Post-Meshing

NOTE :
Command list presented in this chapter is not exhaustive. The complete information is available in on line documentation.

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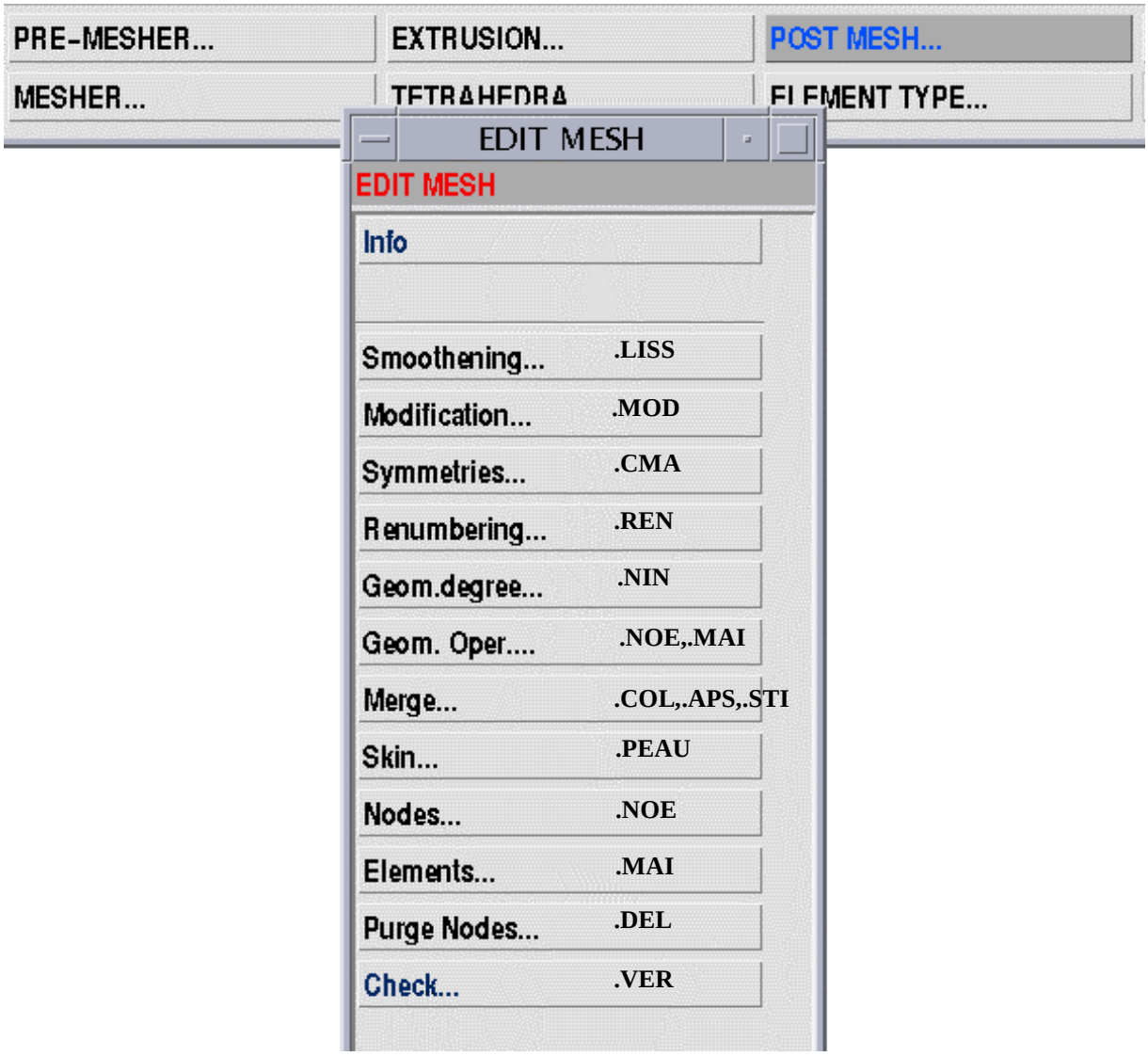
1. Modifying the mesh

This section describes the operations to interactively create or modify an existing mesh.



