Modelings DIS_T and DIS_TR

Summary:

This document describes for modelings DIS_T and DIS_TR :

- degrees of freedom carried by the finite elements which support modeling,
- the related meshs supports,
- supported loadings,
- nonlinear possibilities,
- CAS-tests implementing modelings.

Two modelings DIS_T and DIS_TR allow the representation of discrete elements of translation and translation-rotation.

They are usable for three-dimensional problems in linear and nonlinear mechanical analysis.

Contents

1 Discretization

1.1 Degrees of freedom

For two modelings into three-dimensional the degrees of freedom of discretization are, in each node of the mesh support, the three components of displacement of translation or the six components (three translations and three rotations).

Finite element	Degrees of freedom (with each node top)					
DIS_T	DX	DY	DZ			
DIS_TR	DX	DY	DZ	DRX	DRY	DRZ
					MARTINI	

1.2 Mesh support of the matrices of rigidity

The meshs support of the discrete elements, in displacement formulation, are segments with two nodes SEG2 or of the specific meshs POI1 confused with a node:

Modeling	Mesh	Finite element	Remarks
DIS_T	POI1	MECA_DIS_T_N	
	SEG2	MECA_DIS_T_L	
DIS_TR	POI1	MECA_DIS_TR_N	
	SEG2	MECA_DIS_TR_L	

For the meshs POI1, the efforts are calculated starting from the differences of the degrees of freedom of the node of the mesh with the fixed reference mark, while for the meshs SEG2, they are calculated starting from the differences in degree of freedom between the two nodes.

2 Assignment of the characteristics

For these discrete elements, it is necessary to affect geometrical characteristics which are complementary to the data of grid. The definition of these data is carried out with the order AFFE_CARA_ELEM associated with the keywords following factors:

- DISCRETE
  Allows to define and affect the values of the matrices of rigidity, mass or damping. Supported modelings: DIS_T, DIS_TR
- ORIENTATION
  Allows to define and affect a local reference mark. Supported modelings: DIS_T, DIS_TR

3 Supported loadings

- GRAVITY
  Allows to apply a loading of type gravity.
  Supported modelings: DIS_T, DIS_TR

4 Non-linear possibilities

4.1 Law of behaviors

Laws of behaviors specific to these modelings, usable under BEHAVIOR in STAT_NON_LINE and DYNA_NON_LINE are documented in DEFI_MATERIAU [U4.43.01]. All the discrete ones support these behaviors:

/ **ASSE_CORN**
/ **WEAPON**
/ **DIS_CHOC**
/ **DIS_C ONTACT**
/ **ELAS**
/ **DIS_VISC**
/ **DIS_ECRO_CINE**
/ **DIS_ECRO_EXAM NERVES**
/ **DIS_BILI_ELAS**
/ **DIS_GRICRA**
/ **DIS_GOUJ2E**

Besides the assignment of the characteristics (AFFE_CARA_ELEM), the use of modelings DIS_T and DIS_TR with STAT_NON_LINE/DYNA_NON_LINE/DYNA_TRAN_EXPLI imply to define characteristics material (via DEFI_MATERIAU and AFFE_MATERIAU).

With the material DIS_CONTACT and behaviors DIS_CHOC and DIS_CONTACT the elastic matrix is calculated with the characteristic of stiffness defined in AFFE_CARA_ELEM, while the tangent matrix is calculated via the behavior DIS_CHOC or DIS_CONTACT.

4.2 Deformations

Deformations available, used in the relations of behavior under the keyword DEFORMATION for the operators STAT_NON_LINE and DYNA_NON_LINE are (cf [U4.51.11]):

/ **'SMALL'**
The deformations used for the relation of behavior are the linearized deformations calculated on the initial geometry.

5 Examples of implementation: CAS-tests

- **DIS_T**
  - Linear statics
    - SSLL100B [V3.01.100]: Linear static analysis of a formed structure by right and curved beams subjected to a loading of inflection.
  - Non-linear statics
    - SSNL118A [V6.02.118]: Non-linear static analysis of a bar subjected to a field speed of wind.
  - Linear dynamics
    - SDLD02A [V2.01.002]: Research of the frequencies and the modes of vibration of a mechanical structure made up of masses and springs.
  - Non-linear dynamics
    - SDND102B [V5.01.102]: Seismic answer of a system masses non-linear spring multi supported.

- **DIS_TR**
  - Linear statics
    - SSLX100D [V3.05.100]: Analysis of a beam in inflection whose model is composed of a mixture of modeling 3D, Hull and Beam.
  - Non-linear statics
    - SSNL102A [V6.02.102]: Analysis of the non-linear behaviour of an assembly of angles subjected to a two-dimensional loading of traction and moment.
  - Linear dynamics
    - SDLD02C [V2.01.002]: Research of the frequencies and the modes of vibration of a mechanical structure made up of masses and springs.
  - Non-linear dynamics
    - SDND102B [V5.01.102]: Seismic answer of a system masses non-linear spring multi supported.