

SSLS130 - Structural zoom: plate perforated subjected to a normal force on a Summarized

edge:

This test represents the static computation of a clamped perforated plate free setting in bending by a normal force applied to its free edge.

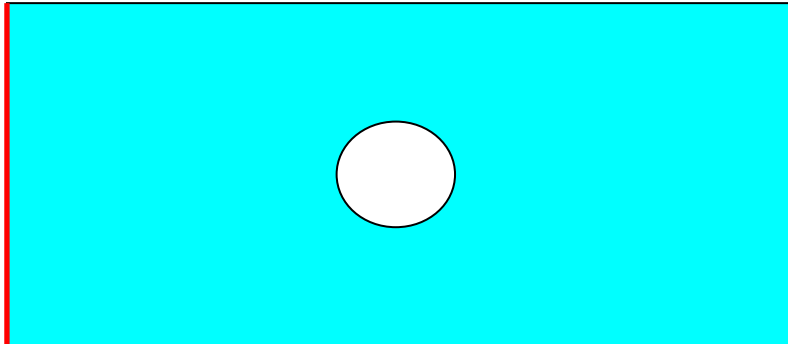
It is about an application of the method known as of “structural zoom” which makes it possible to improve quality of one result obtained on a too coarse or insufficiently detailed mesh. The characteristic of the method lies in the fact that one calculates the solution on a network located around the zone of interest (patch), by applying like loading to the contour of the patch displacements (or forces) from the initial model.

In this test, the solutions obtained on a fine network and a coarse mesh after use of the structural zoom are compared.

1 Problem of reference

1.1 Geometry

It acts of a rectangular plate, perforated are center:



Thickness: 0.001m

1.2 Properties of the homogeneous

material classical Material on all structure: $E = 7.1 \cdot 10^{10}$ $\nu = 0.3$.

1.3 Boundary conditions and loadings

Fixed support on the 6 degrees of freedom on the left side of the plate.

Nodal force on the right side of the plate of amplitude 100N in the direction X and 1N in Z .

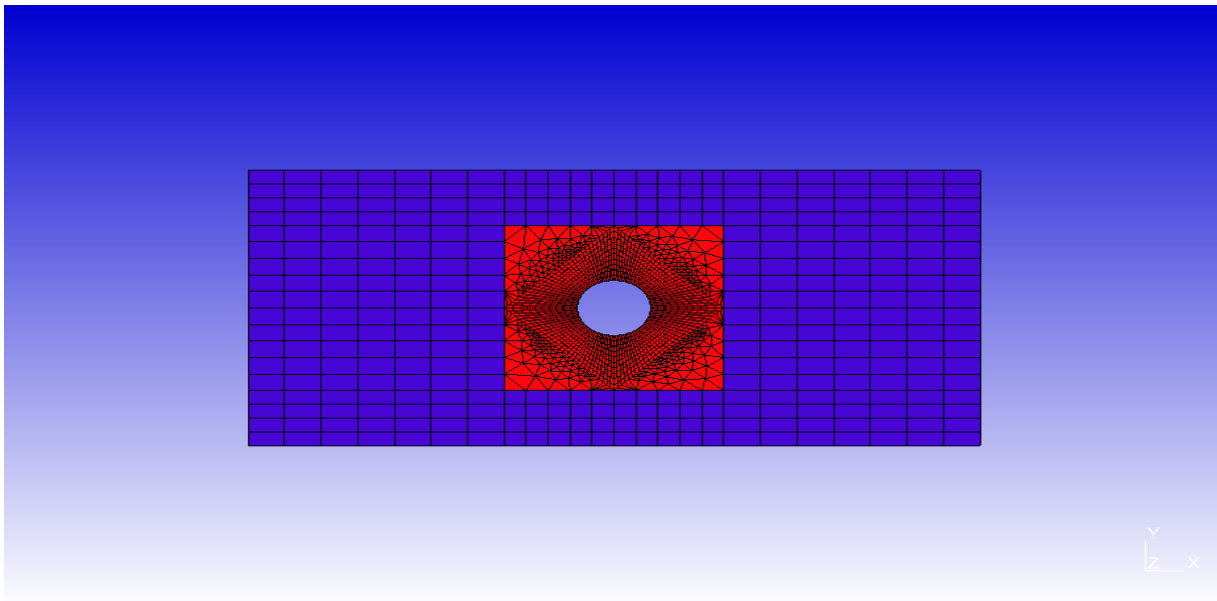
2 Reference solution

2.1 Méthode de calcul used for the reference solution

the reference solution is obtained by modelization A. It acts of the same computation obtained on a mesh of which the degree of refinement is similar to that of the modelization B after use of the method of structural modification.

