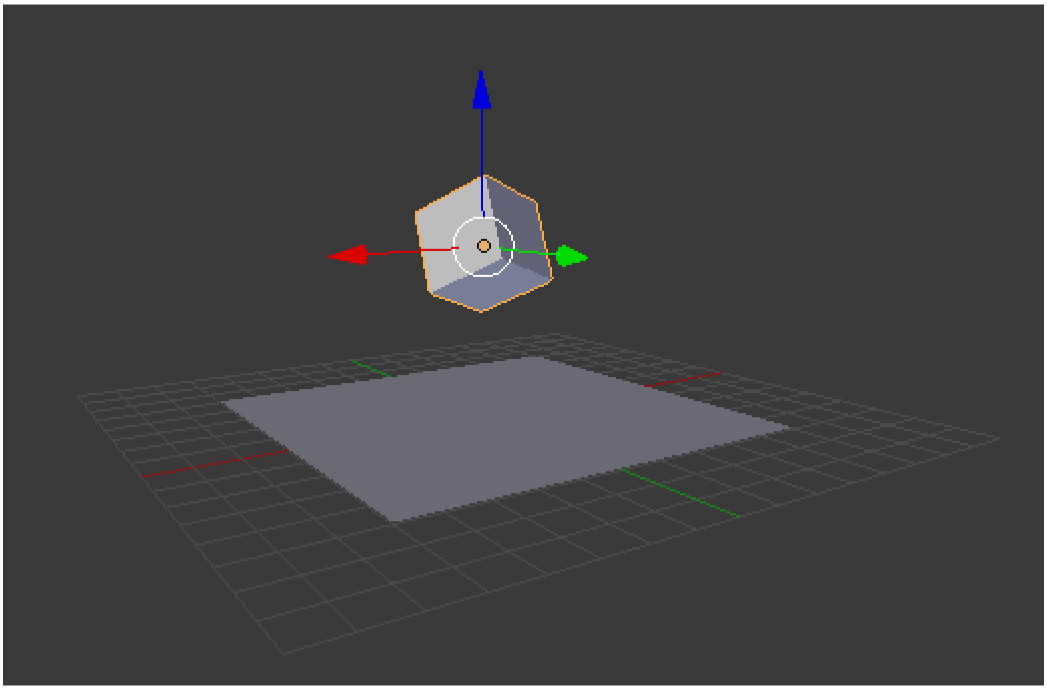


Fig. 1312: The scene, ready for soft body physics.

Under *Soft Body Cache* change the values of your start and end frames. In this case 1 and 150. Now, to test if everything is working, you can take a cache step of 5 or 10, but for the final animation it is better to reduce it to 1, to cache everything.

You can now bake the simulation, give the cube materials and textures and render the animation.

The Result

The rendered bouncing cube:

A video can be found at https://www.youtube.com/watch?v=3PzgB9jw9iA

2.6 Sculpting & Painting

2.6.1 Introduction

Sculpting and painting use *brushes* to paint directly on meshes. There are several *modes* that use this.

- *Sculpting*: Change the topology of the mesh.
- *Vertex Paint*: Change the color of vertices in the active vertex color layer.
- *Weight Paint*: Change the weight of vertices in the active vertex group.
- *Texture Paint*: Change the pixels of the active image texture.

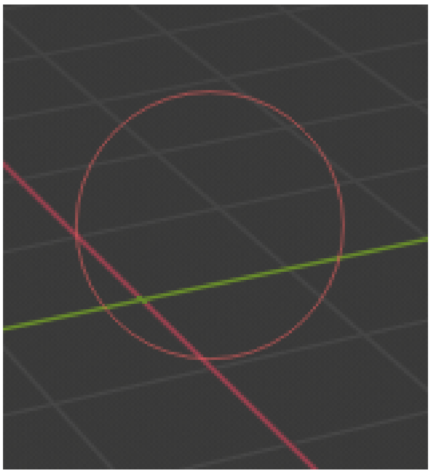


Fig. 1313: Brush cursor.

2.6.2 Brush

Introduction

Brush Control

- Set brush size F
- Set brush strength Shift-F
- Rotate brush texture Ctrl-F
- Invert stroke toggle Ctrl

You can then either adjust the value interactively or by typing in numbers. After pressing the hotkey move the mouse to increase/reduce the value (additionally with precision and/or snapping activated). Finally confirm (LMB, Return) or cancel (RMB, Esc).

Selection Masking

If you have a complex mesh, it is sometimes not easy to paint on all vertices. Suppose you only want to paint on a small area of the Mesh and keep the rest untouched. This is where "selection masking" comes into play. When this mode is enabled, a brush will only paint on the selected vertices or faces. The option is available from the header of the 3D View (see icons surrounded by the yellow frame):

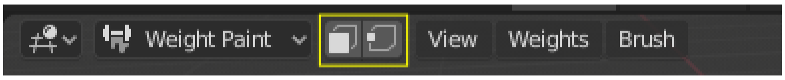


Fig. 1314: You can choose between *Face Selection masking* (left button) and *Vertex selection masking* (right button).

Selection masking has some advantages over the default paint mode:

- The original mesh edges are shown, even when modifiers are active.
- You can select faces to restrict painting to the vertices of the selected faces.

Details About Selecting

The following standard selection operations are supported:

- RMB – Single faces. Use Shift-RMB to select multiple.
- A – All faces, also to deselect.
- B – Box selection.
- C – Circle select with brush.
- L – Pick linked (under the mouse cursor).
- Ctrl-L – Select linked.
- Ctrl-I – Invert selection *Inverse*.

Vertex Selection Masking

Reference

Mode Vertex and Weight Paint Modes

Header *Vertex Selection*

Hotkey V

In this mode you can select one or more vertices and then paint only on the selection. All unselected vertices are protected from unintentional changes.

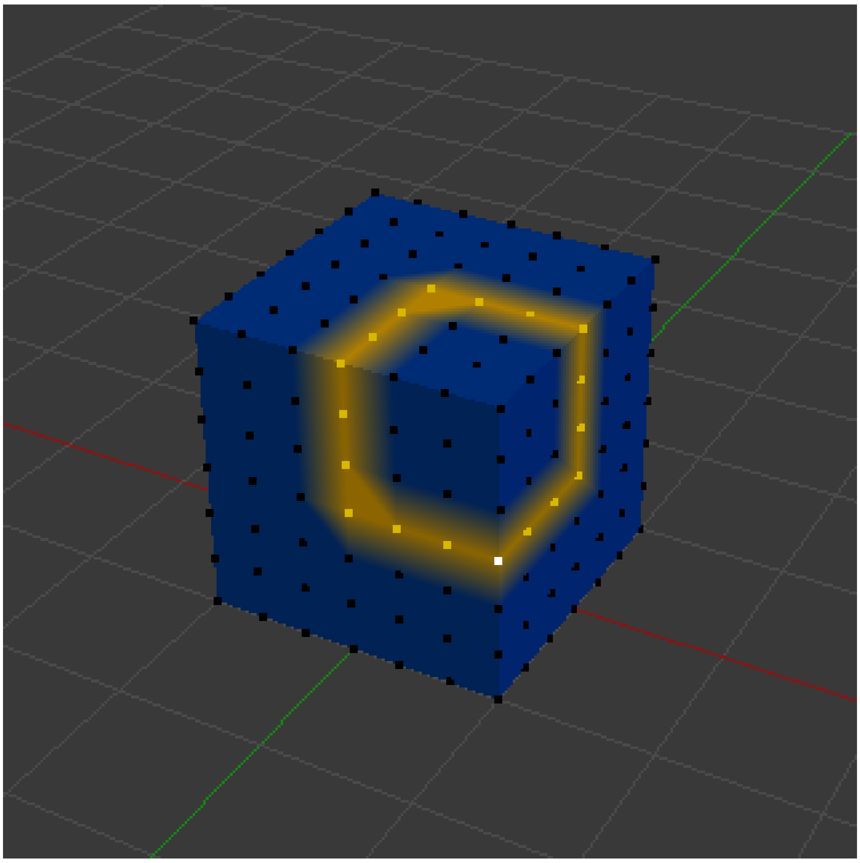


Fig. 1315: Vertex Selection masking.

Face Selection Masking

Reference

Mode Texture, Vertex, and Weight Paint Modes

Header *Paint Mask*

The *Face Selection masking* allows you to select faces and limit the paint tool to those faces, very similar to Vertex selection masking.

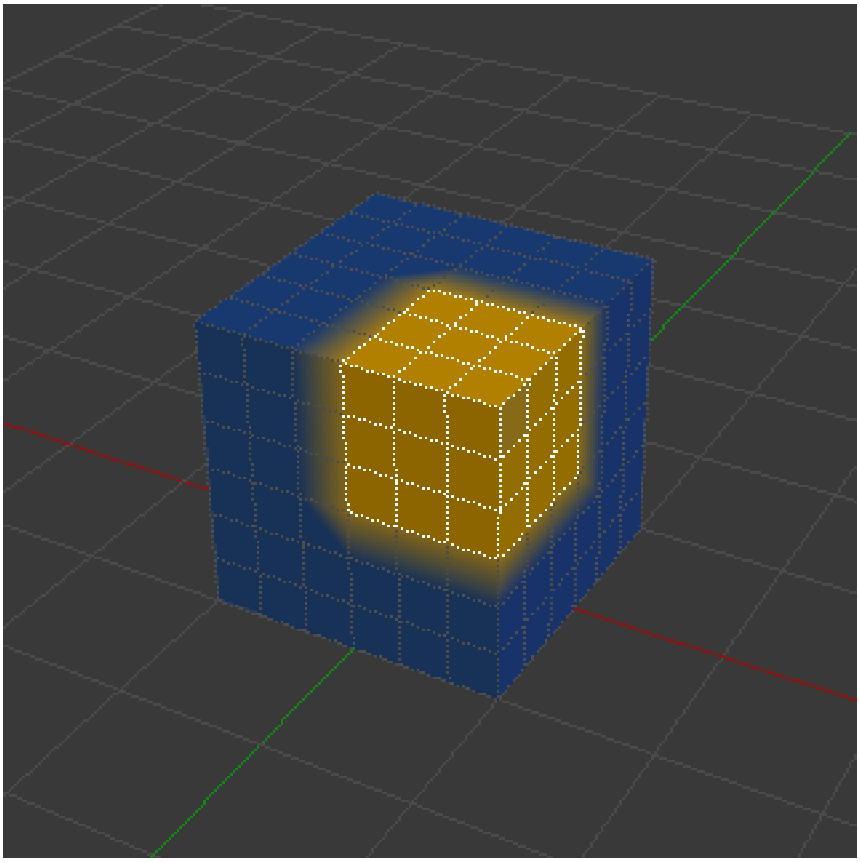


Fig. 1316: Face Selection masking.

Hide/Unhide Faces

You also can hide selected faces as in Edit Mode with the keyboard Shortcut `H`, then paint on the remaining visible faces and finally unhide the hidden faces again by using `Alt-H`.

Hide/Unhide Vertices

You cannot directly hide selected faces in vertex mask selection mode. However, you can use a trick:

1. First go to Face selection mask mode.
2. Select the areas you want to hide and then hide the faces (as explained above).
3. Switch back to Vertex Selection mask mode.

Now the vertices belonging to the hidden Faces will remain hidden.

