

# 299 Tools

v1.2.1

Blender Figure Output Helper  
User Manual

## About This Manual

This is the English user manual for 299 Tools v1.2.1. It is intended mainly for figure model-making and 3D-print preparation workflows.

**299 MODEL WORKS**

# Introduction

299 Tools is a Blender helper suite for preparing figure models for model making and 3D printing. The initial public release installs the following seven tools together from a single ZIP file. Development and testing have focused mainly on figure-shaped meshes; the tools are not designed for automatic segmentation of hard-surface models.

- Size from Head Proportion
- Simple Pose Helper
- Auto Segment
- Surface Bridge
- Freehand Cut
- Backface Check
- Clearance Boolean

## Development / Test Environment

|                       |                                             |
|-----------------------|---------------------------------------------|
| Verified version      | Blender 5.2.1 LTS                           |
| Development / testing | Blender 5.2.1 LTS / Mac mini M2 / 16 GB RAM |
| Windows / Linux       | Not tested                                  |

### Before Use

Save your Blender file before starting. Segmentation, SDF, and Boolean operations on high-density meshes may require more processing time and memory depending on the shape. Review automatically generated results before finalizing them.

## How to Use This Manual

Start with Quick Start for the shortest workflow, then refer to the detailed section only for the tool you need. For advanced settings, we recommend trying the default values first.

# About Units in the Development / Test Environment

In the 299 Tools development and test environment, generated models are used that display a head height of about 0.2 m when imported into Blender. With the current export and slicer workflow used in that environment, the same data is interpreted by the slicer as about 0.2 mm.

For this reason, Size from Head Proportion uses the current head-dimension value measured in Blender as the basis for calculating the scale factor required for the intended model size.

## Important

This describes the unit handling in the 299 Tools development/test environment. Actual dimensions may be interpreted differently depending on Blender unit settings, export format/settings, and the slicer used. In the development environment, generated data shown as about 0.2 m in Blender is interpreted as about 0.2 mm in the current export/slicer workflow. Always verify final dimensions in your slicer.

In the development environment, when Blender measures a generated model at about 0.2 m, the numeric value shown in Blender is entered into Current Head Height. This is an example of the development/test workflow. The target finished dimensions are checked in millimeters.

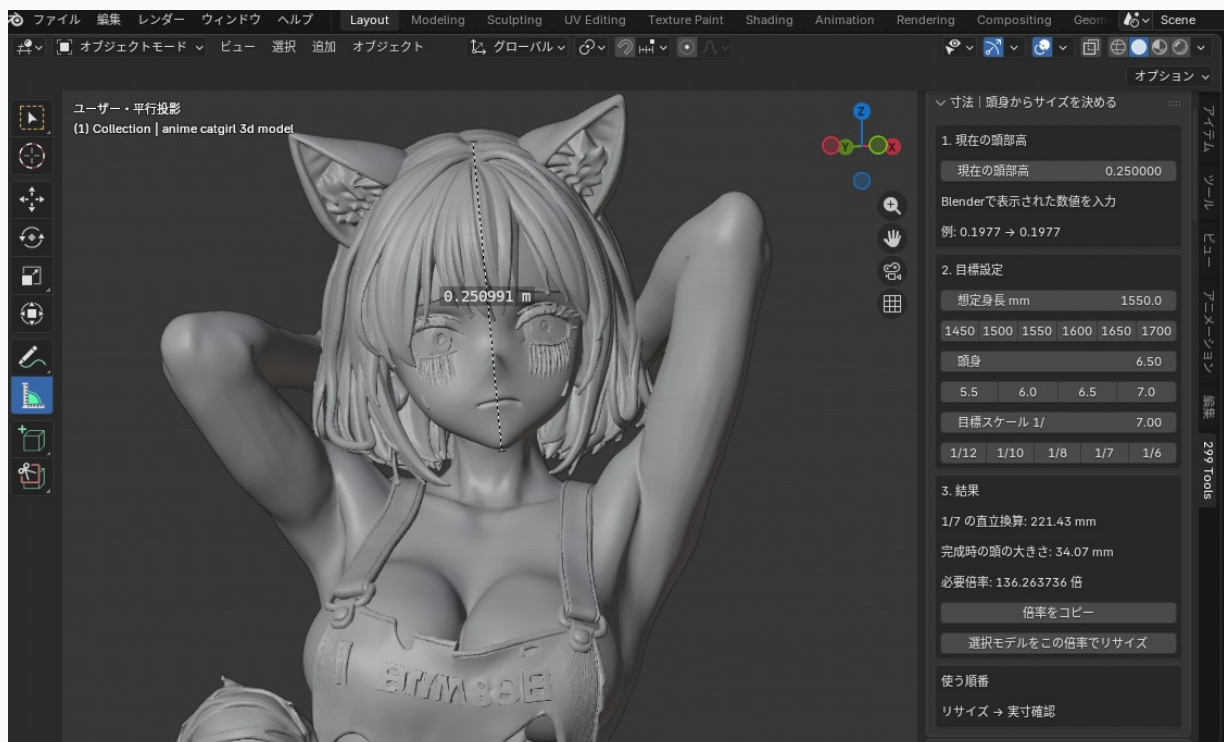


Figure: Checking head dimensions and the Size from Head Proportion panel in the development environment

