ZZZZ298 – Data-processing validation of

Summarized

POST_K1_K2_K3:

The purpose of this test is validating in an elementary way operator `POST_K1_K2_K3`. This test does not have physical meaning inevitably, it is primarily a data-processing test.

Modelization a:

- Modelization: crack with a grid (FEM)
- Resolution of an elastic mechanical problem linear

Modelization b:

- Modelization: crack NON-with a grid (X-FEM)
- Resolution of an elastic mechanical problem linear

Modelization C:

- Modelization: crack with a grid (FEM)
- Resolution of a problem of modal analysis

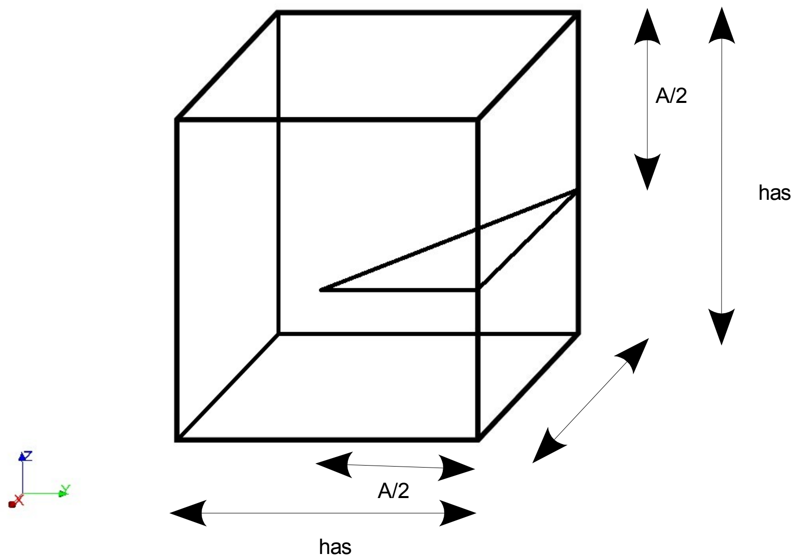
Although this test is of data-processing nature and that one can be satisfied with a voluntarily brief documentation, certain modelizations are more detailed:

- the modelizations A and B are documented in a complete way,
- the modelization C, resulting from benchmark SDLS114A, is not documented.

1 Problem of reference for the modelizations A and B

1.1 Geometry

the studied structure is a cube of edge 1 measures comprising a plane crack, being at middle height (see [Figure 1.1-a]). If with the problem is dealt by a classical method (modelization A), the crack is with a grid. On the other hand, if the method X-FEM is employed (modelization B), the crack is not with a grid, and the geometry is in fact a healthy cube without crack. The crack will then be introduced by functions of levels (level sets) directly into the file orders using operator DEFI_FISS_XFEM [U4.82.08].



Appears 1.1-a: Geometry of the cube fissured

1.2 Materials properties

the behavior of structure is elastic and its materials properties are:

Young's modulus: $E=205000\,Mpa$
Poisson's ratio: $\nu=0$

1.3 Boundary conditions and

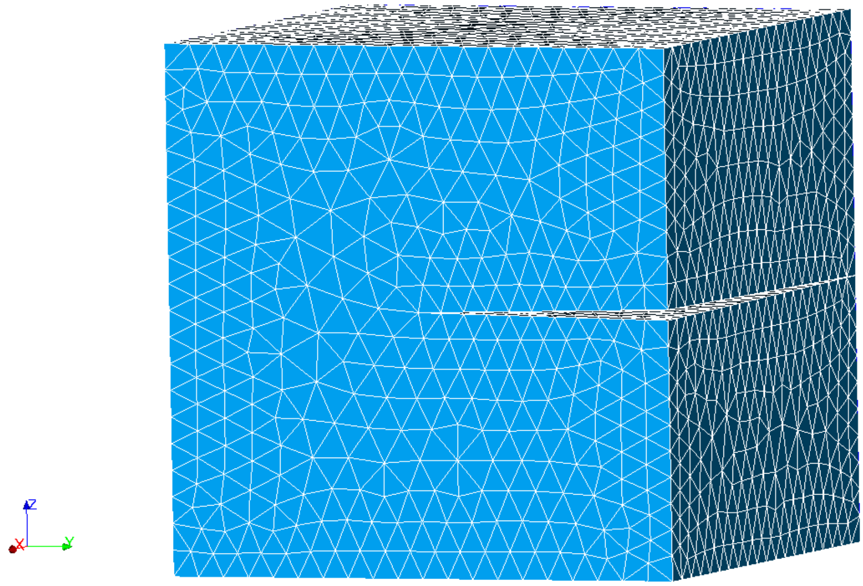
loadings the displacement of the lower face of structure are blocked whereas a pressure of $1\,MPa$ is applied to the upper face in order to simulate a loading of tension. This makes it possible to request crack in pure mode of I opening.