With Menu	With command lines
Smoothing by recombination of triangular cells into quadrangular cells	
/Smoothing/Recombine	.LISS RECOMBINAISON
Smoothing by barycentrical displacement of the nodes	
/Smoothening/Relocation	.LISS RELOCATION
Modification	
/Modification	.MOD
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/Symmetries	.CMA
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/Renumbering	.RENUM
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/Geom. operation	.NOE CHA and .MAI CHA
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/Purges nodes	.PURGE purge noeud
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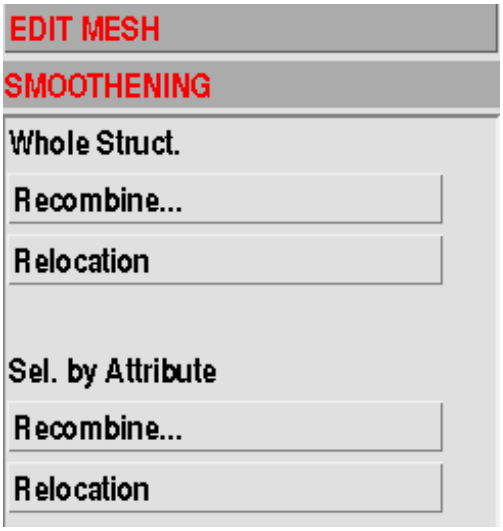
2. Smoothening, Recombine, Relocations (.LISS)



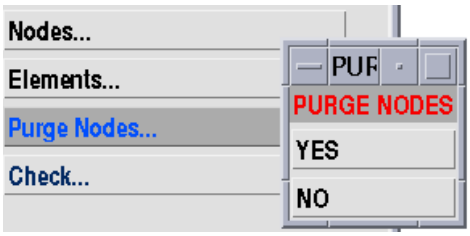
Recombine triangles into quadrangles (with a medium severity)
.LISS RECOMBINE SEVERITE 3
Smoothening with relocation of nodes
.LISS RELOCALIS n

Severity can vary between 1 to 5.If value is 1, two adjacent triangles are recombined. If value is 5, two triangles are recombined only they form a quadrangle.

For relocation, n is the number of successive relocations for one node. The relocation is a iterative process.

3. Purge nodes (.DEL)

- To delete all nodes not used for modeling (free nodes)



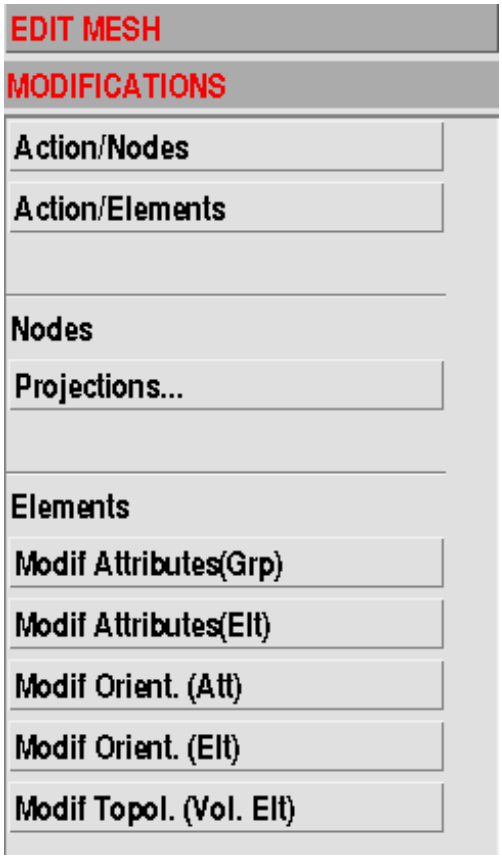
Delete free nodes
.DEL.NOE

4. Modifications of mesh (.MOD)

Actions :