# Installation

1. Prepare 299\_Tools\_v1.2.1.zip. Do not extract the ZIP.
2. Start Blender 5.2.1 LTS and open Preferences.
3. Open Add-ons and choose Install from Disk....
4. Select the distributed ZIP file directly and install it.
5. Search for 299 Tools in the add-on list and enable it.
6. Return to the 3D Viewport, press `N` to open the right sidebar, and check the 299 Tools tab.

## Seven Panels

- Auto Segment
- Dimensions | Size from Head Proportion
- Assist | Simple Pose Helper
- Process | Surface Bridge
- Process | Freehand Cut
- Process | Clearance Boolean
- Inspect | Backface Check

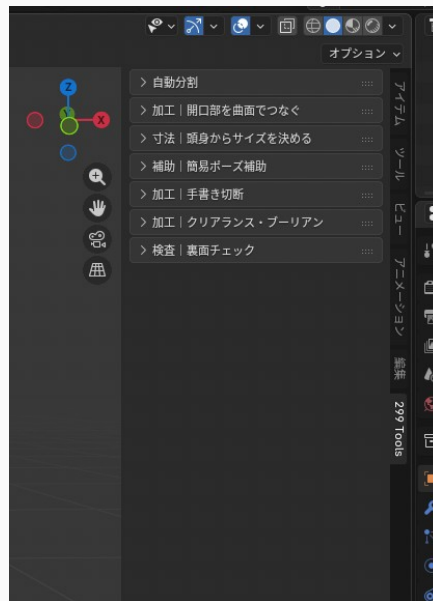


Figure: N-panel 299 Tools tab - seven panels

Tested on Blender 5.2.1 LTS. The suite still contains seven tools.

# Quick Start

Size from Head Proportion: current head height -> assumed height -> head proportion -> target scale -> check the required scale factor -> resize the target

Simple Pose Helper: in Edit Mode, select the faces to move -> Set Auto Axis from Selected End -> adjust the axis offset if needed -> rotate with `R`

Auto Segment: select one mesh -> Auto Segment -> review the color-coded result -> re-split/merge if needed -> Finalize Split

Surface Bridge: A/B start points -> route -> A/B end points -> confirm two lines -> surface preview -> adjust control points -> confirm

Freehand Cut: start in Object Mode with the target mesh selected.

Outline Cut & Delete: closed outline -> Enter -> review -> confirm deletion.

Line Split & Separate: outside-to-outside line -> Enter -> review -> confirm separation.

Backface Check: Backface Check ON -> rotate the model and inspect red backfaces -> OFF

Clearance Boolean: select the cutter source first and the object to be cut last -> set one-sided clearance -> run -> inspect the result

# 1. Size from Head Proportion

|                      |                                        |
|----------------------|----------------------------------------|
| <b>Panel</b>         | Dimensions   Size from Head Proportion |
| <b>When Resizing</b> | Object Mode                            |

Calculates the finished head size and required scale factor from the current head dimension, assumed height, head proportion, and model scale. You can copy the scale factor or apply it directly to selected meshes.

1. Check the current model head height in Blender and enter the displayed numeric value in Current Head Height.
2. Enter Assumed Height (mm), Head Proportion, and Target Scale 1/, or use the presets.
3. Check the finished head size and required scale factor.
4. If you only need the value, click Copy Scale Factor.
5. To apply the factor, select the mesh, switch to Object Mode, and click Resize Selected Model by This Factor.
6. After resizing, confirm the final dimensions in your slicer as well.

## Unit Handling

In the development environment, for generated data measured at about 0.2 m in Blender, the numeric portion of that measurement is entered into Current Head Height. In the current export/slicer workflow, the same generated data is interpreted as about 0.2 mm. Because this interpretation may vary by environment, verify final dimensions in your slicer.