2 Modelization a: fissures with a grid

In this modelization, the crack is with a grid, and one uses the standard method of the finite elements to carry out computation.

2.1 Characteristics of the mesh

the structure is modelled by a cracked mesh made up of 13874 tetrahedrons (see [Figure 2.1-a]).



Appear 2.1-a: Cracked mesh

2.2 Quantities tested and results

One tests the values of $K1$ on the first two nodes and the three last of the crack tip. Indeed, the directional sense of crack implies that $K1$ could not be calculated on some nodes. We test the nodes concerned to check that Code_Aster their attribute the value of the close node nearest or computation to $K1$ with which been able to be carried out.

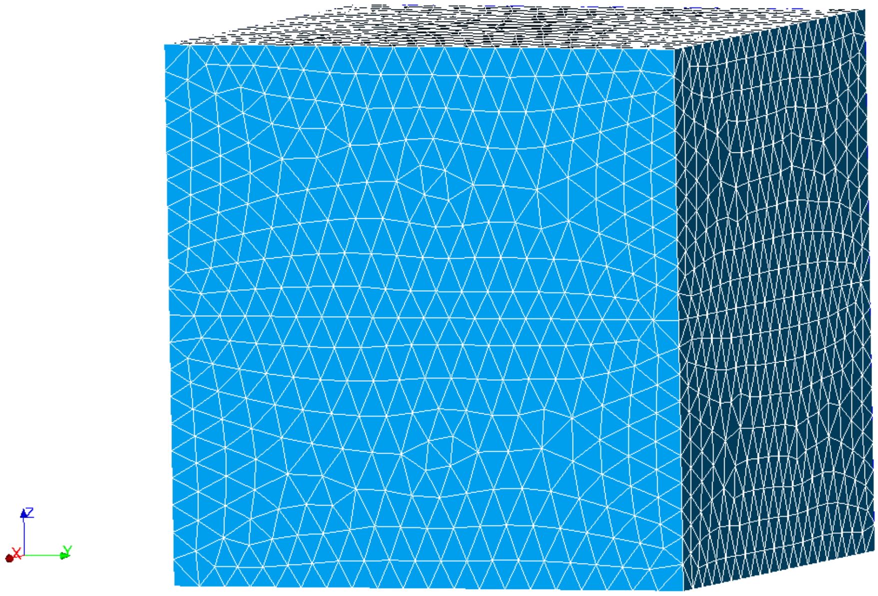
Standard	identification of reference	Value of reference
Node 1	"NON_REGRESSION"	7.7933E+05
Node 2	"NON_REGRESSION"	7.7933E+05
Node 22	"NON_REGRESSION"	3.81219E+05
Node 23	"NON_REGRESSION"	3.81219E+05
Node 24	"NON_REGRESSION"	3.81219E+05

3 Modelization b: fissures X-FEM

In this modelization, the crack is not with a grid, but it is represented by of the level sets: $LSN=z-1/2$ and $LST=-y-x/2+1$.

3.1 Characteristics of the mesh

the structure is modelled by a mesh made up of 15872 tetrahedrons (see [Figure 2.1-a]).



Appear 2.1-a: Sane mesh

3.2 Quantities tested and results

One tests the values of $K1$ on the first three nodes and the two last of the crack tip. Indeed, the directional sense of crack implies that $K1$ could not be calculated on some nodes. We test the nodes concerned to check that *Code_Aster* their attribute the value of the close node nearest or computation to $K1$ with which been able to be carried out.

Standard	identification of reference	Value of reference
Node 1	`"NON_REGRESSION"`	8.96954e5
Node 2	`"NON_REGRESSION"`	8.96954e5
Node 3	`"NON_REGRESSION"`	8.96954e5
Node 23	`"NON_REGRESSION"`	1.47784e6
Node 24	`"NON_REGRESSION"`	1.47784e6