

## Operator DYNA\_ISS\_VARI

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### 1 Drank

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This operator allows to calculate the response of a structure subjected to a variable seismic motion in space from a function of coherence, matrix of impedance and seismic force. These last can be calculated by software PROMISS3D. More precisely, one builds the spectral vectors of modal response (exits of a spectral decomposition of the matrix of coherence) via a harmonic computation out of generalized components. In output, one obtains the spectral concentration (DSP) of the modal response (for a unit excitation) or the temporal response in acceleration to deduce from it from the response spectrums if an accelerogram is given.

Product a concept of type `interspectrum` or `tran_gene`.

## 2 Syntax

```
RES_VARI=DYNA_ISS_VARI      (
    ◆ |      FONC_SIGNAL=acce      [fonction_sdaster]
      ◆◆FREQ_PAS=pas      ,      [R]
      ◆FREQ_FIN=ffin      ,      [R]
    |      NB_FREQ=fpas      ,      [I]
      ◆FREQ_INIT=fmin      ,      [R]
      ◆FREQ_PAS=pas      ,      [R]
      ◆OPTION=/      "TOUT",      [DEFAULT]
      /      "DIAG",
    ◆NOM_CMP=/      "DX",
      /      "DY",
      /      "DZ",
    ◆PRECISION=/prec      ,      [R8]
      /0.999      ,      [DEFAULT]
    ◆INTERF=_F      (
      ◆GROUP_NO_INTERF=ma_interf      ,      [grma]
      ◆MODE_INTERF=/      "TOUT",
      /      "CORP_RIGI"
    ),
    ◆ ISSF      =      /"NON"      [DEFAULT]
      /"OUI"
    ◆MATR_COHE=_F      (
      ◆TYPE=/      "MITA_LUCO"
      /"ABRAHAMSON"
      ◆VITE_ONDE=vite_onde      ,      [R8]
      /600.0      ,      [DEFAULT]
      ◆PARA_ALPHA=/alpha      ,      [R8]
      /0.5      ,      [DEFAULT]
    ),
    ◆MATR_GENE=_F      (
    [matr_asse_gene_R] ◆MATR_MASS=massgen      ,
    [matr_asse_gene_R] ◆MATR_RIGI=rigigen      ,
    [matr_asse_gene_C] ◆MATR_AMOR=amogen      ,
    ),
    ◆UNITE_RESU_IMPE=/uresimp      ,      [I]
      /32      ,      [DEFAULT]
    ◆UNITE_RESU_FORC=/uresfor      ,      [I]
      /33      ,      [DEFAULT]
    ◆TYPE=/      "BINAIRE",
```

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

```

/ "ASCII" [DEFAULT]
◇INFO=/1 [DEFAULT]
/2 , '
) ;
if FONC_SIGNAL present : RES_VARI= [tran_gene]
if NB_FREQ present : RES_VARI= [interspectrum]
```

## 3 Operands

### 3.1 Operand UNITE\_RESU\_IMPE and UNITE\_RESU\_FORC

◆UNITE\_RESU\_IMPE=/uresimp , [I]  
/32 , [DEFAULT]

logical Unit of the file of the matrix of impedance of interface calculated by MACRO\_MISS\_3D option MISS\_IMPE. This matrix can be either already calculated and given like entry in the profile of study, or result of MACRO\_MISS\_3D in the same command file.

◆UNITE\_RESU\_FORC=/uresfor , [I]  
/33 , [DEFAULT]

logical Unit of the file of the seismic forces of interface previously calculated by MISS3D with MACRO\_MISS\_3D in postprocessing and data like entry in the profile of study.

### 3.2 Operand TYPE

◇TYPE=/ "BINAIRE"  
/ "ASCII" [DEFAULT]

This operand makes it possible to read impedances calculated by the command MACRO\_MISS\_3D [U7.03.11] in a file of binary format if necessary.

### 3.3 Operand FONC\_SIGNAL

If one wishes to obtain a **temporal response**, one must give an accelerogram via key word FONC\_SIGNAL.

◇FONC\_SIGNAL=acce , [fonction\_sdaster]

**Note:**

| If FONC\_SIGNAL is not indicated, then DYNA\_ISS\_VARI gives in output the spectral concentrations of response (for a unit excitation).

The frequential discretization is given from the temporal discretization of the accelerogram:

$$FREQ\_INIT=0.0, PAS=1./(NB*DT),$$

where NB indicates the number of time step of the accelerogram and DT is time step.

**Note:**

| It is necessary that time step accelerogram is constant.

In order to reduce the time of computing time, it is possible to indicate the step of frequency and the maximum frequency for the computation of the transfer transfer function (advised):

◇FREQ\_FIN=ffin

◇FREQ\_PAS=pas

If FREQ\_FIN and FREQ\_PAS are indicated, then one determines the transfer transfer function, taking account of spatial variability, only for one reduced number of frequency. For the computation of the temporal response to the excitation by a seismic signal (accelerogram), one interpolates these values in order to lead to the necessary frequential discretization by the theorem of Shannon.



rigid body, one must inform "CORP\_RIGI", if one works with all the fashions D `interface (unit modes finite elements), one informs "TOUT". For all the other cases of foundation (inserted geometry, modes of unspecified representation for flexible foundation, case ISSF=' OUI'), one informs "QUELCONQUE".

## 3.7.2 Operand GROUP\_NO\_INTERF

◆GROUP\_NO\_INTERF=gr\_inter

With this key word, one defines the nodes group leaning on meshes the surface constitutive ones of the interface soil-structure.