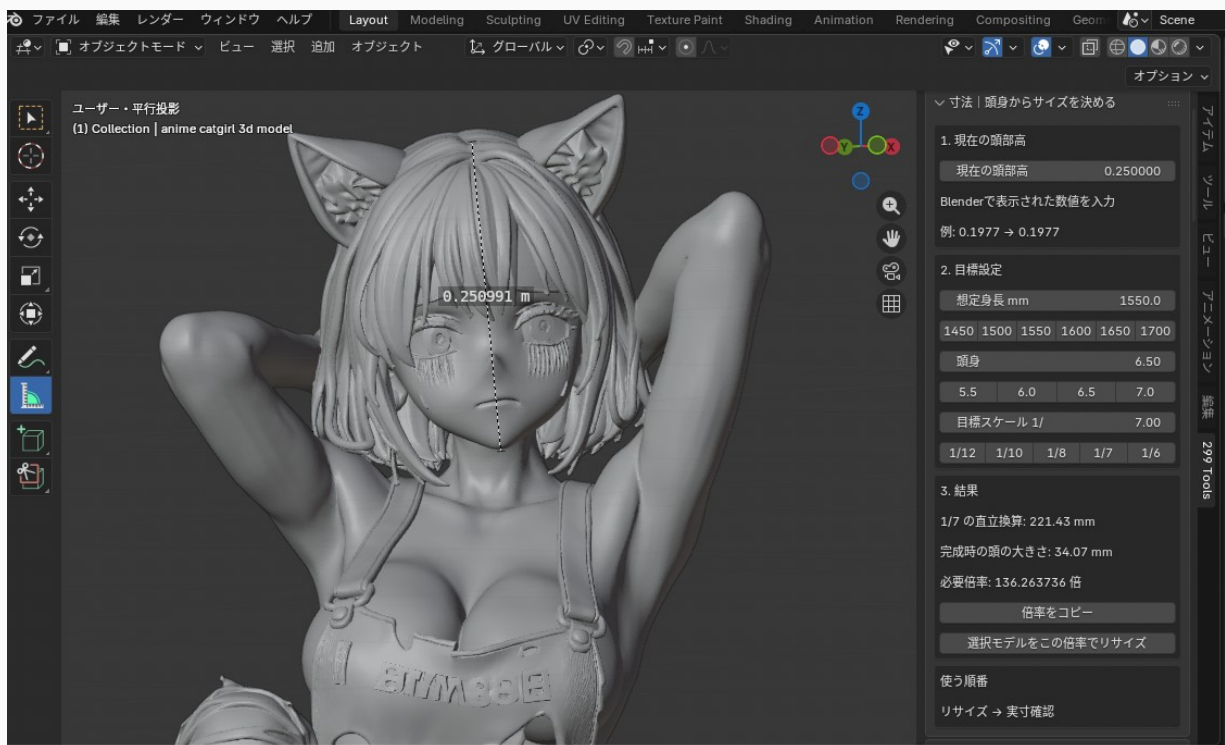


Figure: Size from Head Proportion - head dimension, target settings, and required scale factor

## 2. Simple Pose Helper

|              |                             |
|--------------|-----------------------------|
| <b>Panel</b> | Assist   Simple Pose Helper |
| <b>Mode</b>  | Edit Mode                   |

Sets a simple rotation axis from the boundary of the selected region, making it easier to adjust a pose with Blender's standard Rotate and Proportional Editing tools.

1. Switch the mesh to Edit Mode.
2. Select the faces you want to move, such as an arm.
3. Click Set Auto Axis from Selected End.
4. Check the 3D Cursor and axis marker positions.
5. If needed, adjust the position with the X/Y/Z axis offsets.
6. Rotate with `R`; use `O` for Proportional Editing if needed.

