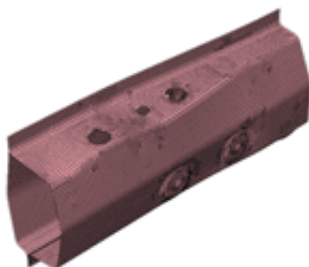
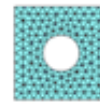
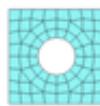
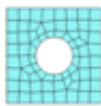


Mesh Generation  
**Auto-Mesh Generation**

MIDAS/FX+ provides Auto-mesh, Map-mesh & Protrude-mesh methods to easily and conveniently generate optimum meshes for complex models of any particular configuration.

<b>Surface Mesh</b>	Surface	Quadrilateral, triangle or combined element mesh is generated for Surface Geometry.
	Planar Area	A planar area enclosed by arbitrarily shaped curves is automatically composed, and the program generates a mesh within the area.
	4-curve Area	Elements within a planar or curved surface area composed by 4 curves are meshed.
<b>Solid Mesh</b>	Solid	Quadrilateral element mesh is generated for Solid Geometry.
	2D->3D	Tetrahedron solid mesh is automatically generated within a volume enclosed by 2D meshes.

MIDAS/FX+ provides three auto-mesh algorithms for generating optimal surface meshes based on the geometric configuration, analysis type and the user's preference. All of the three algorithms can freely include curves and points within a surface for mesh generation.



