Modelings AXIS, D_PLAN, C_PLAN

Summary:

Modelings AXIS, D_PLAN, C_PLAN (Phenomenon: MECHANICS) correspond to finite elements whose meshs supports are surface.

The assumptions of modeling are the following ones:

- AXIS for the axisymetry (mode 0 of Fourier) according to the axis of Y,
- D_PLAN for the plane deformations,
- C_PLAN for the plane constraints.

This document described:

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

1 Discretization

1.1 Degrees of freedom

Modeling	Degrees of freedom (with each node top)
AXIS	DX : corresponds to radial displacement DY : corresponds to longitudinal displacement
D_PLAN	DX : following displacement X DY : following displacement Y
C_PLAN	DX : following displacement X DY : following displacement Y

1.2 Mesh support of the matrices of rigidity

The meshs support of the finite elements can be triangles or quadrangles. The elements are isoparametric.

Modelings	Mesh	Interpolation
AXIS	TRIA3	Linear
D_PLAN	QUAD4	Bilinear
C_PLAN	TRIA6	Quadratic
	QUAD8	Serendip
	QUAD9	Biquadratic

1.3 Mesh support of the loadings

Modelings	Mesh	Interpolation
AXIS	SEG2	Linear
D_PLAN		or
C_PLAN	SEG3	Quadratic

2 Supported loadings

The loadings available are the following:

- **CONTACT**

  Allows to define the zones subjected to conditions of contact.

  Supported modelings: AXIS, C_PLAN, D_PLAN

- **EPSI_INIT**

  Allows to apply a loading of initial deformation.

  Supported modelings: AXIS, C_PLAN, D_PLAN

- **FORCE_CONTOUR**

  Allows to define linear forces at the edge of a field.

  Supported modelings: AXIS, C_PLAN, D_PLAN

- **FORCE_INTERNE**

Allows to define voluminal forces.

Supported modelings: AXIS, C_PLAN, D_PLAN

- **GRAVITY**

  Allows to define the acceleration and the direction of gravity.

  Supported modelings: AXIS, C_PLAN, D_PLAN

  In axisymmetric modeling, gravity is exerted only parallel to the axis of revolution Y .

- **PRES_REP**

  Allows to apply a pressure.

  Supported modelings: AXIS, C_PLAN, D_PLAN

- **ROTATION**

  Allows to define a number of revolutions and the direction of the vector of rotation.

  Supported modelings: AXIS, C_PLAN, D_PLAN

3 Nonlinear possibilities

3.1 Laws of behaviors

Laws of behaviors (model classics, local models with damage, models for the concrete,…), usable under BEHAVIOR in STAT_NON_LINE and DYNA_NON_LINE, under the keyword RELATION, are described in details in the document 'Behavior nonlinear' [U4.51.11].

3.2 Deformations

Deformations usable under BEHAVIOR in STAT_NON_LINE and DYNA_NON_LINE, under the keyword DEFORMATION, are described in details in the document "Behavior nonlinear" [U4.51.11].

4 Examples of implementation: CAS-tests

- **AXIS**
  - Linear statics
    FORMA09B [V7.20.101]: Thermoelastic analysis of a tube right subjected to a cold shock.
    SSLS07A [V3.03.007]: Linear static analysis of a thin cylinder subjected to a uniform axial loading.
  - Nonlinear statics
    SSNL129C [V6.02.129]: Simulation of a tensile test: validation of the laws of behavior 'VISC_ISOT_TRAC' and 'VISC_ISOT_LINE'.
  - Linear dynamics
    SDLS07B [V2.03.007]: Research of the Eigen frequencies and the modes associated with a thin spherical envelope.
  - Nonlinear dynamics
    SDNV103B [V5.03.103]: Impact of a bar of TAYLOR: analysis of the impact rubbing of an elastoplastic bar on a rigid solid mass. Modeling understands: contact, friction, elastoplasticity, great deformations.

- **D_PLAN**
  - Linear statics
    SSLV100H [V3.04.100]: Analysis of a hollow roll subjected to an internal pressure, in plane deformations.
  - Nonlinear statics
    SSNL129B [V6.02.129]: Simulation of a tensile test: validation of the laws of behavior 'VISC_ISOT_TRAC' and 'VISC_ISOT_LINE'.
  - Linear dynamics
    SDLS501A [V2.03.501]: Research of the Eigen frequencies and the modes associated with a corrugated iron into free-free.
  - Nonlinear dynamics
    SDNV104A: Dynamic response of a rigid shoe rubbing subjected to a pressure and a back pulling force.

- **C_PLAN**
  - Linear statics
    SSLP101B [V3.02.101]: Analysis of a plate fissured in traction, calculation of the rate of refund of energy in plane constraints.
  - Linear dynamics
    SDLL11G: Search of the Eigen frequencies and modes associated with a thin circular ring into free-free.
  - Nonlinear statics
    HSNV100B [V7.22.100]: Analysis of a cylinder in thermo plasticity subjected to a simple tractive effort.
  - Nonlinear dynamics
    DEMO002A: Nonlinear dynamic analysis of a wing fissured with contact.