

POLYGONALmeister
**Operation Guide
(Introduction)**

(ver.5.0.0)

POLYGONALmeister is software for editing and evaluating the shape represented by the triangle group.

This document explains the operation method for users who are new to POLYGONALmeister.

See also the "Quick Guide" on the "Help" tab.

For details on how to operate, see the following materials.

- "Operation Manual (Basic)"
Describes the entire POLYGONALmeister and explains the functions and operation methods of each command.
- "Operation Manual (Utilization)"
Explains the recommended usage for each application.
- "Manual" on the "Help" tab.
Explains the functions and operation methods of POLYGONALmeister in detail.

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Basic Operation of POLYGONALmeister

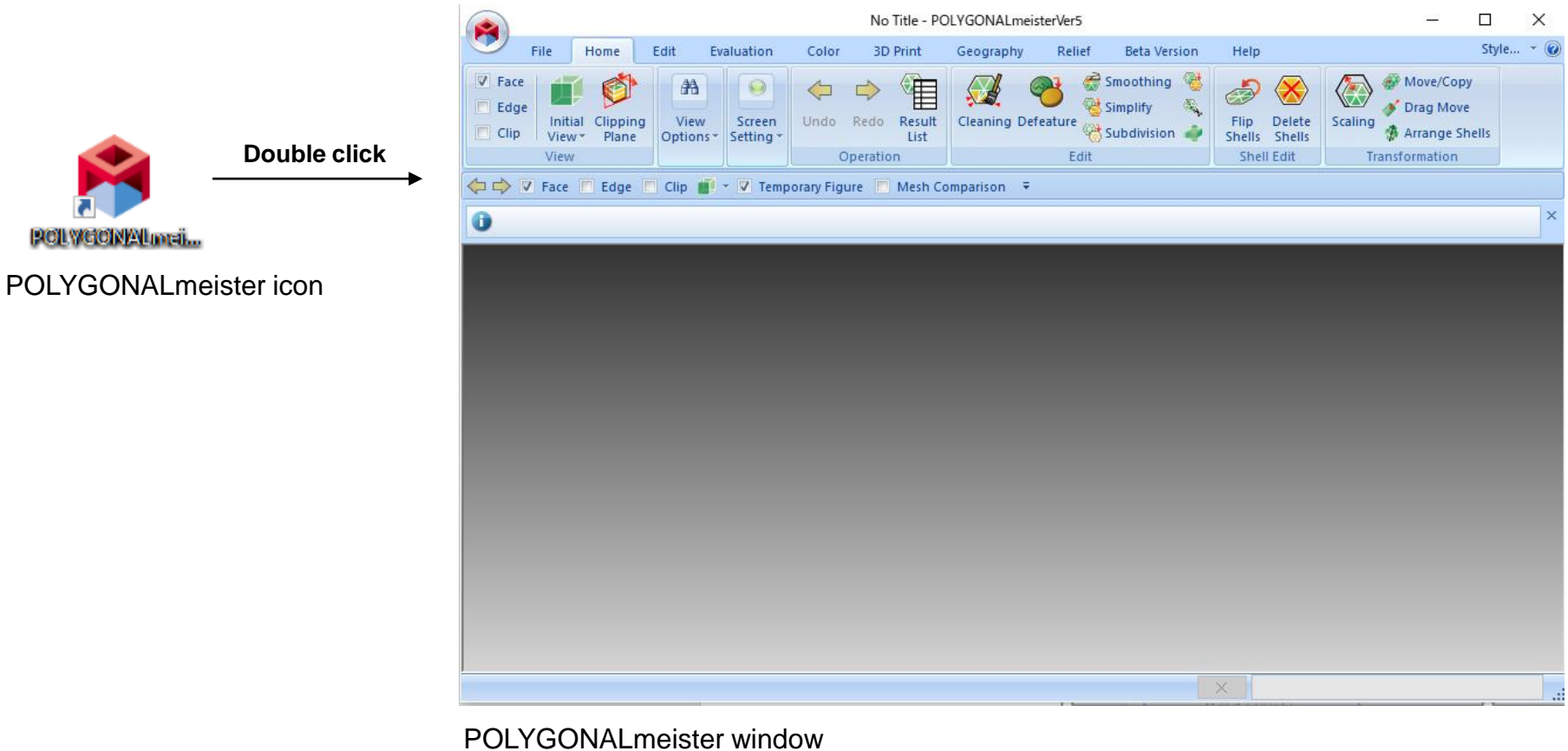
The basic operation method is explained through the following operations:

- (1) POLYGONALmeister startup
- (2) File import
- (3) Cleaning (correction of incorrect parts)
- (4) Simplification (reduction of polygons)
- (5) File export and Exit

(step-1) POLYGONALmeister startup

When POLYGONALmeister is installed, a POLYGONALmeister icon (left in the figure below) will be created on the desktop. Double-click this icon to start POLYGONALmeister. (You can also start from the list of installed applications by pressing the "Start" button.)

The POLYGONALmeister window on the right of the figure below appears.



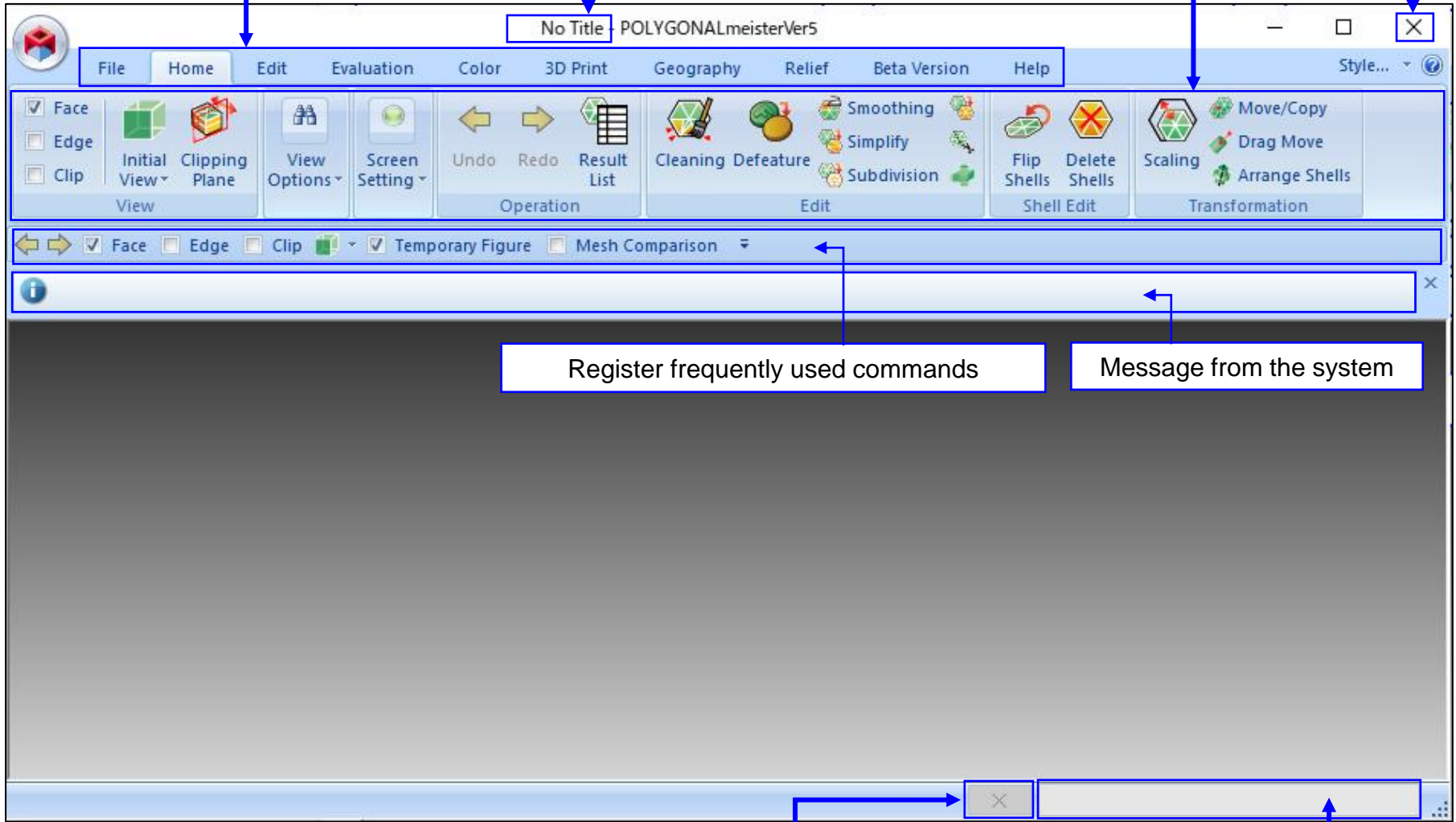
POLYGONALmeister window

Tabs (major classification of commands)

Name of imported file

Exiting POLYGONALmeister

Commands



Register frequently used commands

Message from the system

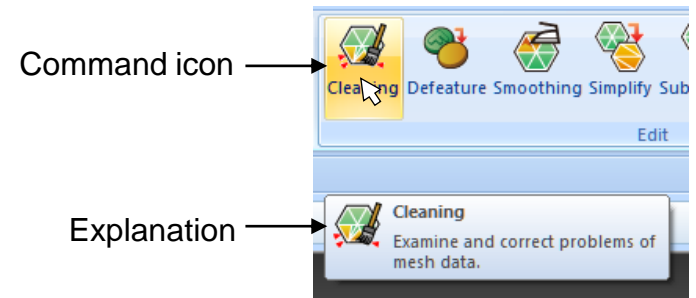
Button to stop processing the command

Display progress of processing

Command selection

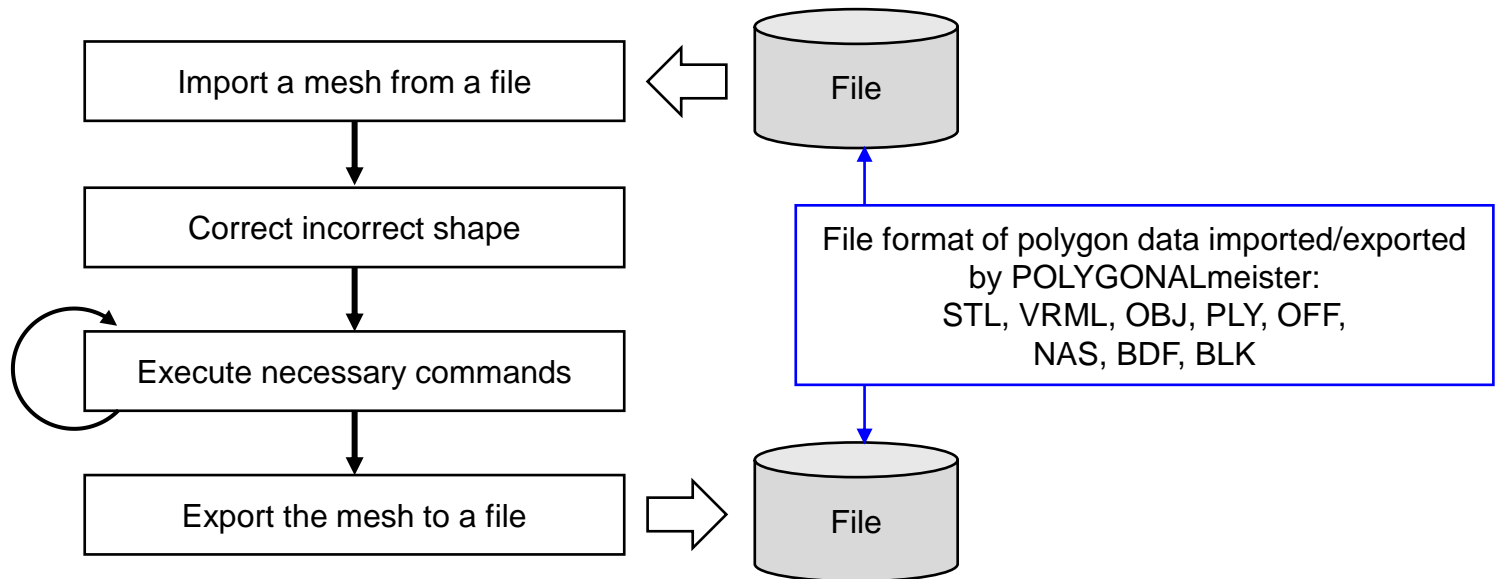
Switch "tab" and select "command".

If you move the mouse pointer over the "command" icon, an explanation of the command will be displayed.



The basic operation flow is as follows.

First, import a mesh (polygon data) from a file, repair any incorrect shape (using the "cleaning" command, etc.), and then execute necessary commands. Finally, export the mesh to a file.



(step-2) File Import

Reads a polygon data file such as STL.

(1) Click the "File" tab to display the file input/output commands.