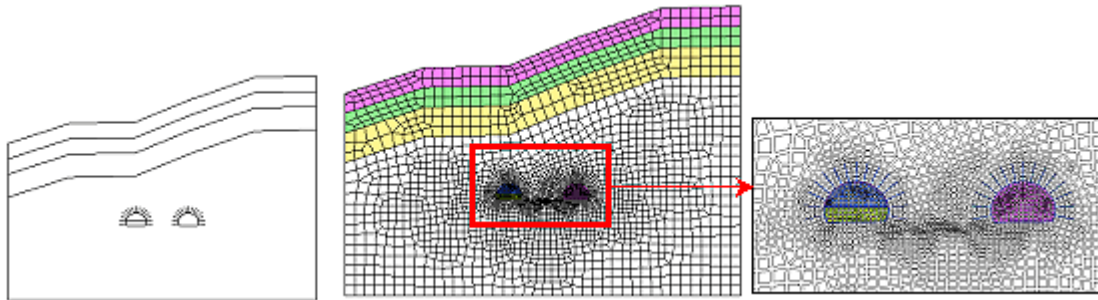
Loop Mesher



Grid Mesher



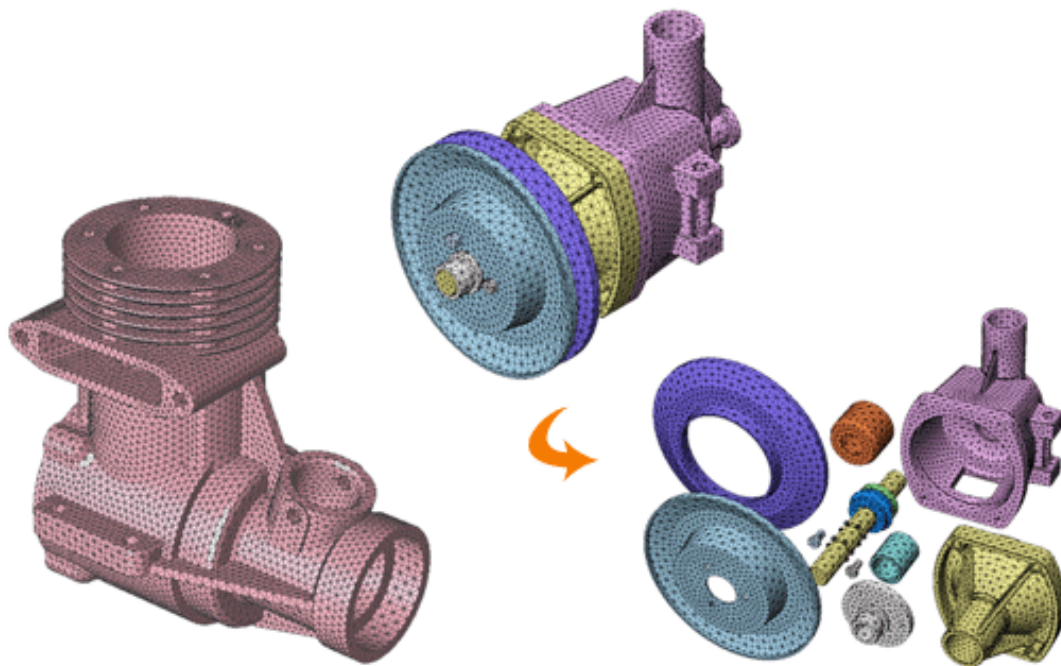
Delaunay Mesher



<2-D analysis models meshed by Auto-mesh Planar Area from DXF data>

(Examples in which the program automatically defines the ranges and groups of elements for each range)

The Solid Mesher in MIDAS/FX+ generates 200,000 elements per minute. The user is allowed to define and reflect various mesh size information for meshing most desirable tetrahedron elements. In addition, the program automatically groups elements for each solid, which in turn helps us in subsequent modeling operations.

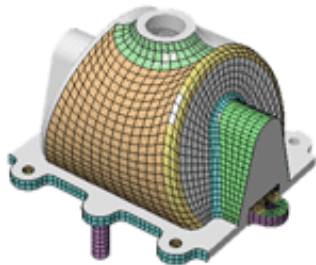


<Auto Mesh Solid>

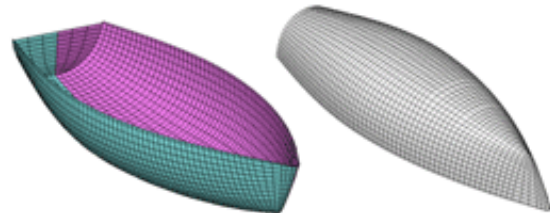
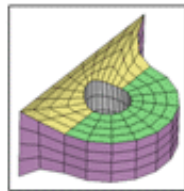
Mesh Generation  
**Mapped-Mesh Generation**

MIDAS/FX+ provides Mapped-mesh methods, which generate quadrilateral, pentahedron and hexahedron meshes together with Auto-mesh Generation, which generates triangles, quadrilaterals and tetrahedrons.

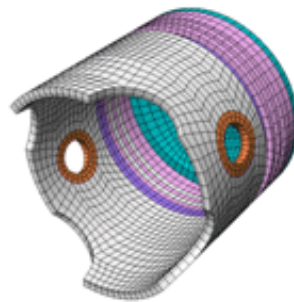
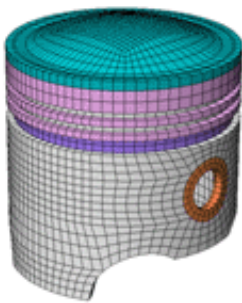
Surface Mesh	Surface	Quadrilateral mapped mesh is generated for Surface Geometry.
	k-Curve Area	Mapped mesh is generated within an area bounded by a number of arbitrarily shaped curves.
	4-Node Area	Mapped mesh is generated within an area defined by 4 nodes.
Solid Mesh	Solid	Hexahedron, pentahedron or combined element mesh is generated for Solid Geometry.



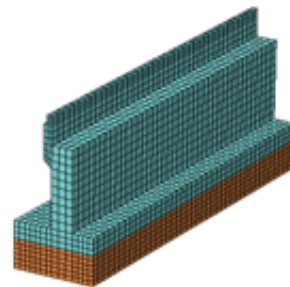
k-sided Areas (Simply-connected)



Hull of Small Ship (Surface Mesh)

