

ZZZZ319 – Data-processing validation of Summarized

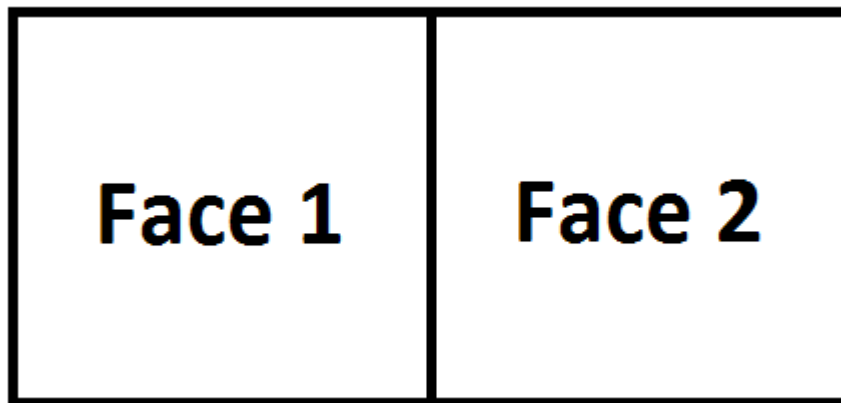
MACR_ADAP_MAIL:

The case test aims to validate by means of computer certain options MACR_ADAP_MAIL of the command.

1 Modelization A

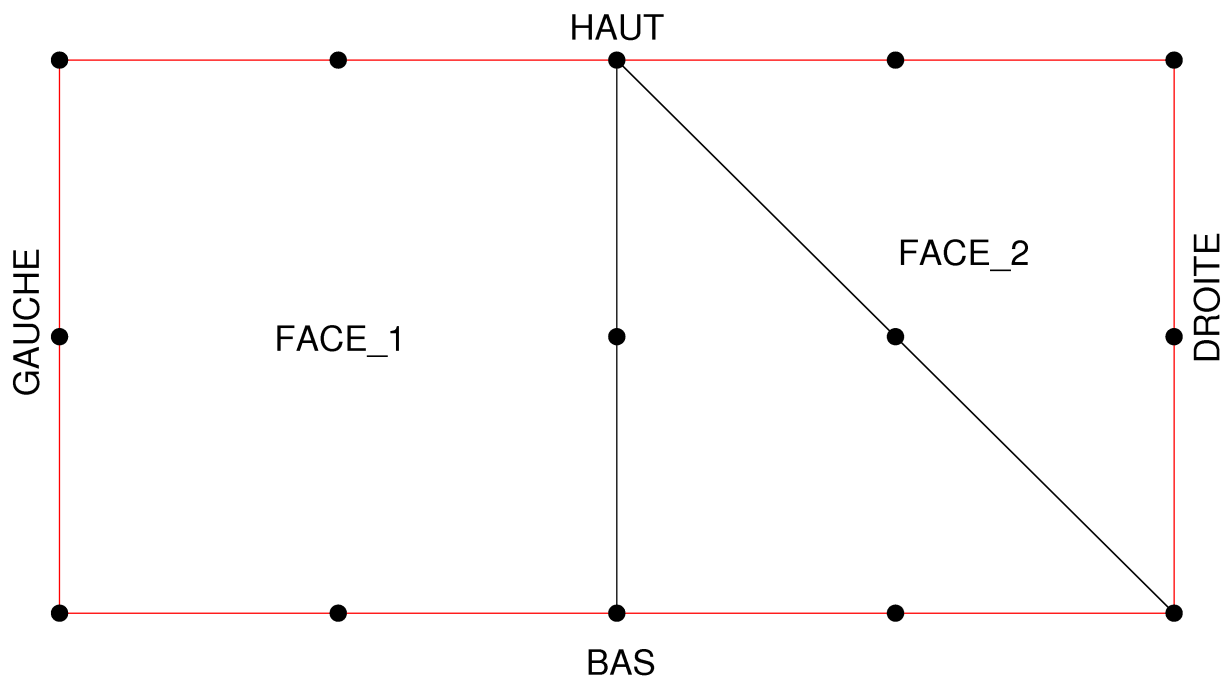
1.1 Geometry

the geometry, presented by the following figure, is made up of two squares of with dimensions $1 m$.



1.2 Characteristics of the mesh

The mesh is 2D, quadratic, and is presented by the following figure:



It is composed of 14 nodes for a mesh QUAD8 composing group FACE_1 and two meshes TRIA6 composing group FACE_2. The edge segments are present in the form of meshes SEG3 and are arranged in the LOW groups, HIGH, RIGHT, GAUCHE.