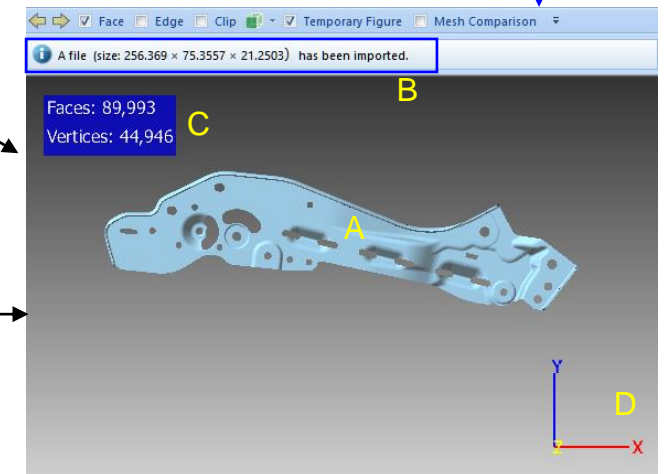
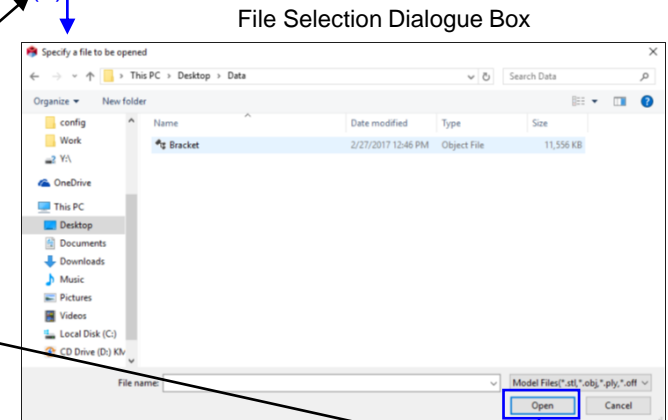
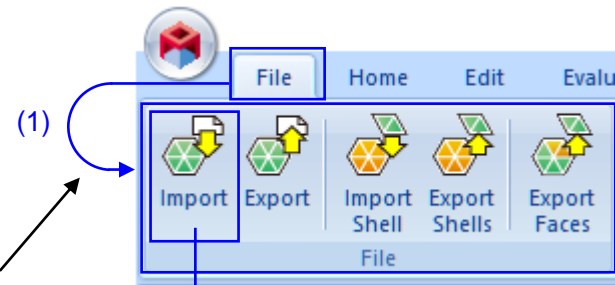
(2) Click "Import" to display a File Selection Dialogue Box.

(3) Select a file to be imported. And click "Open" button.

One or more external files can also be loaded by dropping them from the Explorer onto the graphic display area.

(4) When the file importing process is completed, the following information is displayed.

- A) Shape of the imported mesh
- B) Three-dimensional size of the mesh
- C) Number of faces and vertices
- D) A symbol that specifies the orientation of the coordinate system



Mouse operation

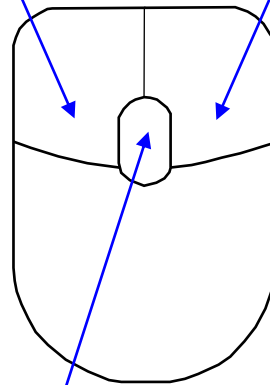
You can use the mouse to translate, rotate, and scale the displayed figure on the screen.

Left button

Click: Select command or figure
Drag: Draw a line
Ctrl + drag: Translate the displayed

Right button

Click: Change center of enlargement and center of rotation
Drag: Rotate the displayed figure



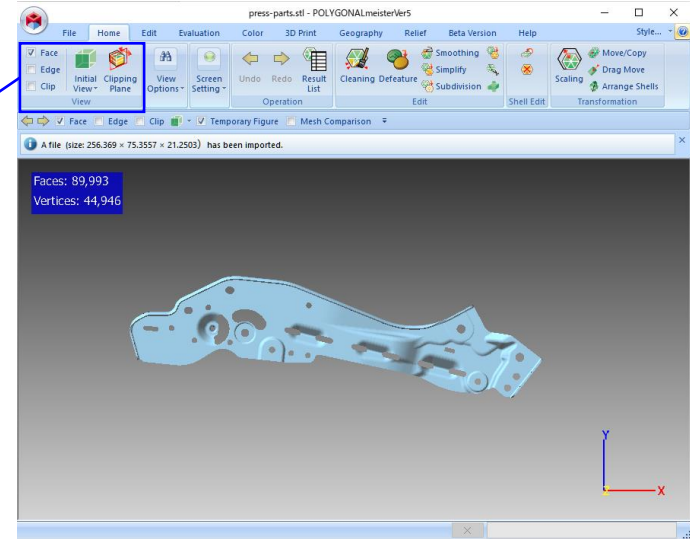
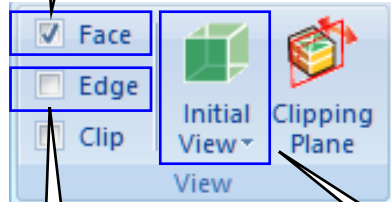
Mouse wheel

Rotation: Enlarge the displayed figure (PgUp/PgDn can be substituted)
Drag: Translate the displayed (Ctrl + drag can be substituted)
Ctrl + rotation: Move the clip plane (Ctrl + PgUp/PgDn can be used instead)

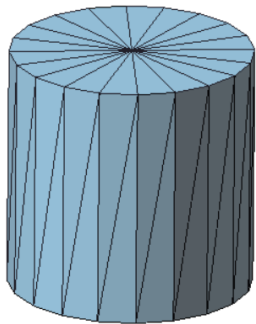
(Some mice do not have wheels, so an alternative operation method is available.)

Display state setting

Switches display/non-display of faces.



Switches display/non-display of edges.



Edge

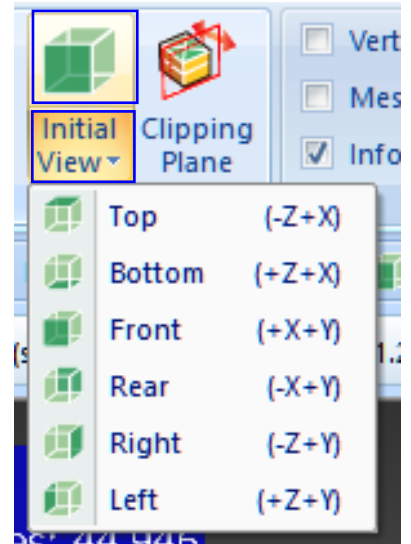


Edge

There are two buttons above and down.

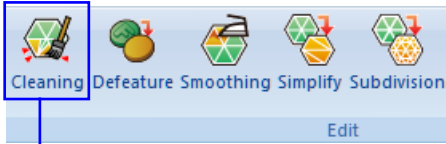
If you click the button above (the green rectangular parallelepiped is drawn), the line of sight changes to look from the Z+ direction.

By clicking the button below (character part), you can select the direction of the line of sight as another coordinate axis direction.



(step-3) Executing the „Cleaning“ command

“Cleaning” command inspects and repairs error(incorrect) area of the mesh.



Click "Cleaning" on "Home" tab

Cleaning

Inspection Items	Detection Qty	After Repair
<input type="checkbox"/> Reversed Faces	?	-
<input checked="" type="checkbox"/> Gap between Shells	?	-
<input checked="" type="checkbox"/> Tiny Faces	?	-
<input checked="" type="checkbox"/> Irregular Connection	?	-
<input checked="" type="checkbox"/> Holes	?	-
<input type="checkbox"/> Folded Faces	?	-
<input type="checkbox"/> Small Shells	?	-
<input type="checkbox"/> Overlapped Shells	?	-
<input type="checkbox"/> Self-Intersection	?	-

Display Result List

Inspect Repair

A window for selecting the inspection item and displaying the processing result appears.

Move the cursor over ? to display the explanation of the inspection item.

Overlapped Shells

Self-Intersection

Detect where faces meet each other shell. Display the intersection through the use of a temporary figure. Connected intersections are recognized as one line of intersection. The number of detected lines of intersection is displayed.

Cleaning

Inspection Items	Detection Qty	After Repair
<input checked="" type="checkbox"/> Reversed Faces	?	-
<input checked="" type="checkbox"/> Gap between Shells	?	-
<input checked="" type="checkbox"/> Tiny Faces	?	-
<input checked="" type="checkbox"/> Irregular Connection	?	-
<input checked="" type="checkbox"/> Holes	?	-
<input checked="" type="checkbox"/> Folded Faces	?	-
<input checked="" type="checkbox"/> Small Shells	?	-
<input checked="" type="checkbox"/> Overlapped Shells	?	-
<input checked="" type="checkbox"/> Self-Intersection	?	-

Display Result List

Inspect Repair

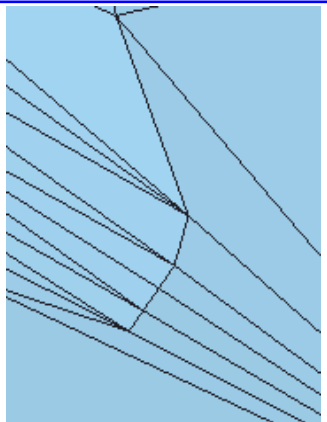
Check all inspection items and click "Inspect" button.

Cleaning

Inspection Items	Detection Qty	After Repair
<input checked="" type="checkbox"/> Reversed Faces	?	0
<input checked="" type="checkbox"/> Gap between Shells	?	0
<input checked="" type="checkbox"/> Tiny Faces	?	5
<input checked="" type="checkbox"/> Irregular Connection	?	1
<input checked="" type="checkbox"/> Holes	?	5
<input checked="" type="checkbox"/> Folded Faces	?	1
<input checked="" type="checkbox"/> Small Shells	?	0
<input checked="" type="checkbox"/> Overlapped Shells	?	0
<input checked="" type="checkbox"/> Self-Intersection	?	2

Display Result List

Inspect Repair



The errors are repaired and the number of errors of the repaired data is displayed.

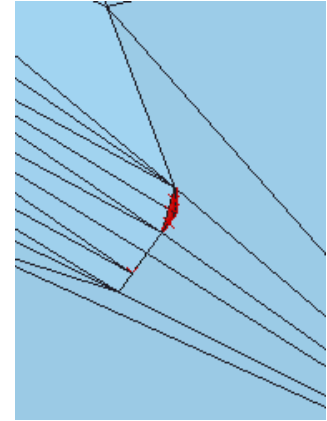
Click „Repair“ button

Cleaning

Inspection Items	Detection Qty	After Repair
<input checked="" type="checkbox"/> Reversed Faces	?	0
<input checked="" type="checkbox"/> Gap between Shells	?	0
<input checked="" type="checkbox"/> Tiny Faces	?	5
<input checked="" type="checkbox"/> Irregular Connection	?	1
<input checked="" type="checkbox"/> Holes	?	5
<input checked="" type="checkbox"/> Folded Faces	?	1
<input checked="" type="checkbox"/> Small Shells	?	0
<input checked="" type="checkbox"/> Overlapped Shells	?	0
<input checked="" type="checkbox"/> Self-Intersection	?	2

Display Result List

Inspect Repair



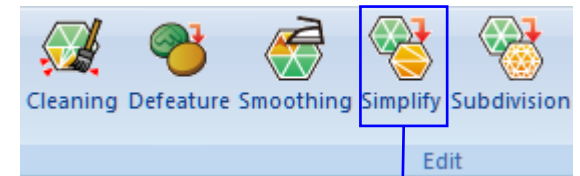
The number of detected errors is displayed.

The detected errors are displayed in red.

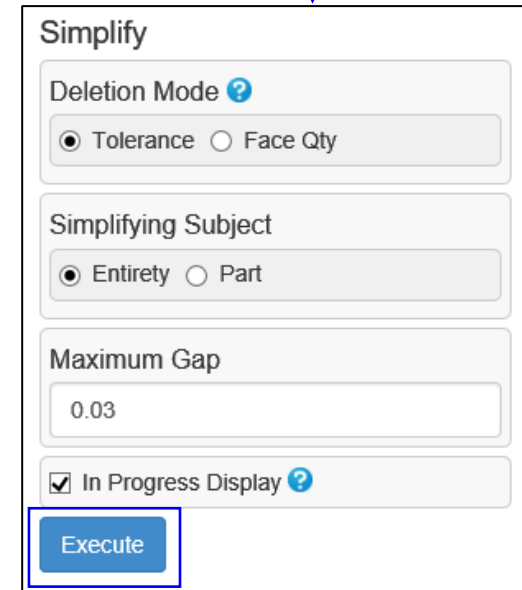
(step-4) Executing the „Simplify“ command

“Simplify” command reduces the number of faces in the mesh (to keep the mesh from deforming as much as possible).

Click “Execute” button to start the process. You can see how the number of faces gradually decreases.