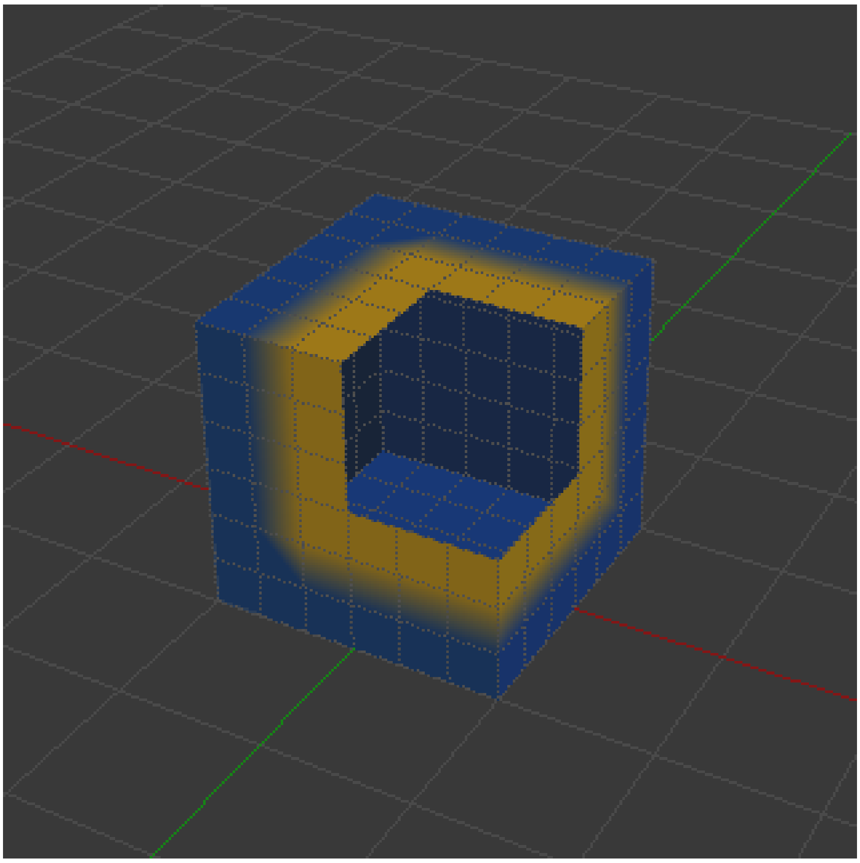


Fig. 1317: Hidden faces.

The Clipping Region

To constrain the paint area further you can use the *Clipping Region*. Press `Alt-B` and `LMB`-drag a rectangular area. The selected area will be "cut out" as the area of interest. The rest of the 3D Viewport gets hidden.

You make the entire mesh visible again by pressing `Alt-B` a second time.

All paint tools that use the view respect this clipping, including box select, and of course brush strokes.

Brush Settings

Brushes

Reference

Mode Sculpt Mode

Panel *Sidebar* → *Tools* → *Brushes*

For painting/sculpting modes each brush type is exposed as a tool, the brush can be changed from the tool setting.

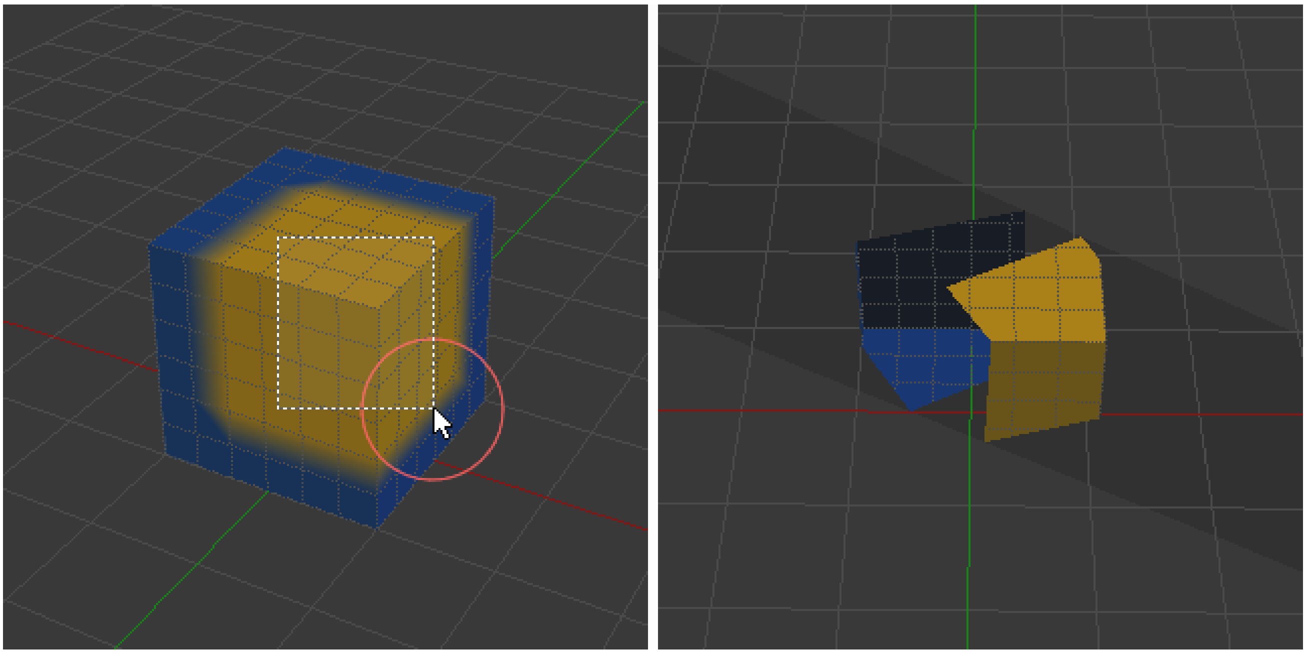


Fig. 1318: The Clipping Region is used to select interesting parts for local painting.

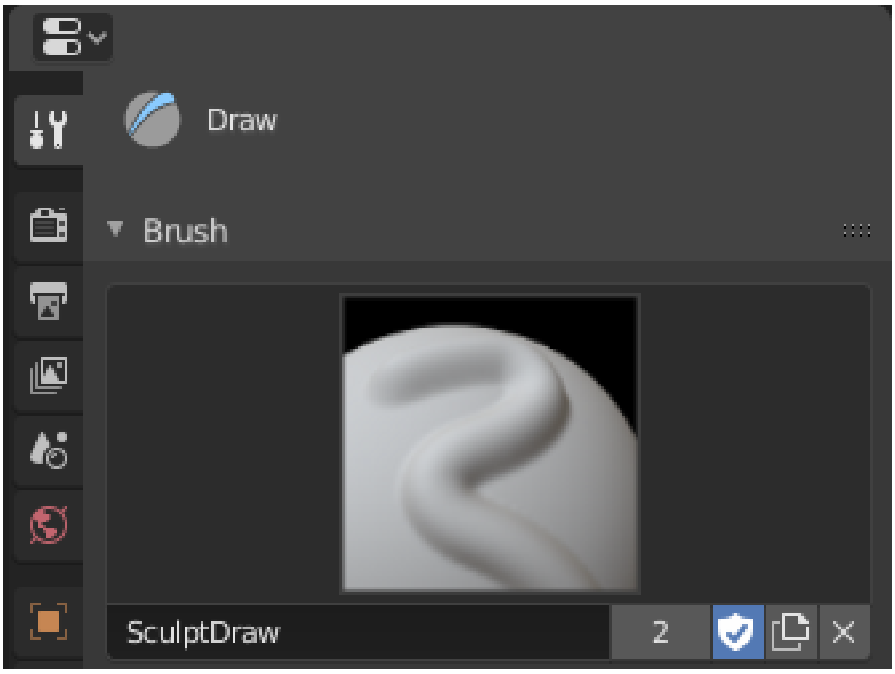


Fig. 1319: Brush data-block menu.

Brushes The *Data-Block Menu* to select a preset brush type or a custom brush. They are a combination of a "tool", along with stroke, texture, and options.

Add Brush When you add a brush, the new brush is a clone of the current one.

Brush Specials

Enabled Modes Todo.

Tool Selection Todo.

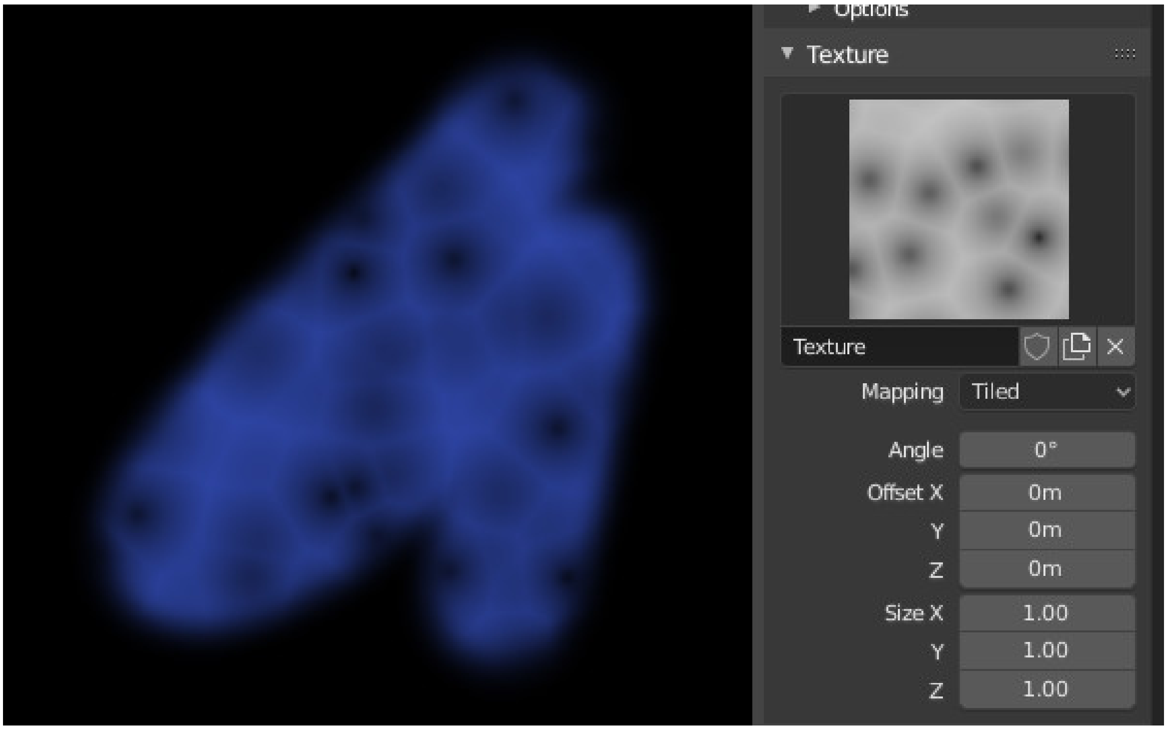
Reset Brush Todo.

Custom Icon Allows definition of a custom brush icon.

Note: In order to save a custom brush in a blend-user, enable Fake User.

Texture & Texture Mask

Texture



Options

Texture

Texture

Mapping: Tiled

Angle: 0°

Offset X: 0m

Y: 0m

Z: 0m

Size X: 1.00

Y: 1.00

Z: 1.00

Fig. 1320: Texture options and example.