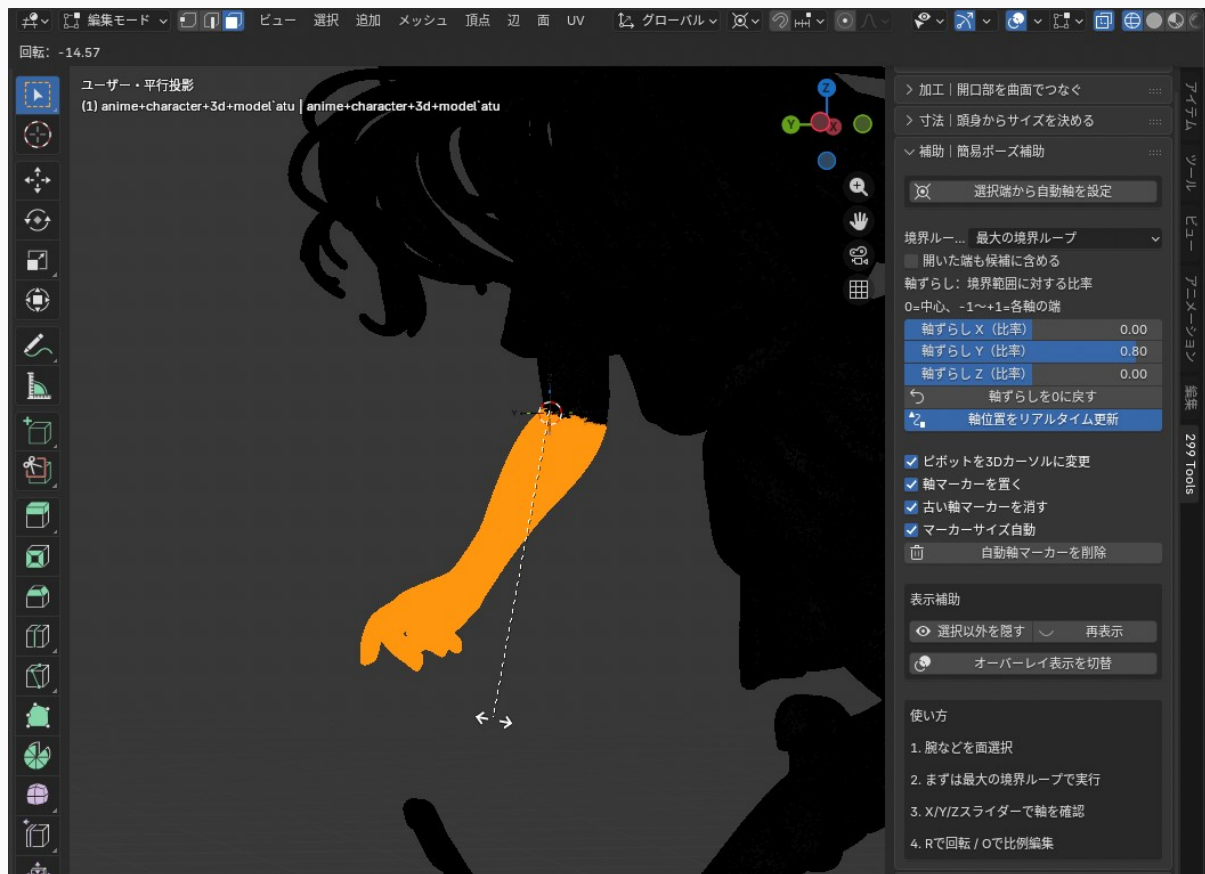


Figure: Simple Pose Helper - selected region and automatic axis setup

### If the Axis Appears in the Wrong Place

Turn off Include Open Ends as Candidates and try Largest Boundary Loop first. Reset the axis offsets to 0 and review the selected region to make troubleshooting easier.

### 3. Auto Segment

|              |              |
|--------------|--------------|
| <b>Panel</b> | Auto Segment |
| <b>Mode</b>  | Object Mode  |

Automatically classifies a single mesh into multiple parts based on thickness differences and concavity/fold analysis. Review the color-coded result, re-split individual parts or merge parts if needed, then finalize them as separate objects.

#### Basic Operation

1. Select only the mesh you want to segment and make it active.
2. Set Target Parts if needed.
3. Click Auto Segment.
4. Review the color-coded result and the Current: X Parts count.
5. If needed, use Select Part to Re-split or Select Parts to Merge.
6. If the result is satisfactory, click Finalize Split.

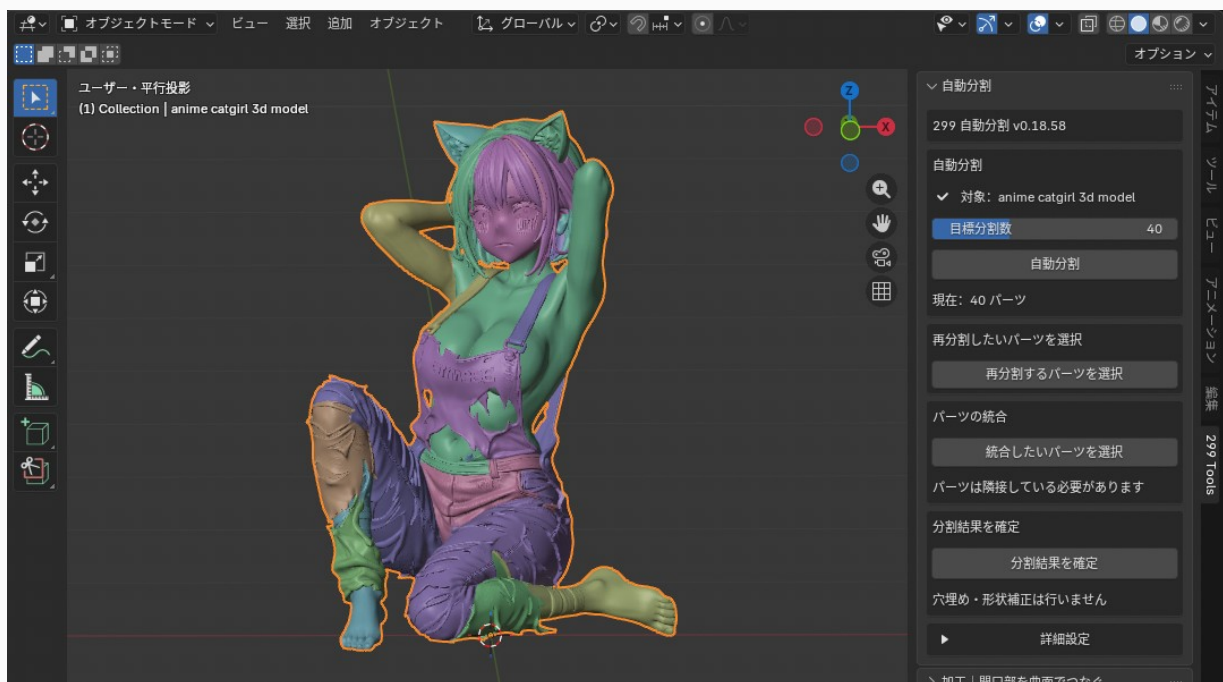


Figure: Auto Segment - color-coded part candidates and Current: X Parts

#### Re-splitting One Part

1. Click Select Part to Re-split, then click the target part.
2. Click Start Cut Line.
3. Place a line with at least two points, starting and ending outside the target part.
4. Press `Enter` to confirm.
  - Left click: add a point
  - Backspace / Delete: remove the last point
  - Enter: confirm

