



Progettazione Meccanica CAD/CAE Integrata

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Analisi strutturale in ambiente virtuale Definizione della mesh in Ansys mechanical

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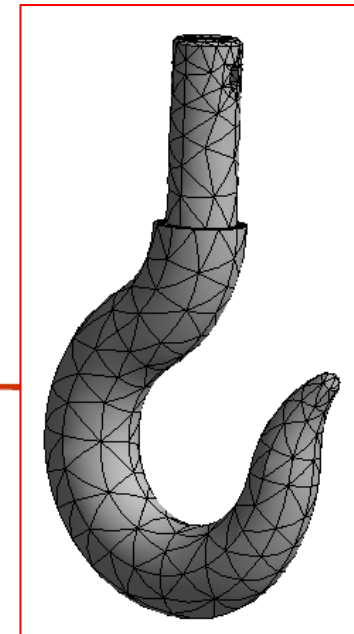
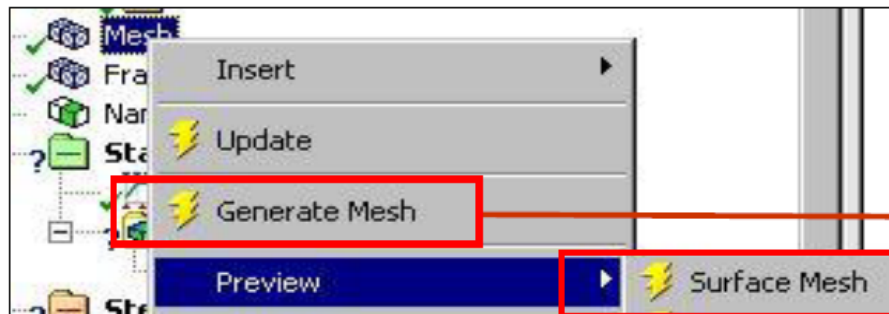


UNIVERSITÀ
DEGLI STUDI DI TRIESTE

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Università degli Studi di Trieste**

La discretizzazione (“mesh”) è generata attraverso l’utilizzo di nodi ed elementi:

- Nella maggior parte dei casi è possibile generare una mesh automatica con impostazioni di “default”
- In genere è raccomandato aggiungere “controlli” di mesh per definire una mesh specificamente adatta alla soluzioni del determinato problema,
- Una mesh più fine produce risultati più precisi ma allo stesso tempo richiede risorse di CPU e memoria più elevate e maggiori tempi computazionali