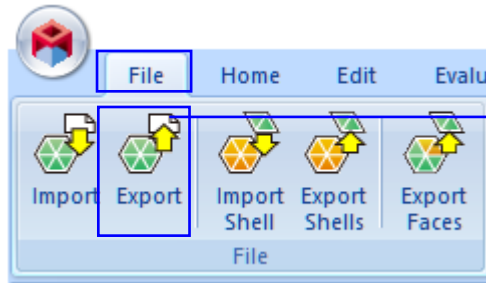
Click “Simplify” command on “Home” tab



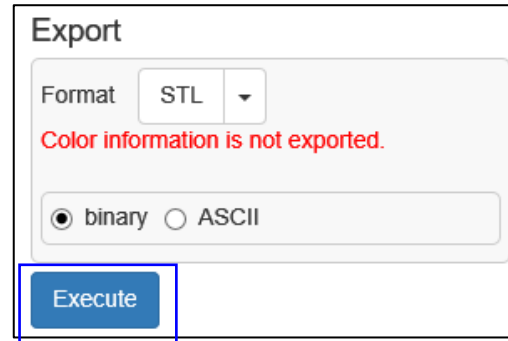
89,992 faces

8,952 faces

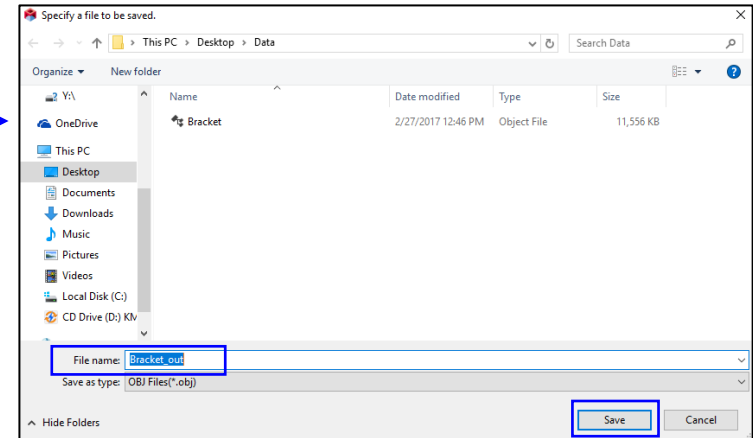
(step-5) File export and Exit



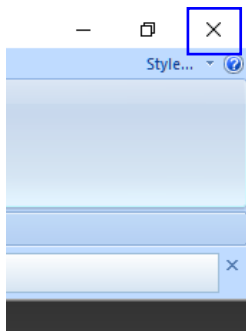
Click "Export"
command on the
"File" tab



Click "Execute" button



Enter the file name and click "Save"
button to export the mesh to a file.



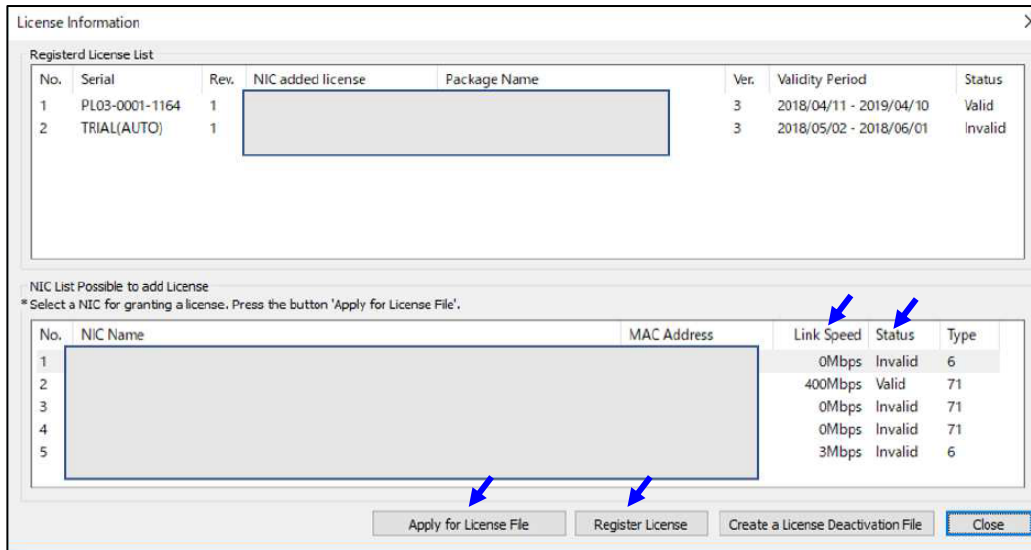
If you click "x" (close) at the top right of the window,
POLYGONALmeister will end.

Registration of POLYGONALmeister License

This section describes how to register the POLYGONALmeister license.

Registration of License

1) Creating a license application file



Click "License" on the "Help" tab. The dialog as shown below will be displayed.

Click the line with the fastest link speed among the valid lines in the table below, and click the "Apply for License File" button.

A file-save dialog is displayed, and the name "PC name _ PC identification information.pmpci" is set in the file name. Do not change the file name. Save the "license application file" in an arbitrary place with the save button.

2) Send the license application file

Send "License application file" to

pm_license_request@ml.excel.co.jp

as an attachment to an e-mail with the following information in the mail body:

Company name (unnecessary in the case of individuals), Affiliation (unnecessary in case of individuals), Name, Contact (phone number etc.)

We will send "license file" by e-mail normally within 3 to 5 business days.

3) Register the license file in POLYGONALmeister

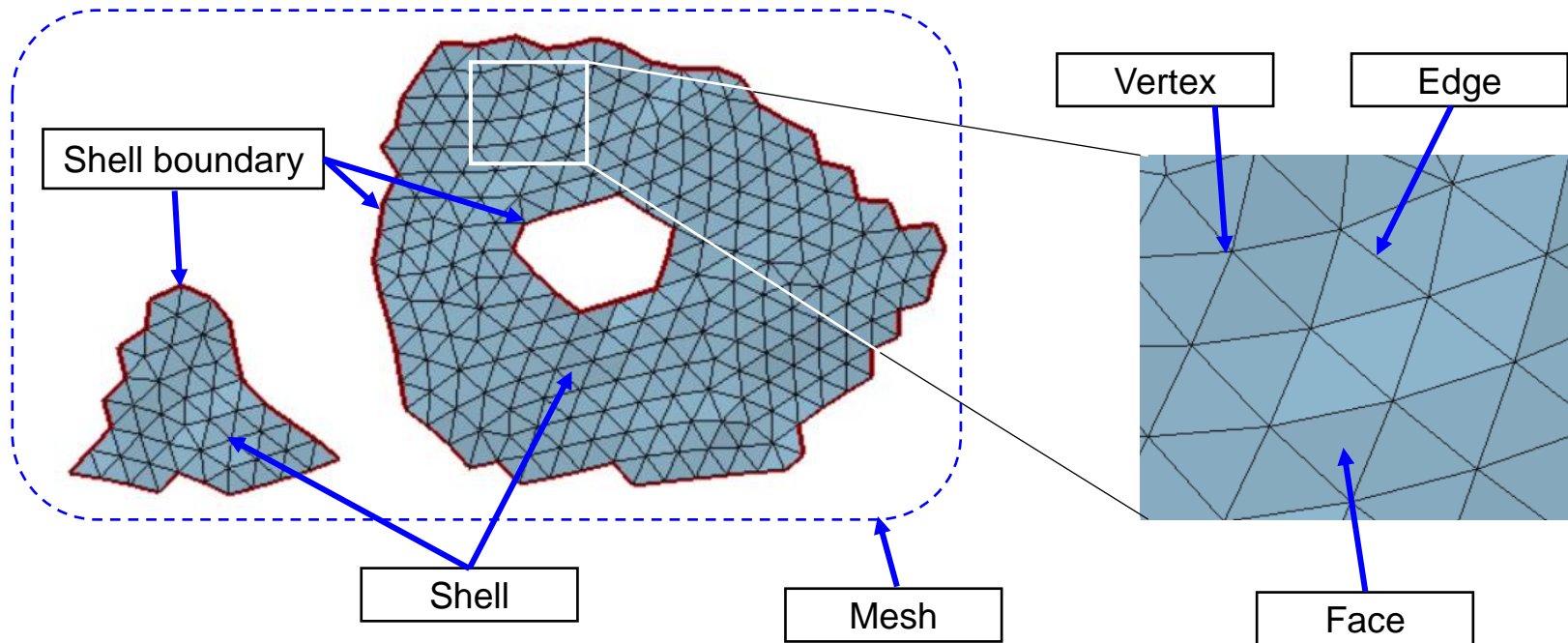
Click the "Register License" button, select the received license file, and click "Open".

Restart POLYGONALmeister and check that the license is registered in the "License" command table. For details on the license registration operation, click the "License Guide" command on the "Help" tab and refer to the document that appears.

Terms Expressing Shapes

This section explains the basic terms used in the forms used in the POLYGONALmeister.

Terms Expressing Shapes



[Mesh] = The whole set of triangles

[Shell] = A collection of connected (sharing edges with adjacent triangles) triangles

[Shell Boundary] = Lines around a shell or lines around a hole in a shell

[Face] = A triangle that composes a mesh

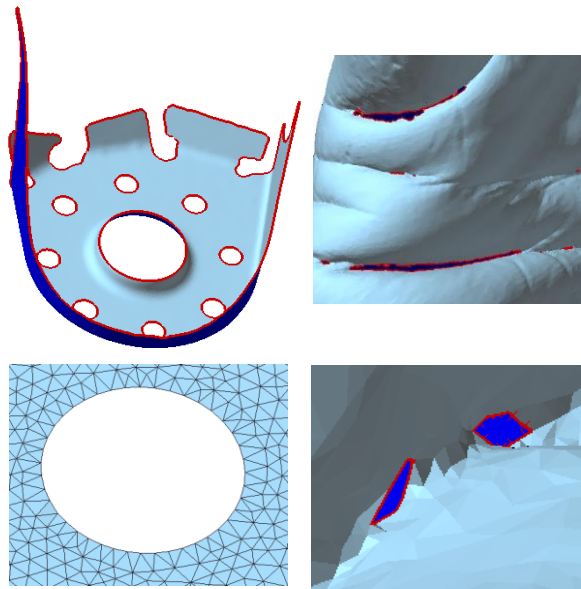
[Edge] = a side of a triangle

[Vertex] = triangle vertex

Hole

There are three types of mesh holes handled by POLYGONALmeister.

Hole

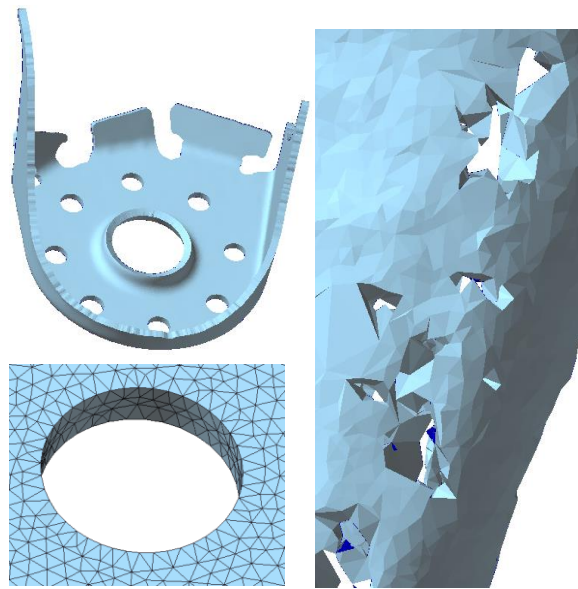


A hole(missing faces) in the surface of the mesh, also called a shell boundary.

Holes in the sheet parts.
Or missing faces that exists because the light does not reach in the optical measurement.

To fill holes, use the "Fill Holes", "Cleaning (holes)", and "Defeature" commands.

Through Hole

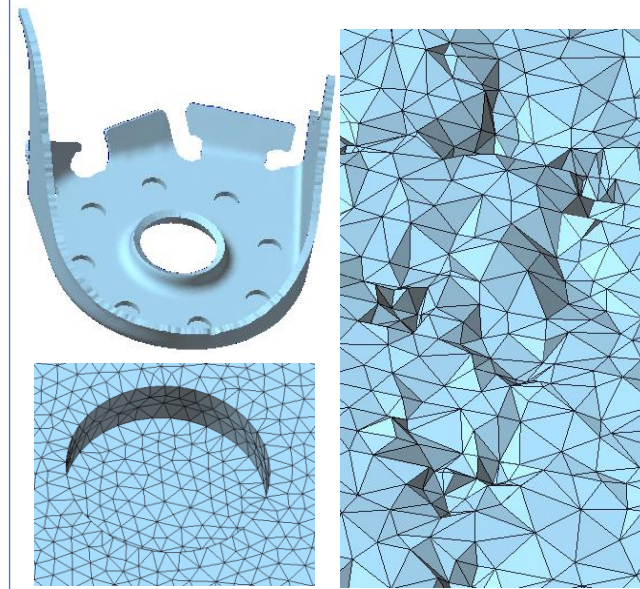


A hole that penetrates into a solid.

Holes for mechanical parts for bolting.
Or holes that exist when the model is thin in CT measurement.

To fill through holes, use the "Fill Caves", and "Defeature" commands.

Blind Hole



A dent on the mesh surface.

Dent holes in mechanical parts.
Or dents due to a rough measurement surface.

To fill blind holes, use the "Fill Caves", and "Defeature" commands.

