
Macro-command MACR_INFO_MAIL

1 Drank

To give information about the quality of a mesh.

This macro-command makes it possible to obtain information on a mesh, of degree 1 or 2, containing meshes-points, segments, triangles, quadrangles, tetrahedrons, hexahedrons or pentahedrons. The printing is directed on the file of messages.

One finds initially an assessment total of mesh: dimension, degree, number of nodes, number of meshes, dimensions extreme.

Then six information is accessible in an optional way:

- a summary on the quality of meshes,
- a summary on the diameter of meshes,
- a control of nonthe interpenetration of meshes,
- an assessment on the connexity of the mesh
- a summary of the size of the various subdomains
- the number of overstrained elements

This analysis is made by the software of mesh adaptation HOMARD. For more details, to see: <http://www.code-aster.org/outils/homard> or to refer to the documents quoted in bibliography.

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2 Syntax

```
MACR_INFO_MAIL (

◆MAILLAGE =ma [mesh]

◇NOMBRE = "OUI" [DEFAULT]
          / "NON"

◇QUALITE = "OUI" [DEFAULT]
           / "NON"

◇DIAMETRE = "OUI" [DEFAULT]
            / "NON"

◇CONNEXITE = "OUI" [DEFAULT]
             / "NON"

◇TAILLE = "OUI" [DEFAULT]
          / "NON"

◇PROP_CALCUL = "OUI" [DEFAULT]
               / "NON"

◇INTERPENETRATION = "OUI" [DEFAULT]
                    / "NON"

◇MAILLAGE_FRONTIERE =maf [mesh]
  ◇GROUP_MA_FRONT = l_grma
[l_gr_maille]

◇ELEMENTS_ACCEPTES = "HOMARD" [DEFAULT]
                    / "IGNORE_PYRA"

◇LANGUE = "FRANCAIS" [DEFAULT]
          / "FRENCH"
          / "ANGLAIS"
          / "ENGLISH"

◇VERSION_HOMARD = "V10_6" [DEFAULT]
                 / "V10_N"
                 / "V10_N_PERSO"

◇LOGICIEL =logiciel [K]

#Si the version is the version of development, (V10_N, V10_N_PERSO):
  ◇ UNITE =unite [I]
#Finsi

◇INFO = 1 [DEFAULT]
        / 2
        / 3
        / 4

)
```

3 Operands

3.1 Operand MAILLAGE

◆MAILLAGE = my

The mesh of type [mesh] to analyze. Attention, the analysis will relate only to the nodes, the meshes-points, the segments, the triangles, the quadrangles, the tetrahedrons, the hexahedrons or the pentahedrons. If one meshes provides a mesh comprising of others, for example pyramids, two cases are possible: either a stop in error, or information on the authorized zone, the rest of the mesh being ignored. The choice between these two operating modes is made by the key word ELEMENTS_NON_HOMARD.

The mesh is in degree 1 or 2, but it is not possible to mix both.

In all the cases, the presence of meshes enriched the HEXA27 is prohibited.

3.2 Operand NOMBRE

◇NOMBRE = "OUI" [DEFAULT]
/ "NON"

If the choice is "NON", nothing occurs.

If the choice is "OUI", an assessment of the numbers of nodes and meshes is printed on the file of messages.

3.3 Operand QUALITE

◇QUALITE = "OUI" [DEFAULT]
/ "NON"

If the choice is "NON", nothing occurs.

If the choice is "OUI", an assessment of the quality of meshes is printed on the file of message.

The quality of a triangle is defined as being the relationship between the length on the largest side and the radius of the inscribed circle.

The quality of a quadrangle is defined like the quotient of the product biggest length and averages on the sides and the diagonal by smallest of surfaces of the internal triangles to the quadrangles.

In the same way, the quality of a tetrahedron is defined as being the relationship between the length on the largest side and the radius of the registered sphere.

The quality of a hexahedron is defined like worst of qualities of the registered tetrahedrons.

All these measurements of quality are standardized to be worth 1 in the case of an equilateral triangle, of a square, an equilateral tetrahedron or a cube. For any nonequilateral mesh, quality is higher than 1. See the reference [bib1] for detailed explanations.