- Delete, create, move or edit nodes and elements
- Modify element attribute
- Reduce number of sides of elements
- Subdivide cells into triangles
- Merge triangular cells into a single quadrangular cell
- Modify numbering order (normal of a shell element)
- List of nodes or elements
- Display the nodes or the mesh
- Display center of gravity of element

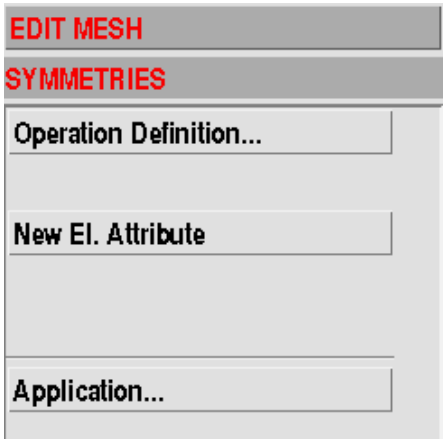
Example:



Project a group of nodes on a circle (line 33)
.MOD NODE LIEU LIGNE 33 **DIRECTION 0 DEPLACE GROUP "node_group"**
Divides cells with attribute **1** into triangles which accept the centre of each cell as a common node.
.MOD maille att 1 divise
Suppress cells with attribute 1
.MOD maille att 1 suppr
Merge (if possible) cell a and b
.MOD maille fusionne a b
Reverse the direction of the cell a and b
.MOD maille inverse sens a b

5. Symmetries and basic geometrical operation on cells and nodes (.CMA)

- Translations, Rotations, Change scale based on existing nodes or cells or group.



Apply a symmetry of the mesh (Z=0)

```
.CMA
 INI SZ -1
 MAI
 EXECUTE
```

The optional parameter INCREMENT - - that allows to give a specific numbering to the created nodes and cells can also be used if the user wants only to move the initial mesh. In fact, by using INCREMENT 0 0, no new node and cell is created, the initial mesh is just moved.

Copy of mesh with attribute 1)

```
.CMA
 Tx 1
 Colle 3                  ! Full merging of nodes (new and old)
 Atn 2                    ! New attribute for new cell
 Execute 1 maille att 1
```

Simple move of the structure

```
.CMA
 Tx 1
 Incrememt 0 0
 Execute 1 maille att 1
```

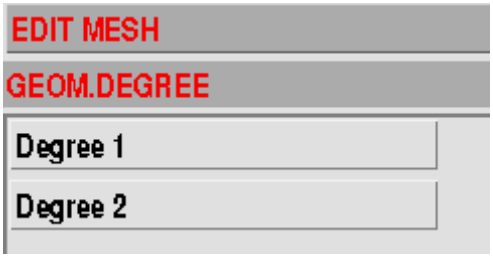
6. Nodes and cells numbering

Management of nodes or cell numbering of the model.

Renumbering from 1 by step of 2
.RENUM <entities> <selection> **DEBUT 1 PAS 2** **EXECUTE**

Entities can be nodes or cells
Selection can be attributes, groups, number

7. Modification of the meshing degree (.NIN)



It generate mid-nodes (implicit degree 2)
.NIN DEGRE 2
It Suppresses mid-nodes
.NIN DEGRE 1 FORCE

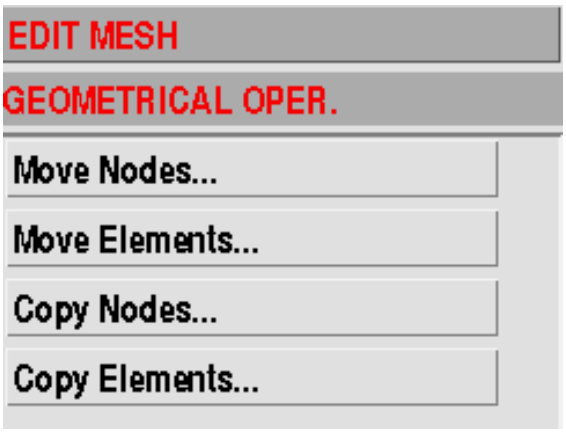
8. Merge (.COL)

8.1. Identical meshing merging (.COL)

Merge nodes of same coordinates belonging to cells of attribute 2 and 4
.COLL ELEMENT ATT 2 4;EXECUTE

9. Geometric operations (.NOE,.MAI)

- Symmetries, translations, rotations carried out on the nodal coordinates in order to generate new nodes.