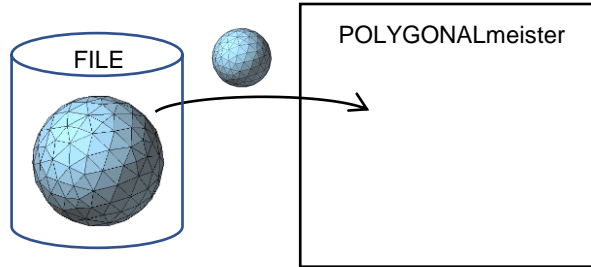
POLYGONALmeister ver.5 Command

The commands of POLYGONALmeister ver.5 are explained for each tab.

File Tab

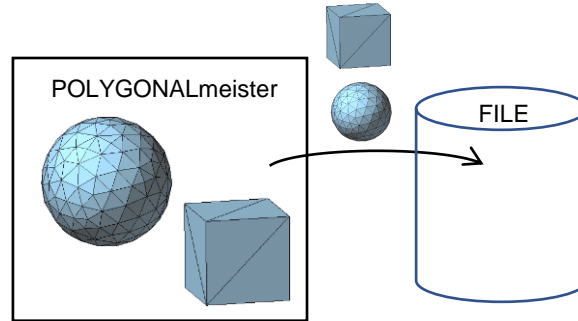
Import

Read polygon data from an external file.



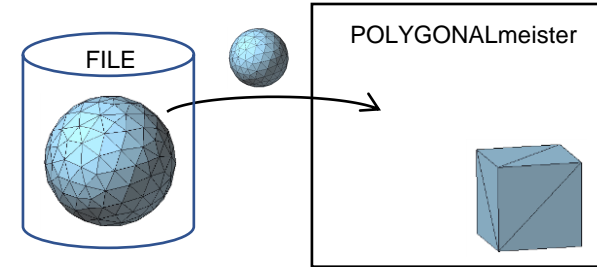
Export

Export the mesh to an external file.



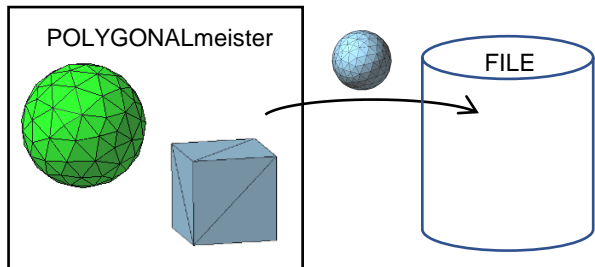
Import Shell

Add the polygon data of the external file to the mesh as shells.



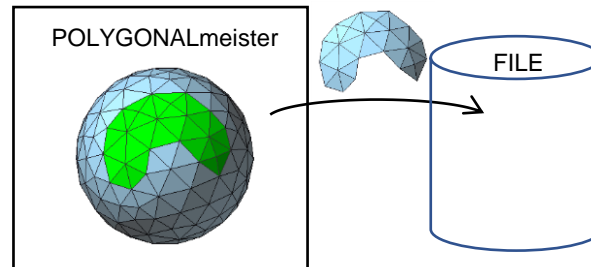
Export Shells

Write the specified shell to an external file.






Export Faces

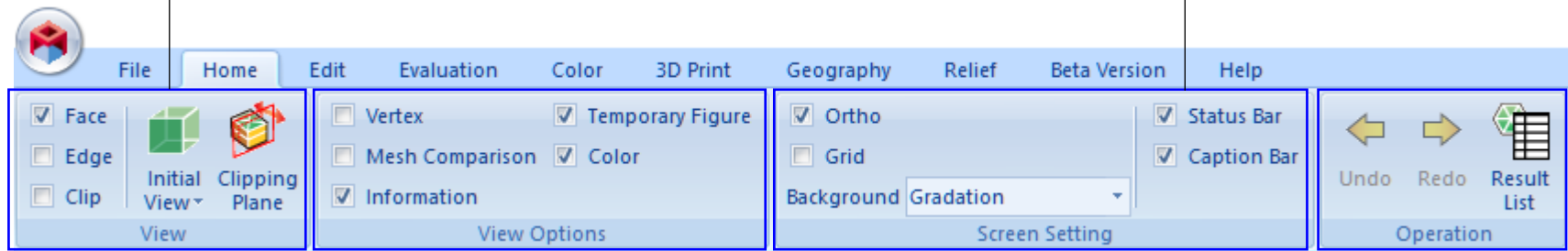
Write the specified faces to an external file.



Home Tab

[Face] Check in order to display a face.
[Edge] Check in order to display an edge.
[Clip] Check in order to hide the figure in front of the clipping plane and display the interior of a solid, and thus display the internal side of a solid.
[Initial View] Click  in order to retrieve the display status when the file was imported. Click  in order to enable a display in accordance with the direction of selected coordinate axis.
[Clipping plane] Click  in order to set a plane perpendicular to the visual line direction as a clipped surface.

[Ortho] Display method of the figure between parallel projection (checked) and single point perspective projection (unchecked) can be switched.
[Grid] If checked, a line parallel to the X and Y axes is displayed in the XY plane, and a red sphere indicating the origin position is displayed.
[Background] You can change the background color of the figure display area. Please select from gradation/black/white/gray.
[Status bar] Hide the process stop button and the progress display area at the bottom of the screen.
[Caption bar] Hides the system message display area.



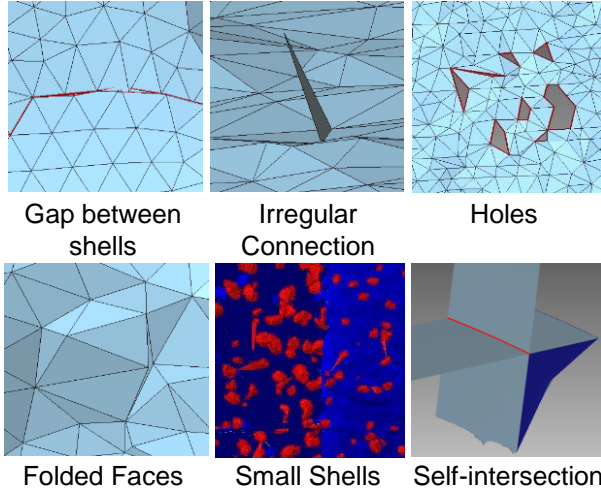
[Vertex] Check in order to display vertices.
[Mesh Comparison] Check in order to divide the figure display area into two: mesh before processing or the external file on the left; and the current mesh on the right.
[Information] Check in order to display in the figure display area face qty, vertex qty and coordinate axes.
[Temporary Figure] Check/uncheck in order to display/hide temporary figures such as command execution results.
[Color] Check/uncheck in order to enable display/non-display status of color assigned to faces.

[Undo] The mesh returns to the state before the previous operation was executed (before the command that involves changing the shape).
[Redo] Cancel "Undo" to return to the state after execution.
[Result list] Click to display the dialog for managing the saved temporary figures.

Home Tab

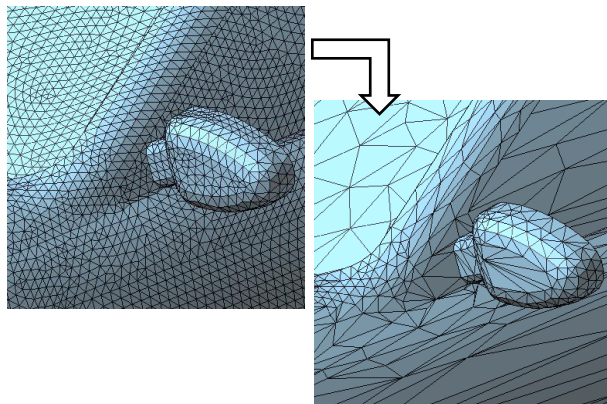
Cleaning

Inspect and repair incorrect parts of the mesh.



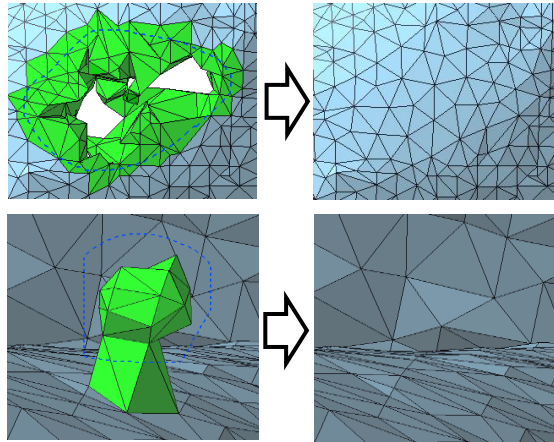
Simplify

Reduce the number of faces in the mesh (to keep the mesh from deforming as much as possible).



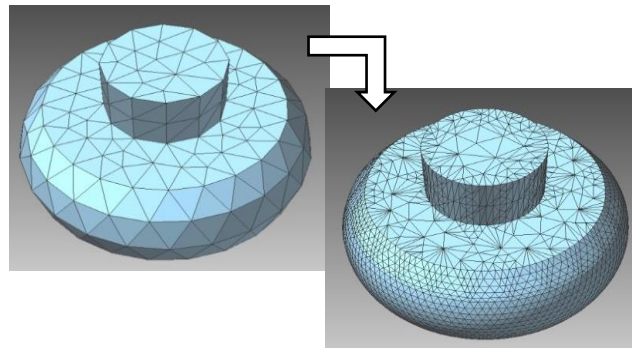
Defeature

Remove through holes, blind holes, dents, protrusions, self-intersections, etc.



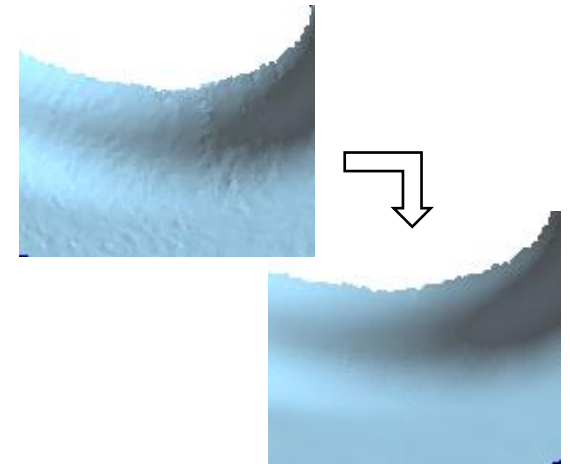
Subdivision

Approximate the mesh to a smooth curved surface and divide the face into small pieces so that it fits on the curved surface. The mesh will be smooth.



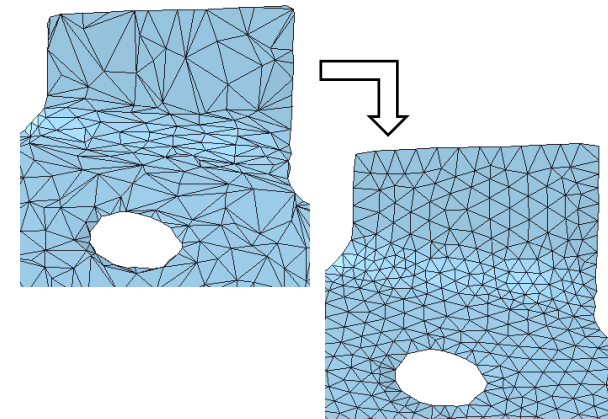
Smoothing

Make smooth by removing fine irregularities on the surface of the mesh.



Remesh

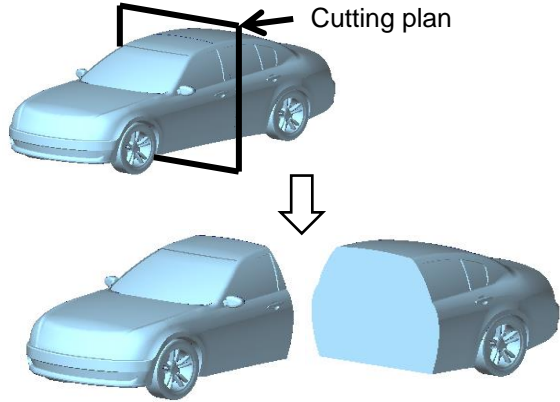
Reconstruct the mesh so that the faces are close to equilateral triangles.



Home Tab

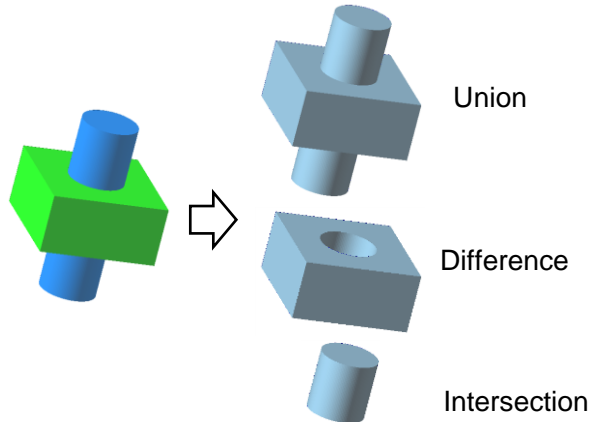
Cut

Cut the mesh with a plane. You can remove one side of the cut or leave both sides.



