

Modelings 2D_DIS_T and 2D_DIS_TR

Summary:

This document describes for modelings 2D_DIS_T, 2D_DIS_TR (cf [R5.03.17]):

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

Modeling 2D_DIS_T the representation of discrete elements of translation allows one or two nodes.

Modeling 2D_DIS_TR the representation of discrete elements of translation and rotation allows one or two nodes.

They are usable for two-dimensional problems in linear mechanical analysis or not linear.

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1 Discretization

1.1 Degrees of freedom

The degrees of freedom of discretization are, in each node of the mesh support, the two components of displacement of translation and rotation.

Finite element	Degrees of freedom (with each node top)		
2D_DIS_T	DX	DY	
2D_DIS_TR	DX	DY	DRZ

1.2 Mesh support of the matrices of rigidity

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

Modeling	Mesh	Finite element	Remarks
2D_DIS_T	POI1	MECA_2D_DIS_T_N	
	SEG2	MECA_2D_DIS_T_L	
2D_DIS_TR	POI1	MECA_2D_DIS_TR_N	
	SEG2	MECA_2D_DIS_TR_L	

With regard to the meshes `POI1`, the internal efforts are calculated starting from the differences of the degrees of freedom of the mesh with the fixed reference mark (as if this discrete node were attached to a fixed reference mark).

For the meshes `SEG2`, the efforts are calculated starting from the differences of the degrees of freedom carried by each of the 2 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: `2D_DIS_T`, `2D_DIS_TR`
- **ORIENTATION**
Allows to define and affect a local reference mark.
Supported modelings: `2D_DIS_T`, `2D_DIS_TR`

3 Supported loadings

The supported loading is the following:

- `'GRAVITY'`
Allows to apply a loading of type gravity.
Supported modelings: 2D_DIS_T, 2D_DIS_TR

4 Possibilities Not - linear

All modelings 2D_DIS_* are usable with STAT_NON_LINE and DYNA_NON_LINE. It is necessary in this case to define a material with `DEFI_MATERIAU`.

4.1 Law of behavior

Laws of behaviors specific to these modelings, usable under BEHAVIOR in STAT_NON_LINE and DYNA_NON_LINE the following ones (cf [U4.51.11]):

- / `'DIS_GOUJ2E_ELAS'`
Supported modeling: All
- / `'DIS_GOUJ2E_PLAS'`
Supported modeling: All
- / `'ELAS'`
Supported modelings: All

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 imply to define characteristics material (`AFFE_MATERIAU`).

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.
Supported modeling: All
- / `'PETIT_REAC'`
The deformations used in the incremental relation of behavior are the linearized deformations calculated on the reactualized geometry.
Supported modeling: All

5 Examples of implementation: CAS-tests

- **2D_DIS_T**
 - Linear statics
 - SLL108A [V3.01.108]: Analysis of the answer of a bar, modelled by 10 discrete elements (Meshs SEG2) subjected to a loading of traction.
 - Non-linear statics
 - ZZZ120A: Calculation of an assembly Pin-Attaches without top of support, with an elastoplastic law of behavior of Von Mises representing the local behavior of a net of pin of threaded assembly.
 - Linear dynamics
 - SLD02E [V2.01.002]: Research of the frequencies of vibration and the modes associated with a mechanical structure made up of masses and springs.
 - Non-linear dynamics
 - SDNV104A: Dynamic response of a rigid shoe rubbing subjected to a pressure and a back pulling force.
- **2D_DIS_TR**
 - Linear dynamics
 - SLD02F [V2.01.002]: Research of the frequencies of vibration and the modes associated with a mechanical structure made up of masses and springs.