
Interface of the file of grid GMSH with Aster

Summary:

GMSH is a tool for modelling, grid and postprocessing diffused under licence GNU-GPL (<http://www.geuz.org/gmsh>, achievable, sources and documentation available on this site).

One describes here the principle of the interface which makes it possible to use in *Aster* a file resulting from GMSH.

This interface is put in work in *Aster* by the order `PRE_GMSH [U7.01.31]`.

1 Use of GMSH

GMSH is a free or regulated tool for grid which integrates a modeller and features of postprocessing. The modeller, easy to use, allows to prepare the grid of structures by geometrical constructions (creation of lines, surfaces, translations/rotations, extrusions...).

The model of the structure can be built interactivement (with the mouse) or by a command file.

The documentation of GMSH is available at this address (it is possible that this direct link is modified, pass by the homepage in this case): <http://www.geuz.org/gmsh/doc/texinfo/gmsh.html>.

The description of the geometry of the structure is contained in a file `.geo`, the produced grid is recorded with the extension `.msh`; this file which will be converted by the order `PRE_GMSH` with the format *Aster*.

2 Entities GMSH and groups Aster

The modeller of GMSH handles points, lines, surfaces or volumes as geometrical entities (nonwith a grid). Grid GMSH is built by netting in this order the lines, surfaces then the volumes supported on those.

In general, one handles parts of the grid to apply the properties materials, the boundary conditions or the loadings. To reach these under-parts of the grid, it is necessary to define "physical" in GMSH. A "physical" is made up of one or more geometrical entities. The interface GMSH-Aster produces a group of meshes for each "physical": if the "physical 21" consists of two volumes, the group of mesh *GM21* contains the meshes of these two volumes.

Note:

In GMSH, one visualizes the entities constituting a "physical" by small Tools/Visibility and by selecting the number. One can then use the order `DEFI_GROUP` in Aster to handle a more explicit name of group of meshes.

Caution:

"Physicals should not be created" gathering of others "physicals", because that would result in producing double meshes.

The number of the "physicals" must be lower than 1 000 000.

3 Examples

3.1 Geometry and grid GMSH

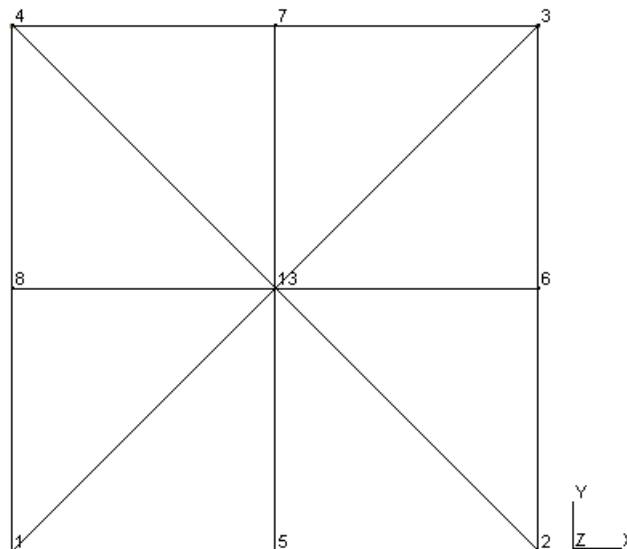
A very simple geometry is created: a square on side 1. Here, one creates the points, the lines, surface; one could also have done it by translation/extrusion...

NB:

| One creates a "physical" which contains the square surface of number 107.

```
L=1;  
d=0.45;  
  
Not (1) = {0, 0.0, D};  
Not (2) = {L, 0.0, D};  
Not (3) = {L, L, 0, D};  
Not (4) = {0, L, 0, D};  
Line (1) = {1, 2};  
Line (2) = {2, 3};  
Line (3) = {3, 4};  
Line (4) = {4, 1};  
Line Loop (106) = {2, 3,4,1};  
Plane Surface (6) = {106};  
Physical Surfaces (107) = {6};
```

The grid created with the anisotropic algorithm 2D is:



The file of grid GMSH contains the description of the nodes and the meshes:

```
$NOD  
9  
1 0 0 0  
2 1 0 0  
3 1 1 0  
4 0 1 0  
5 0.499999999999999931 0 0  
6 1 0.499999999999999931 0  
7 0.50000000000000007 1 0  
8 0 0.50000000000000007 0
```

```
13 0.500000000000000001 0.5 0
$ENDNOD
$ELM
8
1 2,107 6 3 13 1 5
2 2,107 6 3 8 1 13
3 2,107 6 3 5 2 13
4 2,107 6 3 13 2 6
5 2,107 6 3 6 3 13
6 2,107 6 3 13 3 7
7 2,107 6 3 7 4 13
8 2,107 6 3 13 4 8
$ENDELM
```

The syntax of this file is described in the section "Spins formats/Gmsh mesh file format" of the handbook of GMSH.

3.2 File of grid Aster product by the operator PRE_GMSH

```
TITLE
AUTEUR=INTERFACE_GMSH DATE= 7/17/2003
FINSF
%
COOR_3D NBOBJ=9
%FORMAT= (1*NOM_DE_NOEUD, 3*COORDONNÉE)
  N1 0.0000000000000000E+00 0.0000000000000000E+00 0.0000000000000000E+00
  N2 1.0000000000000000E+00 0.0000000000000000E+00 0.0000000000000000E+00
  N3 1.0000000000000000E+00 1.0000000000000000E+00 0.0000000000000000E+00
  N4 0.0000000000000000E+00 1.0000000000000000E+00 0.0000000000000000E+00
  N5 4.9999999999999993E-01 0.0000000000000000E+00 0.0000000000000000E+00
  N6 1.0000000000000000E+00 4.9999999999999993E-01 0.0000000000000000E+00
  N7 5.0000000000000007E-01 1.0000000000000000E+00 0.0000000000000000E+00
  N8 0.0000000000000000E+00 5.0000000000000007E-01 0.0000000000000000E+00
  N13 5.0000000000000000E-01 5.0000000000000000E-01 0.0000000000000000E+00
FINSF
%
TRIA3 NOM=INDEFINI NBOBJ=8
M1 N13 N1 N5
M2 N8 N1 N13
M3 N5 N2 N13
M4 N13 N2 N6
M5 N6 N3 N13
M6 N13 N3 N7
M7 N7 N4 N13
M8 N13 N4 N8
FINSF
%
GROUP_MA NOM=GM107
  M1 M2 M3 M4 M5 M6 M7 M8
FINSF
%
END
```

The eight triangles composing the square with a grid are then accessible in Aster in the group of mesh GM107.