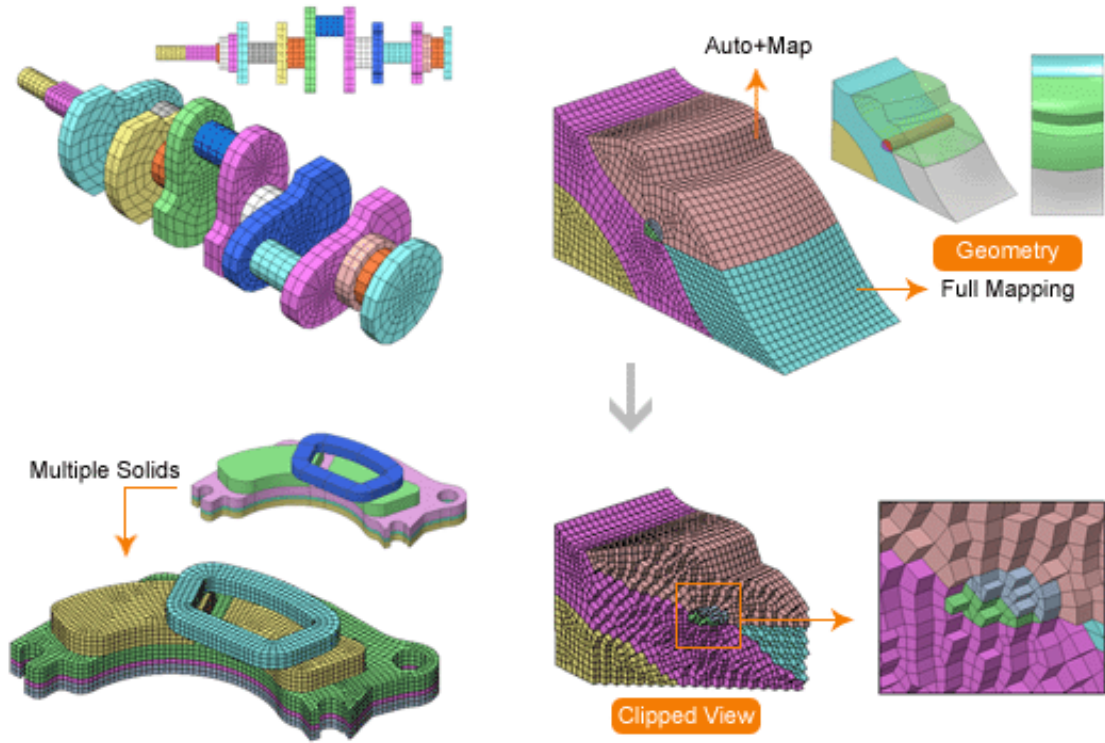


k-faced Volumes (Simply-closed)



<Mapped Mesh 1>

The Solid Map-Mesh algorithm in MIDAS/FX+ allows generation of hexahedron meshes for even complex solids. In a complex solid model, a quadrilateral element mesh is automatically generated on a reference face from which the mesh is mapped within the solid.

