Data format sd_macr_elem_dyna

Summarized:

The data structure sd_macr_elem_dyna contains the projection of the stiffness matrixes, mass and possibly of damping of one substructure on a beforehand definite basis.
It also contains the projection of the loading if one applies a loading to substructure.

That data structure is used for computations of dynamic substructuring. The dynamic macro-element creates can also be used as super-mesh in a mixed model.

Contents

1 General information

the data structure sd_macr_elem_dyna contain the projection of the stiffness matrixes, mass and possibly of damping of one substructure on a beforehand selected basis.
It also contains the projection of the loading if one applies a loading to substructure.
A data structure sd_nume_ddl is attached to the data structure sd_macr_elem_dyna. One referred there for the fictitious classification of the basic vectors of projection.
In order to ensure compatibility with the sd_macr_elem_stat, of the data are repeated in various objects of data structure.

This data structure is used in computations of dynamic substructuring or computations with a mixed modelization. In this case, the dynamic macro-element is used as super-mesh of the model.

2 Tree structure of Data format

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the sd_macr_elem_dyna (K8):: = record

   % description of the substructure dynamic
      ♦       ' .DESM'          :  OJBSVI
      ♦       ' .REFM'          :  OJBSVK8
      ♦       ' .CONX'          :  OJBSVI
      ♦       ' .LINO'          :  OJBSVI
      ♦       ' .MAEL_DESC'        :  OJBSVI
      ♦       ' .MAEL_REFE'        :  OJBSVK          24%
   description of the loadings
       ◊     ".LICH"            :  OJBXCVK8NO
      ◊       ' .LICA'          :  OJBXDVRNO
   % projected stiffness
      ♦       ' .MAEL_RAID_DESC' :  OJBSVI
      ♦       ' .MAEL_RAID_REFE' :  OJBSVK24
      ♦       ' .MAEL_RAID_VALE' :  OJBSVR           or C
   % masses projected
      ♦       ' .MAEL_MASS_DESC' :  OJBSVI
      ♦       ' .MAEL_MASS_REFE' :  OJBSVK24
      ♦       ' .MAEL_MASS_VALE' :  OJBSVR
   % damping project
      ◊       ' .MAEL_AMOR_DESC' :  OJBSVI
      ◊       ' .MAEL_AMOR_REFE' :  OJBSVK24
      ◊       ' .MAEL_AMOR_VALE' :  OJBSVR
   % inertias following DX, DY and DZ
      ◊       ' .MAEL_INER_REFE' :  OJBSVK24
      ◊       ' .MAEL_INER_VALE' :  OJBSVR
   % classification of the basic vectors
      ♦       ' $VIDE'          :  sd_numérique_ddl
```

3 Contained objects

3.1 Object .DESM

".DESM" : OJBSVIlong = 10

DESM (1): 0
DESM (2): nbnstc (many nodes used for the classification of the basic vectors)
DESM (3): many internal nodes of the substructure

DESM (4): nbvect (many basic vectors)
DESM (5): 0
DESM (6): 0
DESM (7): many loadings
DESM (8) with DESM (10): 0

3.2 Object .REFM

".REFM" : OJBSVK8long = 8
REFM (1): name of model
REFM (2): name of mesh
REFM (3): field material
REFM (4): elementary characteristics
REFM (5): name of dynamic macro-element
REFM (6): "OUI_RIGI"
REFM (7): "OUI_MASS"
REFM (8) : "OUI_AMOR"/"NON_AMOR"

3.3 Object .LINO

".LINO" : OJBSVIlong = nbnstc

List of the numbers of the nodes used for the classification of the basic vectors

3.4 Object .CONX

".CONX" : OJBSVIlong = 3*nbnstc

For I varying of 1 with nbnstc :
CONX (3* (i-1) +1): 1
CONX (3* (i-1) +2): LINO (I)
CONX (3* (i-1) +3): 0
…

3.5 Object .MAEL_DESC

".MAEL_DESC" : OJBSVIlong = 3
MAEL_DESC (1): many coded integers necessary to quantity DEPL_R
MAEL_DESC (2): maximum number of components for quantity DEPL_R
MAEL_DESC (3): number of quantity DEPL_R in the catalog of quantities

3.6 Object .MAEL_REFE

".MAEL_REFE" : OJBSVK24long = 2
MAEL_REFE (1): name of the base of projectionformule Φ
MAEL_REFE (2): name of the mesh

3.7 Object .LICH

This object is created only if one applies a loading to substructure.

".LICH" : OJBXCVK8NO