1.3 Adaptations carried out and meshes resulting

1.3.1 First series from adaptations

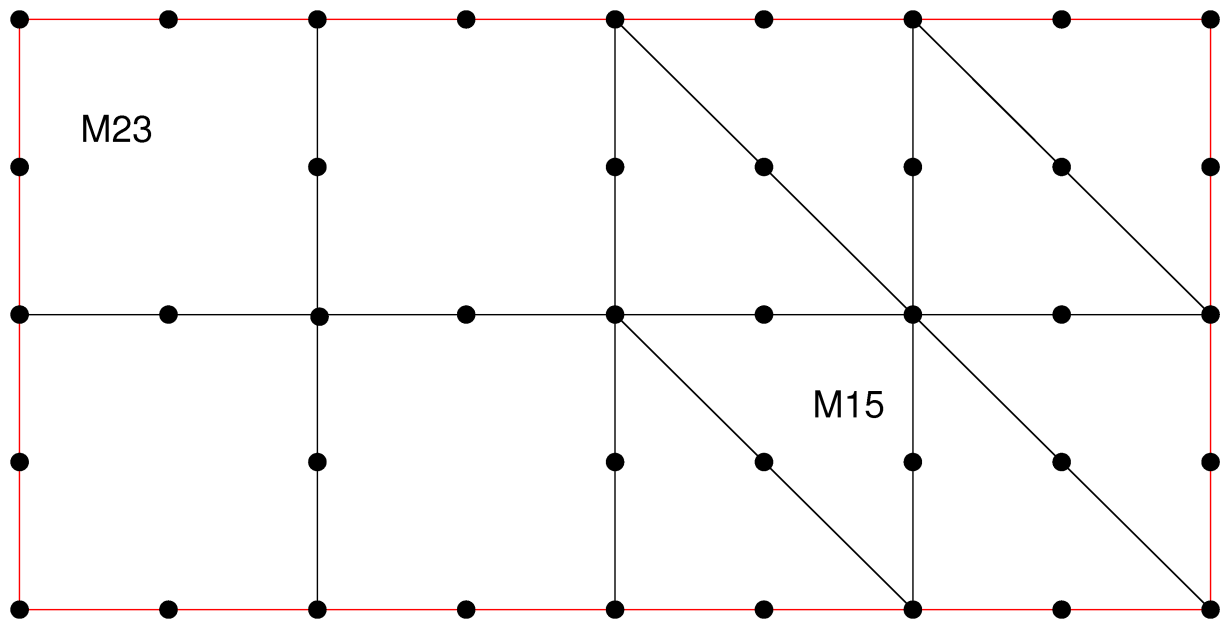
Two refinements are carried out starting from the initial mesh and of a field of local variables, with a proportion of meshes to refine of 50%. For the first component of the field $V1$, the value -1 is assigned to the nodes of the face n°1 and the value -2 is assigned to the nodes of the face n°2. Key word `USAGE_CMP` is equal to `RELATIF` for the first adaptation and `ABSOLU` for the second. The goal is to compare the results of the two options. One thus expects to refine the face n°1 with the first adaptation and the face n°2 at the second. To test it, one will use the field created by `MACR_ADAP_MAIL` with option `ADD_CHAM= (_F (CHAM_CAT=' DIAMETRE') ,)`. This field contains the value of the diameter of each mesh after refinement. For the triangles resulting from refinement

by conformity, it is the length on the largest side whose value is of $\sqrt{1 + \frac{1}{2^2}} = 1,118033989$. For the

quadrangles resulting from refinement, it is the diagonal whose value is of $\sqrt{\frac{1}{2^2} + \frac{1}{2^2}} = 0,70710681$.

For the triangles resulting from standard refinement, the diameter is their larger side $0,70710681$.

The following figure presents the mesh adapt é with `USAGE_CMP = RELATIF` :

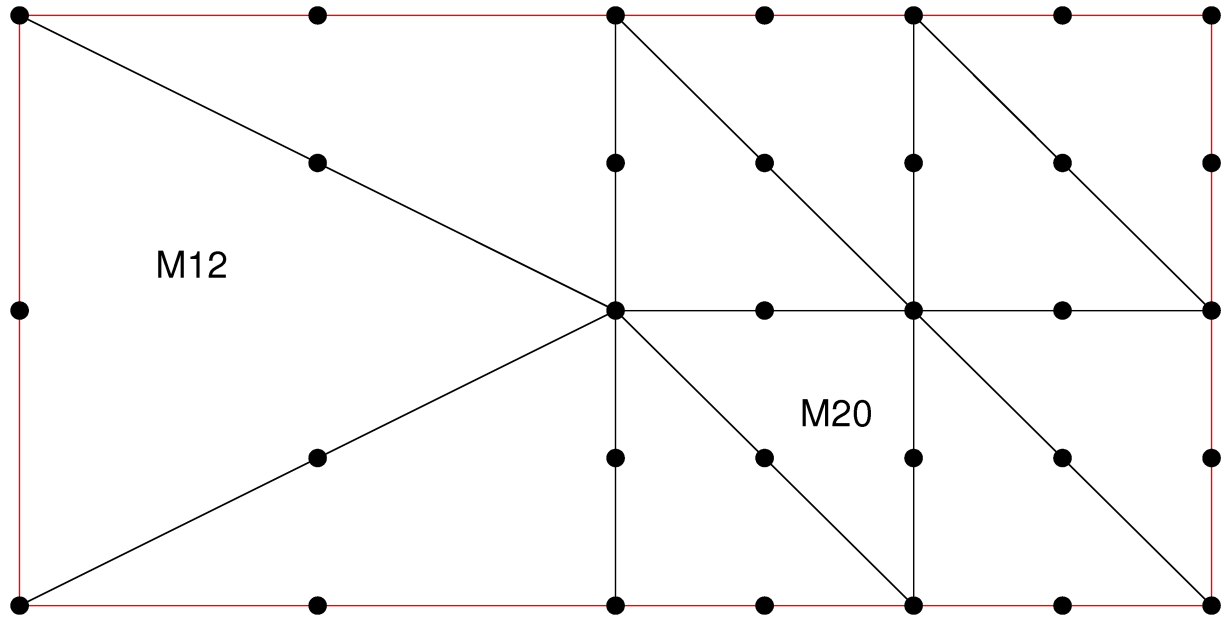


In accordance with our waitings, the face n°1 undergoes refinement.

Note:

The validation, from the value of the diameter, will be carried out on meshes the 15 and 23.

The following figure presents the mesh adapted with `USAGE_CMP = ABSOLU` :



In accordance with our waitings, the face n°2 undergoes refinement.