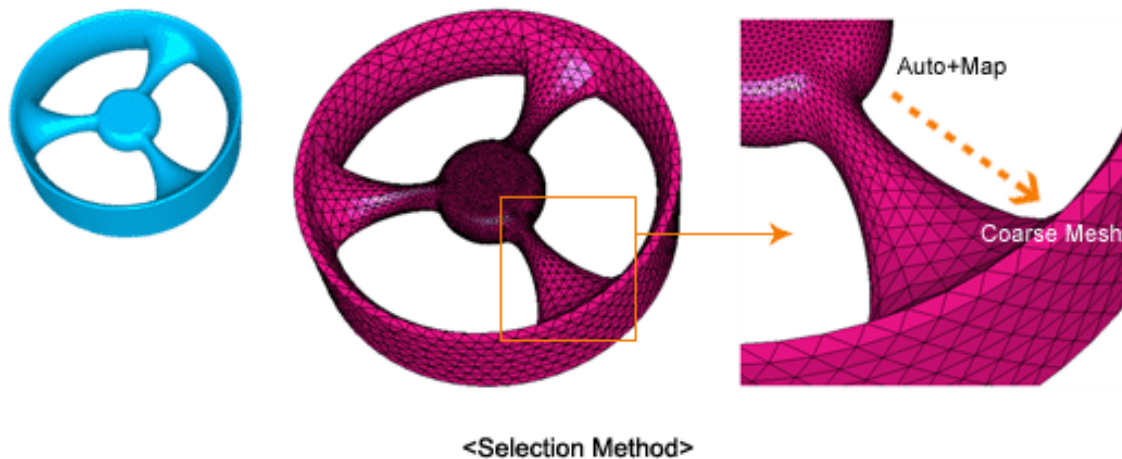


<Mapped Mesh 2>

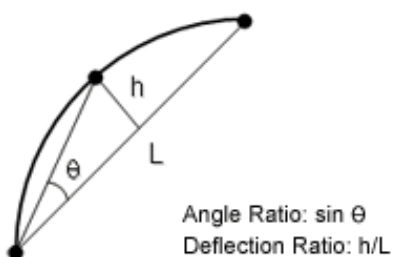
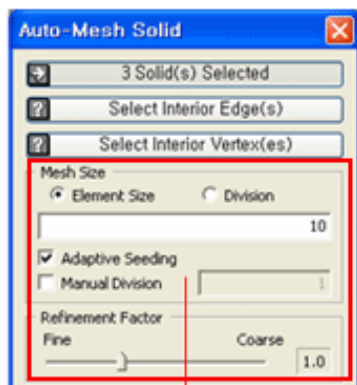
Mesh Generation  
**Size Control**

MIDAS/FX+ provides various element size control methods for effectively generating quality meshes for complex models.

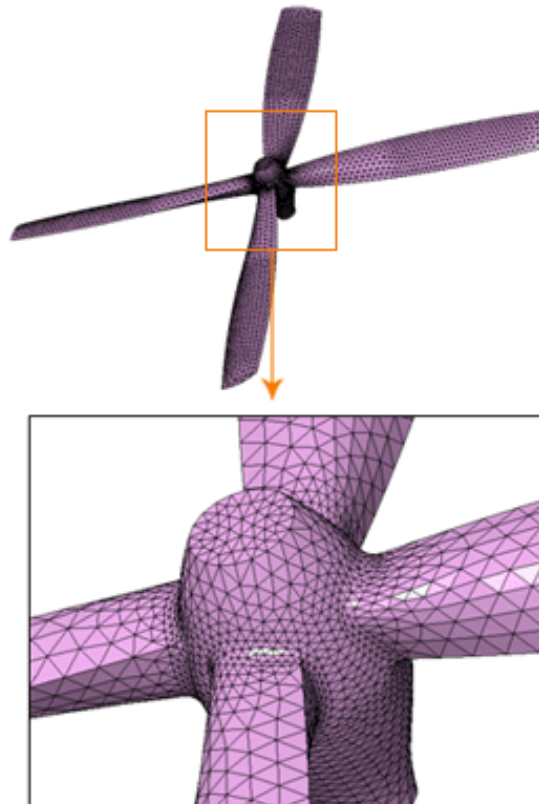
<b>Definition of element size</b>	An element size for Curve, Surface and Solid is defined.
<b>Definition of number of divisions</b>	A number of divisions for Curve is defined.
<b>Length based Biased Seeding</b>	Element sizes at the start and end are defined for Curve. A linearly varying mesh is generated between the two end elements. A mesh, which symmetrically varies relative to the center of Curve, can be also defined.
<b>Ratio based Biased Seeding</b>	The ratio of the end element size to the start element size can be defined for Curve, and a linearly varying mesh can be generated. A mesh, which symmetrically varies relative to the center of Curve, can be also defined.



MIDAS/FX+ also provides the Adaptive Seeding function, which conveniently allows the control of element sizes in complex models. The program automatically determines the distribution of nodes according to the geometric characteristics on the basis of a user-defined element size.



Adaptive Seeding



<Adaptive Seeding>

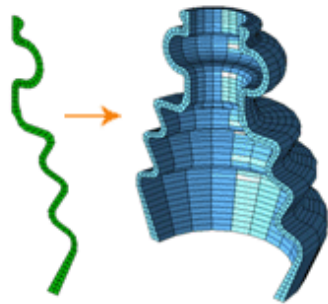
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**Mesh Generation**  
**Mesh Protrusion**

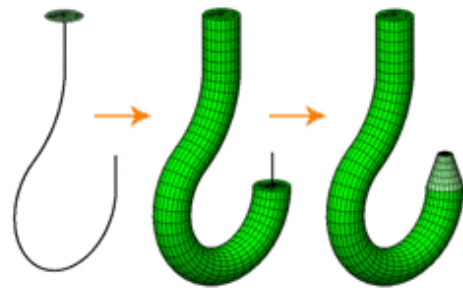
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MIDAS/FX+ provides various protrusion methods by which the user can manually generate meshes. MIDAS/FX+ allows protrusions of complex meshes including nodes and elements using a variety of geometry objects through advanced modeling methods.