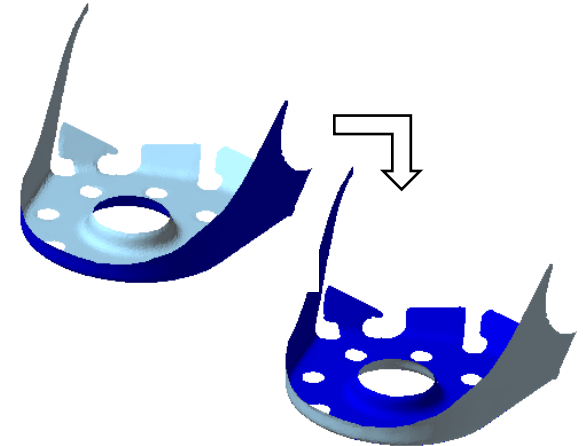
Boolean Operation

Create union / difference / intersection of two shells.



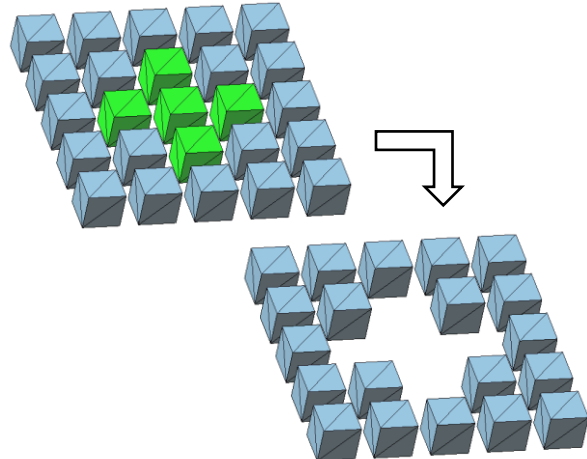
Flip Shells

Flip the front and back sides of the specified shells.



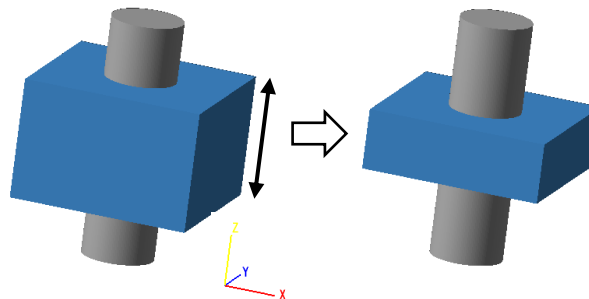
Delete Shells

Delete the specified shells.



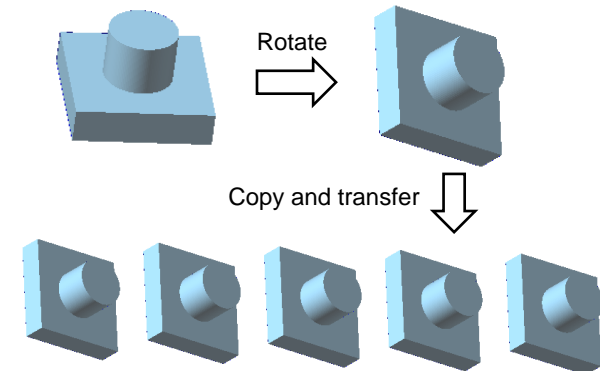
Scaling

Scale the entire mesh or individual shells. You can also change the enlargement ratio for each coordinate axis direction.



Move / Copy

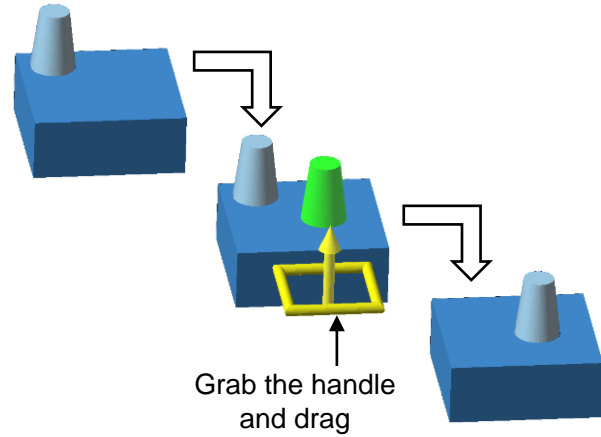
Parallel, rotate, and mirror move the entire mesh, shells, and faces. You can also make copies and place them.



Home Tab

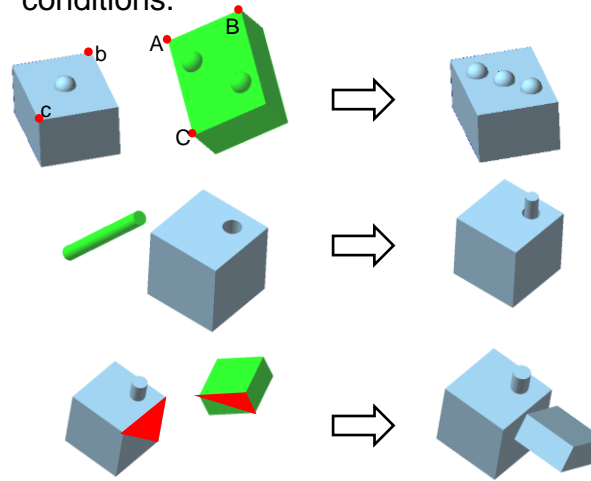
Drag Move

Shells can be moved along a straight line or on a plane by dragging.



Arrange Shells

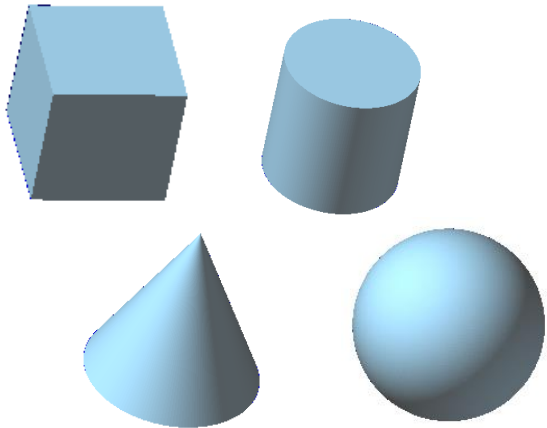
Arrange shells according to various conditions.



Edit Tab

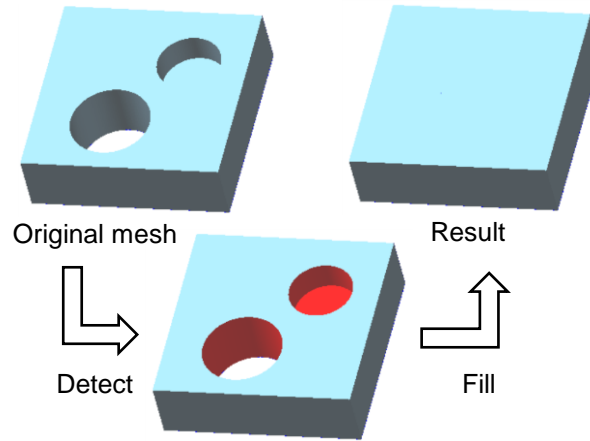
Primitive Solid

Create a cuboid, cylinder, cone or sphere shell.



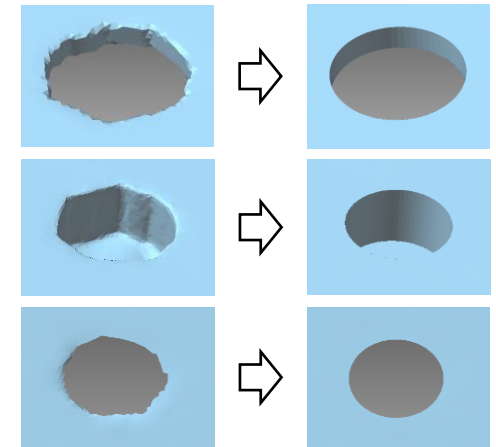
Fill Caves

Detect through holes and blind holes, and fill them.



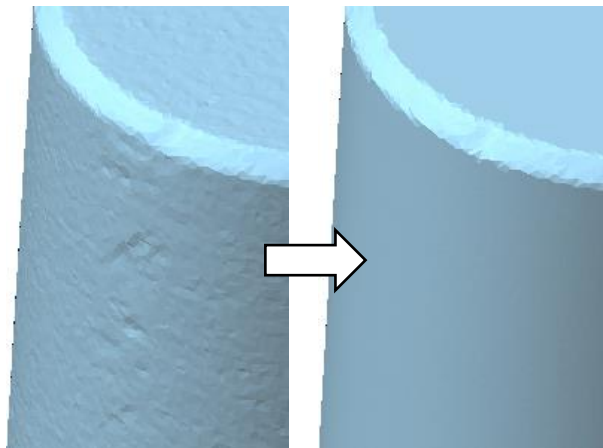
Reshape Hole

Compensate for the irregularities in a hole (through hole, blind hole, and hole in a shell) to round.



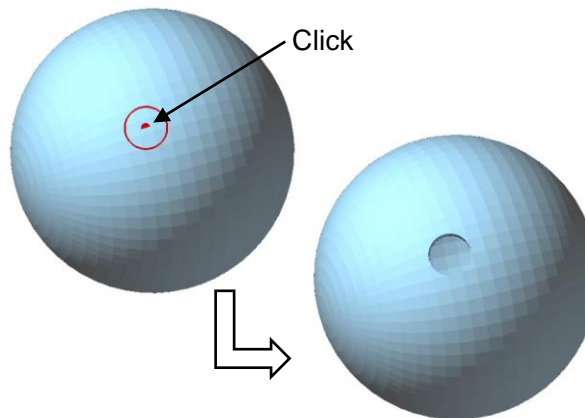
Make Flat / Cylindrical

The specified area is reshaped into a flat or cylindrical surface.



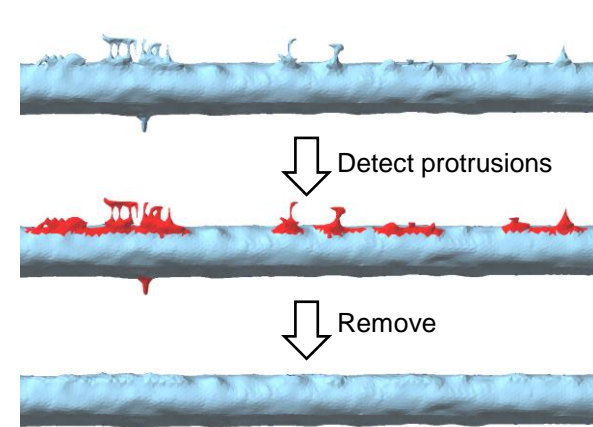
Through Hole

A circular through hole with the specified diameter is made at the clicked position.



Remove Protrusion

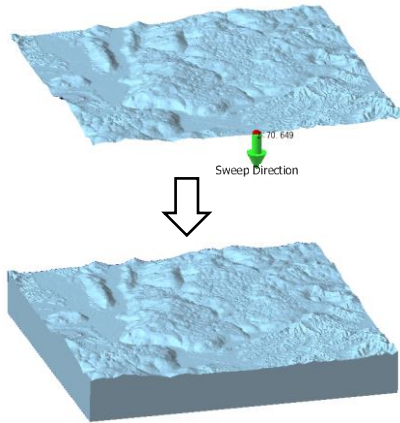
Detect protrusions of a mesh and remove them.



Edit Tab

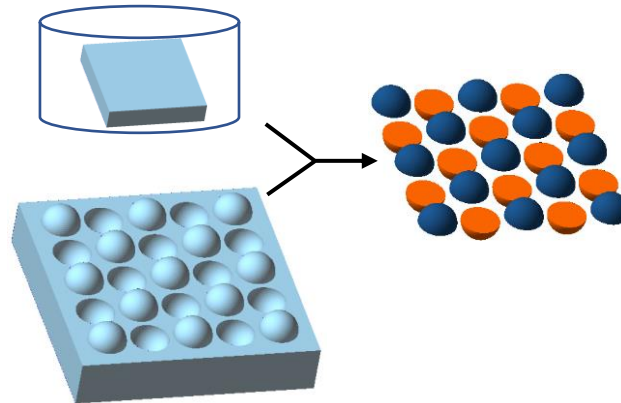
Projection Solid

Sweep the open shell to a flat surface to create a solid shell.



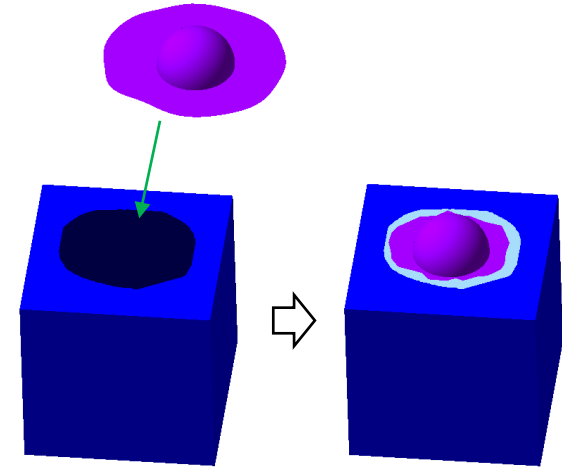
Difference Solid

Create the difference between the mesh and the polygon data of an external file as shells.