Result is presented in the form of tables, with the extreme values.

3.4 Operand DIAMETRE

◇DIAMETRE = "OUI" [DEFAULT]
/ "NON"

If the choice is "NON", nothing occurs.

If the choice is "OUI", an assessment of the diameters of meshes is printed on the file of message.

The diameter of a mesh is defined as the length of the greatest segment than it is possible to insert in the mesh.

For a triangle or a tetrahedron, the diameter corresponds to the length on the largest side.

For a quadrangle, a hexahedron, a pentahedron or a pyramid, the diameter are the maximum between the length on the largest side and the length of the largest diagonal.

Result is presented in the form of tables, with the extreme values.

3.5 Operand CONNEXITE

```
◇CONNEXITE      =  "OUI"          [DEFAULT]
                  /  "NON"
```

If the choice is "NON", nothing occurs.

If the choice is "OUI", an assessment of the connexities is printed on the file of messages. It will be known then if the segments, meshes 2D (triangles and quadrangles joined together) or meshes 3D (tetrahedrons, hexahedrons, pentahedrons and pyramids joined together) of only one holding or are divided into several blocks. One will also know the number of holes of structure: crossing holes or internal holes.

3.6 Operand CUTS

```
◇TAILLE        =  "OUI"          [DEFAULT]
                  /  "NON"
```

If the choice is "NON", nothing does not occur.

If the choice is "OUI", an assessment of the sizes of the subdomains is printed on the file of messages. A subdomain is defined like a set of meshes of the same dimension and pertaining to the same groups.

3.7 Operand PROP_CALCUL

```
◇PROP_CALCUL   =  "OUI"          [DEFAULT]
                  /  "NON"
```

If the choice is "NON", nothing occurs.

If the choice is "OUI", a diagnosis on the properties of meshes as elements for computation is printed on the file of messages. One counts the number of overstrained elements: the elements of which all the tops are located on edge. One counts the meshes voluminal ones (resp. surface) which touches edge of the field but which is not bordered by the meshes surface ones (resp. linear).

3.8 Operand INTERPENETRATION

```
◇INTERPENETRATION =  "OUI"          [DEFAULT]
                    /  "NON"
```

If the choice is "NON", nothing does not happen.

If the choice is "OUI", it is checked that the mesh is correct from the point of view of covering: no mesh has one of its tops inside another mesh.

Caution: this operation can prove to be expensive for large meshes, from where the choice "NON" by default.

3.9 Operand **MAILLAGE_FRONTIERE**

```
◇MAILLAGE_FRONTIERE = maf
```

the choice of this option means that the segments forming edge of the mesh of computation or a limit interns are attached to a fine description of this edge. This fine mesh is transmitted here. The restrain is done by membership of the segments to the same groups.

3.10 Operand **GROUP_MA_FRONT**

```
◇GROUP_MA_FRONT = l_grma
```

If this option is absent, the restrain between the segments is made for all the groups present in the mesh of the border. If the link is established only for some groups, they are indicated here.

3.11 Operand **ELEMENTS_ACCEPTES**

```
◇ELEMENTS_ACCEPTES = "HOMARD"  
[DEFAULT]  
/"IGNORE_PYRA"
```

In its current version, HOMARD makes meshes carry information only on some: meshes-points, segments, triangles, quadrangles, tetrahedrons, hexahedrons, pentahedrons in degree 1 or 2.

By retaining the option "HOMARD", transmission of a mesh containing another thing that these types of meshes will cause a stop in error. It is the option by default.

By choosing option "IGNORE_PYRA", one will be able to analyze a comprising mesh of the pyramids. Information will relate only to the zones authorized by HOMARD, the rest of the mesh will be ignored.

In all the cases, the presence of meshes enriched the HEXA27 is prohibited.

3.12 Operand **LANGUE**

```
◇LANGUE = "FRANCAIS" [DEFAULT]  
/"FRENCH"  
/"ANGLAIS"  
/"ENGLISH"
```

This operand specifies the language in which the messages resulting from HOMARD are printed.