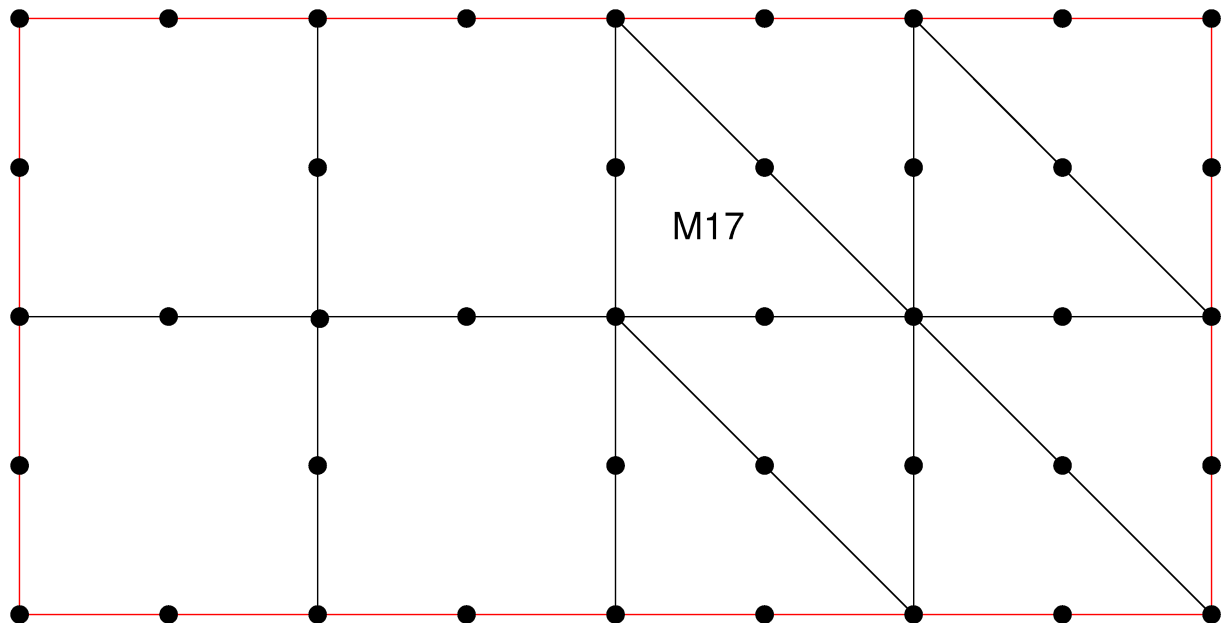
Note:

The validation, from the value of the diameter, will be carried out on meshes the 12 and 20

1.3.2 Second series of adaptations

Two cycles of uniform refinement - coarsening are carried out starting from the initial mesh. This time, the mesh of output of the adaptation n is used like mesh of entry of the adaptation $n+1$. For refinements, a resulting field corresponding to the number of refinement per mesh is created via key words `ADD_CHAM= (_F (CHAM_CAT=' NIVEAU',),)`. For the coarsenings, this field is used as criterion with option `NIVE_MIN=1`. One seeks to check that one does not go déraffiner at the end of the first cycle and that one goes déraffiner at the end of the second.

The mesh adapted, after the first cycle, is presented by the following figure:

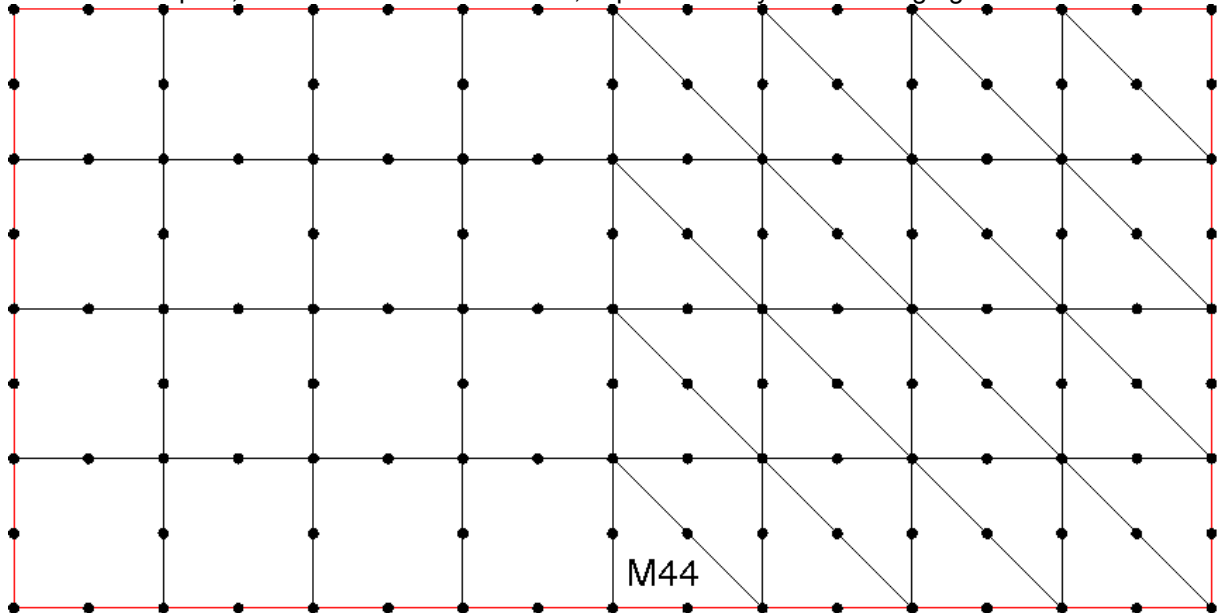


Refinement operated whereas the coarsening was not carried out.