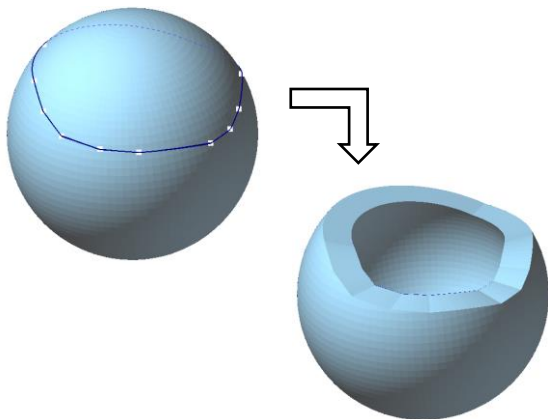
Transplant

Embed another shell in the hole.



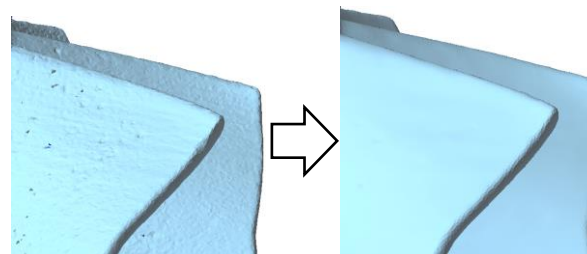
Loop Cut

Cut the mesh with the closed polyline drawn on the mesh.



Reshape CT Mesh

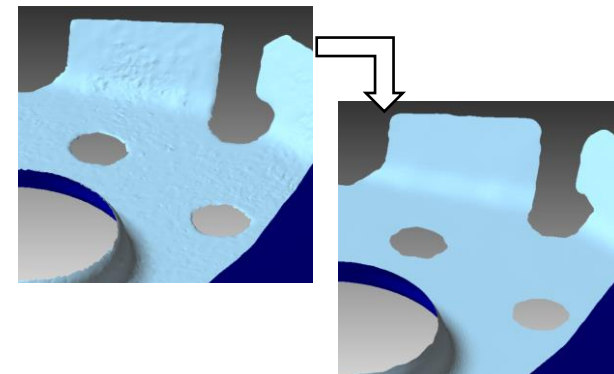
Repair the irregular part of the mesh derived from CT measurement, smooth the mesh, and remesh the faces to be close to equilateral triangles.



Irregular connection:	6,081	⇒	0
Folded faces:	180	⇒	0
Self-intersection:	942	⇒	0

Reshape Optical Mesh

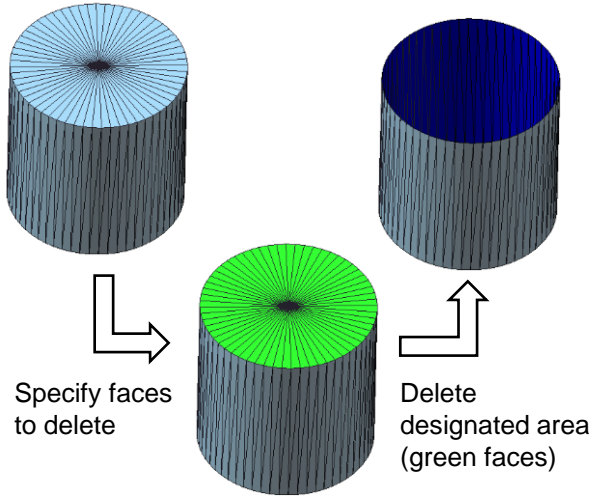
Repair the irregular part of the mesh derived from optical measurement, smooth the mesh, and remesh the faces to be close to equilateral triangles.



Edit Tab

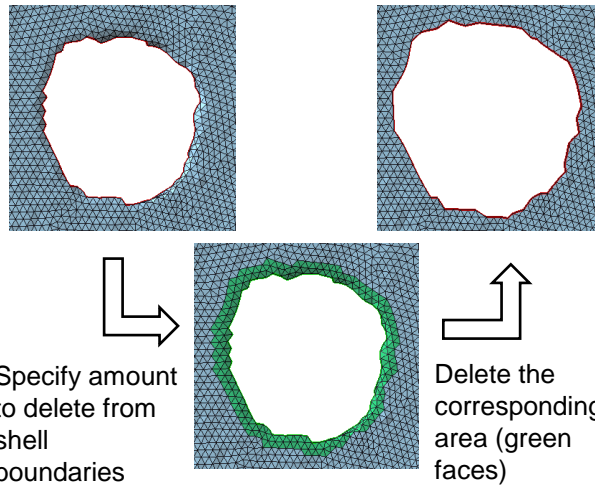
Delete Faces

Delete the specified faces.



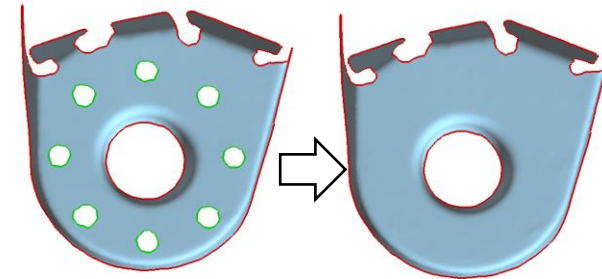
Delete Boundary Faces

Delete faces near the shell boundary.



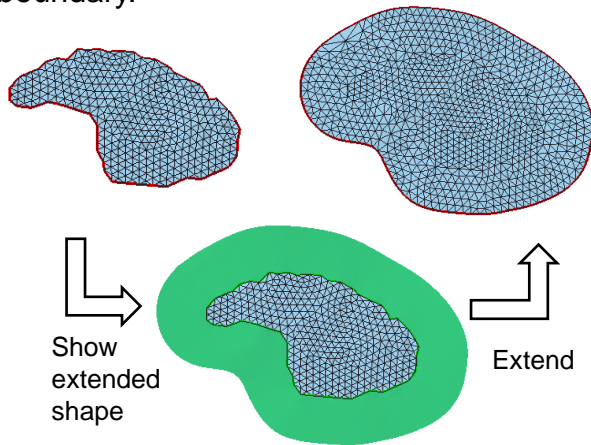
Fill Holes

Fill the holes on the mesh surface.
(In order to fill through holes, use the "Defeature" or "Fill Caves" command)



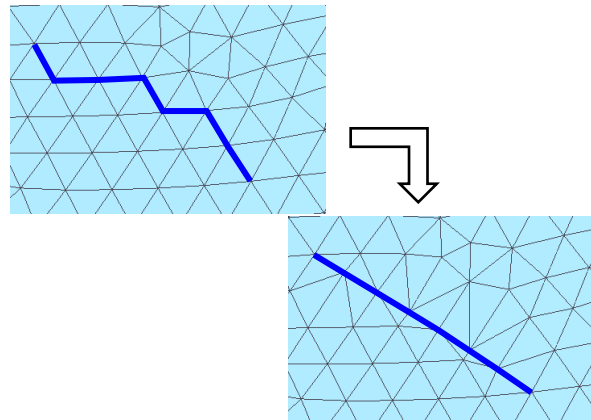
Extension

Extend the mesh smoothly at the shell boundary.



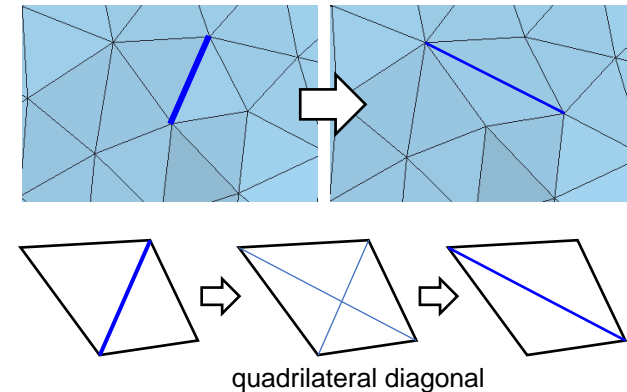
Align Vertices

Adjust the positions of the vertices so that the edge strings are connected smoothly.



Flip Edge

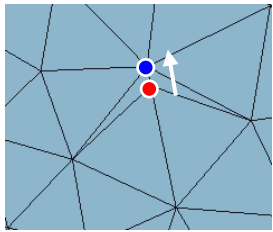
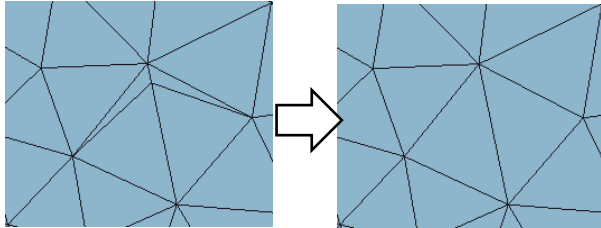
Replace the edge using the quadrilateral diagonal formed by two triangles on either side of the edge.



Edit Tab

Merge Vertices

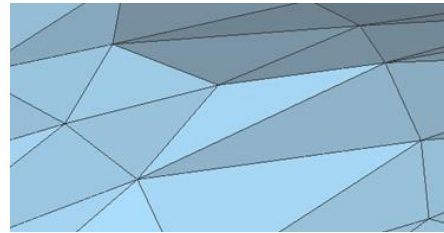
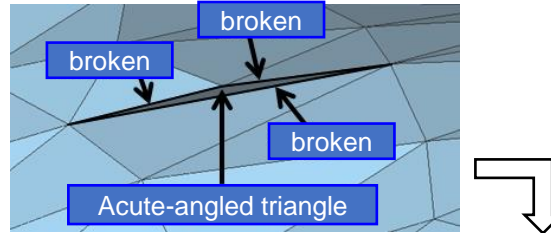
Move a vertex to its adjacent vertex, and combine the two vertices into one vertex.



Move red vertex to blue vertex, and combine the two vertices into one.

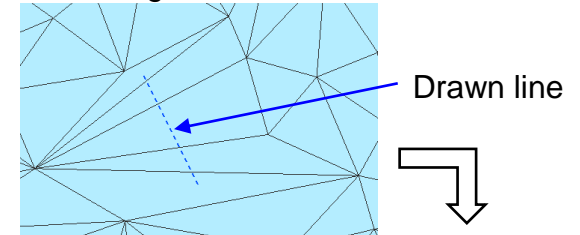
Remove Acute Triangles

Detects acute triangles and removes them.

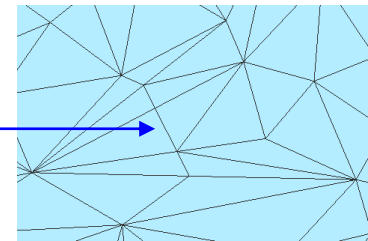


Divide Faces

Faces are divided at the intersection of their edges and the drawn line.



Edges are created at the position of the drawn line.



Evaluation Tab

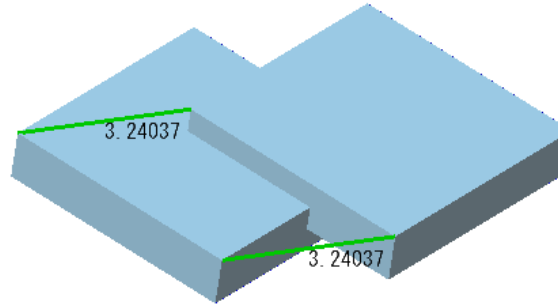
Property

The following features related to the shape of the mesh are displayed.

- Surface area, Volume
- Center of gravity
- Size(Length of the range where the mesh exists in each coordinate axis direction)
- Number of shells
- Number of shell boundaries
- Average / Maximum / Minimum edge length

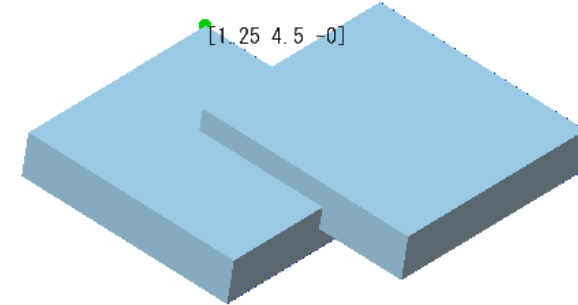
Distance

Measure the distance between the two vertices.



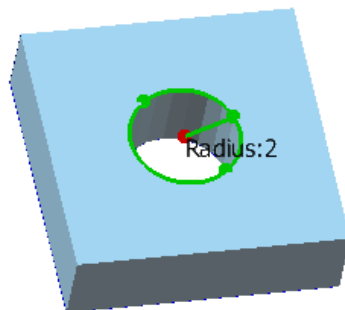
Coordinates

The coordinate value of the specified vertex is displayed.