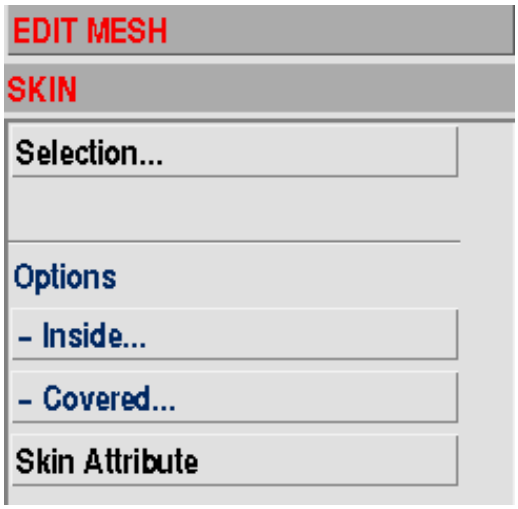


Translation of nodes along X.

```
.NOE CHARGE
 GRAP INIT TX 15.5
 EXECUTE I 1 0
```

10. Creation of skin elements (.PEA)

- To get skin results from membranes elements.



Skin elements on faces of attribute 2

```
.PEAU ELEMENT ATTRIBUTE 2
```

11. Nodes Creation

To create nodes by their coordinates, by repetition, interpolation, etc.

Node 321 creation by coordinates definition

```
.NOE I 321 X 300.54   59.01   45
```

12. Cells Creation

To create cells based on existing nodes.

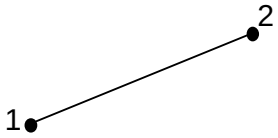
Cell creation with attribute 3

```
.MAI I 5 N 3  5  9  12 ATT 3
```

12.1. Cells without nodes on edges

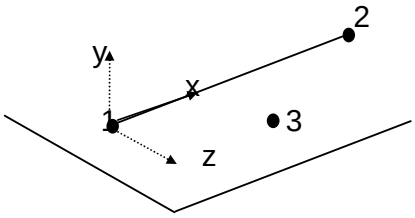
The edges are necessarily straight.

12.1.1. Rod




```
.MAI i 1 n 1 2 ATT 2
```

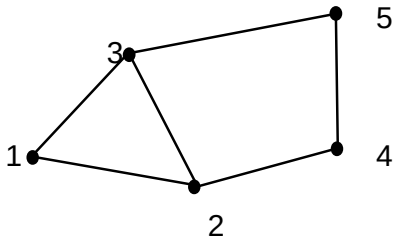
12.1.2. Beam




```
. mai I 1 n 1 2 -3
```

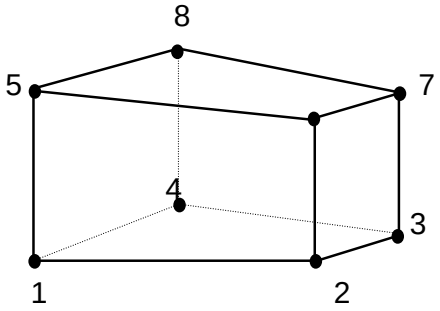
Third node defines orientation of z local axis of the beam.

12.1.3. Triangle or quadrangle




```
.mai i 1 n 1 2 3
     i 2 n 2 4 5 3
```

12.1.4. Volume with 8 nodes



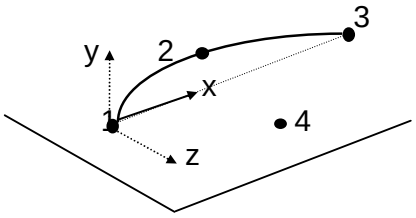

```
.MAI i 1 n 1 2 3 4 0 5 6 7 8
```

The `0` indicates the face changing. The superposed nodes have to correspond.