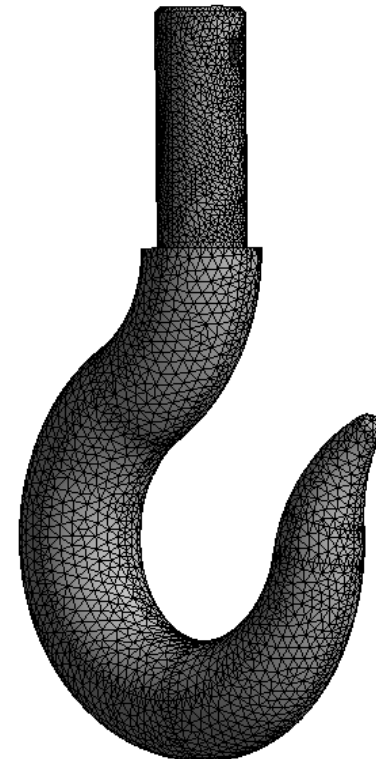


Meshing in Mechanical



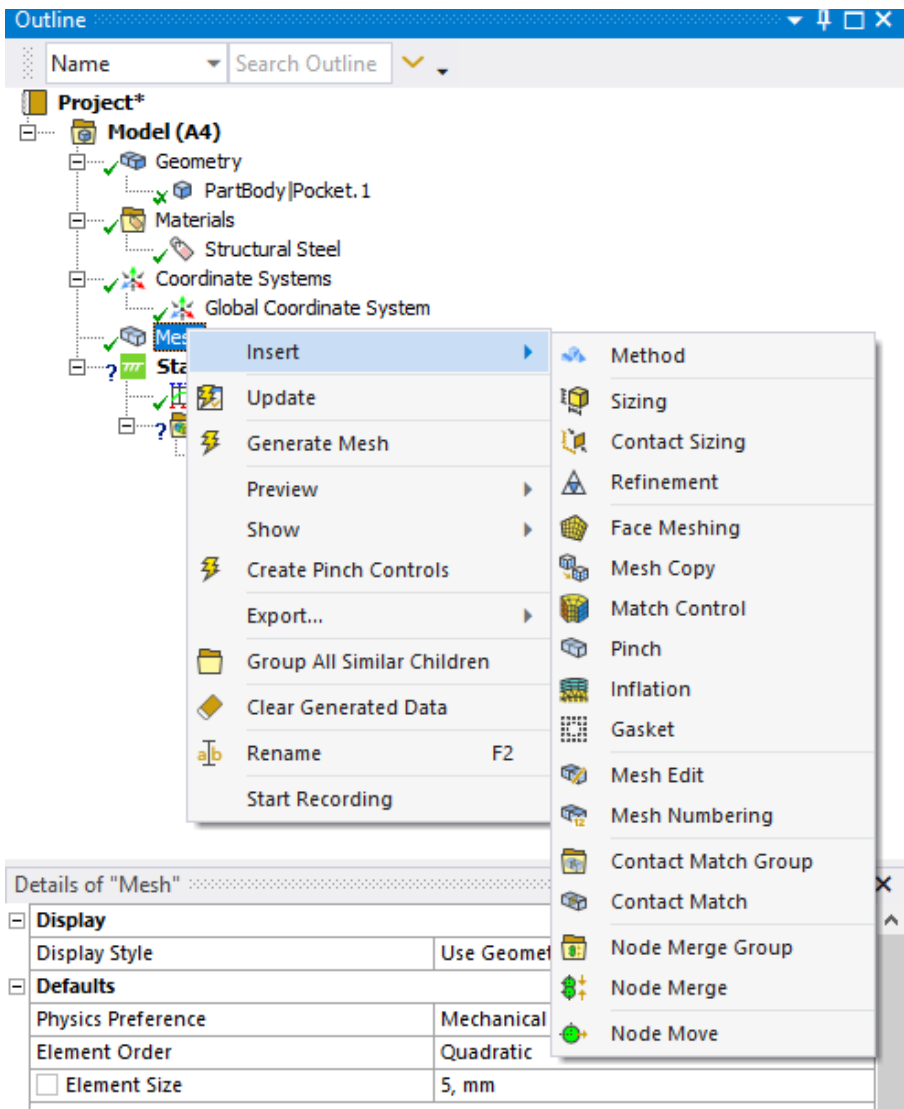
- Physics Based Meshing permette all'utente di specificare la metrica utilizzata nel misurare la qualità dell'elemento rispetto al tipo di analisi da effettuare.
- "Element size" è il primo (e più basilare) controllo di mesh che è possibile applicare al modello globale. Definisce la dimensione massima dell'element utilizzata per l'intero modello.

Details of "Mesh"	
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Mechanical
Element Order	Program Controlled
<input type="checkbox"/> Element Size	5, mm
Sizing	
Use Adaptive Sizing	Yes
Resolution	Default (2)
Mesh Defeaturing	Yes
<input type="checkbox"/> Defeature Size	Default
Transition	Fast
Span Angle Center	Coarse
Initial Size Seed	Assembly
Bounding Box Diagonal	749,51 mm
Average Surface Area	9337,8 mm ²
Minimum Edge Length	5,9868 mm





Meshing in Mechanical



Local Mesh Controls can be applied to either a Geometry Selection or a Named Selection.

Some of the available controls include :

- Method Control**
- Sizing Control**
- Contact Sizing Control**
- Refinement Control**
- Face Meshing Control**
- Inflation Control**
- Pinch Control**



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Method Control: provides the user with options for the meshing algorithm to be used.