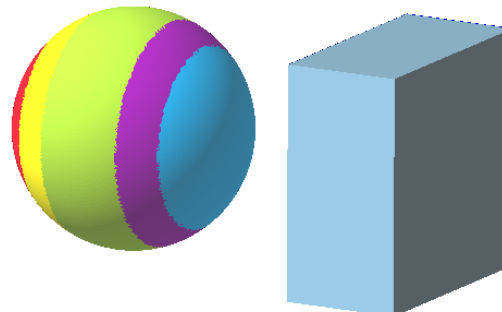
Circle radius

Calculate the radius, diameter, and center coordinate values of the circle passing through three vertices.



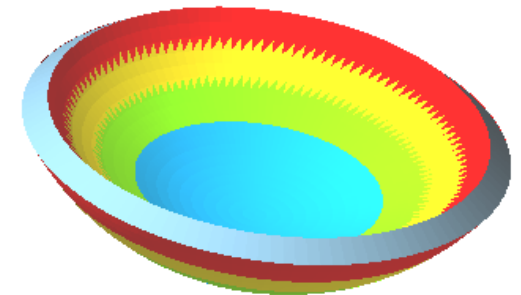
Distance Contour

The distance between two figures (between shells / before and after processing / polygon data in the external file and mesh) is painted with a color according to the distance for each face.



Thickness Inspection

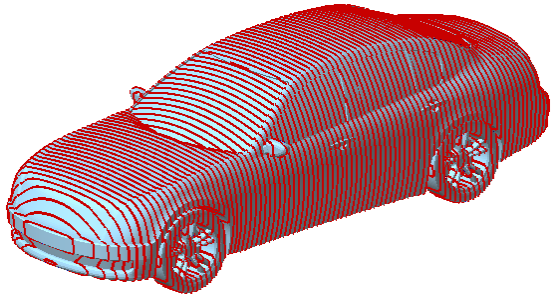
The color map of the mesh thickness is displayed.



Evaluation Tab

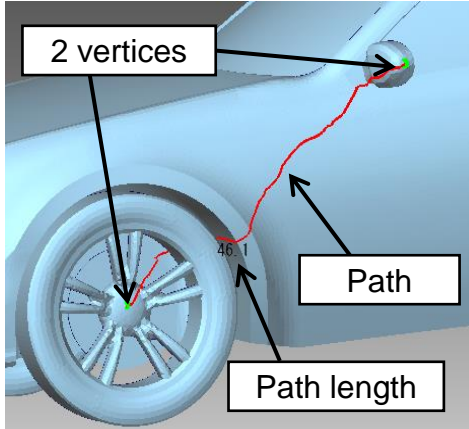
Display Section Lines

Display intersections between the mesh and planes.



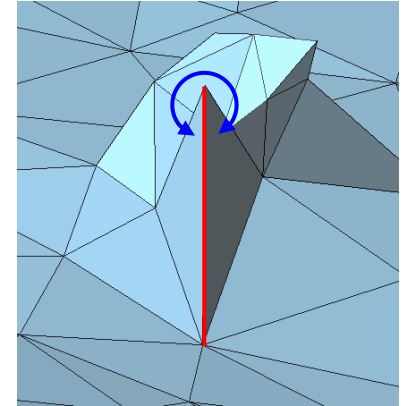
Find Path

Display the shortest path (edge string) that connects two vertices by following an edge.



Crease Detection

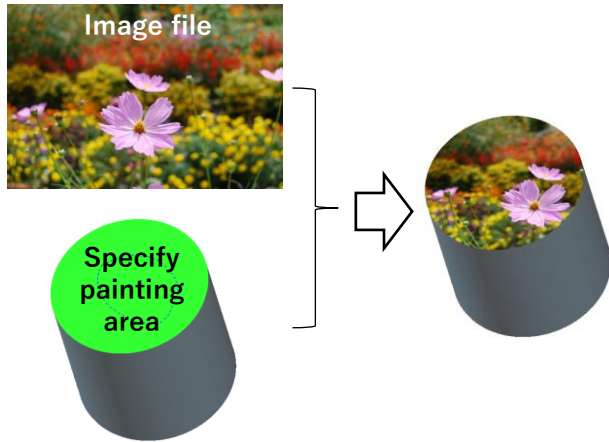
Detect edges that are bent more than the specified angle.



Color Tab

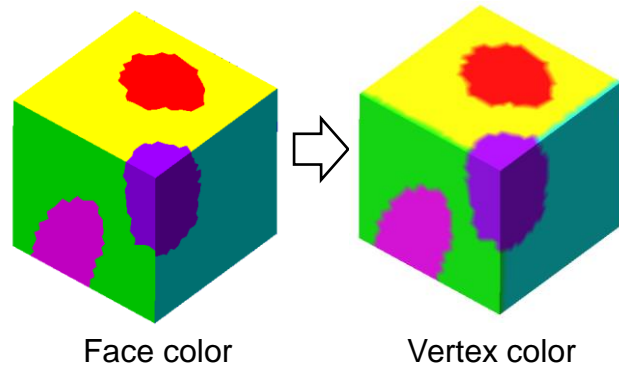
Fill Color

Add colors (texture, face color, vertex color) to faces.



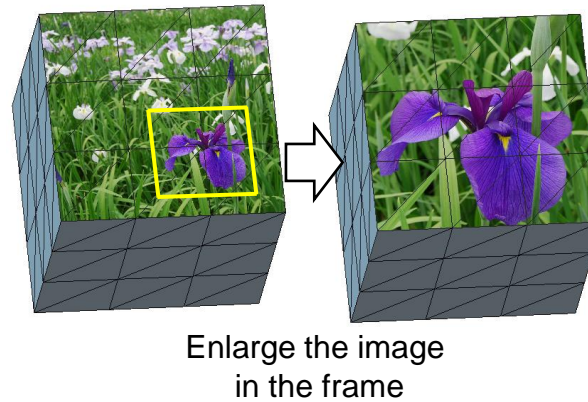
Convert to Vertex Color

Change the "texture" or "face color" on the mesh to "vertex color".



Texture Alignment

Change the area of the texture image referenced by the faces.



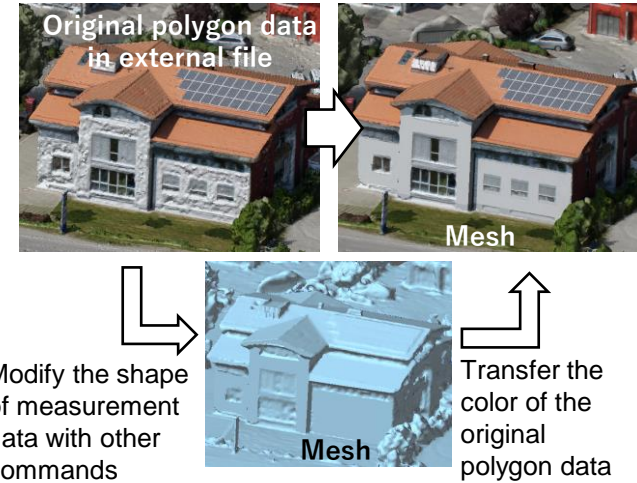
Segmentation

Divide the mesh into multiple color-coded areas based on shape feature.



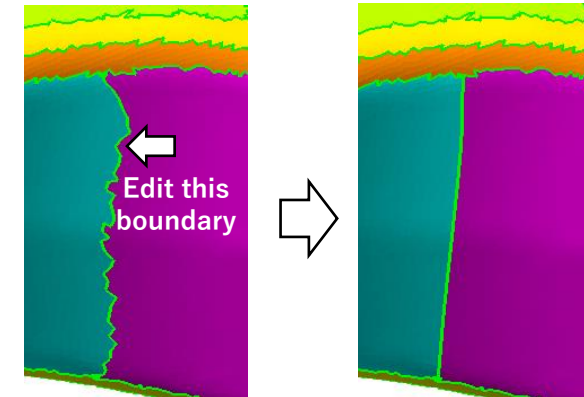
Transfer Color

Paste the color of the polygon data in the external file on the mesh as a texture.



Edit Segment Boundary

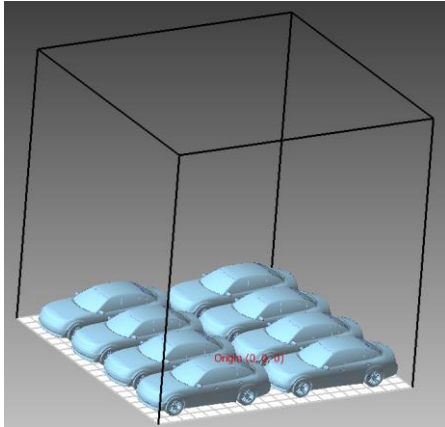
Merge segments divided by "Segmentation" command. And smooth a segment boundary.



3D Print Tab

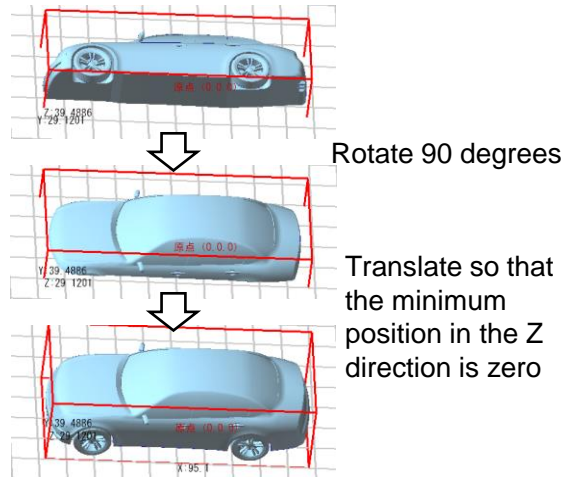
Display Forming Table

This function displays the forming table of the 3D printer in the figure display area.



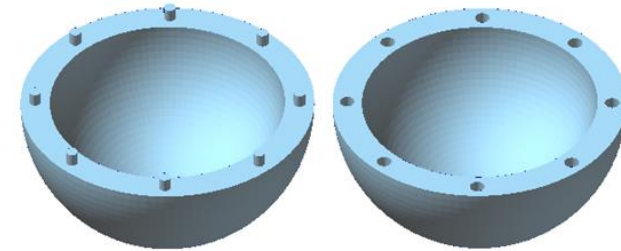
Forming Arrangement

Arrange the mesh or shell on the forming table with a simple operation.



Pinned Cut

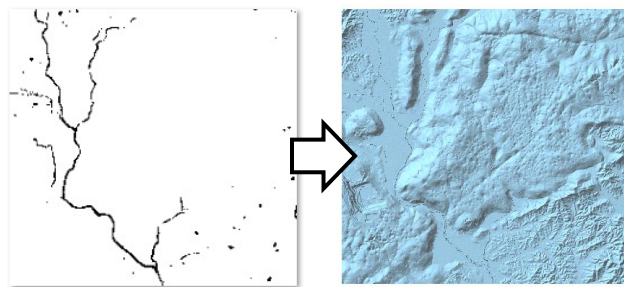
Cut the mesh, and add protrusions and holes to the cut surface. (For assembling 3D printed objects)



Geography Tab

Terrain Meshing

Read the Geographic Information (GeoTIFF) file and create a mesh that reflects the written geographic information.

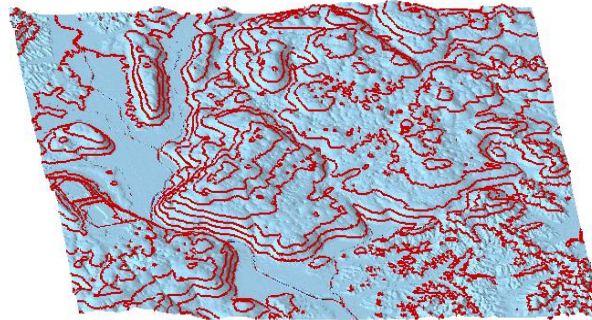


GeoTIFF

Mesh

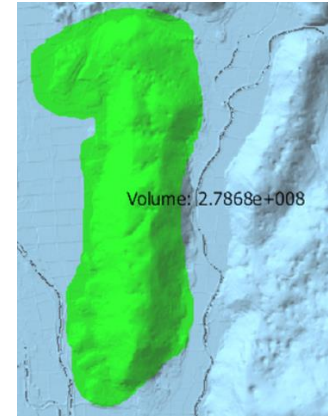
Display Contour Lines

Display contour lines.



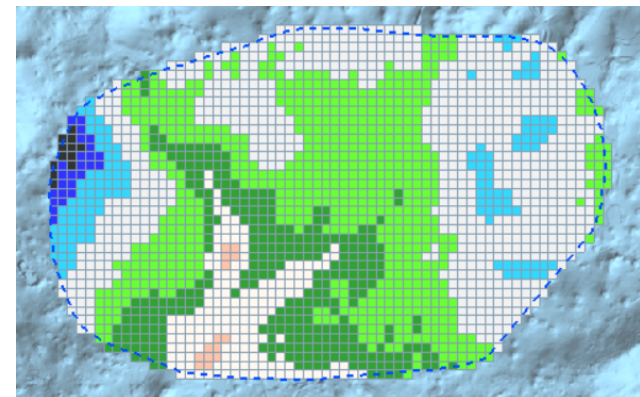
Soil / Space Volume

Displays the amount of soil volume or space volume (volume required to fill the soil) in the specified area.