- Esc: cancel

## Merging Parts

1. Click Select Parts to Merge.
2. Click two or more adjacent parts.
3. Press `Enter` to confirm.

**Note**

Finalize Split does not fill openings or correct boundary shapes. Inspect the resulting boundaries visually.

## 4. Surface Bridge

|                   |                          |
|-------------------|--------------------------|
| <b>Panel</b>      | Process   Surface Bridge |
| <b>Start Mode</b> | Edit Mode - Edge Select  |

Defines two edge lines, A and B, from a single open boundary and creates a surface between them. You can preview the surface before confirmation and adjust its shape with three control points: start, center, and end.

1. Click Start Two-Line Generation.
2. Select one open-boundary edge for A Start and click Confirm A Start.
3. Select another open-boundary edge for B Start and click Confirm B Start.
4. Review the displayed route. Use Show Opposite Side if needed; otherwise click Use This Route.
5. Set A End and B End, then click Confirm Two Lines.
6. Click Create Surface Preview.
7. If needed, adjust the start, center, and end control points with `G` / `R`.
8. If the result is satisfactory, click Confirm This Surface.

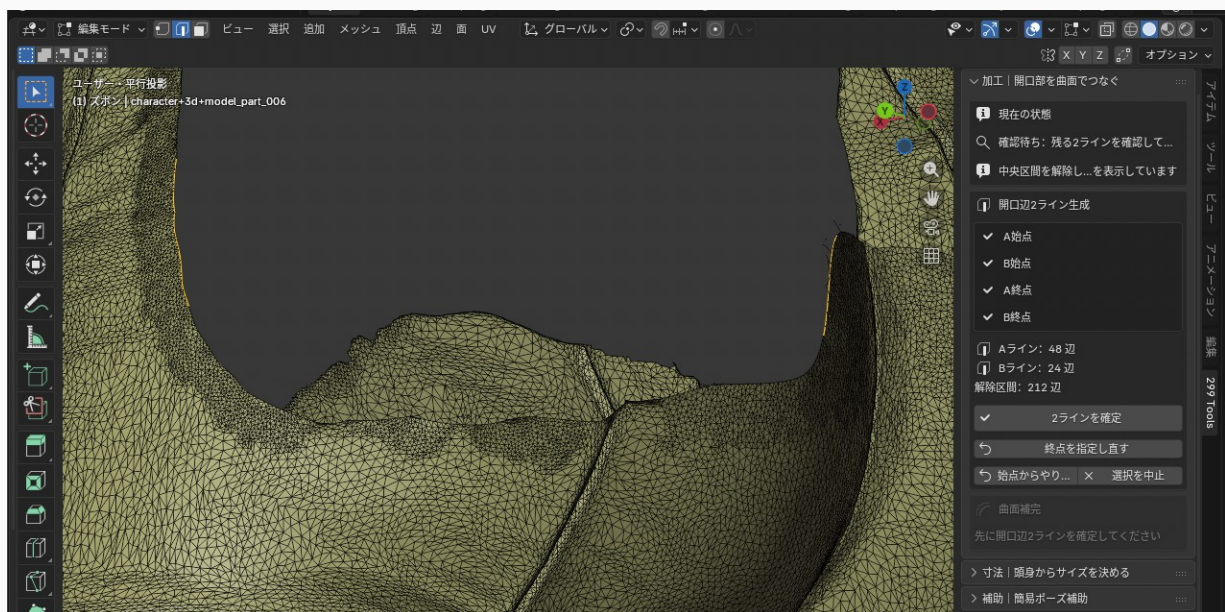


Figure: Surface Bridge - selecting open-boundary edges

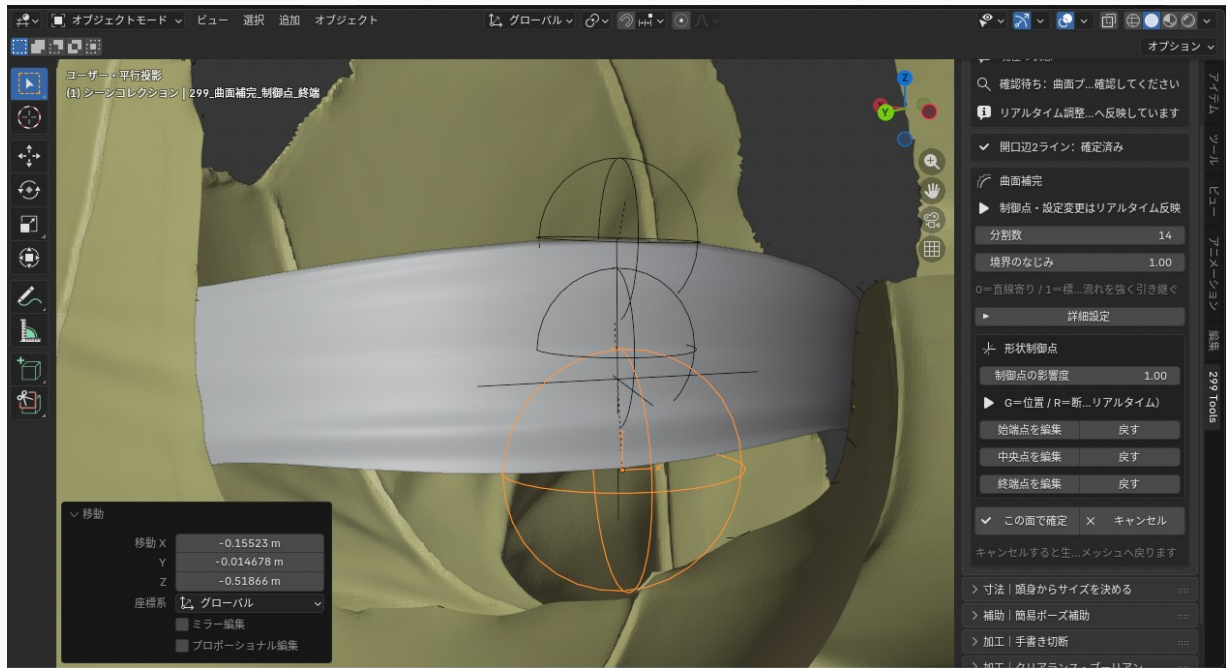


Figure: Surface Bridge - surface preview and control points

**Redo / Restart**

Use Reselect End Points, Restart from Start Points, Stop Selection, or Cancel to return before confirmation. If you change the topology during the workflow, undo that change and restart from the beginning.

## 5. Freehand Cut

Panel: Process | Freehand Cut

Start in Object Mode with the target mesh selected.

Freehand Cut offers two methods within one tool. Drawing cannot start without a selected mesh or from an unsupported mode.