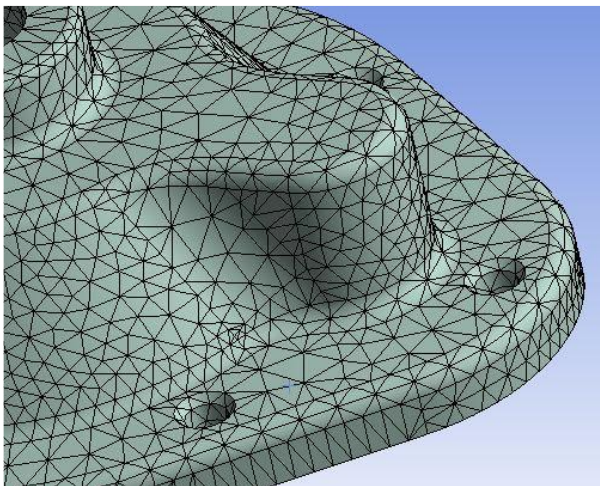
Method = Automatic (default):

–Body will be swept if possible. Otherwise, the “Patch Conforming Tetrahedron” mesher will be used.

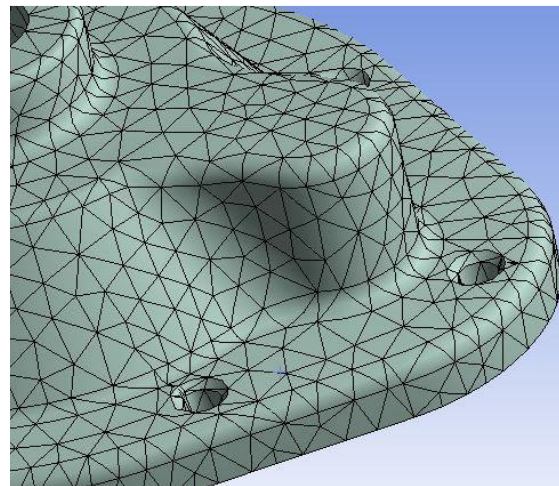
Method = Tetrahedrons:

- An all-tetrahedron mesh is generated (not usually requested for mechanical applications).
- Can use Patch Conforming or Patch Independent Meshing algorithms.

Patch conforming



Patch independent





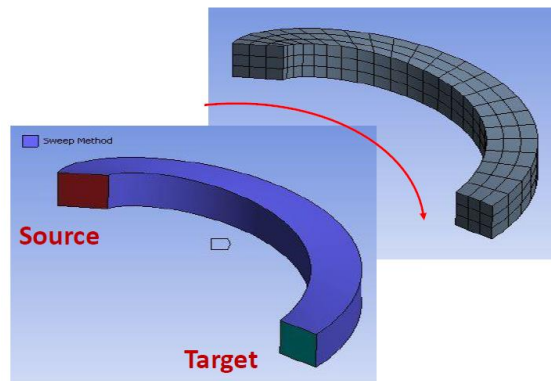
Method = Hex Dominant:

Creates a free hex dominant mesh

- Recommended for meshing bodies with large interior volumes.
- Not recommended for thin or highly complex shapes.
- Useful for meshing bodies that cannot be swept.

Method = Sweep (hex and possibly wedge shapes):

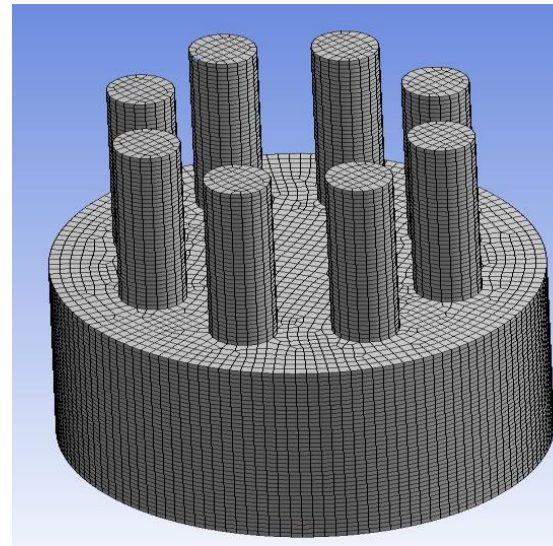
- Source/Target Selection: Manually select the start/end faces for sweeping or allow the mesher to choose.
- Can include size controls and/or biasing along sweep.