Note:

Validation, starting from field "NIVEAU", will be realized on mesh 17. At the end of the first cycle as the coarsening was not carried out, the value of this field must be equal to 1.

The mesh adapted, after the second refinement, is presented by the following figure:

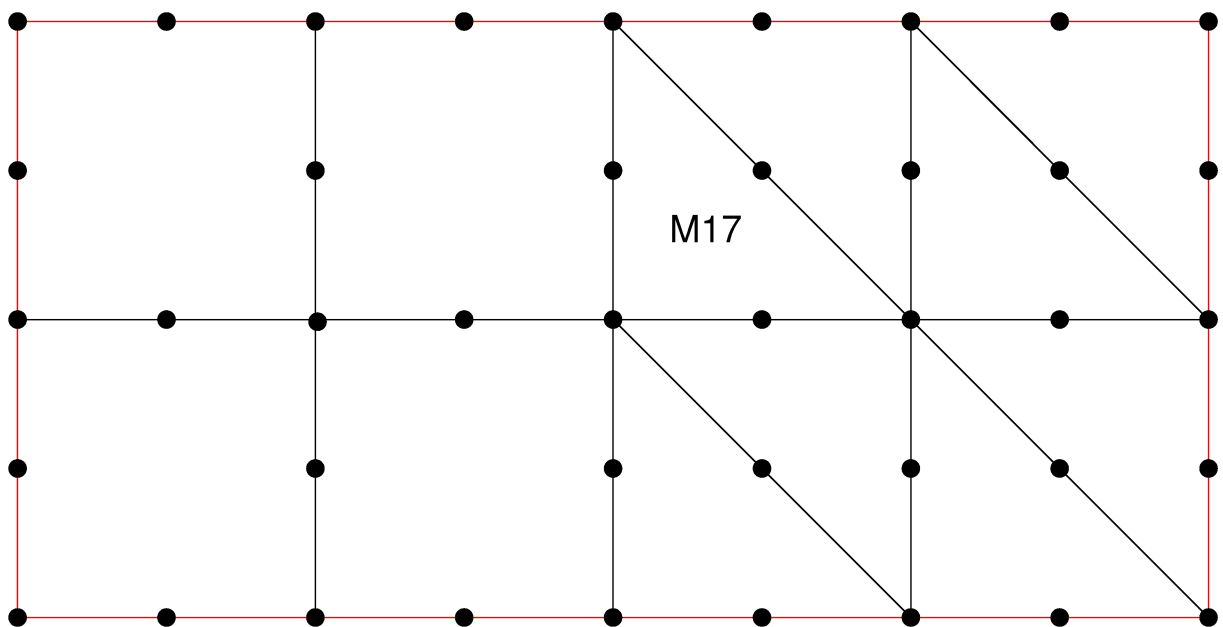


New refinement indeed was carried out.

Note:

Validation, starting from field "NIVEAU", will be realized on mesh 44. At the end of the refinement of the second the value of this field cycles must be equal to 2.

The mesh adapted, after the second cycle, is presented by the following figure:



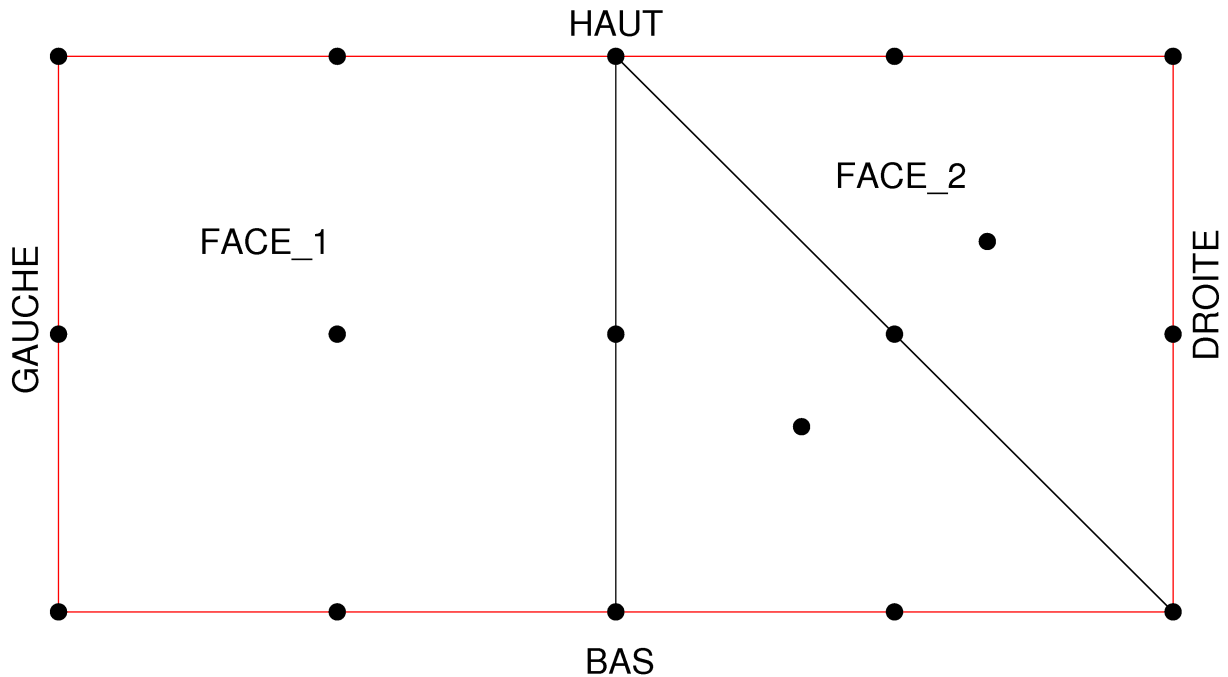
The coarsening of the second cycle indeed was thus carried out.