Use the texture data-block at the bottom of the paint panel to select a preloaded image or procedural texture to use as your brush pattern.

Note that in order to use it, you must have a placeholder material defined, and that particular texture defined using the Material and Texture buttons. It is not necessary to have that material or texture applied to any mesh anywhere; it must only be defined.

The example to the right shows the effects of painting with a Voronoi texture.

Texture In paint modes the texture is used as a color source, while for sculpting it is used to determine the strength of the brush.

Mapping Sets the way the texture is applied to the brush stroke.

View Plane If *View Plane* is enabled, the current view angle is used to project the brush texture onto the model. I.e. the texture follows the mouse, so it appears that the texture is being dragged across the model. In 2D painting, the texture moves with the brush.

Area Plane Projects the brush texture along the local surface normal, which keeps the texture from stretching when sculpting on a portion of the mesh that is at an extreme angle to the viewpoint.

Tiled The *Tile* option tiles the texture across the screen, so moving the brush appears to move separately from the texture. The *Tile* option is most useful with tileable images, rather than procedural textures.

3D The *3D* option allows the brush to take full advantage of procedural textures. This mode uses vertex coordinates rather than the brush location to determine what area of the texture to use.

Random Picks a random texture coordinate to sample from for each dab.

Stencil Stencil mapping works by projecting the paint from the camera space on the mesh or canvas. Painting is applied only inside the boundaries of the stencil. The stencil is displayed as a screen space overlay on the viewport. To the transform the stencil texture and the stencil mask with additional `Alt` pressed:

- Move `RMB`
- Scale `Shift-RMB`
- Rotate `Ctrl-RMB`

When using stencil scaling, `X` and `Y` are used to constrain the scaling to one axis. Pressing one of the buttons twice reverts to unconstrained scaling.

Image Aspect Restore the aspect ratio of the original image to reset stretching introduce by scaling, (Image textures only.) This operator can use the tiling and scale values of the brush texture if the relevant are enabled in *Adjust Last Operation* panel.

Reset Transform Restores the position of the stencil.

Angle `Ctrl-F` This is the rotation angle of the texture brush. It can be changed interactively via `Ctrl-F` in the 3D Viewport. While in the interactive rotation you can enter a value numerically as well.

Rake `R` Angle follows the direction of the brush stroke. Not available with *3D* textures. (Shortcut sculpting only.)

Random `R` Angle is randomized per dab.

Random Angle Constraints the random deviation to a range.

Offset Offset the texture map placement in X, Y, and Z axes.

Size Set the scale of the texture in each axis. Not available for *Drag* sculpting textures.

Sample Bias Value added to texture samples (sculpting only).

Texture Mask

Brush strength is masked with a texture.

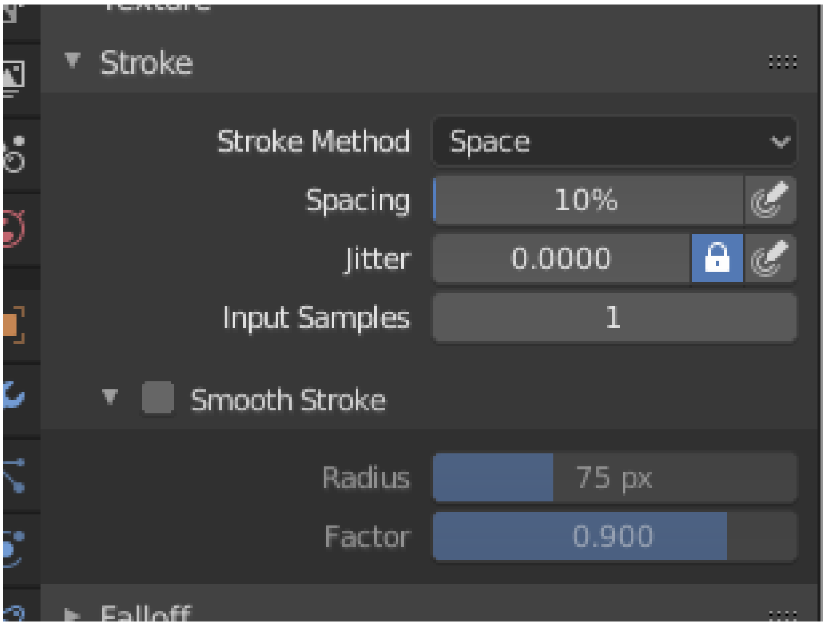
Pressure Masking A mask cut-off function. It allows to clip the mask result based on pressure, creating areas of no paint when low pressure is applied to the brush, similar to how a real brush would behave.

Off Deactivated.

Ramp Distributes the mask effect above the pressure value.

Cutoff Simply selects between zero and one based on stylus pressure.

Stroke



Stroke

Stroke Method: Space

Spacing: 10%

Jitter: 0.0000

Input Samples: 1

Smooth Stroke

Radius: 75 px

Factor: 0.900

Falloff

Fig. 1321: Stroke panel.

Stroke Method `E` Defines the way brush strokes are applied to the canvas.

- **Dots** Apply paint on each mouse move step.
- **Drag Dot** Leaves only one dab on the canvas which can be placed by dragging.
- **Space** Creates brush stroke as a series of dots, whose distance (spacing) is determined by the *Spacing* setting.
  - **Spacing** Represents the percentage of the brush radius.

    Limits brush application to the distance specified by spacing.
- **Airbrush** Flow of the brush continues as long as the mouse click is held (spray), determined by the *Rate* setting. With other methods the brush only modifies the color when the brush changes its location. This option is not available for the *Grab* sculpting brush.
  - **Rate** Interval between paints for airbrush.
- **Anchored** Creates a single dab at the brush location. Clicking and dragging will resize the dab diameter.
  - **Edge to Edge** The brush location and orientation are determined by a two point circle, where the first click is one point, and dragging places the second point, opposite from the first.
- **Line** Clicking and dragging lets you define a line in screen space. The line dabs are separated by *Spacing*, similar to space strokes. With `Alt` the line stroke is constrained to 45 degree increments.
- **Curve** Defines the stroke curve with a Bézier curve (dabs are separated according to *Spacing*). Use `Ctrl-RMB` to create the initial control point of the curve.
  - **Paint Curves** Stroke Curves are reusable and can be stored and selected by using the *Data-Block Menu* menu.
  - **Add Points** You can define additional curve control points by using `Ctrl-RMB`. The handles can be defined by dragging the mouse. The stroke flows in the direction of the first control point to the second control point. If another control point is added after the second control point, instead of extending it from the first control point in a

different direction, it will become the initial control point, and thus the stroke still flows in the direction of the first to the second.

Transforming Points The control points and handles can be dragged with `LMB`. To make sure that the handles of a control point are symmetrical, drag them using `Shift-RMB`. A few transform operators are supported such as moving, scaling and rotating.

Selection The handles can be selected individually by using `RMB`, extend the selection by `Shift-RMB` and deselect/select all by using `A`.

Delete Points `X` To delete a curve point, use `X`.

Draw Curve `Return` To confirm and execute the curved stroke, press `Return` or use the Draw Curve button.

Spacing Distance *Sculpt Mode Only* Method used to calculate the distance to generate a new brush step.

View Calculates the brush spacing relative to the view.

Scene Calculates the brush spacing relative to the scene using the stroke location. This avoids artifacts when sculpting across curved surfaces.

Adjust Strength for Spacing Attenuate the brush strength according to spacing. Available for the *Space*, *Line*, and *Curve* stroke methods.

Dash Ratio Ratio of samples in a cycle that the brush is enabled. This is useful to create dashed lines in texture paint or stitches in Sculpt Mode. Available for the *Space*, *Line*, and *Curve* stroke methods.

Dash Length Length of a dash cycle measured in stroke samples. This is useful to create dashed lines in texture paint or stitches in Sculpt Mode. Available for the *Space*, *Line*, and *Curve* stroke methods.

Jitter Jitter the position of the brush while painting.

Jitter Pressure Brush *Jitter* can be affected by enabling the pressure sensitivity icon, if you are using a *Graphics Tablet*.

Jitter Unit Controls how the brush *Jitter* is measured.

View The *Jitter* is measured based on how the cursor appears on the monitor i.e. "screen space".

Scene The *Jitter* is measured based on real world units. The unit type and scaling can be configured in the *Scene Units*.

Input Samples Recent mouse locations (input samples) are averaged together to smooth brush strokes.

Stabilize Stroke

Stabilize Stroke makes the stroke lag behind the cursor and applies a smoothed curve to the path of the cursor. This can be enabled temporary by holding `Shift-S` while painting or permanently by clicking the checkbox found in the header.

Radius Sets the minimum distance from the last point before stroke continues.

Factor Sets the amount of smoothing.

Falloff

The Falloff allows you to control the *Strength* falloff of the brush. The falloff is mapped from the center of the brush (left part of the curve) towards its borders (right part of the curve). Changing the shape of the curve will make the brush softer or harder. Read more about using the *Curve Widget*.

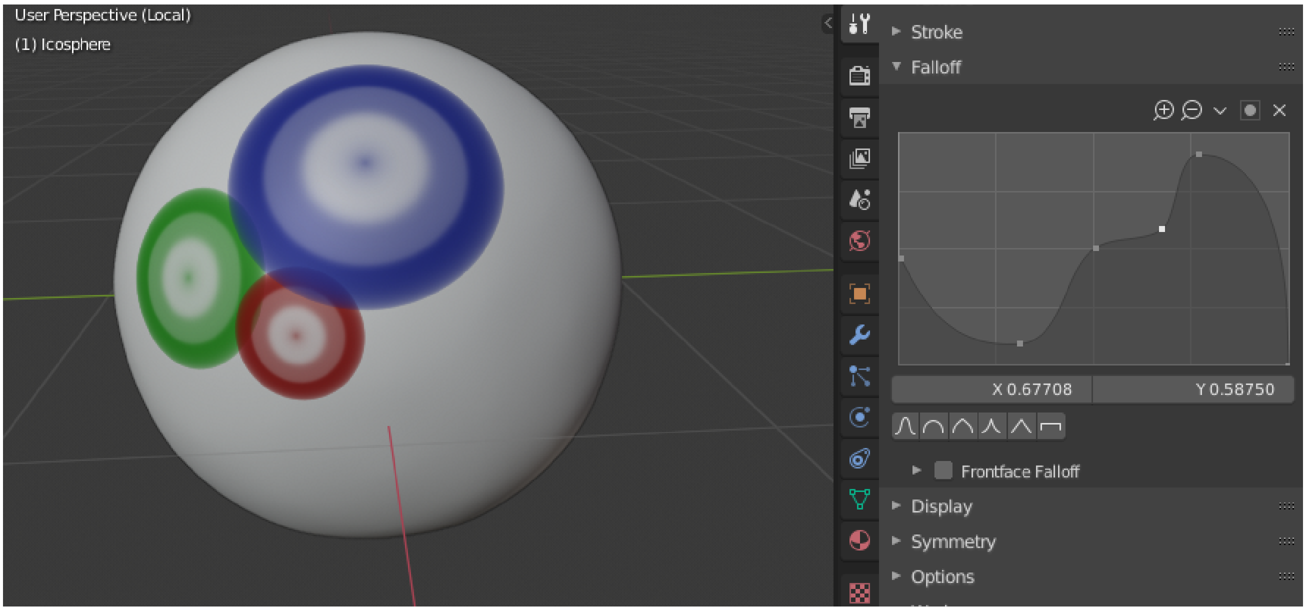


Fig. 1322: Brush curve example.