Method=MultiZone:

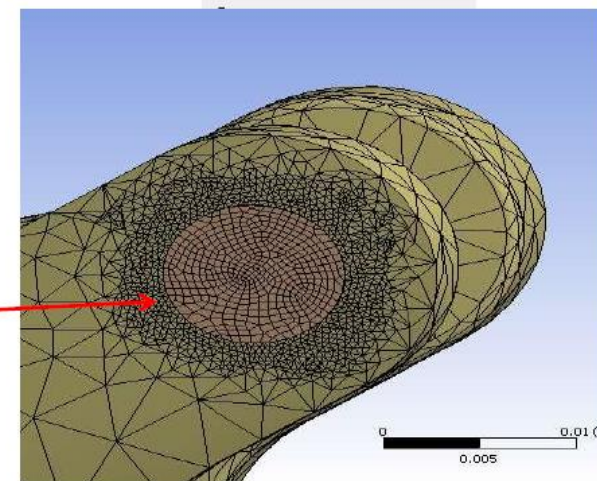
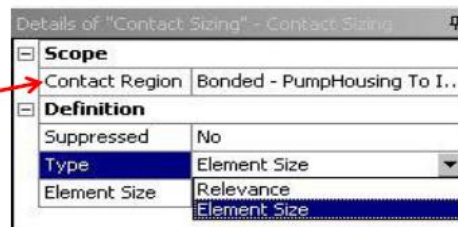
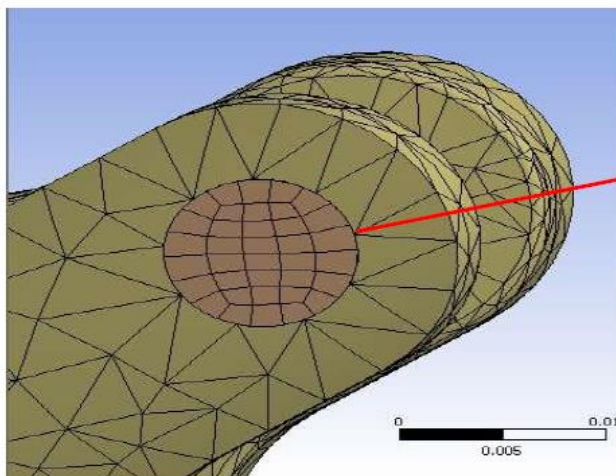
- Based on blocking approach used in ANSYS ICEM CFD Hexa
- Automatically decomposes geometry
- Uses structured and unstructured blocks
- Can have multiple source and target faces
- Depends on settings of Free Mesh Type
- Structured blocks are meshed with Hexa or Hexa/Prism
- If Free Mesh Type is set to other than Not Allowed then unstructured blocks are meshed with Tetra, Hexa Dominant or Hex Core based on the selected method
- Program Controlled inflation



Contact Sizing:

generates similarly-sized elements on contact faces for face/face or face/edge contact regions.

- “Element Size” or “Relevance” can be specified.
- Can drag and drop a Contact Region object onto the “Mesh” branch as a shortcut.





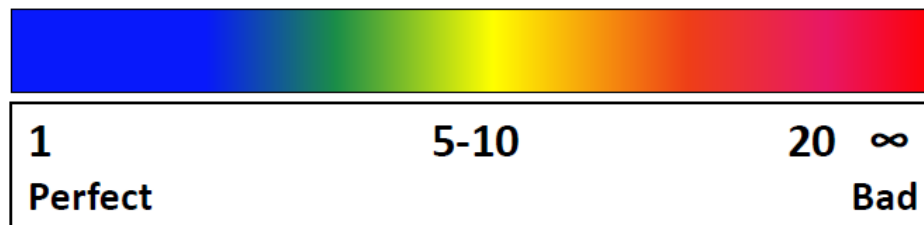
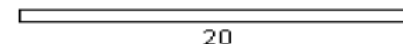
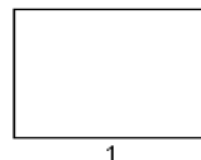
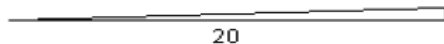
Mesh Quality Criteria