Note:

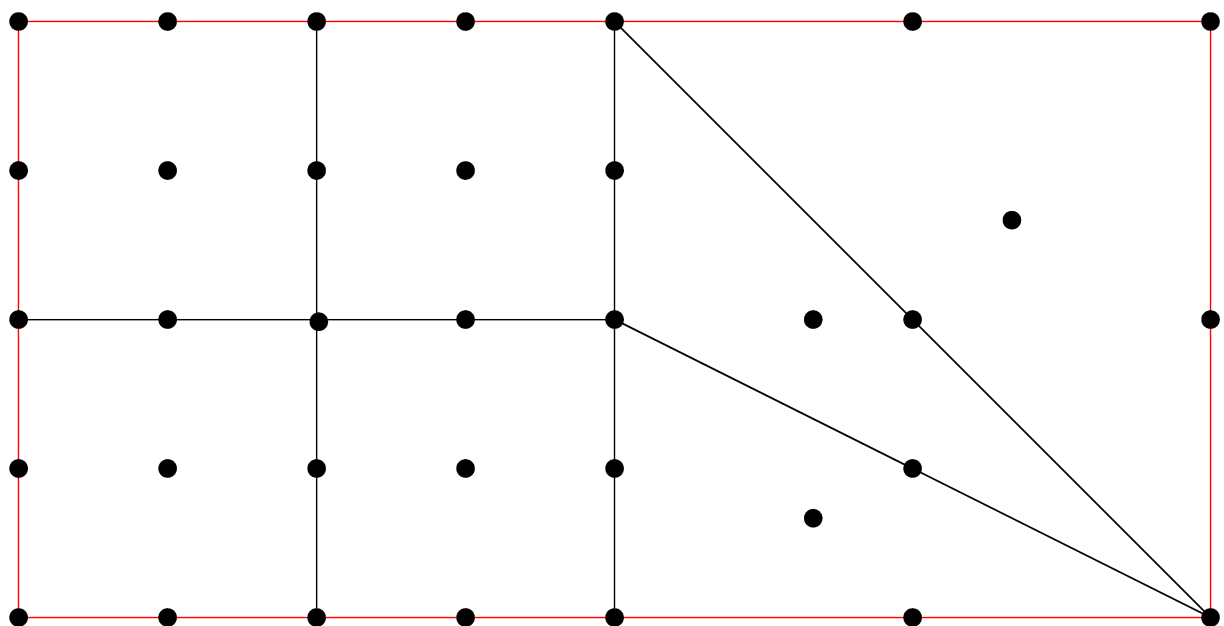
Validation, starting from field "NIVEAU", will be realized on mesh 17. At the end of the second cycle as the coarsening functioned, the value of this field must be again equal to 1.

1.3.3 Third series of adaptations

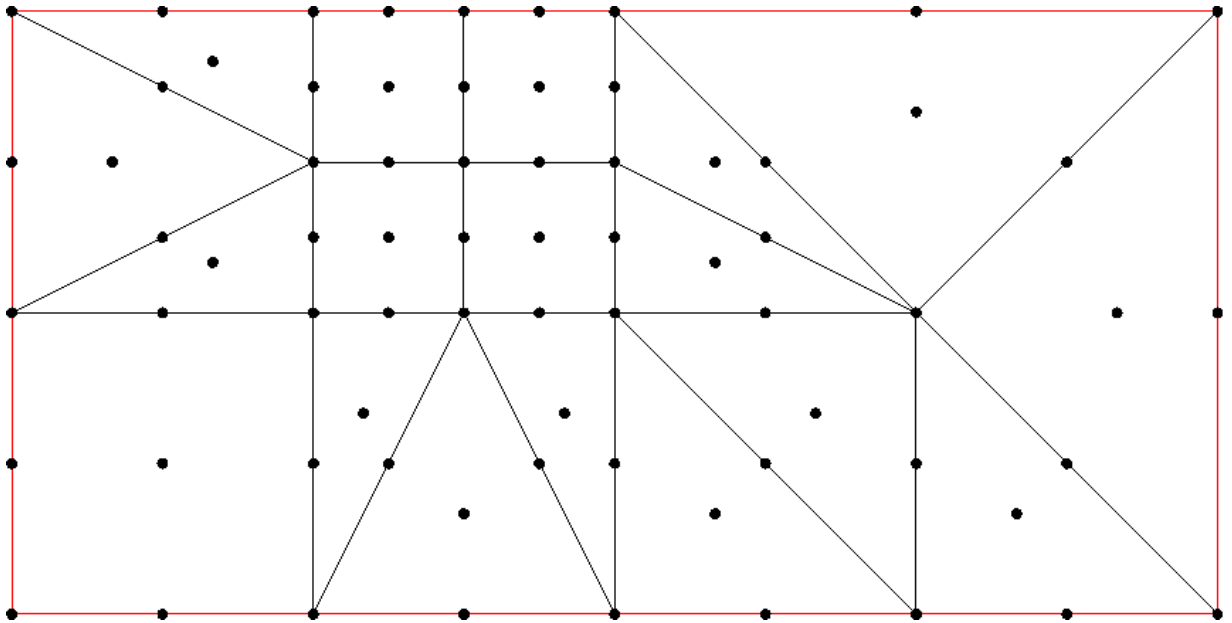
The mesh is enriched to contain meshes TRIA7 and QUAD9 . It is presented by the following figure:



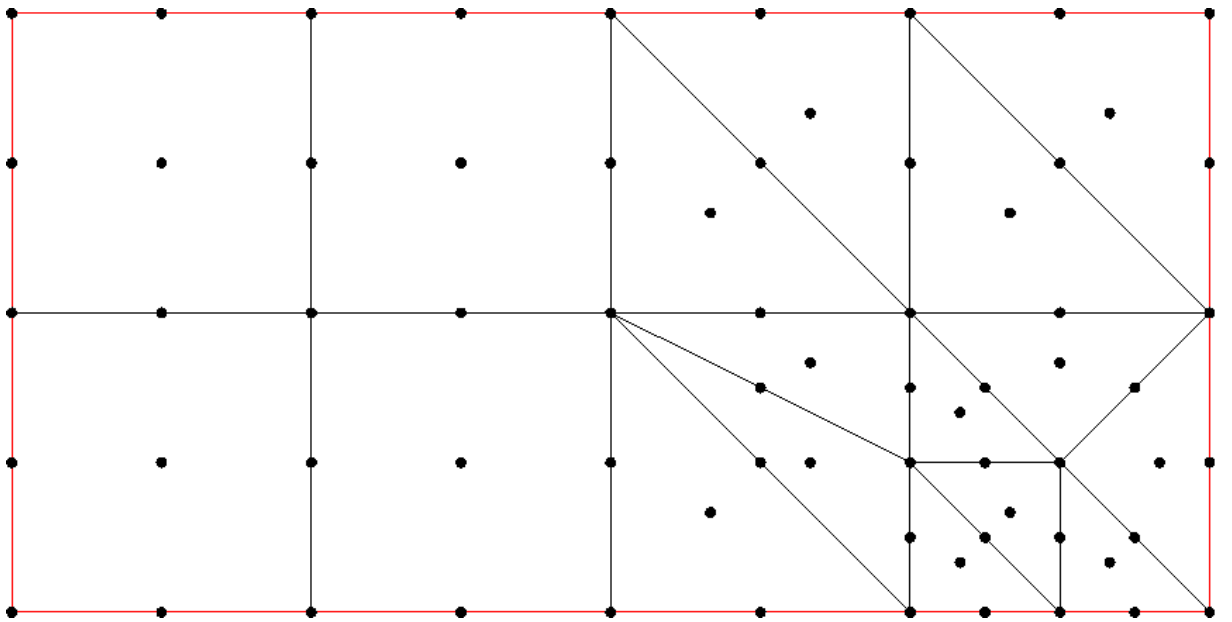
The mesh n°1 is obtained by requiring the refinement of meshes group FACE_1 .



The mesh n°2 is obtained while refining meshes whose edge is included in the bored disc of center $(0,75/0,75)$, interior 0,1 , external radius 0,4 .



The mesh n°3 is obtained while déraffinant meshes contained in the rectangle of corners $(0,5/0,5)$ and $(1/1)$ while refining meshes whose edge is included in the rectangle of corners $(1,5/0)$ and $(2/0,5)$.



The tests are made on the centres of inertia of each half FACE_1 and FACE_2 of structure.

1.4 Quantities tested

the following quantities of the first two refinements are tested:

	Analytical values	Tolerance
(RELATIF) Diameter of the mesh 23	0.707106781	1.E-6
(RELATIF) Diameter of the mesh 15	0.707106781	1.E-6
(ABSOLU) Diameter of the mesh 12	0.707106781	1.E-6
(ABSOLU) Diameter of the mesh 20	1.118033989	1.E-6

following quantities of the two cycles of uniform refinement - coarsening are tested:

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	Analytical values	Tolerance
(End of cycle 1) Level of the mesh 17	1.	1.E-6
(Refinement of the cycle 2) Level of the mesh 44	2.	1.E-6
(Fine of the cycle 2) Level of the mesh 17	1.	1.E-6

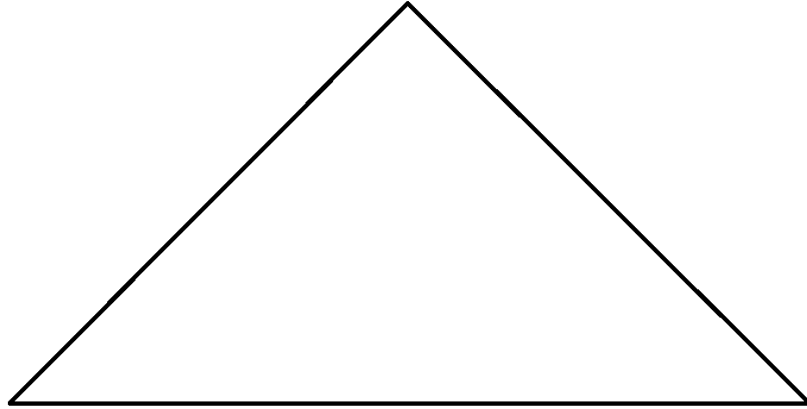
following quantities of the three cycles of refinement - coarsening are tested:

	Values of non regression	Tolerance
Face n°1	1.283333333	1.E-6
Face n°2	1.383333333	1.E-6