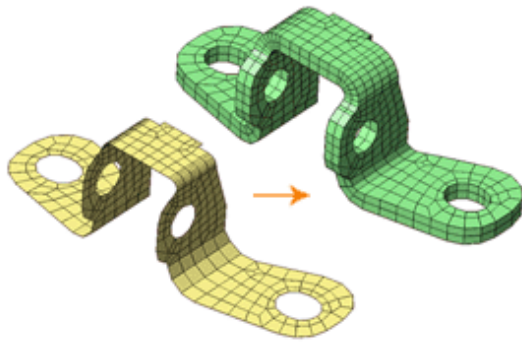
<b>Extrude</b>	Elements of a lower order element type are extruded in a straight line direction to create elements of a higher order type. Equal and unequal spaces are permitted. Nodes to 1D, 1D to 2D, Curve to 2D and 2D to 3D
<b>Revolve</b>	Elements of a lower order element type are extruded in a circular direction to create elements of a higher order type. <Method> Nodes to 1D, 1D to 2D, Curve to 2D and 2D to 3D
<b>Project</b>	Elements of a lower order element type are extruded by projection onto a curved or plane surface to create elements of a higher order type. <Method> Nodes to 1D, 1D to 2D, Curve to 2D, 2D to 3D and 3D to 3D
<b>Sweep</b>	Elements of a lower order element type are linearly extruded along a guide curve or a series of nodes to create elements of a higher order type. A Scale Factor, which will be applied to the size of elements during a Sweep operation, is permitted. <Method> Nodes to 1D, 1D to 2D, Curve to 2D and 2D to 3D
<b>Offset</b>	Elements of a lower order element type are extruded in a perpendicular direction to create elements of a higher order type. <Method> 1D to 2D, Curve to 2D and 2D to 3D
<b>Fill</b>	A space between two groups of elements of a lower order element type and same topology is filled in with higher order elements. <Method> Nodes to 2D, 1D to 2D, Curve to 2D and 2D to 3D