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Aspect Ratio:

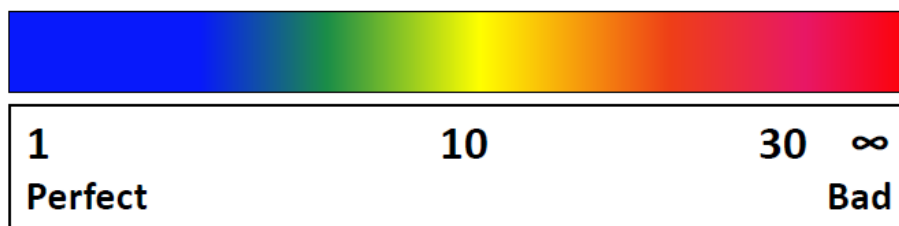
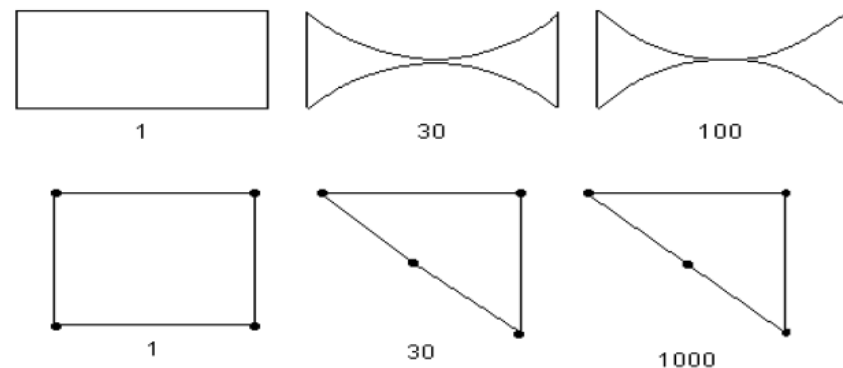
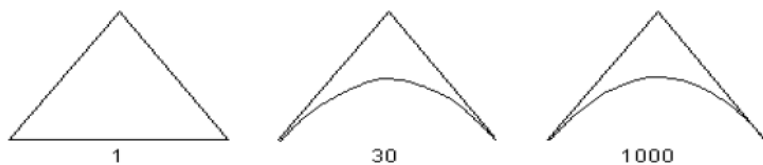




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Jacobian Ratio:

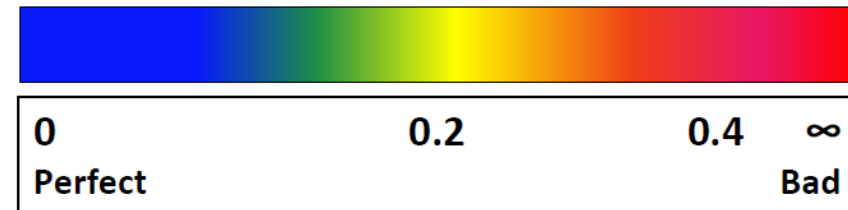
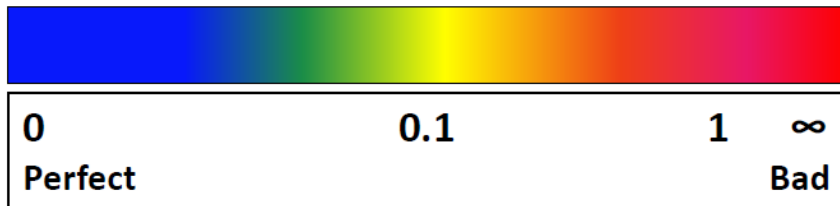
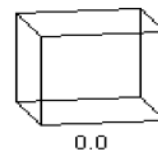
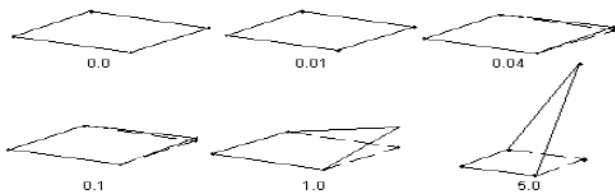