### Outline Cut & Delete

1. Select the target mesh and switch to Object Mode.
2. Choose Outline Cut & Delete, set Cut Through as needed, and start drawing.
3. Draw a closed outline around the area to remove. Press Enter to confirm the outline.
4. Review the orange deletion candidates, then confirm deletion. Restore the mesh to its state before cutting if you want to start over.

### Line Split & Separate

1. With the target mesh selected in Object Mode, start drawing for this method.
2. Draw from outside the object, across the model, and out beyond the other side.
3. Press Enter to confirm the line and preview the part to be separated.
4. Confirm separation to create a separate object. Redraw the line if needed, or cancel to restore the original mesh.

### Drawing controls for both methods

Left-click: place a point.

After placing a point: a red preview segment follows the cursor toward the next point.

Left-drag: draw a freehand line.

Enter: confirm the drawing and show the preview.

Esc: cancel drawing.

### Cut Through and open boundaries

Cut Through ON extends the cut through surfaces hidden from view.

Line Split & Separate does not cap the cut surfaces. Inspect the open boundaries after separating the parts.

Tested on Blender 5.2.1 LTS / Mac. Windows and Linux have not been tested.

## 6. Backface Check

|                |                          |
|----------------|--------------------------|
| <b>Panel</b>   | Inspect   Backface Check |
| <b>Used In</b> | 3D Viewport              |

Uses Blender's standard Face Orientation display to show front faces normally while overlaying backfaces in red. Materials and nodes are not changed.

1. Open a 3D Viewport showing the model you want to inspect.
2. Click Backface Check ON.
3. Rotate the model and inspect any backfaces shown in red.
4. When finished, click Backface Check OFF.

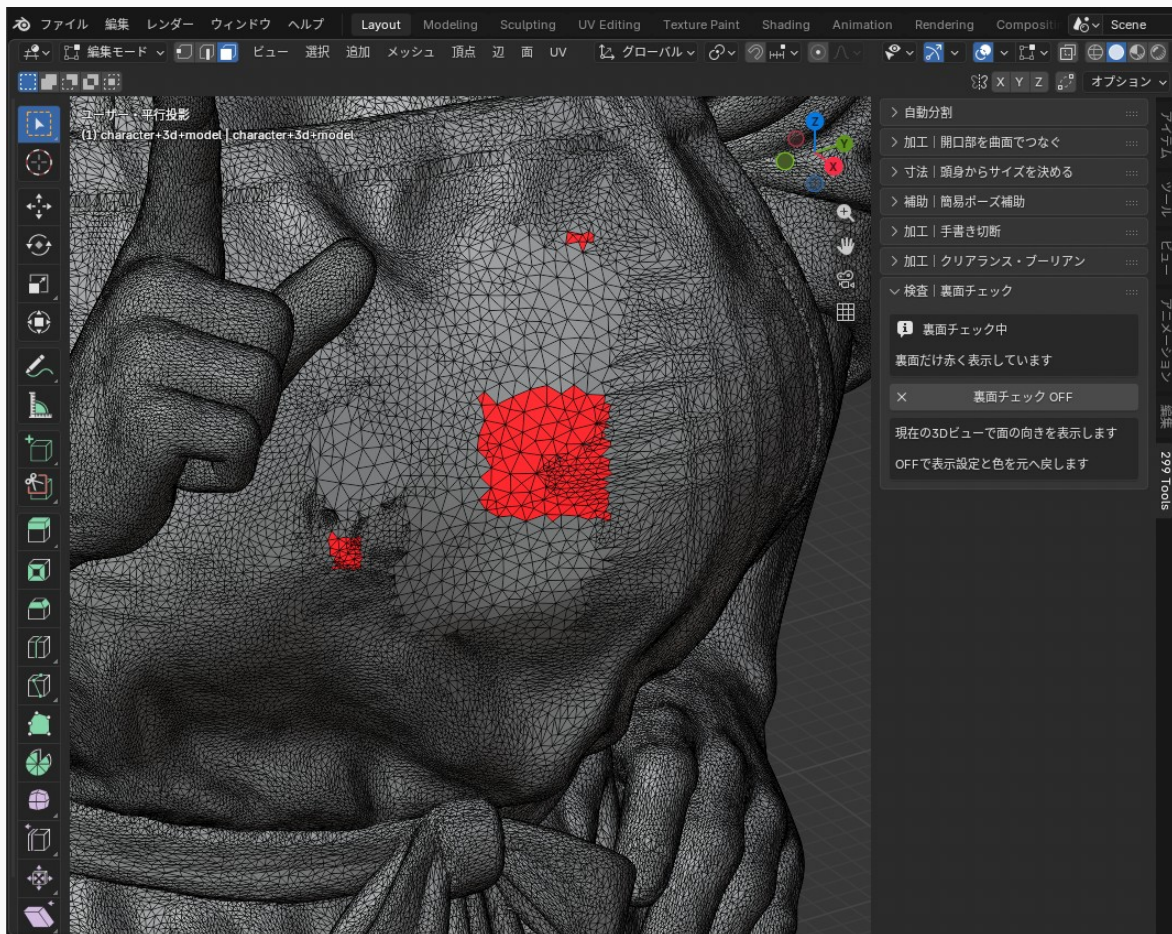


Figure: Backface Check - inspecting backfaces shown in red

### When Finished

Backface Check OFF restores the Face Orientation display, overlay state, and front/back colors that were in use before the check was enabled.

## 7. Clearance Boolean

|                             |                             |
|-----------------------------|-----------------------------|
| <b>Panel</b>                | Process   Clearance Boolean |
| <b>Clearance Boolean</b>    | Object Mode                 |
| <b>Selected-Face Cutter</b> | Edit Mode - Face Select     |

Duplicates the cutter source, expands it by the specified amount, and adds or immediately applies a Difference Boolean with clearance to the target object. You can also create a local cutter from selected faces.

### Selection Order Matters

Select the cutter source first, then select the object to be cut last and make it active.

## Clearance Boolean

1. Select the cutter source first.
2. Select the object to be cut last and make it active.
3. Set One-Sided Clearance (mm) and the cutter expansion method.
4. To preserve the original, enable Process Independent Copy, Keep Original.
5. Choose whether to apply the Boolean immediately or add it as a modifier.
6. Click Add Clearance-Cutter Boolean Setup or Cut with Clearance Cutter (Apply Now).
7. Check the result.

