and the degree of freedom j (respectively i ème and j ème modes of the total structure) result from the same substructure or are connected by at least a degree of freedom of LAGRANGE of two substructures connected by a connection.

/'FULL' storage "line of sky" of the assembled matrices generalized per blocks, but with a full profile (one stores all the elements of the higher triangular part of the matrix). This kind of storage must be employed if one wants to calculate the generalized added matrices (mass, rigidity, damping) which are full, as all the generalized matrices to which they are added.

For the matrices of rigidity and damping, the assembly is always done from one nume_ddl_gene resulting from one mode_meca.

/'DIAG' storage "line of sky" of the diagonal terms of the matrices projected on modal basis. This kind of storage is to be employed when the base on which one reduces the problem is orthogonal compared to the matrices used (matrices of mass, stiffness and damping). This storage makes it possible to improve the performances of the operators of calculation (DYNA_TRAN_MODAL for example). Attention, that can lead to false results if orthogonality is not checked, for example when one uses a base of modes made up of static modes. Indeed, the static modes are not orthogonal between them.

3.4 Operand BASE

This operand is used to identify the modal base on which one projects the matrices.

3.5 Operand NB_VECT

Behind this keyword, one expects the number of basic vectors of projection, possibly smaller than the number of modes defined in the base specified by the keyword BASE. By default, this number is equal to the number of modes of the base.

4 Production run

No optimization of bandwidth is carried out during classification. The order of appearance of the substructures in classification corresponds to the order of their definition in the model generalized (operator DEFI_MODELE_GENE). The user can thus limit the bandwidth by defining in a judicious order the substructures of the generalized model.

The degrees of freedom, resulting from the double dualisation, are then assembled on both sides of the generalized degrees of freedom of the second assembled substructure (among the two pennies - structures put concerned by the connection).