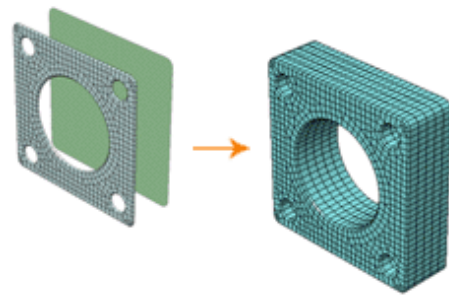
Revolve



Sweep

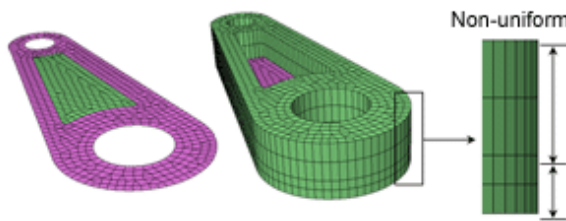


Offset

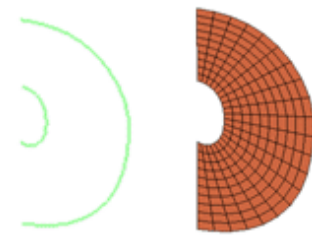


Project

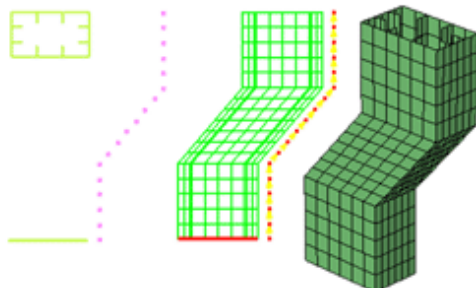
<Mesh Protrusion 1>



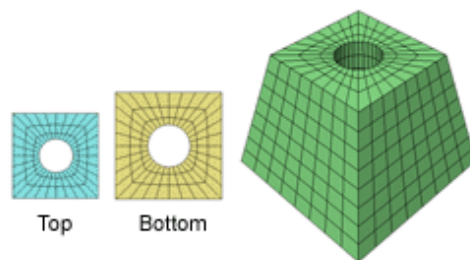
Extrude



Fill Between 1D



Extrude by Node Sequence



Fill Between 2D

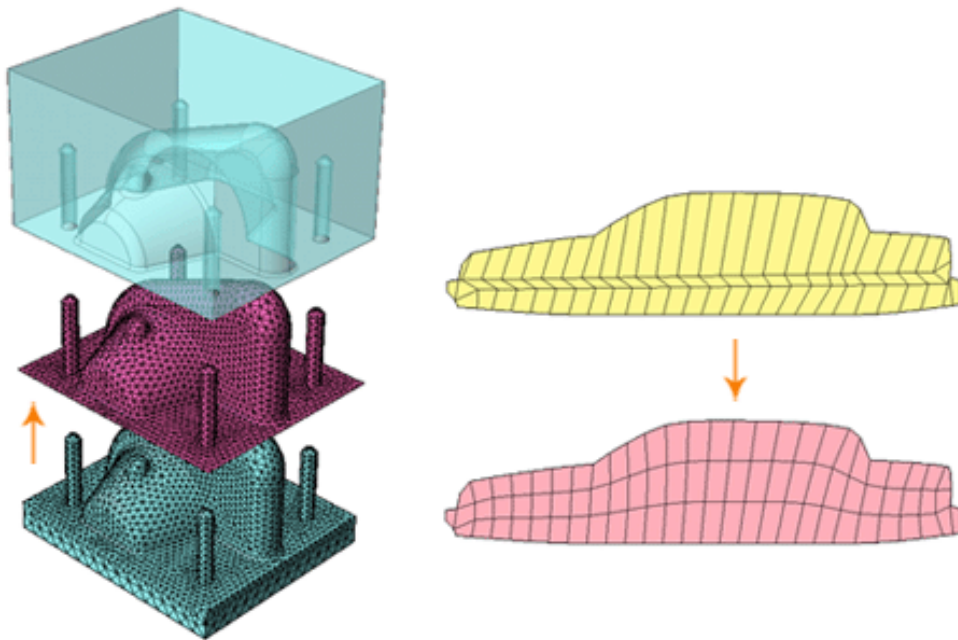
<Mesh Protrusion 2>

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**Geometry Modeling**  
**Mesh Manipulation**

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MIDAS/FX+ supports a variety of mesh manipulation and checking functionality. Especially, Contact elements can be extracted from the surfaces of solids of 3-D meshes. An option is provided to group extracted elements on the basis of the solids.

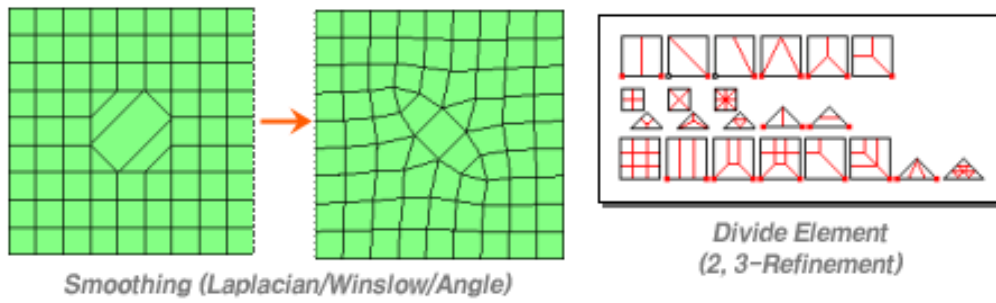


Extract 2D Mesh from 3D Mesh

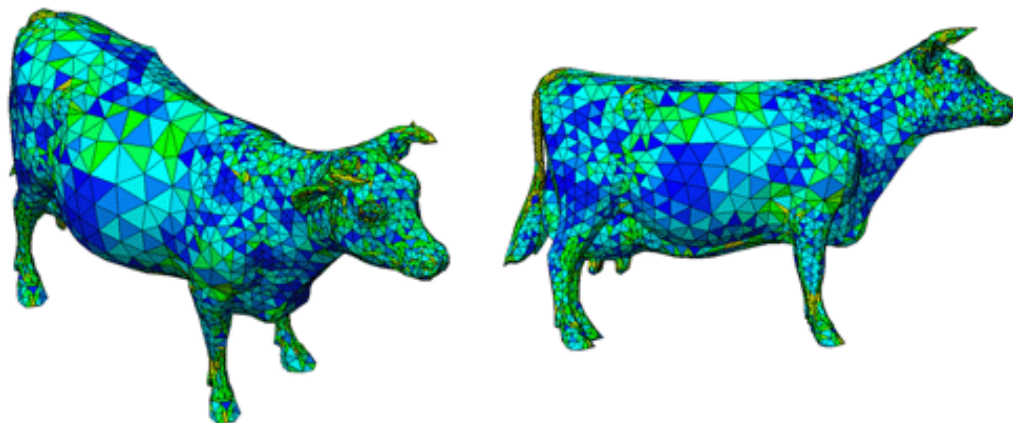
Mesh Smoothing (Laplacian/Winsow/Angle)