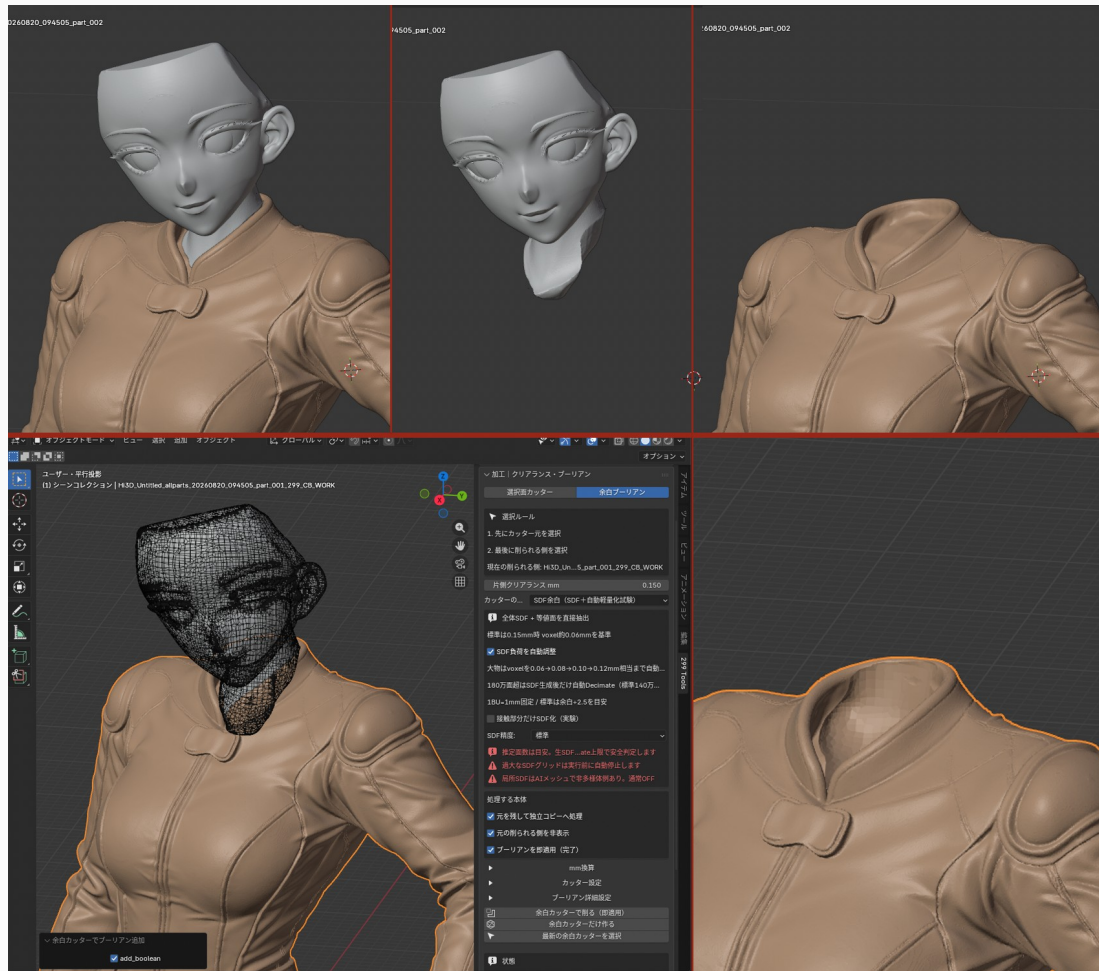


Figure: Clearance Boolean - workflow example and main settings

## Selected-Face Cutter

1. Switch to Selected-Face Cutter.
2. Put the source part in Edit Mode and select faces slightly wider than the contact area.
3. Set Local Cutter Depth (mm) and Thickness Direction.
4. Click Create Local Cutter from Selected Faces.
5. Use the created local cutter as the cutter source, select the object to be cut last as the active object, and run Clearance Boolean.

### Advanced Settings

For settings such as SDF precision, self-intersection handling, and hole tolerance, start with the defaults. Some settings can be computationally heavy on high-density meshes.

# Updating and Uninstalling

## Updating

To avoid leaving old files behind, we recommend removing the previous version before installing the new ZIP.

1. Save the Blender file you are working on.
2. In Preferences, disable the current 299 Tools add-on.
3. Remove the current 299 Tools add-on.
4. Restart Blender.
5. Install the new distribution ZIP with Install from Disk....
6. Enable 299 Tools and confirm that all seven panels appear.

## Uninstalling

1. Save the Blender file you are working on.
2. In Preferences, search for 299 Tools and disable it.
3. Remove it from the add-on item menu.
4. Restart Blender and confirm that 299 Tools no longer appears in the N-panel.

### Objects Already Created

Removing the add-on does not necessarily remove or organize ordinary Blender objects created with 299 Tools. Review the objects you need and organize them manually in Blender.

## If Installation Fails

- Make sure the ZIP has not been extracted.
- Make sure you selected the distributed ZIP itself, not a ZIP wrapped inside another ZIP.
- Make sure you are using Blender 5.2.1 LTS.
- If an older version or standalone versions of the same tools are enabled, disable them and try again.
- If an error appears, save the full error message and the system console/log output.

# Bug Reports and Important Notes

## If You Find a Bug

If you encounter a bug or behavior that differs from this manual, please report it using the bug report form on the 299 Tools page at 299 MODEL WORKS.

When reporting an issue, include your Blender version, OS, the 299 Tools feature you were using, steps to reproduce the issue, and screenshots or error messages if possible.

## Important

299 Tools does not guarantee correct operation or processing results for every mesh or environment. Save your Blender file before use and keep backups of important data.

299 MODEL WORKS cannot accept responsibility for data corruption, loss of work, or other damages resulting from the use of 299 Tools. Please use the tools with this understanding.