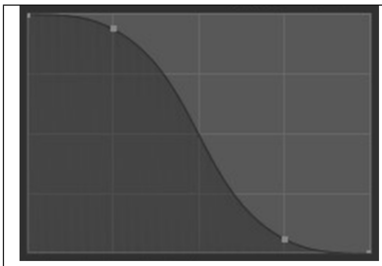
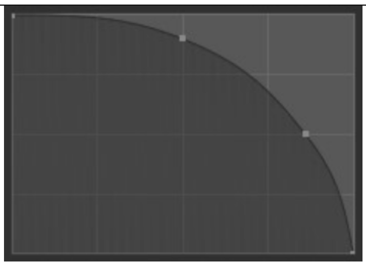
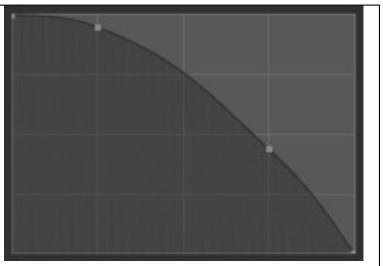
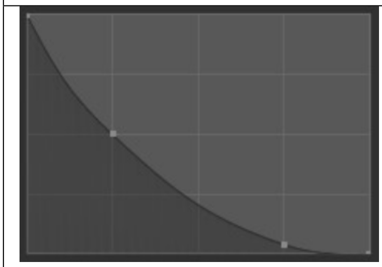
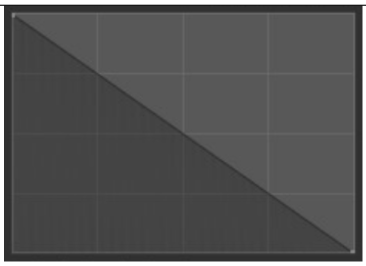
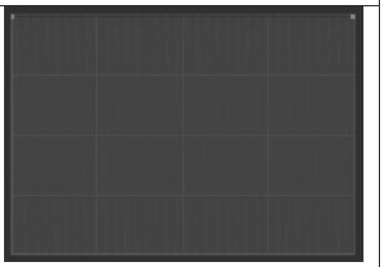
Curve Preset

Custom The user can choose how the strength of the falloff is determined from the center of the brush to the borders by manually manipulating the control points within the Curve Widget.

Custom Presets

- Smooth
- Sphere
- Root
- Sharp
- Linear
- Constant

Table 69: Custom Preset types.

 Fig. 1323: Smooth.	 Fig. 1324: Sphere.	 Fig. 1325: Root.
 Fig. 1326: Sharp.	 Fig. 1327: Linear.	 Fig. 1328: Constant.

Smooth The center strength, the border strength, and the falloff transition between them are evenly distributed.

Smoother Similar to *Smooth* but produces a wider center point of the brush before tapering off.

Sphere The strength of the brush is predominately at its strongest point with a steep falloff near the border of the brush.

Root Similar to a Sphere but the center is a more concentrated point.

Sharp The center of the brush is the strongest point then exponentially tapers off to a lower strength, creating a fine point.

Linear With the center being the strongest, the strength will consistently weaken as it reaches the border of the brush.

Sharper Similar to *Sharp* but the center point is more condensed.

Inverse square A hybrid between *Smooth* and *Sphere*.

Constant The strength of the brush remains unified across the entire brush. This will create a sharp edge at the border of the brush.

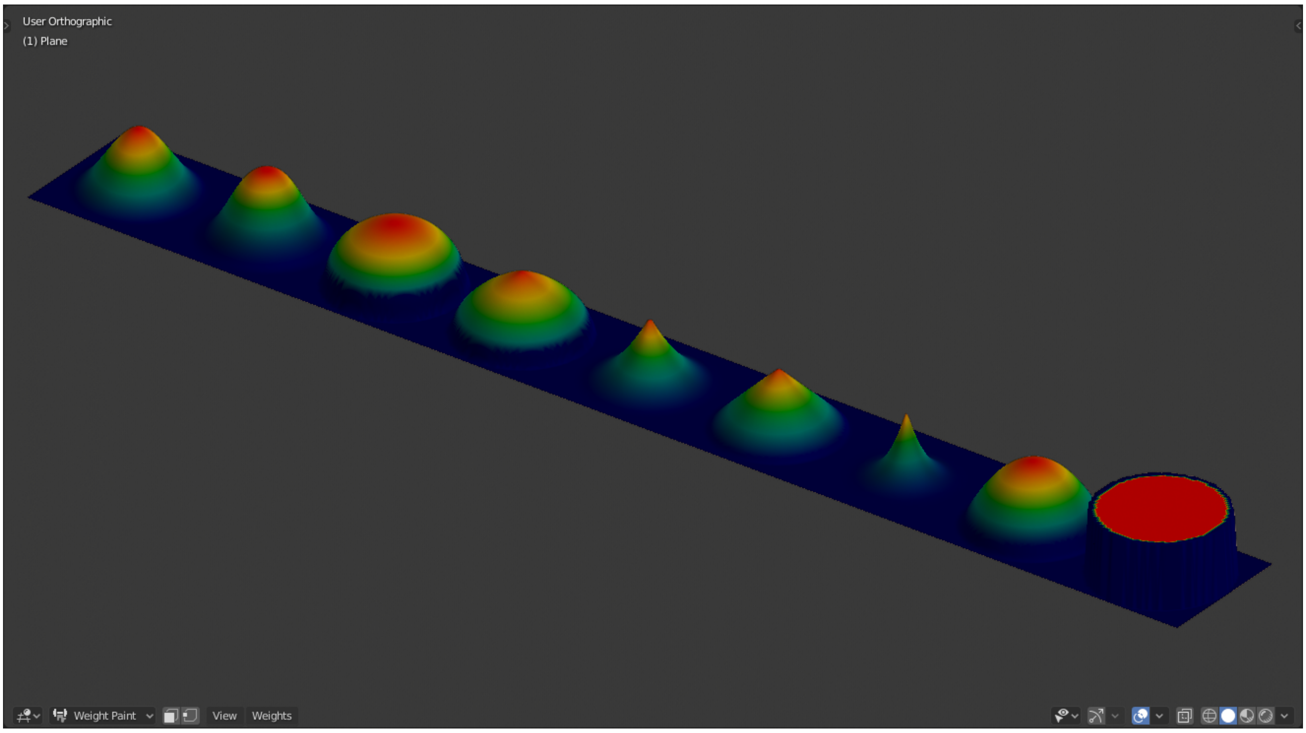


Fig. 1329: (From Left to Right) Smooth, Smoother, Sphere, Root, Sharp, Linear, Sharper, Inverse square, Constant.

Falloff Shape

Sphere Applies brushes influence in a sphere, outwards from the center.

Projected This turns the brush influence into a cylinder (the depth along the view is ignored) instead of a sphere. It can be used along the outline of a mesh to adjust its silhouette.

Normal Falloff

As faces point away from the view the brush strokes fade away to prevent harsh edges.

Angle The angle at which the falloff begins.

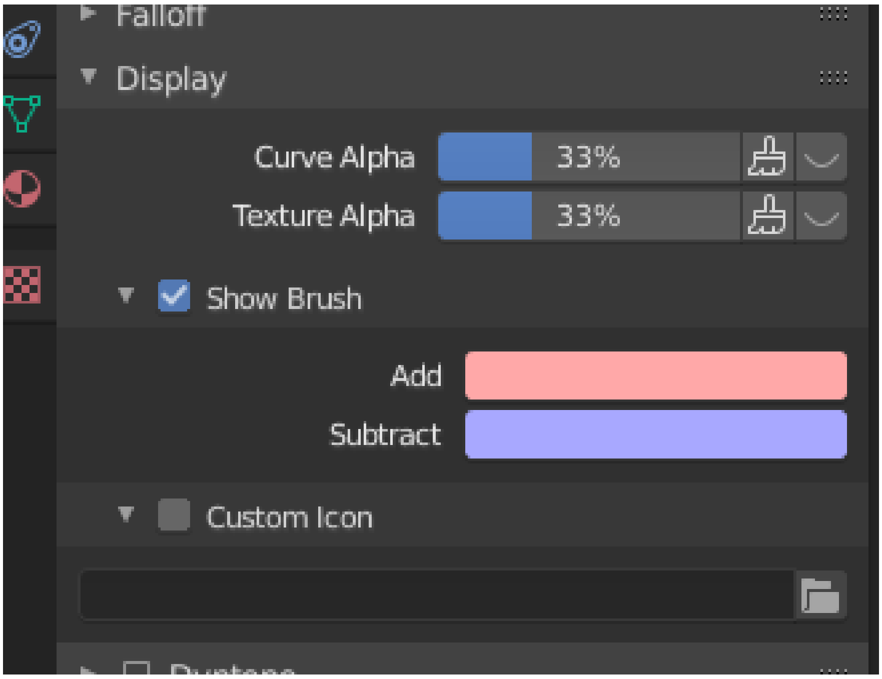
Cursor

Reference

Mode All Paint Modes

Header *Tool Settings* → *Brush Settings* → *Cursor*

Panel *Sidebar* → *Tool* → *Brush Settings* → *Cursor*



▸ Falloff

▾ Display

Curve Alpha 33%

Texture Alpha 33%

▾ ☑ Show Brush

Add

Subtract

▾ □ Custom Icon

Fig. 1330: Cursor options.

While painting or sculpting a special cursor is help display information about the brush. The cursor is shown as a circle in the 3D Viewport, the radius of the circle match the size of the brush.

The cursor can be disabled by toggling the checkbox in the *Cursor* header.

Cursor Color Set the color of the brush ring while performing an add/positive stroke.

Inverse Color In some paint/sculpt modes the brush can be negative and subtract information from the paint target; these brushes can be given a separate color.

Opacity Options Depending on the paint or sculpt mode different overlays are shown within the cursor to give information on how the brush is textured. This is most commonly used to show the brush falloff with a gradient from the circle center to the perimeter.

Alpha You can change the amount of transparency used when showing the texture using the slider.

Override Overlay (brush icon) Allows you to turn off the viewport overlay during strokes.

View (eye icon) Toggles whether to show or hide the given brush texture overlay.

2.6.3 Navigation

Center on Last Stroke **`NumpadPeriod`** Center the View on the average position of the last stroke.