**<Mesh Manipulation>**

Other capabilities include: the Smoothing function, which optimizes manually created mesh shape by adjusting the locations of nodes; the Divide function, which divides elements in a specified pattern; and the connection function, which disconnects or connects the connectivity of elements.



MIDAS/FX+ retains features for visually checking Free Edges, Free Faces, etc. and the quality of meshes. Contour plots are produced for various element quality checks. Those elements, which do not reach the specified standards of quality, can be registered in a separate group.

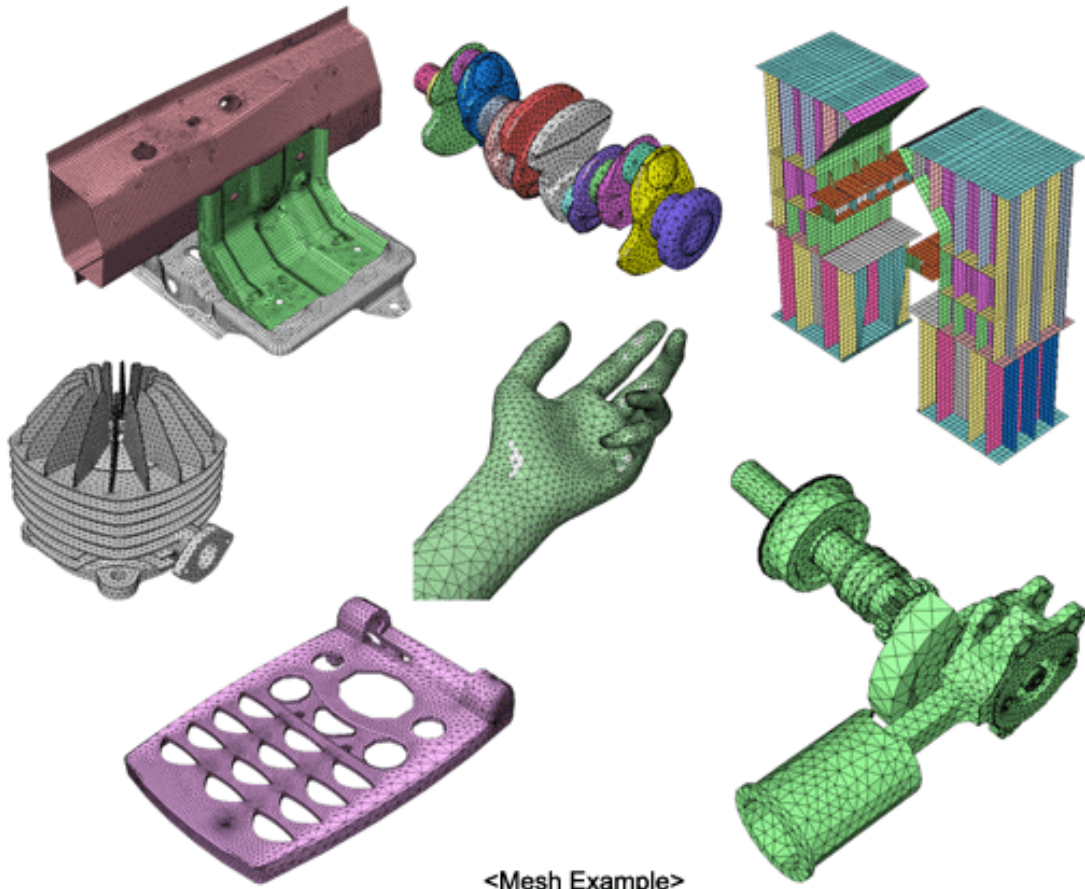


<Mesh Quality>

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Mesh Generation  
**Mesh Generation Examples**

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<Mesh Example>