

ZZZZ364 - Validation of great rotations

Summary:

This test makes it possible to check the good taking into account of great rotations by some modelings of Code_Aster which can take them into account: '3D', 'COQUE_3D', 'POU_D_T_GD', 'POU_D_EM', 'POU_D_TGM'.

1 Principle of the test

The model (constituted by meshes 3D, or of meshes of hull or meshes of beam) is subjected to a displacement imposed on part of its edge (there is no loading of the type "forces").

As imposed displacement corresponds to a simple rotation of the edge, the total solution is also imposed rotation.

The structure does not become deformed, its state of stress is null.

Modelings tested are those which accept great rotations:

3D, COQUE_3D, POU_D_T_GD, POU_D_EM and POU_D_TGM

For three modelings of structure (which have ddls of rotation), it is interesting to see how great rotations "are composed". Indeed, the large ones rotations are not additive quantities. For that, imposed displacement is broken up into 4 stages:

- a rotation of angle ϕ_0 around OZ enters moments 0. and 1.
- a rotation of angle ϕ_0 around OY enters moments 1. and 2.
- a rotation of angle ϕ_0 around OX enters moments 2. and 3.
- rotation allowing to return to the initial position.

1.1 Results of reference, validation

The solution in displacement is known: it is imposed rotation. The solution in constraint is known: a null state of stress.

For displacement, it is checked that the field $U - U_{ref}$ has a maximum and a minimum close to zero.

2 Observations

- It is difficult to make converge this calculation for all modelings and an important angle ϕ_0 . Therefore the angle ϕ_0 and the step division of time are differently selected for each modeling.
- Modelings POU_D_EM and POU_D_TGM are frankly put at fault on this test (error > 100%).

This documentation is voluntarily brief.