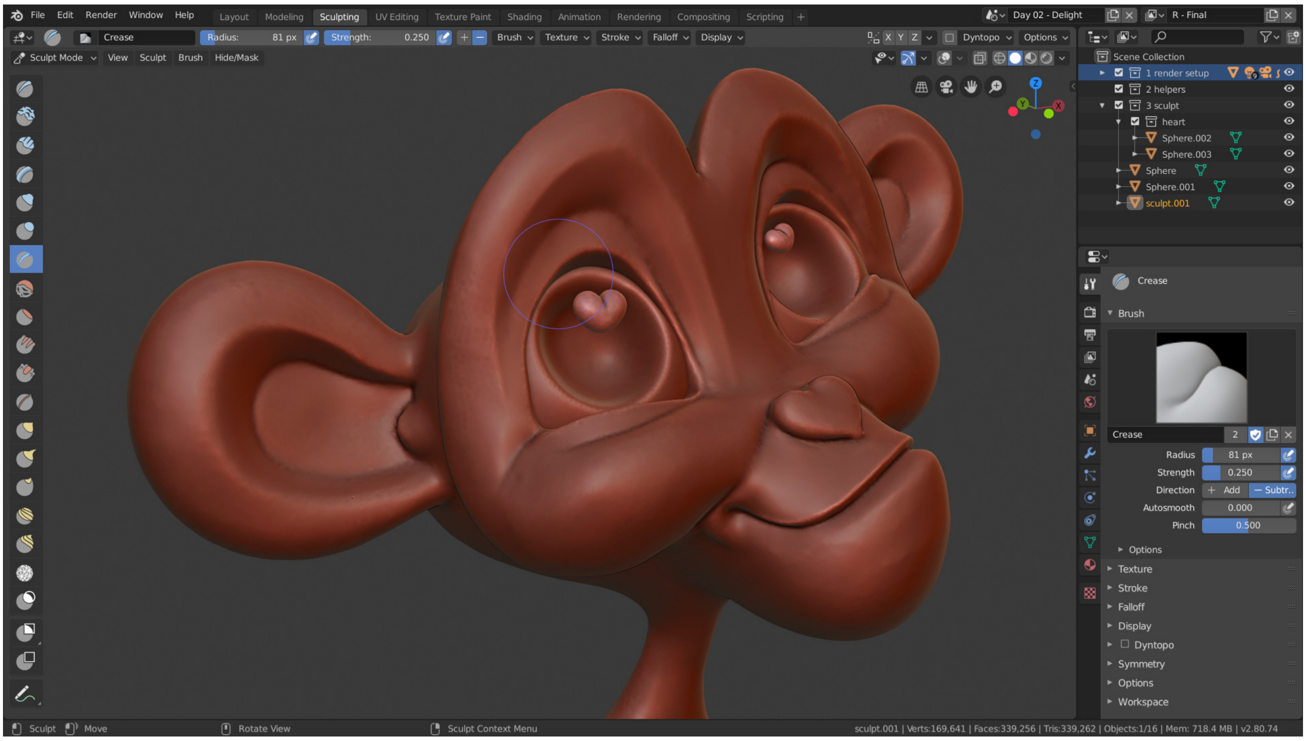
Orbit Around the Last Stroke You can orbit the view around the average position of the last stroke, if you enable the *Rotate Around Selection* in the *Preferences*.

2.6.4 Modes

Sculpting

Introduction

Sculpt Mode is similar to *Edit Mode* in that it is used to alter the shape of a model, but Sculpt Mode uses a very different workflow: instead of dealing with individual elements (vertices, edges, and faces), an area of the model is altered using a brush. In other words, instead of selecting a group of vertices, Sculpt Mode manipulates geometry in the brush region of influence.



Crease Radius: 81 px Strength: 0.250

Crease 2

Radius 81 px
Strength 0.250
Direction + Add − Subtr..
Autosmooth 0.000
Pinch 0.500

sculpt.001 | Verts:169,641 | Faces:339,256 | Tris:339,262 | Objects:1/16 | Mem: 718.4 MB | v2.80.74

Fig. 1331: Sculpting Mode Example.

Sculpt Mode is selected from the mode menu of the 3D Viewport header. Once Sculpt Mode is activated, the Toolbar of the 3D Viewport will change to Sculpt Mode specific panels. A red circle will appear and follow the location of the cursor in the 3D Viewport.

Note: To have a predictable brush behavior, apply the scale of your mesh.

The Brush

Sculpt Mode uses a similar brush to the other *painting modes*, but it is slightly more advanced. All the normal brush controls still apply, and it functions exactly the same, yet the brush for sculpting is displayed in 3D. This means that the brush will follow the contours of the mesh and the radius is displayed by orienting the brush to match the topology *Normal*. How closely the cursor follows the curvature of the mesh can be changed in the *Brush Settings*.

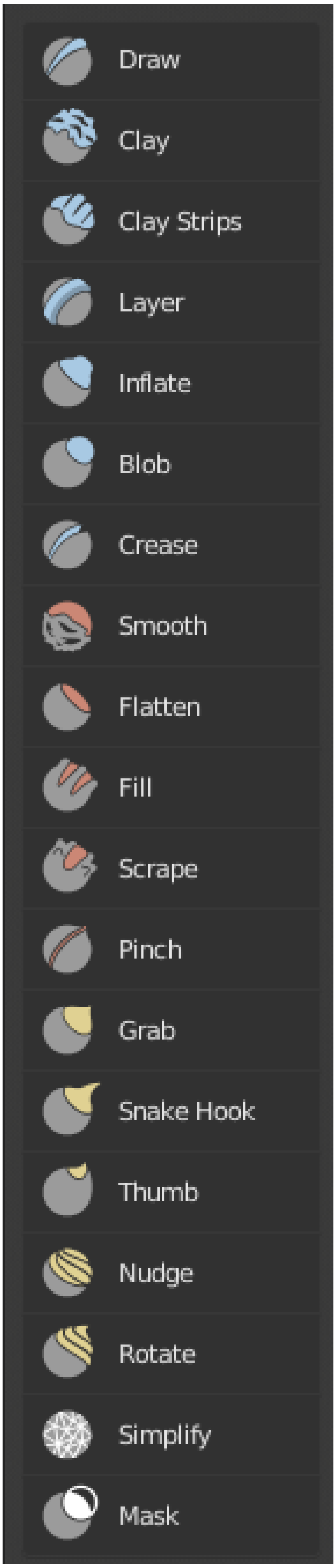
The brush can also change depending on the currently active *tool* to better display how that tool works.

Usage

Limiting Brush Interactions

While sculpting, areas might be hidden behind parts of the mesh or they might be too close to other parts. To work through these, it is useful to isolate parts of a mesh to sculpt on. This can be done by either completely hiding parts of the mesh or by masking areas that can not be sculpted on.

Toolbar


Draw
Clay
Clay Strips
Layer
Inflate
Blob
Crease
Smooth
Flatten
Fill
Scrape
Pinch
Grab
Snake Hook
Thumb
Nudge
Rotate
Simplify
Mask

Draw Moves vertices inward or outward based on the average normal.

Draw Sharp Move vertices inward or outward based the original coordinates and uses the *Sharper Falloff*.

Clay Similar to the *Draw* brush, but includes settings to adjust the plane on which the brush acts.

Clay Strips The same as the *Clay* brush, but it uses a cube to define the brush area of influence rather than a sphere.

Layer Moves all vertices to an exact height creating a flat layer.

Inflate Displaces the mesh in the direction of the vertex normals.

Blob Pushes mesh outward or inward into a spherical shape.

Crease Creates sharp indents or ridges by pushing or pulling the mesh, while pinching the vertices together.

Smooth Eliminates irregularities in the mesh by averaging the positions of the vertices.

Flatten Smooths vertices to a flat plain by finding an average height and moves vertices towards that height.

Fill Brings vertices below the brush plane upwards.

Scrape Brings vertices above the plane downwards.

Multiplane Scrape Scrapes the mesh with two angled planes at the same time, producing a sharp edge between them.

Pinch Pulls vertices towards the center of the brush.

Grab Selects a group of vertices and pulls them to follow the mouse.

Elastic Deform Used to simulate realistic deformations such as grabbing or twisting of *Elastic* objects.

Snake Hook Pulls vertices along with the movement of the brush to create long, snake-like forms.

Thumb Flattens the mesh in the brush area, while moving it in the direction of the brush stroke.

Pose Poses a model simulating an armature-like deformations.

Nudge Moves vertices in the direction of the brush stroke.

Rotate Rotates vertices within the brush in the direction the cursor is moved.

Slide Relax Slides the topology of the mesh in the direction of the stroke without changing the geometrical shape of the mesh.

Boundary Transforms and deforms the mesh boundaries.

Cloth Simulates cloth that can be sculpted.

Simplify Cleans up geometry by collapsing short edges.

Mask Lets you select mesh parts to be unaffected by other brushes by painting vertex colors.

Multires Displacement Eraser Deletes displacement information applied on a Multiresolution modifier.

Box Trim Creates a mask based on box select.

> ***Lasso Trim*** Creates a mask based on lasso select.
>
> ***Line Mask*** Creates a mask based on a line.

Box Face Set Creates a face set based on box select.

> ***Lasso Face Set*** Creates a face set based on lasso select.

Box Trim Performs a Boolean operation based on box select.

> ***Lasso Trim*** Performs a Boolean operation based on lasso select.

Line Project Performs a Boolean operation based on a line.

Mesh Filter Applies a deformation to all vertices in the mesh at the same time.

Cloth Filter Applies a cloth simulation to all vertices in the mesh at the same time.

Edit Face Set Modifies the face set under the cursor.

Move Translation tool.

Rotate Rotation tool.

Scale Scale tool.

Transform Tool to adjust the objects translation, rotations and scale.

Annotate Draw free-hand annotation.

- **Annotate Line** Draw straight line annotation.
- **Annotate Polygon** Draw a polygon annotation.
- **Annotate Eraser** Erase previous drawn annotations.

Tools

Draw

Reference

- **Mode** Sculpt Mode
- **Tool** *Toolbar → Draw*
- **Hotkey** X

Moves vertices inward or outward, based the average normal of the vertices contained within the drawn brush stroke.

Draw Sharp

Reference

- **Mode** Sculpt Mode
- **Tool** *Toolbar → Draw Sharp*

Similar to the *Draw* brush however, it deforms the mesh from the original coordinates and uses the *Sharper Falloff*. This is useful for creating cloth wrinkles, stylized hair or hard surface edges.

Clay

Reference

- **Mode** Sculpt Mode
- **Tool** *Toolbar → Clay*
- **Hotkey** C

Similar to the *Draw* brush, but includes settings to adjust the plane on which the brush acts. It behaves like a combination of the *Flatten* and *Draw* brushes.

Clay Strips

Reference

Mode Sculpt Mode

Tool *Toolbar → Clay Strips*

Similar to the *Clay* brush, but it uses a cube to define the brush area of influence rather than a sphere.

Brush Settings

Tip Roundness Factor to control how round the brush is, a value of zero will make the brush square. Note, the *Brush Falloff* is only applied to the rounded portions of the brush.

Clay Thumb

Reference

Mode Sculpt Mode

Tool *Toolbar → Clay Thumb*

This brush simulates deforming clay with the finger, accumulating material during the stroke. It has a plane that tilts during the stroke in the front part of the brush to achieve this effect.

Layer

Reference

Mode Sculpt Mode

Tool *Toolbar → Layer*

Hotkey L

This brush is similar to *Draw*, except that the height of the displacement layer is capped. This creates the appearance of a solid layer being drawn. This brush does not draw on top of itself; a brush stroke intersects itself. Releasing the mouse button and starting a new stroke will reset the depth and paint on top of the previous stroke.

Brush Settings

Height The amount of displacement for each layer.

Persistent You can keep sculpting on the same layer between strokes when this is on.

Set Persistent Base This button resets the base so that you can add another layer.

Inflate

Reference

Mode Sculpt Mode

Tool *Toolbar → Inflate*

Hotkey `I`

Similar to *Draw*, except that vertices in *Inflate* mode are displaced in the direction of their own normals.