2 Modelization B

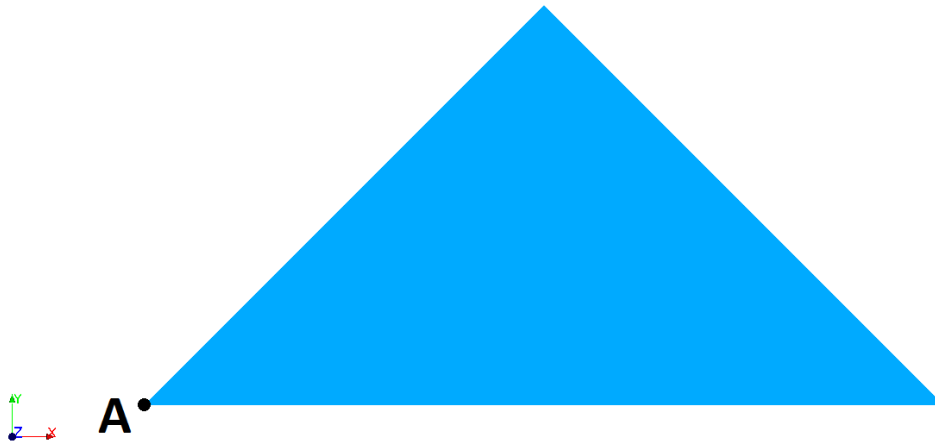
2.1 Geometry

the geometry, presented by the following figure, is made up of a basic triangle 1m and height 1m .



2.2 Characteristics of the mesh

The mesh, quadratic and is 2D presented by the following figure:



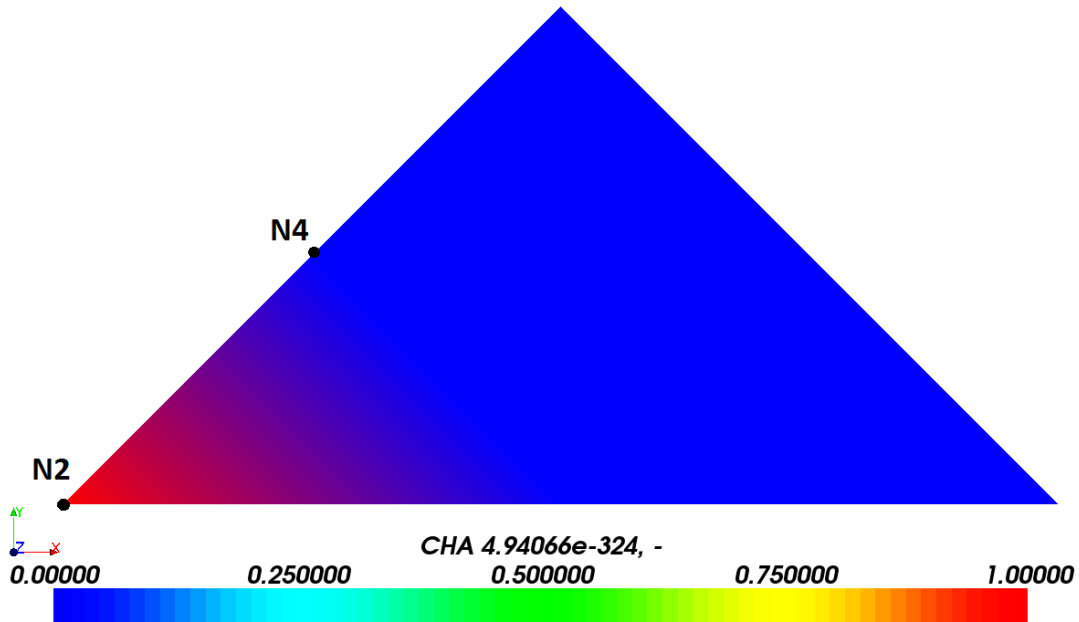
It is composed of 6 nodes for a mesh TRIA6.

2.3 Adaptations carried out and meshes resulting

a field from displacement with the nodes is created and the component DX is initialized to zero for all the nodes, except the node A (located in the preceding figure) for which $DX = 1$.

Two uniform refinements are carried out with update of the field of displacement. The first update is carried out with the option `CH_AUTO` and the second with option `CH_ISOP2`. The expected updated field should not thus be the same one at the end of the two adaptations.

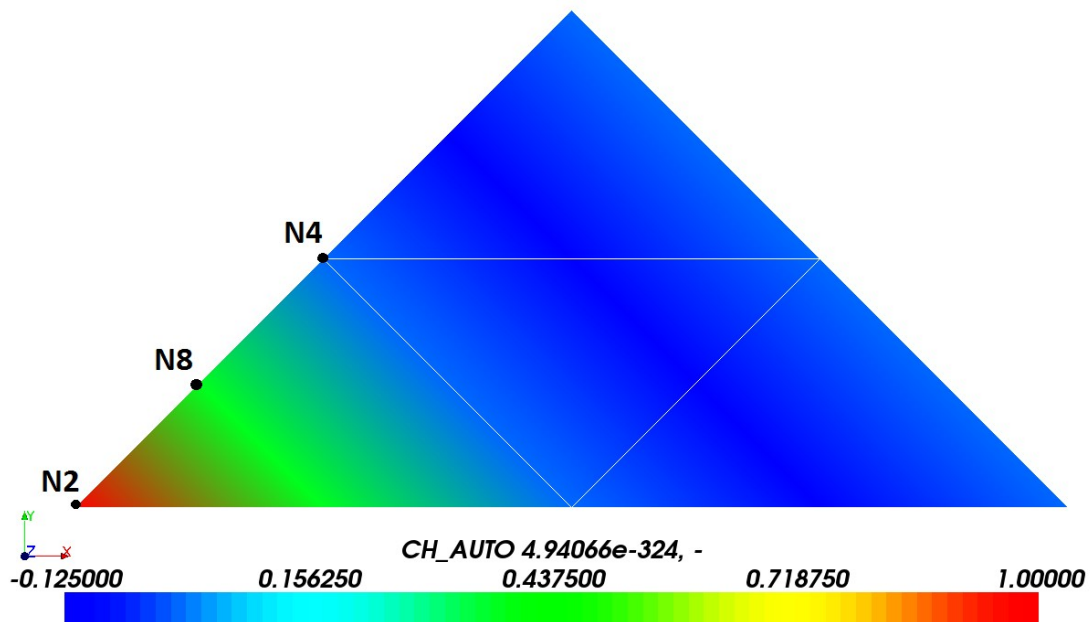
The following figure presents the initial field:



Note:

The validation, starting from the updated field, will be carried out on nodes 2 and 4. The value DX must $N2$ about it be equal to 1 whereas in $N4$ it is null.

The following figure presents the field resulting from the adaptation with option `CH_AUTO` :

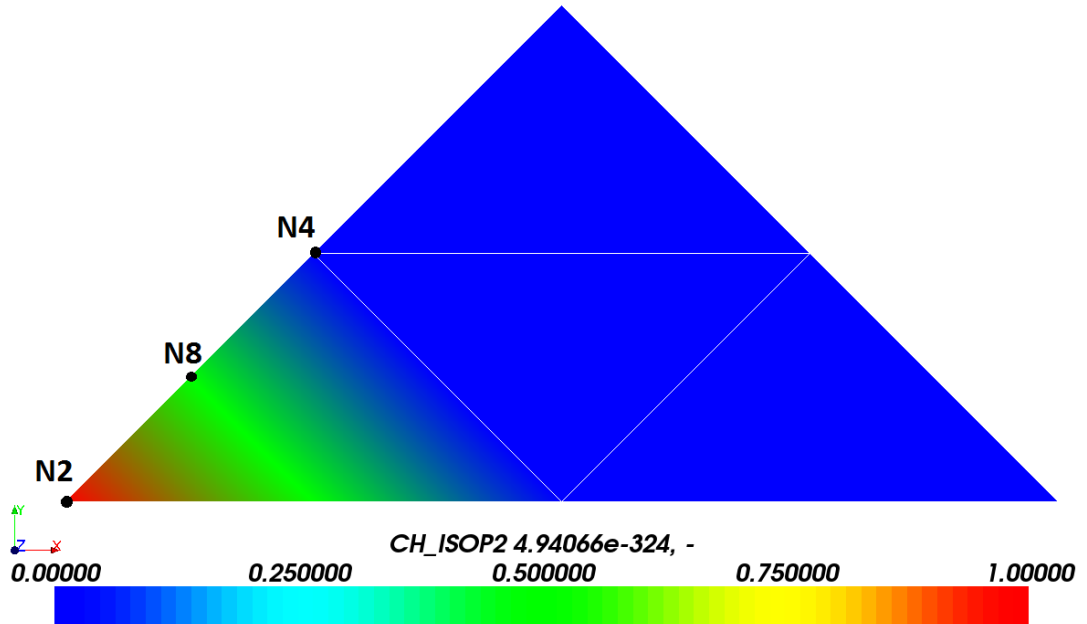


It appears, as expected, that the interpolated field does not respect the extreme values of the initial field (confer U7.03.01, §4.15.5).

Note:

The validation, starting from the updated field, will be carried out on nodes 2,4 and 8. The values with nodes 2 and 4 must be identical to those of the initial field. For node 8, with the option CH_AUTO, the shape functions P_2 , $N_{Ni}(i \in [1,6])$ (confer R3.01.01 §3.1) initial mesh are used for the interpolation. One thus expects to find:
$$DX_{N8} = \sum_1^6 DX_{Ni} \cdot N_{Ni}(\xi_{N8}, \eta_{N8})$$
 for $\xi_{N8}=1/4$, $\eta_{N8}=0$, $DX_{N2}=1$. and $DX_{Ni}=0.(i \neq 2)$ is: $DX_{N8}=1.(-(1.-0.25).(1.-2.(1.-0.25)))=0.375$.

The following figure presents the field resulting from the adaptation with option CH_ISOP2 :



It appears, as expected, that with the option CH_ISOP2, the interpolated field respects the extreme values of the initial field (confer U7.03.01, §4.15.5).

Note:

Nodes 2,4 and 8 are located because they are used for the validation. The values with nodes 2 and 4 must be identical to those of the initial field. For node 8, with option CH_ISOP2, of the shape functions P_1 , $N_{Ni}(i \in [1,3])$ (confer R3.01.01 §3.1) expressed on under-meshes element of the initial mesh are used for the interpolation. One thus expects to find:
$$DX_{N8} = \sum_1^3 DX_{Ni} \cdot N_{Ni}(\xi_{N8}, \eta_{N8})$$
 for $\xi_{N8}=1/2$, $\eta_{N8}=0$, $DX_{N2}=1$. and $DX_{Ni}=0.(i \neq 2)$: $DX_{N8}=1.(1.-0.5)=0.5$.

2.4 Quantities tested

the following quantities are tested:

Initial field	Analytical Values	Tolerance
N2	1.	1.E-6
N4	0.	1.E-6
Analytical Field	CH_AUTO Values	Tolerance
N2	1.	1.E-6
N4	0.	1.E-6
N8	0.375	1.E-6

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Field CH_ISOP2	Analytical Values	Tolerance
N2	1.	1.E-6
N4	0.	1.E-6
N8	0.5	1.E-6