3.13 Operand **VERSION_HOMARD**

```
◇VERSION_HOMARD = "V10_6" [DEFAULT]  
/"V10_N"  
/"V10_N_PERSO"
```

This operand makes it possible to select the HOMARD version which is used for the adaptation. By default, HOMARD 10.6 is launched. It is the version of reference. The choice "V10_N" activates the version 10.n HOMARD which is the version of development. The choice "V10_N_PERSO" activates a version of development specific to the user. This option makes it possible to the development team of HOMARD to develop new features. She also makes it possible to make profit the user from an innovation in HOMARD before the commissioning in *Code_Aster*.

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

3.14 Operand LOGICIEL

◇LOGICIEL =logiciel [K]

This option proposes to use another interface of coupling between *Code_Aster* and HOMARD that provided by default in the directory of the tools associated with *Code_Aster*. This option in fact is reserved to the development team of HOMARD to develop new features. She makes it possible to test innovations before to have modified the macro-command of control.

3.15 Operand UNITE

◇UNITE =unite [I]

This option is possible only if one activated the version of development of HOMARD, 10.n. The data file transmitted by the user under this number of logical unit will be directly transmitted like complement to the file of HOMARD configuration. This option in fact is reserved to the development team of HOMARD to develop new features. She makes it possible to test innovations before to have modified the macro-command of control.

3.16 Operand INFO

◇INFO = 1
 /2
 /3
 /4

If **INFO** is worth 1, the printings is minimal; one obtains only those which were explicitly required, the quality of meshes for example, and the possible error messages.

If **INFO** is worth 2, one will obtain the messages transmitted by the commands subjacent with the macro-command: **IMPR_RESU**, **LIRE_MAILLAGE**, **LIRE_RESU**.

If **INFO** is worth 3, there will be the standard HOMARD messages, recapitulating the execution.

If **INFO** is worth 4, one will have all the messages transmitted by HOMARD, for débogage.

4 Example

```
MACR_INFO_MAIL (MAILLAGE = HAMMER,  
                TAILLE = "OUI",  
                CONNEXITE = "OUI",  
                INTERPENETRATION = "OUI",  
                DIAMETRE = "OUI",  
                QUALITE = "OUI')
```

This sequence will write general information (dimension, degree, many nodes and of meshes,...) then a diagnosis on the quality, the diameters and the interpenetration of meshes used in the mesh `HAMMER` as well as the size and the connexity of the various subdomains. The HOMARD by default version is used.

```
Mesh has to analyze  
HAMMER  
Creation date: Monday, February 15, 2010 has 15:59 mn 22 S  
Dimension: 2  
Degree: 1  
It is a starting mesh.
```

Direction	Unit	Minimum	Maximum
X	cm	0.0000	20.000
there	cm	-2.0000	11.000

information on the number of entities of computation is classified by type: nodes, meshes-points, edges, etc. One makes the sort between meshes of edges and the others.


```
ENTITY many OF CALCUL
the =====

*****
*                               Nodes                               *
*****
* Nombre total                  *           76 *
*****

*****
*                               Segments                           *
*****
* Nombre total                  *           32 **
. of which edges isolees      *           0 **
. of which edge edges of areas 2D *           32 **
. whose internal edges with the sides/volumes *           0 *
*****

*****
*                               Triangles                           *
*****
* Nombre total                  *           118 *
*****
```

the diagnosis on the interpenetrations of meshes is made by type of entities.

```
INTERPENETRATION OF MESHES
the =====

*****
***
Summary on the nodes          ***
*
No problem was meeting.      ***
*****

*****
***
Summary on the triangles      ***
*
No problem was meeting.      ***
*****
```

In the diagnosis on the quality of meshes, one raises initially the extreme values recorded in the analyzed mesh. Here the minimum is of 1,0044, very near to the theoretical absolute minimum which is of 1, and the maximum met is of 1,5788. Then one presents the distribution by equidistant slice from the optimum value, 1. It is seen that 3 triangles have a quality ranging between 1 and 1,025, that is to say 2,54% of the nombre total of triangles. In the same way, 16 triangles have a quality ranging between 1,025 and 1,050, either 11,02% of the nombre total of triangles and 10 triangles have a quality ranging between 1,050 and 1,075, or 8,47% of the nombre total of triangles. In cumulated, one thus notes whom 26 (=3+13+10) triangles have a quality better than 1,075, that is to say 22,03% of the total. And so on. For example, 98,31% of meshes have a quality better than 1,425.