Blob

Reference

Mode Sculpt Mode

Tool *Toolbar → Blob*

Pushes mesh outward or inward into a spherical shape with settings to control the amount of magnification at the edge of the sphere.

Crease

Reference

Mode Sculpt Mode

Tool *Toolbar → Crease*

Hotkey `Shift-C`

Creates sharp indents or ridges by pushing or pulling the mesh, while pinching the vertices together.

Smooth

Reference

Mode Sculpt Mode

Tool *Toolbar → Smooth*

Hotkey `S`

Eliminates irregularities in the area of the mesh within the brush's influence by smoothing the positions of the vertices. The inverse of this tool is to sharpen the details in a mesh by applying a Laplacian smooth in the opposite direction.

Brush Settings

Direction The operation to apply to the mesh. This setting can be toggled with `Ctrl` while sculpting.

Smooth Smooths the surface of the mesh by decreasing the difference between creases and valleys.

Enhance Details Sharpens details on the surface of the mesh by intensifying the difference between creases and valleys.

Deformation Deformation type that is used in the brush.

Laplacian Smooths the surface and the volume.

Surface Smooths the surface of the mesh, while preserving the volume.

Shape Preservation How much of the original shape is preserved when smoothing. Increasing the value reduces the effect of having multiple iterations on the strength of smoothing.

Per-Vertex Displacement How much the position of each individual vertex influences the final result. Increasing the value reduces the overall strength of smoothing.

Iterations Number of smoothing iterations per brush step.

Note: This method works by applying regular smoothing, computing the difference between the original (blended between start of iteration and fully original based on *Shape Preservation*) and the smoothed mesh, smoothing these offsets, pushing vertices back using the smoothed offsets, and finally blending in the original mesh based on *Per-Vertex Displacement*.

Flatten

Reference

Mode Sculpt Mode

Tool *Toolbar → Flatten*

Hotkey `Shift-T`

The *Flatten* brush determines an "area plane" located by default at the average height above/below the vertices within the brush area. The vertices are then pulled towards this plane. The inverse of the *Flatten* brush is the *Contrast* brush which pushes vertices up or down away from the brush plane.

Fill

Reference

Mode Sculpt Mode

Tool *Toolbar → Fill*

Works like the Flatten brush, but only brings vertices below the brush plane upwards.

Brush Settings

Area Radius Ratio between the brush radius and the radius that is going to be used to sample the area center.

Use Pressure (pressure sensitivity icon) Uses stylus pressure to control how strong the effect is. The gradient of the pressure can be customized using the *curve widget*.

Invert to Scrape When enabled, holding `Ctrl` while sculpting changes the brush behavior to be the same as the *Scrape* brush. When disabled, holding `Ctrl` while sculpting, will push vertices below the cursor downward.

Scrape

Reference

Mode Sculpt Mode

Tool *Toolbar → Scrape*

The *Scrape* brush works like the *Flatten* brush, but only brings vertices above the plane downwards.

Brush Settings

Area Radius Ratio between the brush radius and the radius that is going to be used to sample the area center.

Use Pressure (pressure sensitivity icon) Uses stylus pressure to control how strong the effect is. The gradient of the pressure can be customized using the *curve widget*.

Invert to Fill When enabled, holding `Ctrl` while sculpting changes the brush behavior to be the same as the *Fill* brush. When disabled, holding `Ctrl` while sculpting, will push vertices above the cursor up away from the cursor.

Multiplane Scrape

Reference

Mode Sculpt Mode

Tool *Toolbar → Multiplane Scrape*

Scrapes the mesh with two angled planes at the same time, producing a sharp edge between them. This is useful for creating edges when sculpting hard surface objects.

Brush Settings

Plane Angle The angle between the two planes of the brush, pressing `Ctrl` inverts the angle.

Dynamic Mode When enabled, the base angle is sampled from the mesh surface. The *Plane Angle* controls how much the angle will increase when applying pen pressure. When pressing `Ctrl`, it locks the plane angle to 0 degrees.

Show Cursor Preview Displays a preview of the two scrape planes and the angle they form instead of the cursor while performing the stroke.

Pinch

Reference

Mode Sculpt Mode

Tool *Toolbar → Pinch*

Hotkey `P`

Pulls vertices towards the center of the brush. The inverse setting is *Magnify*, in which vertices are pushed away from the center of the brush.

Grab

Reference

Mode Sculpt Mode

Tool *Toolbar → Grab*

Hotkey `G`

Used to drag a group of vertices around. *Grab* selects a group of vertices on mouse-down, and pulls them to follow the mouse. And unlike other brushes, *Grab* does not move different vertices as the brush is dragged across the model. The effect is like moving a group of vertices in Edit Mode with Proportional Editing enabled, except that *Grab* can make use of other Sculpt Mode options (like textures and symmetry).

Brush Settings

Grab Active Vertex Snaps the maximum strength of the brush to the highlighted active vertex, making it easier to manipulate low poly models or meshes with subdivision surfaces.

Enabling *Grab Active Vertex* also enables a dynamic mesh preview which generates a preview of vertices connected to the active vertex. This helps to visualize the real geometry that is being manipulating while sculpting with active modifiers.

Elastic Deform

Reference

Mode Sculpt Mode

Tool *Toolbar → Elastic Deform*

Used to simulate realistic deformations such as grabbing or twisting of *Elastic* objects. For example, this tool works great for modeling the shape of flesh like objects such as humans or animals. When pressing `Ctrl`, the brush deforms vertices along the normal of the active vertex.

Brush Settings

Deformation The surface alteration that is used in the brush.

Grab Used to drag a group of vertices around.

Bi-scale Grab Like *Grab* but the falloff is more localized to the center of the brush.

Tri-scale Grab Like *Bi-scale Grab* but the falloff is more localized to the center of the brush.

Scale Displaces vertices away from the active vertex.

Twist Vertices are rotated around the active vertex.

Volume Preservation Poisson ratio for elastic deformation. Higher values preserve volume more, but also lead to more bulging.

Snake Hook

Reference

Mode Sculpt Mode

Tool *Toolbar → Snake Hook*

Hotkey K

Pulls vertices along with the movement of the brush to create long, snake-like forms.

Brush Settings

Magnify The *Snake Hook* brush tends to loose volume along the stroke, with *Magnify* value greater than 0.5 it's possible to sculpt shapes without loosing volume.

Rake A factor to support moving the mesh with rotation following the cursor's motion.

Thumb

Reference

Mode Sculpt Mode

Tool *Toolbar → Thumb*

Similar to the *Nudge* brush, this one flattens the mesh in the brush area, while moving it in the direction of the brush stroke.

Pose

Reference

Mode Sculpt Mode

Tool *Toolbar → Pose*

This brush is used to pose a model simulating armature-like deformations. Several different deformation modes can be used to perform IK deformations or altering and moving the proportions of the mesh. The falloff of the deformation across multiple segments is controlled by the brush falloff curve.

Brush Settings

Deformation Target How the deformation of the brush will affect the object.

- **Geometry** Brush deformation displaces the vertices of the mesh.
- **Cloth Simulation** Brush deforms the mesh by deforming the constraints of a *cloth simulation*.

Deformation Deformation type that is used by the brush.

- **Rotate/Twist** Rotates segments around a pivot point that is calculated automatically based on the radius of the brush and the topology of the model. When pressing `Ctrl`, the brush applies a twist rotation to the posing segments instead of using the rotation or an IK deformation.
- **Scale/Translate** Alters the proportions of the mesh, using the origin of the segment as a pivot. While holding `Ctrl` the brush moves the entire segment.
- **Squash/Stretch** Works similar to *Scale/Translate* however, it applies different scale values along different axes to achieve the stretching effect. The pivot point for this mode is calculated by using the local space aligned to the segment.

Rotation Origins Method to set the rotation origins for the segments of the brush.

- **Topology** Sets the rotation origin automatically using the topology and shape of the mesh as a guide.
- **Face Sets** Creates a pose segment per *Face Set*, starting from the active face set.
- **Face Sets FK** Simulates an *Forward Kinematics* deformation using the *Face Set* under the cursor as control.

Pose Origin Offset Offset of the pose origin in relation to the brush radius. This is useful to manipulate areas with a lot of complex shapes like fingers.

Smooth Iterations Controls the smoothness of the falloff of the deformation.

Pose IK Segments Controls how many *IK bones* are going to be created for posing.

Lock Rotation when Scaling When using *Scale/Translate Deformation*, do not rotate the segment; only scaling is applied.

Keep Anchor Point Keeps the position of the last segment in the IK chain fixed.

Connected Only Causes the brush to only affect topologically connected elements. Disabling this can have an impact on performance; when disabled, keeping the *Max Element Distance* as low as possible will help counteract the performance impact.

Max Element Distance Maximum distance to search for disconnected loose parts in the mesh.

Nudge

Reference

- **Mode** Sculpt Mode
- **Tool** *Toolbar → Nudge*

Moves vertices in the direction of the brush stroke.

Rotate

Reference

Mode Sculpt Mode

Tool *Toolbar → Rotate*

Rotates vertices within the brush in the direction in which the cursor is moved. The initial drag direction is the zero angle and by rotating around the center you can create a vortex effect.

Slide Relax

Reference

Mode Sculpt Mode

Tool *Toolbar → Slide Relax*

This brush slides the topology of the mesh to areas that require more detail. The brush does this while minimizing changes to the geometrical shape of the mesh. When pressing `Shift`, the brush enters *Relax* mode which tries to create an even distribution of quads without deforming the volume of the mesh.

Brush Settings

Deformation Deformation type that is used by the brush.

Drag Slides or pulls the topology of the mesh in the direction of the stroke.

Pinch Slides the topology of the mesh towards the center of the stroke.

Expand Slides the topology of the mesh away from the center of the stroke.

Boundary

Reference

Mode Sculpt Mode

Tool *Toolbar → Boundary*

This tool is used to transform and deform the boundaries i.e. the unconnected edges of a mesh. The tool detects the mesh boundary closest to the active vertex and propagates the deformation using the brush *Falloff* into the mesh.

Note: Even if this brush can produce deformations in triangle meshes and meshes with a non-regular quad grid, the more regular and clean the topology is, the better the result.

Brush Settings

Deformation Target How the deformation of the brush will affect the object.

Geometry Brush deformation displaces the vertices of the mesh.

Cloth Simulation Brush deforms the mesh by deforming the constraints of a *cloth simulation*.

Deformation Deformation type that is used by the brush.

Bend Rotates the active boundary around the local Y axis.

Expand Moves/extends the mesh boundary in the local X direction.

Inflate Works similar to the *Inflate* tool but, the vertices that are inflated are constrained to the mesh boundary.

Grab Works similar to the *Grab* tool but, the vertices that are grabbed are constrained to the mesh boundary.

Twist Rotates the active boundary around the local Z axis.

Smooth Works similar to the *Grab* tool but, the vertices that are smoothed are constrained to the the mesh boundary.

Boundary Falloff How the brush *Falloff* is applied across the boundary.

Boundary Origin Offset Offset of the boundary origin in relation to the brush radius.

Constant Applies the same deformation in the entire boundary.

Brush Radius Applies the deformation in a localized area limited by the brush radius.

Loop Applies the brush falloff in a loop pattern.

Loop and Invert Applies the falloff radius in a loop pattern, inverting the displacement direction in each pattern repetition.