12.2. Cells with nodes on edges

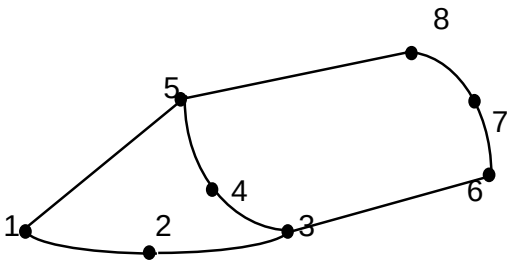
Edges can be curved.

12.2.1. Beam



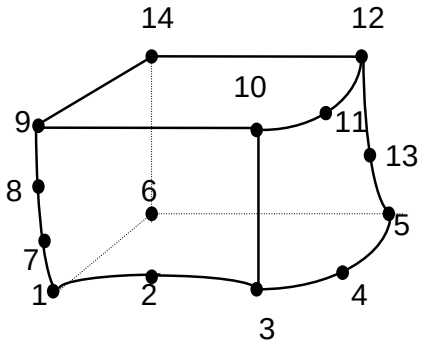

```
.MAI i 1 n 1 -2 3 -4
```

12.2.2. Triangle or quadrangle




```
.MAI i 1 n 1 -2 3 -4 5
     i 2 n 3 6 -7  8 5 -4
```

12.2.3. Volume




```
.MAI i 1 n 1 -2 3 -4 5 6 0  $ (1)
           9 10 -11 12 14 0$ (2)
         -7 -8 0           $ (3)
          0                $ (4)
         -13                 (5)
```

(1) inferior face
(2) superior face
(3) interface 1/9
(4) interface 3/10
(5) interface 5/12

13. Mesh quality (.VER)

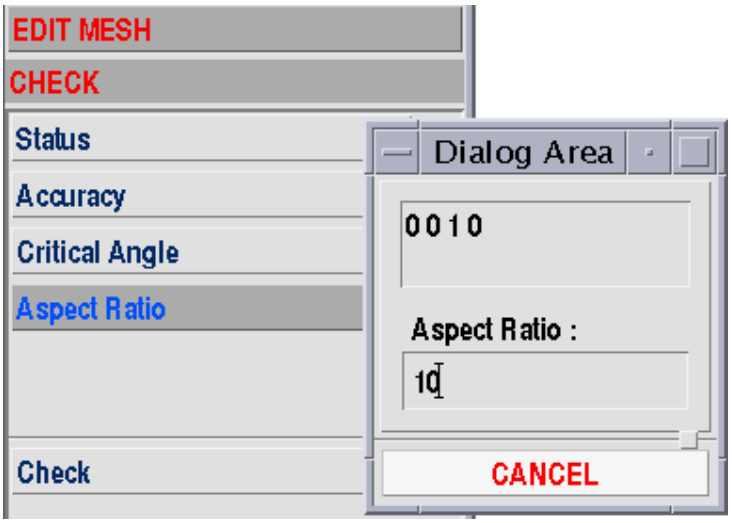
This command allows to check the quality of the mesh according to specific criteria :

1. Topology (general test : *no hypothesis, 2 or more nodes with same coordinates,…)*
2. Side length (find element with 0 length or very small length)
3. Aligned sides (check if two sides are not aligned)
4. Convex element (check of the convexity of the cell)
5. Coplanar element (check if one node is not out-of-plane – In 2D only)
6. Aspect ratio (compute the ratio longer side/smaller side of the cells)
7. Inert. Plane beams (check position of the third nodes)
8. Offset from midside nodes

Default values of criterions : (Status)

- Length Accuracy : 1.E-04
- Critical angle : .175E+03
- Aspect ratio : .2E+02
- Mid-node offset : 10

Example :



Check the aspect ratio
.VER ELANCEMENT 10;VERIFIE

Exercise :

- Mesh 2D tool (exercise 7), with 2D Transfinite on arms, free mesh for head, recombine, relocate;
- Mesh 3D tool (exercise 8)
- Mesh 2 materials plate (exercise 10) with Offsett, recombine, relocate ;