DIAMETERS OF THE TRIANGLES

```
*****
* Recall: the diameter is equal has the length of more      **
  the great segment which one can trace in the mesh.      **
  For a triangle, it is the length of more                 **
  the backbone.                                           *
*****
* Minimum: 1.1777 Maximum: 2.7500 *
*****
* Function of distribution **
  Values * Mini Number of meshes
** < < Maximum * per class * office plurality ***
  in % . number * in % . number *
*****
* 1.100 < 1.150 * 0.00. 0 * 0.00. 0 **
  1.150 < 1.200 * 0.85. 1 * 0.85. 1 **
  1.200 < 1.250 * 0.00. 0 * 0.85. 1 **
  1.250 < 1.300 * 0.85. 1 * 1.69. 2 **
  1.300 < 1.350 * 0.85. 1 * 2.54. 3 **
  1.350 < 1.400 * 1.69. 2 * 4.24. 5 **
  1.400 < 1.450 * 1.69. 2 * 5.93. 7 **
  1.450 < 1.500 * 1.69. 2 * 7.63. 9 **
  1.500 < 1.550 * 2.54. 3 * 10.17. 12 **
  1.550 < 1.600 * 6.78. 8 * 16.95. 20 **
  1.600 < 1.650 * 4.24. 5 * 21.19. 25 **
  1.650 < 1.700 * 11.02. 13 * 32.20. 38 **
  1.700 < 1.750 * 5.08. 6 * 37.29. 44 **
  1.750 < 1.800 * 6.78. 8 * 44.07. 52 **
  1.800 < 1.850 * 6.78. 8 * 50.85. 60 **
  1.850 < 1.900 * 2.54. 3 * 53.39. 63 **
  1.900 < 1.950 * 3.39. 4 * 56.78. 67 **
  1.950 < 2.000 * 11.86. 14 * 68.64. 81 **
  2.000 < 2.050 * 2.54. 3 * 71.19. 84 **
  2.050 < 2.100 * 5.08. 6 * 76.27. 90 **
  2.100 < 2.150 * 2.54. 3 * 78.81. 93 **
  2.150 < 2.200 * 3.39. 4 * 82.20. 97 **
  2.200 < 2.250 * 0.85. 1 * 83.05. 98 **
  2.250 < 2.300 * 3.39. 4 * 86.44. 102 **
  2.300 < 2.350 * 2.54. 3 * 88.98. 105 **
  2.350 < 2.400 * 2.54. 3 * 91.53. 108 **
  2.400 < 2.450 * 2.54. 3 * 94.07. 111 **
  2.450 < 2.500 * 0.00. 0 * 94.07. 111 **
  2.500 < 2.550 * 0.00. 0 * 94.07. 111 **
  2.550 < 2.600 * 0.00. 0 * 94.07. 111 **
  2.600 < 2.650 * 2.54. 3 * 96.61. 114 **
  2.650 < 2.700 * 0.00. 0 * 96.61. 114 **
  2.700 < 2.750 * 0.00. 0 * 96.61. 114 **
  2.750 < 2.800 * 3.39. 4 * 100.00. 118 **
  2.800 < 2.850 * 0.00. 0 * 100.00. 118 **
  2.850 < 2.900 * 0.00. 0 * 100.00. 118 **
  2.900 < 2.950 * 0.00. 0 * 100.00. 118 **
  2.950 < 3.000 * 0.00. 0 * 100.00. 118 **
  3.000 < 3.050 * 0.00. 0 * 100.00. 118 **
  3.050 < 3.100 * 0.00. 0 * 100.00. 118 *
*****
```