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Warping Ratio:

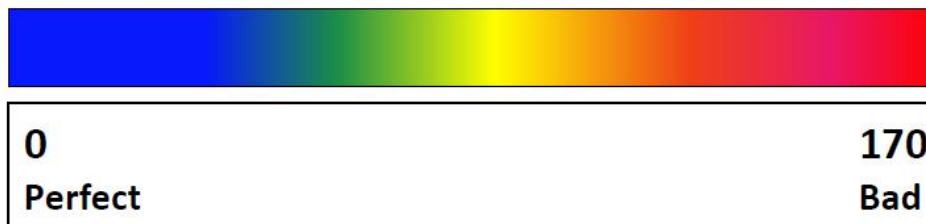
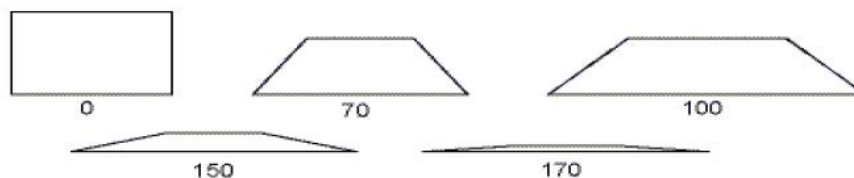




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Parallel Deviation:

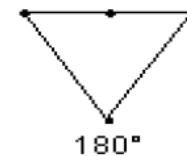
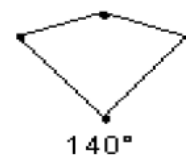
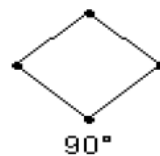
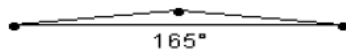
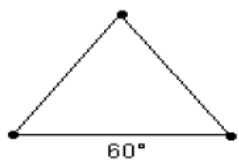




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Maximum Corner Deviation:



60	165
Perfect	Bad



90	180
Perfect	Bad



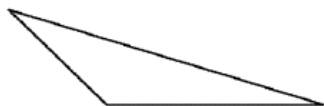
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Skewness:



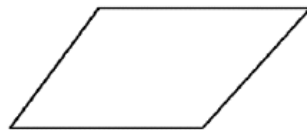
Equilateral Triangle



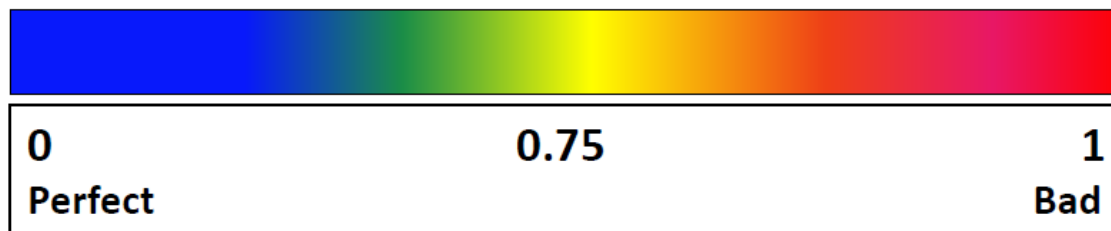
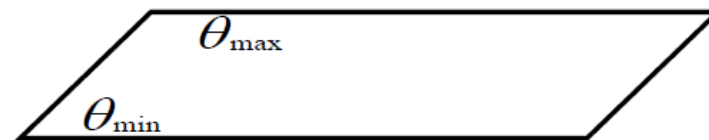
Highly Skewed Triangle



Equiangular Quad



Highly Skewed Quad



Orthogonal Quality:

