

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

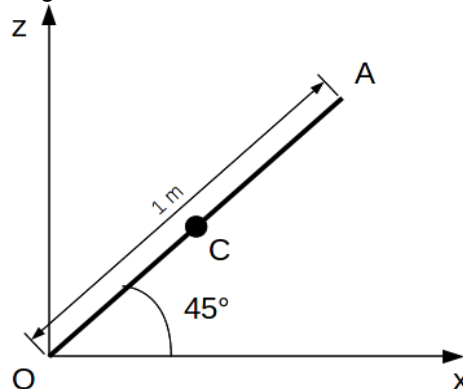
Summarized:

When one uses the elements beam with kinematics `GROT_GDEP`, the two nautical angles which translate the directional sense 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 validating the reactualization of this angle using a nonlinear computation.

1 Description

1.1 Geometry

One considers a beam a length 1 m , directed with 45° in the plane XOZ .



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

1.2 Properties of the materials

the material used has the following properties:

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

1.3 Boundary conditions and loadings

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

Displacements of the node 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 .

Lastly, a force of 100 N according to Y is applied to the node C (medium of beam) so that the beam moves in the direction Y .

1.4 Reference

the results of reference are obtained with a nonlinear computation and a beam directed according to the axis X . For this directional sense the value of the angle of gimlet remains always the same one during computation, with and without reactualization the results are identical.

For the reference L E displacement imposed on the node A is then the following: $DX = -\frac{t}{100}$

the displacement DY of the node C (medium of beam) gives L is tantamount value of reference.

2 Modelization A

2.1 Characteristic of the modelization

the beam is modelled by 10 meshes `SEG2` to which the modelization `pou_d_tgm` is `AFFECTED`. It is pointed out that the kinematics used is `STRAIN = "GROT_GDEP"`.

2.2 Values tested

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

Standard	time of reference	Different Value of reference	
1.0	Tolerance Aster	1.508470E-01	1.0E-05

3 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 computations.