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

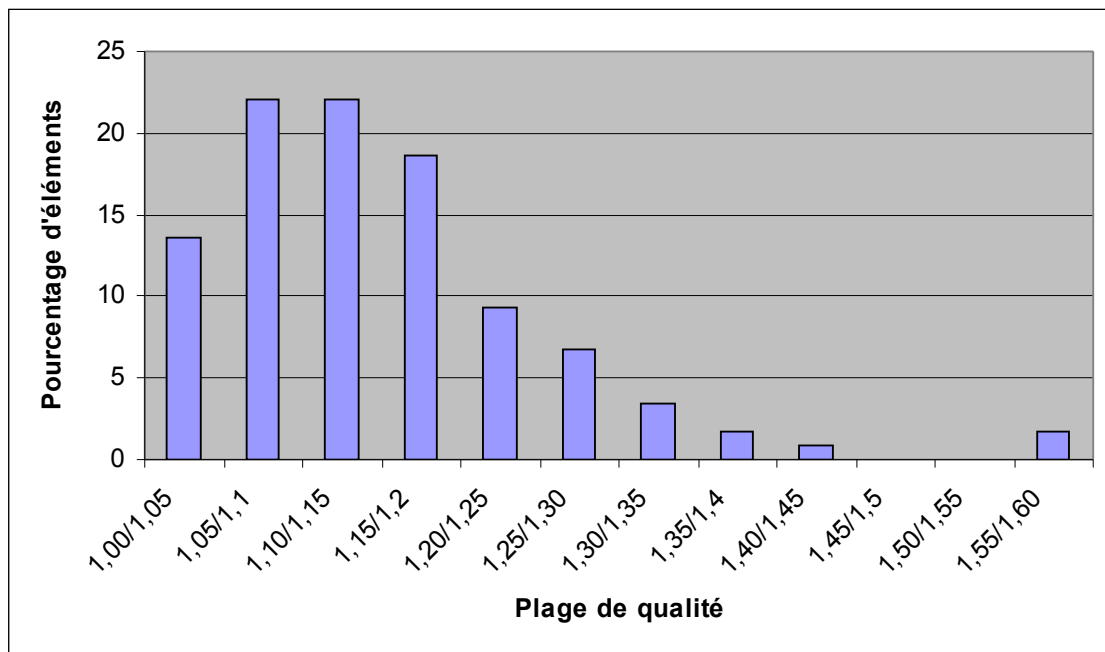
QUALITIES OF THE TRIANGLES

```

*****
* Recall: quality is equal to the ratio of the diameter **
triangle on the radius of the inscribed circle, **
standardizes has 1 for a equilateral triangle. *
*****
* Minimum: 1.0044 Maximum: 1.5788 *
*****
* Function of distribution **
Values * Mini Number of meshes
** < < Maximum * per class * office plurality ***
in % . number * in % . number *
*****
* 1.000 < 1.025 * 2.54. 3 * 2.54. 3 **
1.025 < 1.050 * 11.02. 13 * 13.56. 16 **
1.050 < 1.075 * 8.47. 10 * 22.03. 26 **
1.075 < 1.100 * 13.56. 16 * 35.59. 42 **
1.100 < 1.125 * 7.63. 9 * 43.22. 51 **
1.125 < 1.150 * 14.41. 17 * 57.63. 68 **
1.150 < 1.175 * 11.86. 14 * 69.49. 82 **
1.175 < 1.200 * 6.78. 8 * 76.27. 90 **
1.200 < 1.225 * 5.08. 6 * 81.36. 96 **
1.225 < 1.250 * 4.24. 5 * 85.59. 101 **
1.250 < 1.275 * 2.54. 3 * 88.14. 104 **
1.275 < 1.300 * 4.24. 5 * 92.37. 109 **
1.300 < 1.325 * 1.69. 2 * 94.07. 111 **
1.325 < 1.350 * 1.69. 2 * 95.76. 113 **
1.350 < 1.375 * 1.69. 2 * 97.46. 115 **
1.375 < 1.400 * 0.00. 0 * 97.46. 115 **
1.400 < 1.425 * 0.85. 1 * 98.31. 116 **
1.425 < 1.450 * 0.00. 0 * 98.31. 116 **
1.450 < 1.475 * 0.00. 0 * 98.31. 116 **
1.475 < 1.500 * 0.00. 0 * 98.31. 116 **
1.500 < 1.525 * 0.00. 0 * 98.31. 116 **
1.525 < 1.550 * 0.00. 0 * 98.31. 116 **
1.550 < 1.575 * 0.85. 1 * 99.15. 117 **
1.575 < 1.600 * 0.85. 1 * 100.00. 118 **
1.600 < 1.625 * 0.00. 0 * 100.00. 118 **
1.625 < 1.650 * 0.00. 0 * 100.00. 118 **
1.650 < 1.675 * 0.00. 0 * 100.00. 118 **
1.675 < 1.700 * 0.00. 0 * 100.00. 118 **
1.700 < 1.725 * 0.00. 0 * 100.00. 118 **
1.725 < 1.750 * 0.00. 0 * 100.00. 118 *
*****

