

SSNL139 – Validation of the reactualization of the angle of gimlet of the beams

Summary:

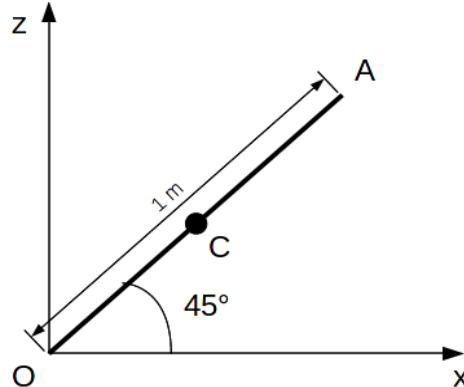
When one uses the elements beam with kinematics `GROT_GDEP`, the two nautical angles which translate the orientation of the element must be brought up to date with each iteration. The same applies to the 3rd nautical angle γ translating the angle of gimlet of the beam. The purpose of this test is to validate the reactualization of this angle using a non-linear calculation.

It makes it possible to check modeling `POU_D_TGM` and that modelings `POU_D_E` and `POU_D_EM` the same results with kinematics give `GROT_GDEP`.

1 Description

1.1 Geometry

A beam a length is considered 10 m , directed with 45° in the plan XOZ .



The section of the beam is rectangular, $0,1\text{ m}$ of broad, $0,2\text{ m}$ of top.

1.2 Properties of materials

The material uses the following properties:

Young modulus $E_b = 1.0\text{E}+10\text{ Pa}$
Poisson's ratio $\nu_b = 0.25$

1.3 Boundary conditions and loadings

Nœud O is blocked in displacement in all the directions and rotation around Y . Nœud A is blocked in displacement according to Y . Moreover, one prohibits with the beam rotation on itself.

Displacements of Nœud A are imposed as follows: $DX = \frac{-\sqrt{2}}{2} \frac{t}{100}$ and $DZ = \frac{-\sqrt{2}}{2} \frac{t}{100}$ with t

taking the values from 0 to 1 per increment of 0.1 .

A force of 100 N according to Y is applied to Nœud C (medium of beam) so that the beam moves in the direction Y .

1.4 Reference

The results of reference are obtained with a non-linear calculation and a beam directed according to the axis X . For this orientation the value of the angle of gimlet remains always the same one during calculation, with and without reactualization the results are identical.

For the reference the displacement imposed on Nœud A is: $DX = -\frac{t}{100}$

Displacement DY Nœud C (medium of beam) gives L has value of reference.

2 Modeling A

2.1 Characteristics of modeling

The beam is modelled by 10 meshes `SEG2` to which modeling is affected `POU_D_TGM`. It is pointed out that kinematics used is `DEFORMATION = 'GROT_GDEP'`.

2.2 Values tested

One compares displacement in Y Nœud C with that obtained by same calculation with a beam directed according to the axis X .

Moment	Type of reference	Value of reference	Tolerance
1.0	Another Aster	1.508470E-01	1.0E-05

3 Modeling B

3.1 Characteristics of modeling

The beam is modelled with 10 meshes SEG2 which one affects modeling POU_D_E. It is pointed out that kinematics used is DEFORMATION = 'GROT_GDEP'.

3.2 Values tested

One compares displacement in Y Nœud C with that obtained by same calculation with a beam directed according to the axis X .

Moment	Type of reference	Value of reference	Tolerance
1.0	Another Aster	0.15658191432102	1.0E-05

4 Modeling C

4.1 Characteristics of modeling

The beam is modelled by 10 meshes `SEG2` which one affects modeling `POU_D_EM`. It is pointed out that kinematics used is `DEFORMATION = 'GROT_GDEP'`.

4.2 Values tested

One compares displacement in Y Nœud C with that obtained by same calculation with a beam directed according to the axis X and also with the same calculation with `POU_D_E`.

Moment	Type of reference	Value of reference	Tolerance
1.0	Another Aster	0.15668437975194	1.0E-05
1.0	Another Aster (<code>POU_D_E</code>)	0.15658191432102	7.0E-04

5 Synthesis

The reactualization of the angle of gimlet makes it possible to give an account of displacements and rotations of the sections of the beam during incrémentaux calculations.