Dekigata Heat Map

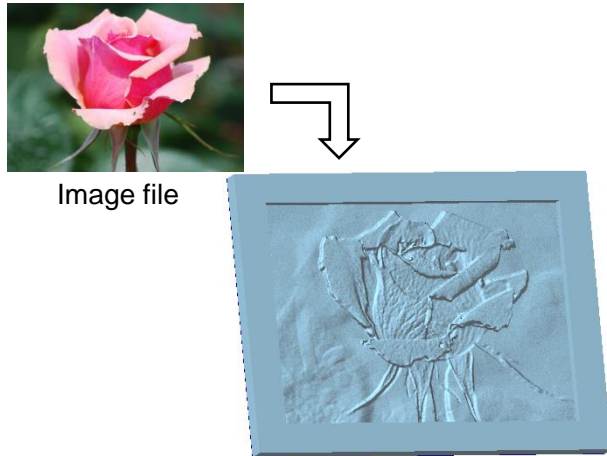
The height difference between the specified area and the polygon data of an external file is displayed as a heat map.



Relief Tab

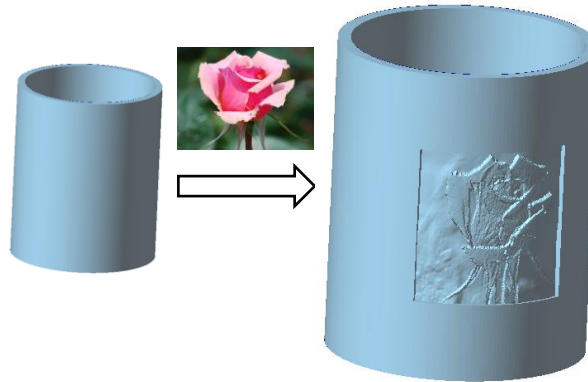
Relief

Create an uneven mesh based on the color of the image.



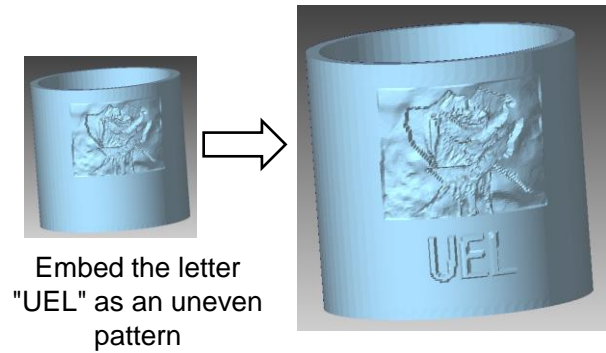
Embed Relief

Add an image to the mesh as an uneven pattern.



Stamp

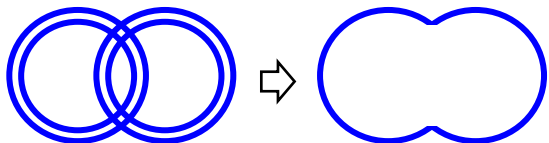
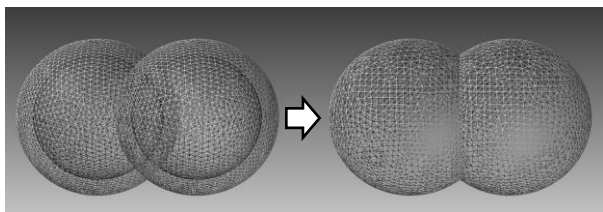
Add a pattern to the mesh with the characters and handwritten lines to enter.



Beta version Tab

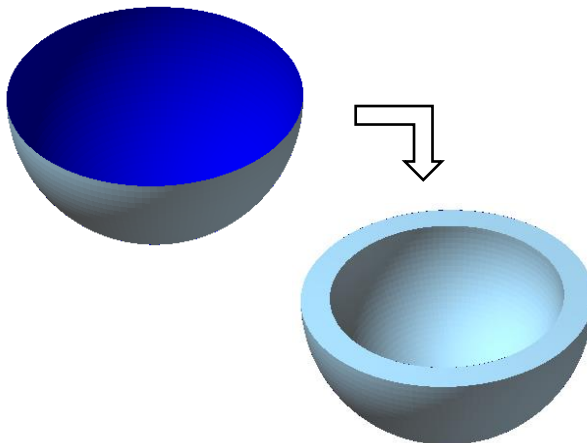
Wrapping

Create a new mesh using only the outside of the mesh.



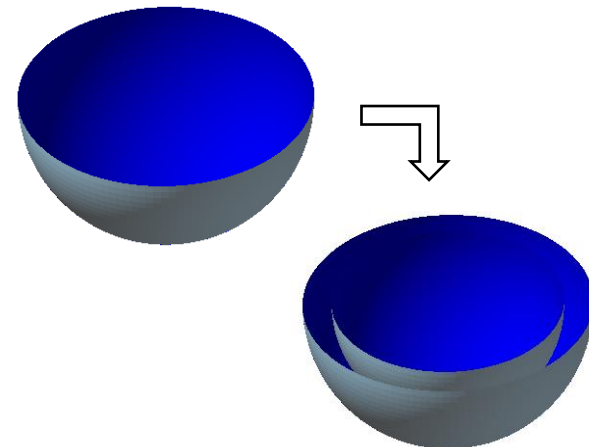
Thicken

Add thickness to the shell.



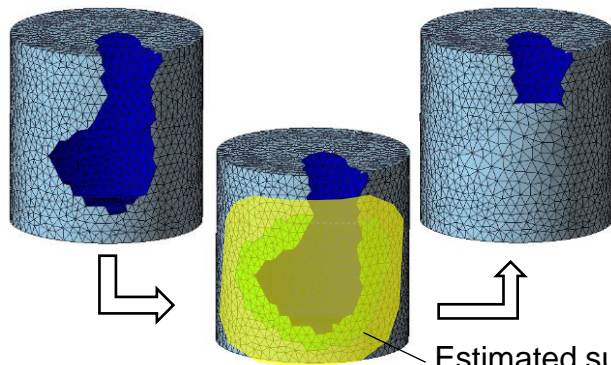
Offset

Create a mesh that is a fixed distance away from the original mesh.



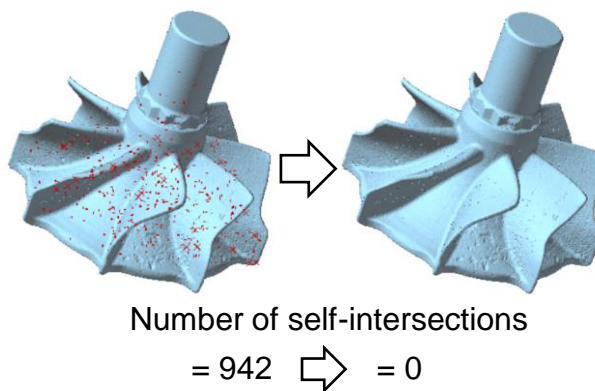
Fill Region

Estimate a surface that passes through the peripheral shape of the hole and create faces that fills the hole so that it rides on the surface.



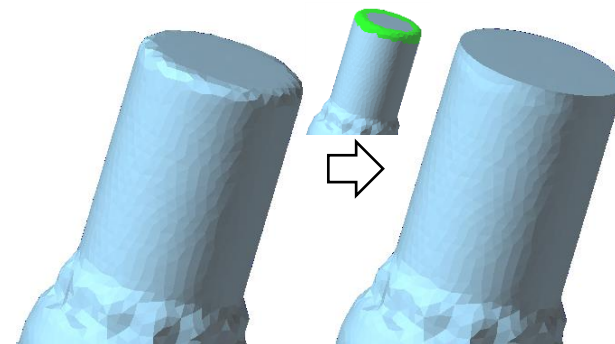
Advanced Self-intersection Removal

Correct self-intersections that cannot be repaired with the cleaning command.



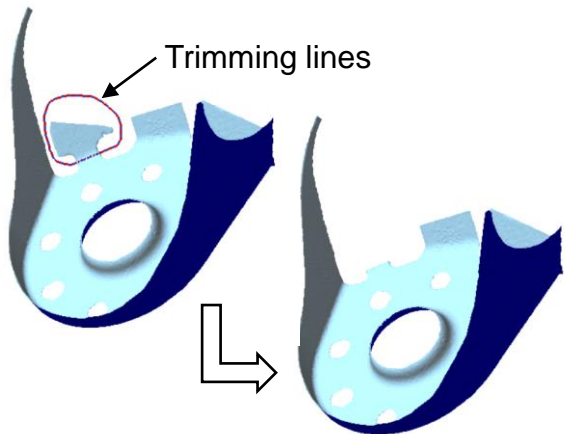
Sharpen

Makes a rounded ridge area into a sharp edge.



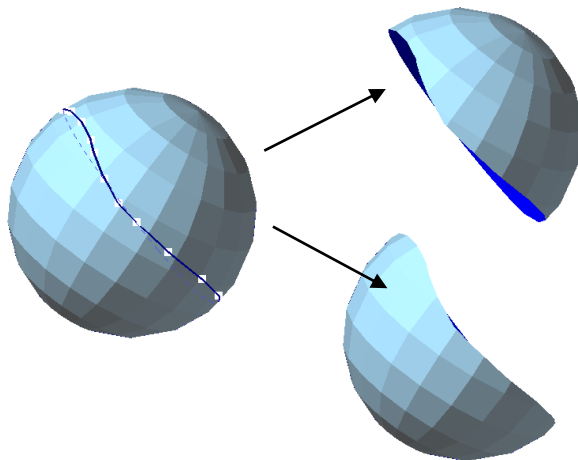
Trim

Trim the mesh with the drawn lines.



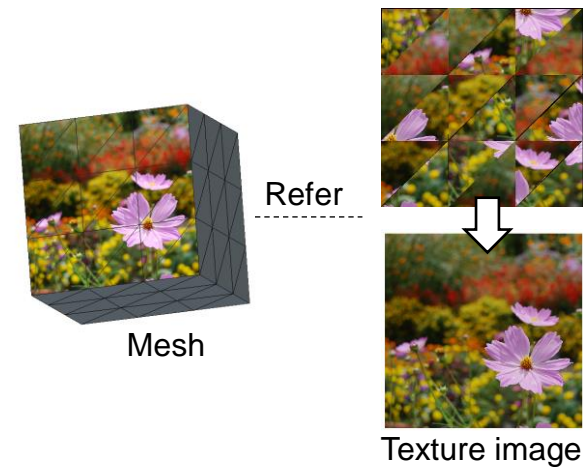
Loop Trim

Divide the mesh by the drawn closed line.



Texture Reconstruction

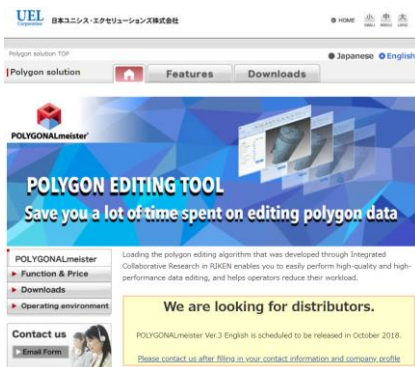
Make the texture image adjacency the same as the face adjacency.



Help Tab

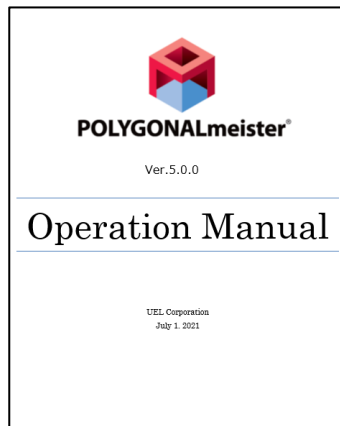
Website

Show the POLYGONALmeister webpage. The Japanese web page will be displayed, so switch to English with the button at the top right of the screen.



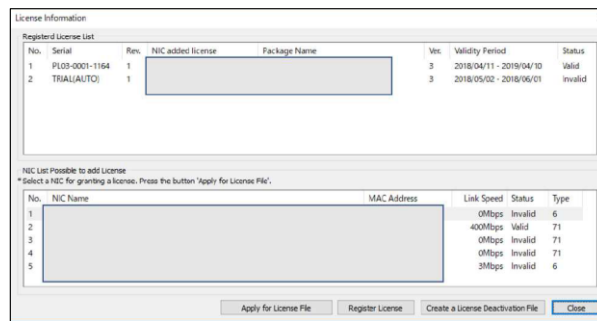
Manual

Show the operation manual for POLYGONALmeister.



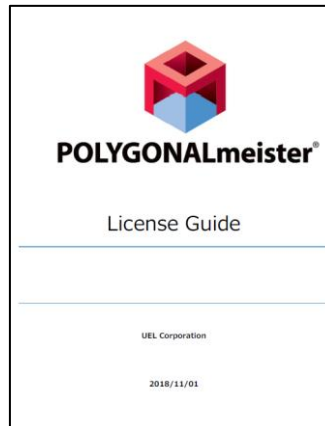
License

Register the POLYGONALmeister license.



License Guide

Show the POLYGONALmeister license guide.



Quick Guide

Show the minimum information required to operate POLYGONALmeister.