This collection contains the names of the loadings.

LICH (I) is of dimension 2.

For the loading case number I, one a:
LICH (I) (1) : "NON_SUIV"
LICH (I) (2) : name of the loading generalized F_i

3.8 Object .LICA

This object is created only if one applies a loading to substructure.

".LICA" : OJBXDVRNO

This collection contains the generalized coordinates of the loadings.

LICA (I) is of dimension 2*nbvect

Each object is made of two end to end stored identical segments.
In each segment, one finds the loadings generalized: $f_i = \Phi^T F_i$

3.9 Object .MAEL_RAID_DESC

".MAEL_RAID_DESC" : OJBSVIlong = 3
MAEL_RAID_DESC (1): 2
MAEL_RAID_DESC (2): nbvect
MAEL_RAID_DESC (3): 2

3.10 Object .MAEL_RAID_REFE

".MAEL_RAID_REFE" : OJBSVK24long = 2
MAEL_RAID_REFE (1): name of the base of projectionformule Φ
MAEL_RAID_REFE (2): vacuum if one exploits the matrix of impedance of the soil, or the name of the matrix rigiditéà K to project

3.11 Object .MAEL_RAID_VALE

".MAEL_RAID_VALE" : OJBSVR or Clong = nbvect* (nbvect+1)/2

This object contains the projected stiffness matrix $\tilde{K} = \Phi^T K \Phi$

This matrix is symmetric, one stores only the higher triangular block.

3.12 Object .MAEL_MASS_DESC

".MAEL_MASS_DESC" : OJBSVIlong = 3
MAEL_MASS_DESC (1): 2
MAEL_MASS_DESC (2): nbvect
MAEL_MASS_DESC (3): 2

3.13 Object .MAEL_MASS_REFE

".MAEL_MASS_REFE" : OJBSVK24long = 2
MAEL_MASS_REFE (1): name of projection base Φ

MAEL_MASS_REFE 2) (: vacuum or name of the matrix masseà M to project

3.14 Object .MAEL_MASS_VALE

".MAEL_MASS_VALE" : OJBSVRlong = nbvect* (nbvect+1)/2

This object contains the projected mass matrix $\tilde{M}=\Phi^T M \Phi$

One stores only the higher triangular block.

3.15 Object .MAEL_AMOR_DESC

".MAEL_AMOR_DESC" : OJBSVIlong = 3
MAEL_AMOR_DESC (1): 2
MAEL_AMOR_DESC (2): nbvect
MAEL_AMOR_DESC (3): 2

3.16 Object .MAEL_AMOR_REFE

".MAEL_AMOR_REFE" : OJBSVK24long = 2
MAEL_AMOR_REFE (1): name of the base of projectionformule Φ
MAEL_AMOR_REFE (2): vacuum or the name of the matrix amortissementà C to project

3.17 Object .MAEL_AMOR_VALE

".MAEL_AMOR_VALE" : OJBSVRlong = nbvect* (nbvect+1)/2

This object contains the terms of the projected damping matrix (triangular higher)

$$\tilde{C}=\Phi^T C \Phi$$

If the user provides generalized depreciation associated with the dynamic modes, diagonal terms of this matrix contain provided depreciation.

3.18 Object .MAEL_INER_REFE

This object is not creates if the matrix of impedance of the soil is exploited.

".MAEL_INER_REFE" : OJBSVK24long = 2
MAEL_INER_REFE (1): name of the base of projectionformule Φ
MAEL_INER_REFE (2): name of the matrix of inertieutilized M for the computation of inertias

3.19 Object .MAEL_INER_VALE

This object is not creates if the matrix of impedance of the soil is exploited.

".MAEL_INER_VALE" : OJBSVRlong = 3*nbvect

This object contains inertias along the axes DX, DY and DZ

MAEL_INER_VALE (1) with MAEL_INER_VALE (nbvect): inertia according to DX
where: MAEL_INER_VALE (I) : $(L_x \Phi_i)^T M (L_x \Phi_i)$

MAEL_INER_VALE (nbvect+1) with MAEL_INER_VALE (2*nbvect): inertia following DY where: MAEL_INER_VALE (nbvect+i) : $(L_y \Phi_i)^T M (L_y \Phi_i)$

MAEL_INER_VALE (2*nbvect+1) with MAEL_INER_VALE (3*nbvect): inertia according to DZ
where: MAEL_INER_VALE (2*nbvect+i) : $(L_z \Phi_i)^T M (L_z \Phi_i)$

L_x indicates a matrix from localization of which the columns are made up of 1 on the d.o.f. DX and 0 elsewhere.

L_y indicates a matrix from localization of which the columns are made up of 1 on the d.o.f. DY and 0 elsewhere.

L_z indicates a matrix from localization of which the columns are made up of 1 on the d.o.f. DZ and 0 elsewhere.

Φ_i indicate the 2rd vector of projection base.

3.20 Classification of the basic vectors

a data structure sd_nume_ddl is attached to the data structure sd_macr_elem_dyna. One refers to it for the classification of the basic vectors.