```

On the following figure, one can see the representation in the form of histogram of the percentages of meshes in each beach of quality concerned.



The control of the connexity makes it possible to make sure that the field of computation is of only one piece. It can happen that this field is in several disjointed parts, for example for problems of contact. But the diagnosis of several pieces often reveals a problem during creation of mesh: under-parts were badly restuck. And as the visual monitoring always does not make it possible to realize it, computation is false... while looking to be right. The worst situation which can arrive. It is thus strongly recommended to use this option.

```

CONNEXITE OF the ENTITIES OF CALCUL
the =====

*****
* the triangles      are in only one block.          *
*****

*****
* the segments      are in only one block.          **
  This line is fermee.                               *
*****
    
```

the display of the sizes of the under-parts of the mesh is done by dimensions. The tri one roughly speaking takes place according to the declared mesh groups; there can be a finer subdivision when the groups are recut. This presentation makes it possible to control that one has quite with a grid what one wanted. In particular, that makes it possible to flush out errors of resticking or creation of groups during the creation of the mesh. Here still, it is strongly recommended to use this option.

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SIZES OF the SUBDOMAINS OF CALCUL
=====

Direction	Unit
X	cm
there	cm

```
*****
*                               Subdomains 2D                               *
*****
* Number * Name * Surface *
*****
*   -12 * Sous-domaine_12 * 20.0000 **
*   -11 * Total          Sous-domaine_11 * 128.000
*
***** * :
* 148.000 *
*****

*****
*                               Subdomains 1D                               *
*****
* Number * Name * Length *
*****
*   -2 * Sous-domaine_2 * 10.0000 **
*   -1 * Sous-domaine_1 * 4.00000 **
*   -3 * Sous-domaine_3 * 16.0000 **
*   -5 * Sous-domaine_5 * 8.00000 **
*   -4 * Total          Sous-domaine_4 * 26.2462
*
***** * :
* 64.2462 *
*****
* Minimum: * 4.00000 **
Maximum: * 26.2462 *
*****
```

the analysis of the properties of the elements of computation and the displays a diagnosis on the overstressed elements edge elements.

DIAGNOSES ON the ELEMENTS OF CALCUL
the =====

```
*****  
*                               Triangles                               *  
*****  
* Many overstrained elements *                                0 **  
Number of elements without meshes of edge *                                0 *  
*****
```

5 Bibliography

- 1) G. Nicolas; T. Fouquet: "Software HOMARD - Volume 1 - general Presentation", ratio EDF H-I23-2008-04107-FR, December 2008.
- 2) G. Nicolas; T. Fouquet: "Software HOMARD - Volume 2 – Algorithms of refinement and coarsening of meshes", ratio EDF H-I23-2008-04108-FR, December 2008.
- 3) G. Nicolas; T. Fouquet: "Software HOMARD - Volume 3 – Interfaces with the ratio, computer codes" EDF H-I23-2008-04118-FR, December 2008.