3 Modelization A

3.1 Characteristic of the modelization



3.2 Characteristics of the mesh

Many nodes: 1944

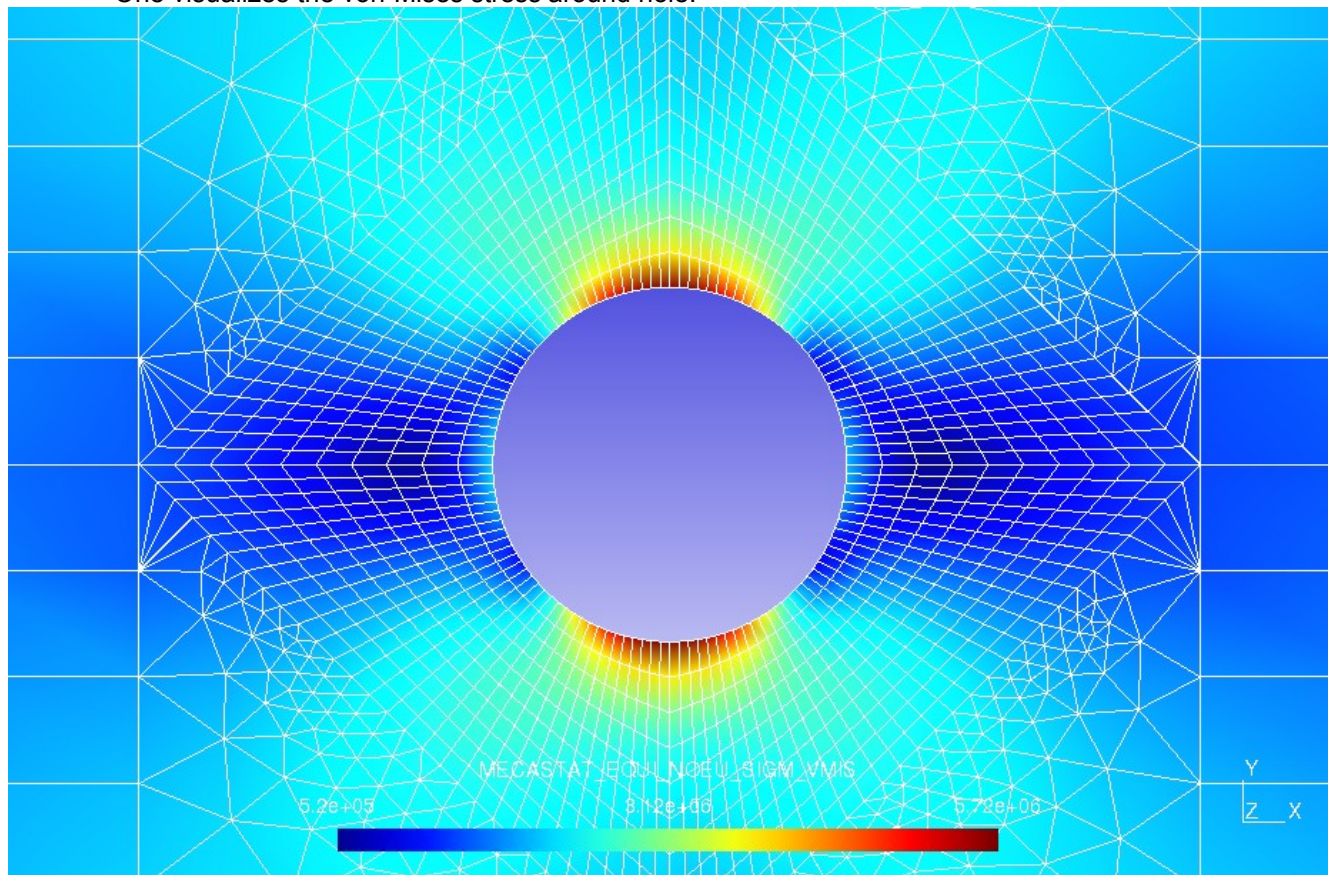
Number of meshes and type: 620 TRIA3 and 1532 QUAD4

3.3 Quantities tested and results

It is about a test of NON-regression

Identification	Reference	Tolerance (%)
SIXX max	6.019E+06	0.10
SIXX min	-2.486E+05	0.10
SIYY max	9.782E+05	0.10
SIYY min	-2.092E+06	0.10

One visualizes the von Mises stress around hole:

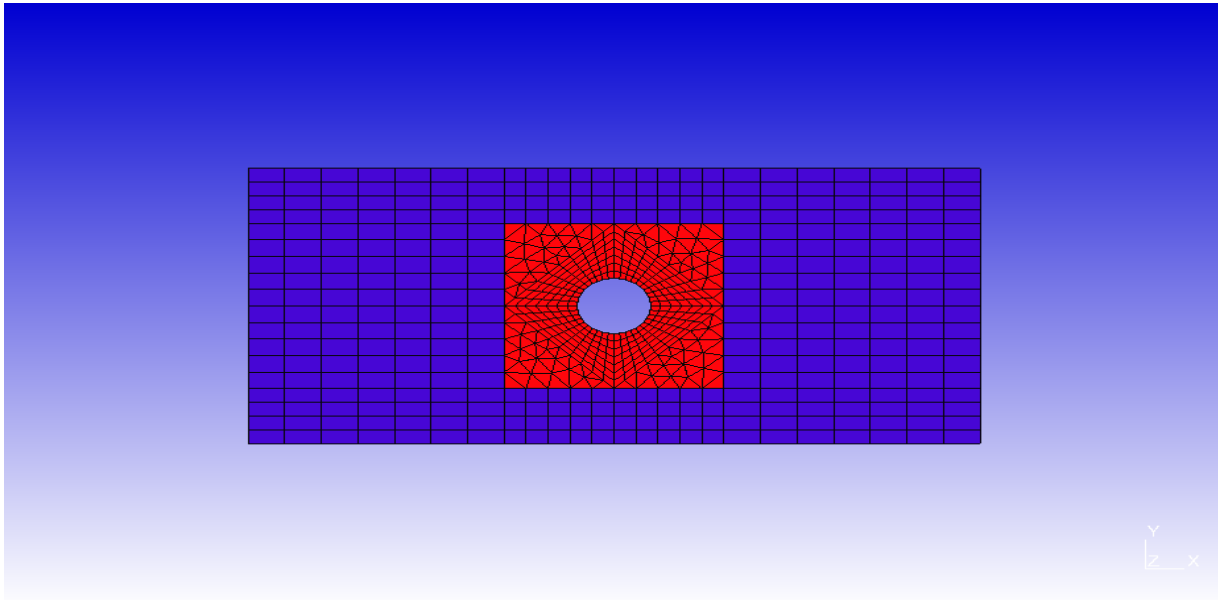


Appear 3.3-a : Result of reference

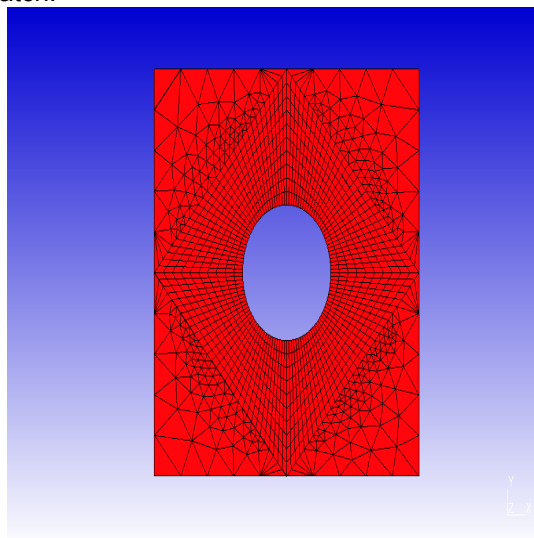
4 Modelization B

4.1 Characteristic of the modelization

Below initial coarse mesh:



Below fine mesh said patch:



4.2 Characteristics of the mesh

the characteristics of the coarse mesh are the following ones:

Many nodes: 754
Number of meshes and type: 160 TRIA3
612 QUAD4

the characteristics of the fine mesh are the following ones:

Number of meshes and type: 620 TRIA3
580 QUAD4

4.3 Quantities tested and results

It act of a test with respect to the values obtained on the modelization A

Identification	Reference	Tolerance (%)
SIXX max	6.019E+06	2.0
SIXX min	-2.486E+05	2.0
SIYY max	9.782E+05	2.0
SIYY min	-2.092E+06	2.0

One visualizes the von Mises stress around hole:

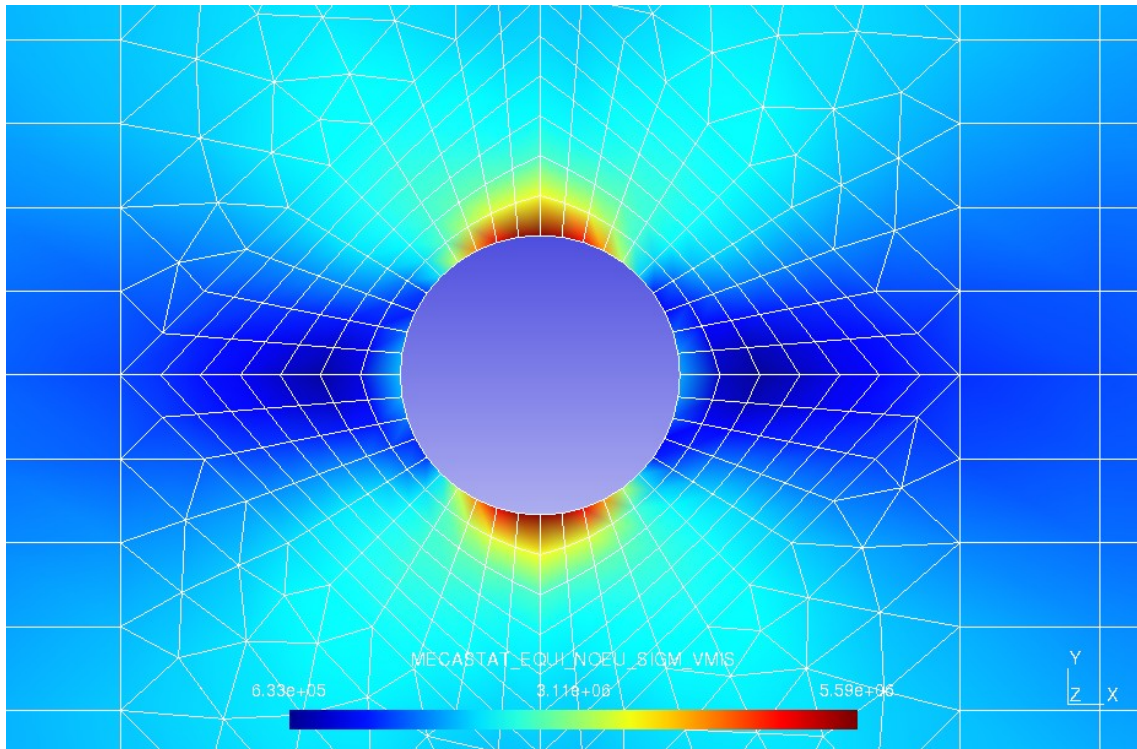
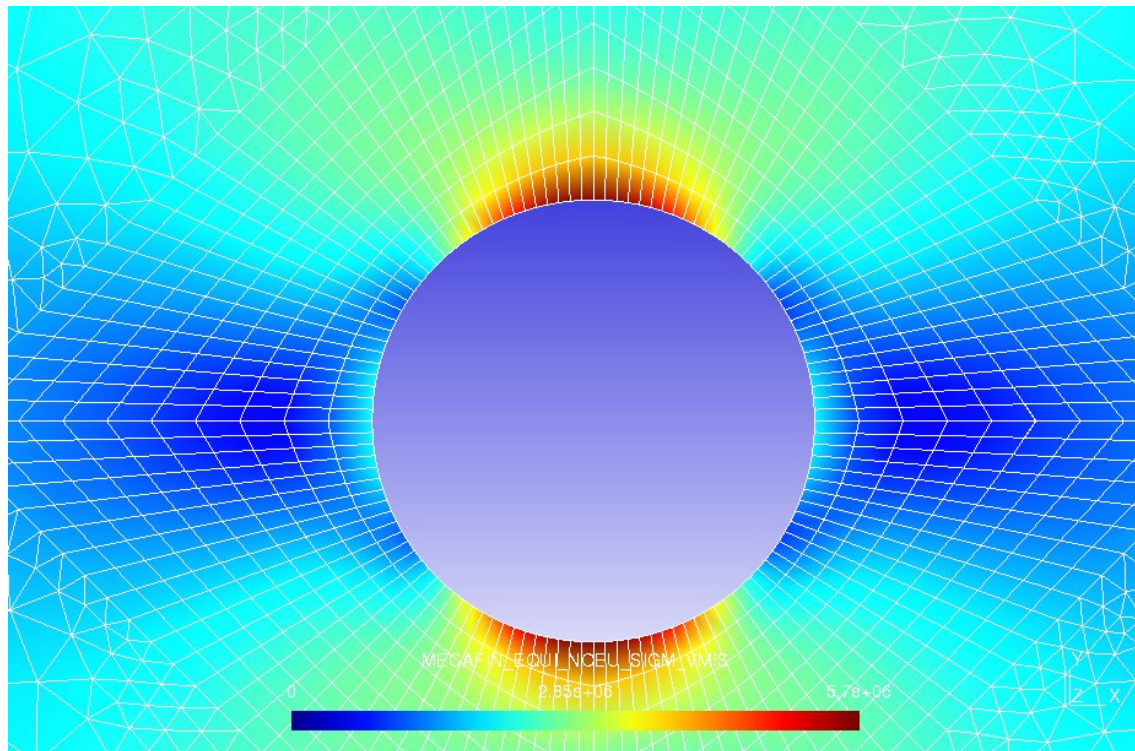


Figure 4.3-a : 4.3-a Result initial on coarse model



4.3-b 4.3-b : Result obtained after structural zoom

5 Summary of the results

the very good agreement of the results between the two modelizations validates the method structural zoom.