Modelings CABLE and CABLE_POULIE

Summary:

This document describes for modelings CABLE and CABLE_POULIE :

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

Modelings CABLE and CABLE_POULIE correspond to elements of bar written specifically to take into account great displacements (cf [R3.08.02] and [R3.08.04]).

They are not usable for problems of linear mechanical analysis.

Contents

1 Discretization

1.1 Degrees of freedom

For these two modelings the degrees of freedom of discretization are, in each node of the mesh support, the three components of displacement of translation.

Finite element	Degrees of freedom (with each node top)		
CABLE	DX	DY	DZ
CABLE_POULIE	DX	DY	DZ

1.2 Mesh support of the matrices of rigidity

The meshs support of the finite elements, in displacement formulation, are segments with two nodes SEG2 :

Modeling	Mesh	Finite element	Remarks
CABLE	SEG2	MECABL2	
CABLE_POULIE	SEG3	MEPOUL1	

2 Assignment of the characteristics

For these modelings 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 keyword factor CABLE, which permet to define and affect a constant section.

3 Supported loadings

The loadings available are the following ones:

- **'CONTACT'**
  Allows to define the zones subjected to conditions of contact.
  Supported modeling: CABLE

- **'FORCE_POUTRE'**
  Allows to apply linear forces
  Supported modeling: CABLE

- **'INTE_ELEC'**
  Allows to apply the force of LAPLACE acting on a principal driver, due to the presence of a secondary driver not necessarily right compared to this principal driver.
  Supported modeling: CABLE.

- **'GRAVITY'**
  Allows to apply a loading of type gravity.
  Supported modelings: CABLE, CABLE_POULIE

Note:

- *Possible following load in the case of a loading of the type FORCE_POUTRE .*
- *Possible contact between beam and surface [R5.03.50].*

4 Non-linear

4.1 Laws of behaviors

The law of behavior specific to these modelings, usable under BEHAVIOR in STAT_NON_LINE and DYNA_NON_LINE is the following one (cf [U4.51.11]):

/ **'CABLE'**
Supported modeling: CABLE

4.2 Deformations

No linear calculation is possible with these modelings (calculations are necessarily done in great displacements).

The deformations used in the relation of behavior are the deformations of GREEN_LAGRANGE : keyword 'GREEN' under DEFORMATION (Cf [U4.51.11]).

5 Examples of implementation: CAS-tests

- **CABLE**
  - Non-linear statics
    - SSNL100A [V6.02.100]: This test simulates the installation of a cable with two ranges. The cable is fixed at the one of its ends, passes on a fast pulley towards the other end and rests in its medium on a pulley placed at the bottom of a mobile suspension.
  - Non-linear dynamics
    - SDNL100A [V5.02.100]: This test simulates the movement of a heavy bar articulated at a point fixed by one of its ends, free elsewhere and oscillating with great amplitude in the vertical plan.

- **CABLE_POULIE**
  - Non-linear statics
    - SSNL100A [V6.02.100]: This test simulates the installation of a cable with two ranges. The cable is fixed at the one of its ends, passes on a fast pulley towards the other end and rests in its medium on a pulley placed at the bottom of a mobile suspension.