## 3.8 Mot\_clé MATR\_COHE

### 3.8.1 Operands VITE\_ONDE and PARA\_ALPHA

◆TYPE=modele

One can choose between the function of coherence of Mita & Luco (MITA\_LUCO) and that of Abrahamson for tough soil (ABRAHAMSON). If MITA\_LUCO is chosen, then one can inform:

◆VITE\_ONDE=  $c_{app}$   
◆PARA\_ALPHA =  $\alpha$

They are the parameters of the function of coherence of Luco and Wong (pure inconsistency without the effect of the transition of wave):

$$\gamma(d) = \exp\left[-\left(\alpha \cdot f \cdot \frac{d}{c_{app}}\right)^2\right]$$

where  $D$  indicates the distance between two items I and J on the foundation,  $f$  is the frequency and  $c_{app}$  the apparent velocity of propagation on the surface of the wave SH (for example 200–600m/s). The parameter  $\alpha$  is generally taken equal to 0.5 (default). The value of default for VITE\_ONDE is worth 600.

## 3.9 Key word MATR\_GENE

### 3.9.1 Operands MATR\_MASS, MATR\_RIGI, MATR\_AMOR

◆MATR\_MASS=m

Name of the concept stamps assembled corresponding to the generalized mass matrix of the system.

◆MATR\_RIGI=rigigen

Name of the concept stamps assembled corresponding to the generalized stiffness matrix of the system.

A hysterical damping is obtained with a complex stiffness matrix.

◆MATR\_AMOR=amogen

Name of the concept stamps generalized assembled corresponding to the generalized damping matrix of the system.

## 3.10 Operand accuracy

◆PRECISION = prec

This parameter is by default taken equal to 0,999.

For the computation of the seismic forces with spatial variability of the incidental field, one carries out the spectral decomposition of the matrix of coherence  $[y_{ij}]$   $i=1\dots,M$ . The parameter `prec` gives the share of "the energy" of the matrix which one preserves by retaining only one reduced number of eigenvectors. If one indicates by  $K \ll M$  the number of eigenvalues selected (the  $K$  greatest eigenvalues are retained), there is

$$\text{prec} = \frac{\sum_{i=1}^K \lambda_i^2}{\sum_{i=1}^M \lambda_i^2}$$

## 3.11 Operand INFO

◇INFO=

Indicates the level of printing of the results of the operator.

- 1 = no particular printing,
- 2 = printing of the eigenvalues of spectral decomposition retained.

The printings are made in the file "MESSAGE".

## 4 Examples of use

One presents here two examples of use of DYNA\_ISS\_VARI. The first example presents a computation of spectral concentration of response. The second example presents a computation of response spectrum of oscillator.

The user must have done before a calculation ProMISS3D (CALC\_MISS [U7.03.12] with TYPE\_RESU=' FICHER' ).

### 4.1 Example 1

One presents here an example of command set for the computation of the spectral concentration of response which takes account of the spatial variability of incidental seismic motion.

```
RESU = DYNA_ISS_VARI (
    FREQ_INIT =fmin,
    NB_FREQ = NF,
    NOT = df,
    NOM_CMP = "DX",
    accuracy = 0.999,
    INTERF =_F (
        GROUP_NO_INTERF=' RADIER',
        MODE_INTERF = ' CORPS_RIGI',),
    MATR_COHE =_F (
        VITE_ONDE = 600. ,
        PARA_ALPHA =0.5,),
    UNITE_RESU_IMPE = 32,
    UNITE_RESU_FORC = 33,
    MATR_GENE =_F (
        MATR_MASS = MASSGEN,
        MATR_RIGI = RIGIGEN,

        MATR_AMOR = AMORT,
    ),
    INFO =2,);
```

One can also consult benchmark SDLS118A for an implementation of the method.

One can recover the spectral concentration of response in physical coordinates using operator REST\_SPEC\_PHYS.

```
SPVX=REST_SPEC_PHYS (MODE_MECA=BAMO,
    TOUT_ORDRE = "OUI",
    INTE_SPEC_GENE = RESU,
    NOM_CHAM=' DEPL',
    NOEUD= ("N77" ),
    NOM_CMP= ("DX",),
    OPTION=' TOUT_TOUT' );
```

The transfer transfer function is obtained for a unit seismic excitation and by tracing the root of the values of the auto-spectrum.

## 4.2 Example 2

One presents here an example of command set for the computation of the spectral concentration of response which takes account of the spatial variability of incidental seismic motion.

```
RESU = DYNA_ISS_VARI (
    FONC_SIGNAL = ACCE_X,
    FREQ_MAX =50.0, FREQ_PAS = 0.5,
    NOM_CMP = "DX",
    ACCURACY = 0.99,
    INTERF =_F (
        GROUP_NO_INTERF=' RADIER',
        MODE_INTERF = ' CORPS_RIGI',),
    MATR_COHE =_F (
        VITE_ONDE = 600. ,
        PARA_ALPHA =0.5,),
    UNITE_RESU_IMPE = 32,
    UNITE_RESU_FORC = 33,
    MATR_GENE =_F (
        MATR_MASS = MASSGEN,
        MATR_RIGI = RIGIGEN,

        MATR_AMOR = AMORT,
    ),
    INFO =2,);

test_1=RECU_FONCTION (RESU_GENE=test_1_a,
    NOM_CHAM=' ACCE',
    NOM_CMP=' DX',
    NOEUD= ("N11" ),
    INTERPOL=' LIN',
    TITER=' ACCELERATION WITH the LOW CENTER OF the
RADIER',);

SROX1=CALC_FONCTION (SPEC_OSCI=_F (FONCTION=test_1,
    NORME=9.81, AMOR_REDUIT=0.05, ),);
```

One can also consult benchmark SDLS118B for an implementation of the method.