Usage

The main use cases of this brush are the *Bend* and *Expand* deformation modes, which depend on a grid topology to create the best results. In order to do further adjustments and tweaks to the result of these deformations, use the Inflate, Grab, Twist, and Smooth deformation modes, which do not depend that much on the topology.

Cloth

Reference

Mode Sculpt Mode

Tool *Toolbar → Cloth*

The Cloth brush uses a simplified *Cloth Solver* to simulate cloth physics on the mesh under the brush. *Masked* vertices are *pinned* in the simulation, and it applies the sculpt *gravity* directly in the solver. Note, using a relatively small brush makes the solver's calculations much faster, larger brush sizes might be too slow to get a usable brush.

Brush Settings

Persistent Allows the cloth brush to not accumulate deformation after each stroke. This is convenient to always simulate the based on the same initial shape, but applying different forces to it.

When disabled, deformations accumulate after each stroke.

Set Persistent Base Resets the base mesh so that you can add another layer of deformations.

Simulation Area Selects the part of the mesh that is going to be simulated when the stroke is active. This can greatly affect performance depending on the complexity of the mesh.

Local Simulates only a specific area around the brush limited by a fixed radius.

Global Simulates the entire mesh.

Dynamic The active simulation area moves with the brush while still being limited by a fixed radius.

Simulation Limit The Factor added relative to the size of the radius to limit the cloth simulation effects.

Simulation Falloff The area to apply deformation falloff to the effects of the simulation. This setting is a factor of the *Simulation Limit* and is shown as a dashed line around the cursor.

Pin Simulation Boundary Lock the position of the vertices in the simulation falloff area to avoid artifacts and create a softer transition with unaffected areas.

Deformation The type of cloth deformation that is used by the brush.

Drag Simulates pulling the cloth to the cursor, similar to placing a finger on a table cloth and pulling.

Push Simulates pushing the cloth away from the cursor, similar to placing a finger on a table cloth and pushing.

Pinch Point Simulates pulling the cloth into a point.

Pinch Perpendicular Simulates pulling the brush into a line.

Inflate Simulates air being blown under the cloth so that the cloth lifts up.

Grab Simulates picking up and moving the cloth.

Expand Simulates stretching the cloth out.

Snake Hook Simulates moving the cloth without producing any artifacts in the surface and creates more natural looking folds than any of the other deformation modes. This is accomplished by adjusting the strength of the deformation constraints per brush step to avoid affecting the results of the simulation as much as possible.

Force Falloff Shape used in the brush to apply force to the cloth.

Radial Applies the force as a sphere.

Plane Applies the force as a plane.

Cloth Mass Mass of each simulation particle.

Cloth Damping How much the applied forces are propagated through the cloth.

Soft Body Plasticity The amount the cloth preserves its original shape, acting as a *Soft Body*.

Use Collisions Enables the detection of collisions with other objects during the simulation. In order for the sculpt object to collide with objects, the collision object must have *Collision Physics* activated.

Simplify

Reference

Mode Sculpt Mode

Tool *Toolbar → Simplify*

This brush collapses short edges (as defined by the detail size) whether or not the *Collapse Short Edges* option is enabled. This brush has no effect if dynamic topology is not enabled.

Mask

Reference

Mode Sculpt Mode

Tool *Toolbar → Mask*

Hotkey `M`

Lets you select mesh parts to be unaffected by other brushes by painting vertex colors. The mask values are shown as gray-scale. I.e. the darker a masked area is, the less effect sculpting on it will have. See also the options of the *Mask* menu.

Brush Settings

Mask Tool The mask brush has two modes:

Draw Mask drawing.

Smooth `Shift` Pressing `Shift` with the mask brush active will toggle the mask smoothing mode.

Multires Displacement Eraser

Reference

Mode Sculpt Mode

Tool *Toolbar → Multires Displacement Erase*

This brush deletes displacement information of the *Multires Modifier*, resetting the mesh to the subdivision limit surface.

This can be used to easily delete parts of the sculpt or to fix reprojection artifacts after applying a *Shrinkwrap Modifier*.

Draw Face Sets

Reference

Mode Sculpt Mode

Tool *Toolbar → Draw Face Sets*

This brush draws a new *Face Set* with each stroke. Holding `Ctrl` will continue drawing the same face set as the one under the cursor. Holding `Shift` will relax or smooth the edges of the face sets by modifying the underlying topology so edges flow along the perimeter of the face sets. This will remove the jagged lines visible after drawing or creating a face set.

Box Mask

Reference

Mode Sculpt Mode

Tool *Toolbar → Box Mask*

Creates a new *Mask* based on a *box selection*.

Tool Settings

Front Faces Only Only creates a mask on the faces that face towards the view.

Lasso Mask

Reference

Mode Sculpt Mode

Tool *Toolbar → Lasso Mask*

Creates a new *Mask* based on a *lasso selection*.

Tool Settings

Front Faces Only Only creates a mask on the faces that face towards the view.

Line Mask

Reference

Mode Sculpt Mode

Tool *Toolbar → Line Mask*

This tool creates a *Mask* based on plan determined by the camera view and a drawn line. The masked region of the mesh is visualized by the shaded side of the line.

Tool Settings

Front Faces Only Only creates a mask on the front side of faces.

Usage

1. Orient the 3D Viewport to define the local view plane to use for the mask.
2. `LMB` and hold while moving the cursor to define the line to pick a region of the view plane to mask.
3. Release `LMB` to confirm.

Controls

Flip `F` Changes the side of the line that the tool creates a mask.

Snap `Ctrl` Constrains the line to 15 degree intervals.

Move `Ctrl-Spacebar` Changes the location of the line.

Box Face Set

Reference

Mode Sculpt Mode

Tool *Toolbar → Box Face Set*

Creates a new *Face Set* based on a *box selection*.

Tool Settings

Front Faces Only Only draw face sets on the front side of faces.

Lasso Face Set

Reference

Mode Sculpt Mode

Tool *Toolbar → Lasso Face Set*

Creates a new *Face Set* based on a *lasso selection*.

Tool Settings

Front Faces Only Only draw face sets on the front side of faces.

Box Trim

Reference

Mode Sculpt Mode

Tool *Toolbar → Box Trim*

Adds or removes geometry using a Boolean operation based on a *box selection*.

Tool Settings

Trim Mode The operation to perform on the mesh; geometry can be either added or removed. When using the *Union* or *Join* mode the new geometry is assigned to a new *Face Set*. When using *Difference* mode, interior geometry is also added to a new face set.

Difference Removes geometry in the shape of the selection filling any holes that are created in existing geometry.

Union Fills the selected outline with a new mesh and joins any intersections with existing geometry.

Join Similar to *Union* but joins the mesh as separate geometry, without performing any Boolean operations with existing geometry.

Use Cursor for Depth Use cursor location and radius for the dimensions and position of the trimming shape. If not set, the tool uses the full depth of the object from the camera view.

Lasso Trim

Reference

Mode Sculpt Mode

Tool *Toolbar → Lasso Trim*

Adds or removes geometry using a Boolean operation based on a *lasso selection*.

Tool Settings

Trim Mode The operation to perform on the mesh; geometry can be either added or removed. When using the *Union* or *Join* mode the new geometry is assigned to a new *Face Set*. When using *Difference* mode, interior geometry is also added to a new face set.

Difference Removes geometry in the shape of the selection filling any holes that are created in existing geometry.

Union Fills the selected outline with a new mesh and joins any intersections with existing geometry.

Join Similar to *Union* but joins the mesh as separate geometry, without performing any Boolean operations with existing geometry.

Use Cursor for Depth Use cursor location and radius for the dimensions and position of the trimming shape. If not set, the tool uses the full depth of the object from the camera view.

Line Project

Reference

Mode Sculpt Mode

Tool *Toolbar → Line Project*

This tool performs a Boolean operation based on plan determined by the camera view and a drawn line. The region of the mesh being removed is visualized by the side of the line that is shaded.

Usage

1. Orient the 3D Viewport to define the local view plane to use for the Boolean.
2. `LMB` and hold while moving the cursor to define the line to pick a region of the view plane to remove.
3. Release `LMB` to confirm.

Controls

Flip `F` Changes the side of the line that the tool removes geometry.

Snap `Ctrl` Constrains the line to 15 degree intervals.

Move `Ctrl-Spacebar` Changes the location of the line.

Mesh Filter

Reference

Mode Sculpt Mode

Tool *Toolbar → Mesh Filter*

Applies a deformation to all vertices in the mesh at the same time. To use this tool, click and drag away from the object to have a positive effect and click and drag towards the mesh to have a negative effect.

Tool Settings

Filter Type

Smooth Eliminates irregularities of the mesh by making the positions of the vertices more uniform. This filter works similar to the *Smooth Brush*.

Scale Increases the size of the mesh. This filter works similar to the *Scale Transform*.

Inflate Displaces vertices uniformly along their normal. This filter works similar to the *Inflate Brush*.

Sphere Morphs the mesh progressively into a sphere. This filter works similar to the *To Sphere Transform*.

Random Randomly moves vertices along the vertex normal. This filter works similar to the *Randomize Transform*.

Relax Tries to create an even distribution of quads without deforming the volume of the mesh. This filter works the same as the *Relax* mode of the *Slide Relax* brush.

Relax Face Sets Smooths the edges of the face sets by modifying the underlying topology so edges flow along the perimeter of the face sets. This will remove the jagged lines visible after drawing or creating a face set.

Surface Smooth Eliminates irregularities of the mesh by making the positions of the vertices more uniform while preserving the volume of the object.

Shape Preservation How much of the original shape is preserved when smoothing.

Per-Vertex Displacement How much the position of each individual vertex influences the final result.

Sharpen Sharpens and smooths the mesh based on its curvature, resulting in pinching hard edges and polishing flat surfaces. It fixes most of the artifacts of the voxel remesher and those produced when sculpting hard surfaces and stylized models with creasing and flattening brushes.

Smooth Ratio How much smoothing is applied to polished surfaces.

Intensify Details Increases the high frequency surface details of the mesh by intensifying the difference between creases and valleys.

Curvature Smooth Iterations The number of times the smoothing operation is applied per brush step. Controls how much smooth the resulting shape is, ignoring high-frequency details.

Enhance Details Increases the high frequency surface details of the mesh by intensifying the difference between creases and valleys.

Erase Displacement Deletes displacement information of the *Multires Modifier*, resetting the mesh to the subdivision limit surface. This can be used to delete parts of the sculpt or to fix reprojection artifacts after applying a *Shrinkwrap Modifier*.

Strength The amount of effect the filter has on the mesh.

Deformation Axis Apply the deformation only on the selected axis.

Orientation *Orientation* of the axis to limit the filter displacement.

Local Use the local axis to limit the displacement.

World Use the global axis to limit the displacement.

View Use the view axis to limit the displacement.

Cloth Filter

Reference

Mode Sculpt Mode

Tool *Toolbar → Cloth Filter*

This tool works similar to the *Cloth Brush*, however, it applies a cloth simulation to all vertices in the mesh at the same time. Click and drag away from the object for a positive effect and towards for a negative effect.

Tip: Vertices can be “pinned” by *masking* vertices that should remain stationary, or by using *Face Sets*.

Brush Settings

Filter Type Operation that is going to be applied to the mesh.

Gravity Applies gravity to the simulation.

Inflate Inflates the cloth.

Expand Expands the cloth’s dimensions.

Pinch Pinches the cloth to the point were the cursor was when the filter started.

Scale Scales the mesh as a *Soft Body* using the distance to the origin of the object as scale. This creates filter produces folds in the surface. The orientation of the folds can be controlled using the *Force Axis* and *Orientation*.

Strength The amount of effect the filter has on the mesh.

Force Axis Apply the force along the selected axis.

Orientation *Orientation* of the axis to limit the filter force.

Local Use the local axis to limit the force and set the gravity direction.

World Use the world axis to limit the force and set the gravity direction.

View Use the view axis to limit the force and set the gravity direction.

Cloth Mass Mass of each simulation particle.

Cloth Damping How much the applied forces are propagated through the cloth.

Use Face Sets Only applies the cloth forces to the vertices assigned to the *Face Set* that are under the mouse.

Use Collisions Enables the detection of collisions with other objects during the simulation. In order for the sculpt object to collide with object, the collision object must have *Collision Physics* activated.

Edit Face Set

Reference

Mode Sculpt Mode

Tool *Toolbar → Edit Face Set*

Operator *Grow/Shrink Face Sets*

Edits the *Face Set* under the cursor.

Tool Settings

Mode The operation to apply to the face set.

Grow Face Set Grows the face sets boundary by one face based on mesh topology.

Shrink Face Set Shrinks the face sets boundary by one face based on mesh topology.

Modify Hidden Apply the edit operation to hidden face sets.

Transforms

Move

Reference

Mode Sculpt Mode

Tool *Toolbar → Move*

Translation tool.

Rotate

Reference

Mode Sculpt Mode

Tool *Toolbar → Rotate*

Rotation tool.

Scale

Reference

Mode Sculpt Mode

Tool *Toolbar → Scale*

Scale tool.

Transform

Reference

Mode Sculpt Mode

Tool *Toolbar → Transform*

Tool to adjust the objects translation, rotations and scale.

Tool Settings

Brush Settings

Radius This option controls the radius of the brush, measured in pixels. `F` allows you to change the brush size interactively by dragging the mouse and then `LMB` (the texture of the brush should be visible inside the circle). Typing a number then enter while using `F` allows you to enter the size numerically.

Size Pressure Brush size can be affected by enabling the pressure sensitivity icon, if you are using a *Graphics Tablet*.

Use Unified Radius Use the same brush *Radius* across all brushes.

Radius Unit Controls how the brush *Radius* is measured.

View The *Radius* is measured based on how the cursor appears on the monitor i.e. "screen space".

Scene The *Radius* is measured based on real world units. The unit type and scaling can be configured in the *Scene Units*.

Strength Controls how much each application of the brush affects the model. For example, higher values cause the *Draw* brush to add depth to the model more quickly, and cause the *Smooth* brush to smooth the model more quickly. This setting is not available for *Grab*, *Snake Hook*, or *Rotate*.

You can change the brush strength interactively by pressing `Shift-F` in the 3D Viewport and then moving the brush and then `LMB`. You can enter the size numerically also while in `Shift-F` sizing.

Strength Pressure Brush strength can be affected by enabling the pressure sensitivity icon, if a supported tablet is being used.

Use Unified Strength Use the same brush *Strength* across all brushes.

Tip: If the range of strengths does not seem to fit the model (for example, if even the lowest strength setting still makes too large of a change on the model) then you can scale the model (in Edit Mode, not Object Mode). Larger sizes will make the brush's effect smaller, and vice versa.

Direction `Ctrl` Brush direction toggle, *Add* raises geometry towards the brush, *Subtract* lowers geometry away from the brush. This setting can be toggled with `Ctrl` while sculpting.

Normal Radius The ratio between the brush radius and the radius that is going to be used to sample the normal i.e. take the average of multiple normals. This influences the brush orientation; increasing this value causes the brush to follow a smooth version of the mesh, while a small value causes the brush to closely follow the contours of the mesh.

Hardness How close the brush falloff starts from the edge of the brush.

Autosmooth Sets the amount of smoothing to be applied to each stroke.

Topology See *Dyntopo*.

Normal Weight `Ctrl` Constrains brush movement along the surface normal. Especially useful with the *Grab* brush, can be temporarily enabled by holding `Ctrl`. E.g. *Grab* brush can be used to push a depression (hole) into the mesh when *Normal Weight* is set.

Applies to *Grab* and *Snake Hook* brushes.

Plane Offset Offset for planar brushes (Clay, Fill, Flatten, Scrape), shifts the plane that is found by averaging the faces above or below.

Plane Trim Ability to limit the distance that planar brushes act. If trim is enabled vertices that are further away from the offset plane than the trim distance are ignored during sculpting.

Advanced

Auto-Masking

Topology Setting per each brush, affects only vertices connected to the active vertex under the brush. This can be used for isolating disconnected meshes, face sets, masking cavities, mesh boundary edges, or creating topological falloffs.

Face Sets Affect only vertices that share face sets with active vertex.

Mesh Boundary Does not affect non-manifold boundary edges.

Face Sets Boundary Does not affect vertices which belong to a face set boundary.

Propagation Steps The distance where *Mesh Boundary Auto-Masking* is going to protect vertices from the fully masked edge.

Sculpt Plane Use this menu to set the plane in which the sculpting takes place. In other words, the primary direction that the vertices will move.

Area Plane The movement takes place in the direction of average normal for all active vertices within the brush area. Essentially, this means that the direction is dependent on the surface beneath the brush.

View Plane Sculpting in the plane of the current 3D Viewport.

X, Y, Z Plane The movement takes place in the positive direction of one of the global axes.

Use Original

Normal When locked it keeps using the normal of the surface where stroke was initiated, instead of the surface normal currently under the cursor.

Plane When locked keep using the plane origin of surface where stroke was initiated, instead of the surface plane currently under the cursor.

Accumulate Causes stroke dabs to accumulate on top of each other.

Front Faces Only When enabled, the brush only affects vertices that are facing the viewer.

Texture

See the global brush settings for *Texture* settings.

Stroke

See the global brush settings for *Stroke* settings.

Falloff

See the global brush settings for *Falloff* settings.

Cursor

See the global brush settings for *Cursor* settings.

Dyntopo

Reference

Mode Sculpt Mode

Panel *Sidebar → Tool → Dyntopo*

Hotkey `Ctrl-D`

Dynamic topology (aka dyntopo) is a dynamic tessellation sculpting method, adds and removes details on-the-fly, whereas regular sculpting only affects the shape of a mesh.

This makes it possible to sculpt complex shapes out of a simple mesh, rather than just adding details onto a modeled base mesh.

Dyntopo can be toggled with the checkbox in the header or with `Ctrl-D`. With dynamic topology active, most brushes will subdivide the mesh during the stroke.

Detail Size/Percentage, Resolution `Shift-D` Each Detail Type's detail is set here. Depending on the Detail Type being used this property will rather show as a pixel count (px), or percentage.

Sample Detail Size (pipette icon) With Constant Detail Size it is possible to sample the detail value of a certain mesh area by clicking the pipette icon next to the detail setting and then clicking on the area.

Refine Method Setting the option will determine which of the methods will be used when altering the topology.

Subdivide Edges Just like the Subdivide tool, this method will only subdivide topology to match the detail given.

Collapse Edges When topology is too dense, and is smaller than the detail given, edges will be collapsed to fit the detail size appropriately.

Subdivide Collapse This method combines the two methods, subdividing edges smaller than the detail size, and collapsing topology.

Detailing Dyntopo uses three different detail methods to create dynamic detail to an object.

Relative Detail This method uses a detail size based on the number of pixels, and in turn will create topology in that size. Zoom out big details, zoom in small fine details.

Constant Detail To keep detail uniform across the entire object, Constant Detail can be used. The Detail is based on the percentage of a single unit.

Brush Detail Giving more control over the topology, with this method you can create topology based on the brush size. You can increase and lower topology by resizing the brush itself. The detail size is based the size of the brush itself, where full detail will create topology the size of the brush radius itself.

Detail Flood Fill When using *Constant* or *Manual Detailing*, this option is made available, allowing you to fill the entire object with a uniform detail, based on the detail size.

Smooth Shading Toggles whether mesh faces are smooth or flat-shaded. In dynamic-topology mode all faces have the same type of shading.

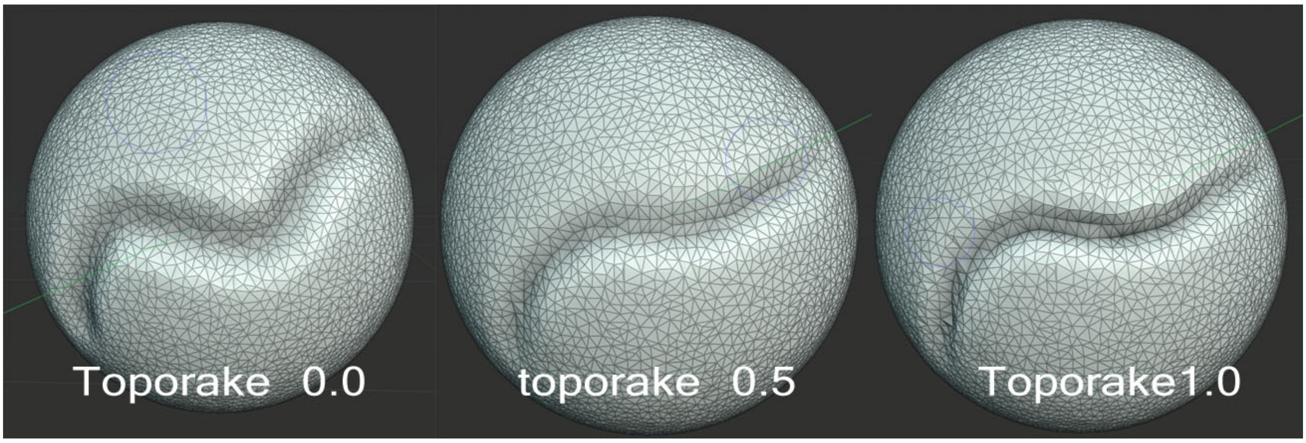
Topology Rake

Reference

Mode Sculpt Mode

Panel *Tool Settings → Brush → Topology Rake*

Topology Rake automatically aligns mesh edges to the brush direction to generate cleaner topology and define sharp features. *Topology Rake* can have a severe performance impact so it works best on low-poly meshes.



Remesh

Reference

Mode All Paint Modes

Header *Tool Settings → Remesh*

Panel *Sidebar → Tool → Remesh*

Hotkey `Ctrl-R` (Voxel), `Ctrl-Alt-R` (Quadriflow)

Remeshing is a technique that automatically rebuilds the geometry with a more uniform topology. Remeshing can either add or remove the amount of topology depending on a defined resolution. This technique is especially useful for *sculpting*, to generate better topology after blocking out the initial shape.

The Voxel Remesher uses an OpenVDB to generate a new manifold mesh from the current geometry. It produces a mesh with perfectly even distributed topology and it does not have any performance penalty once the new mesh is calculated. This makes the voxel remesher great for sculpting has it is possible to sculpt at a much higher level of detail than using other features like dyntopo which often adds more performance overhead.

Voxel Size The resolution or the amount of detail the remeshed mesh will have. The value is used to define the size, in object space, of the *Voxel*. These voxels are assembled around the mesh and are used to determine the new geometry. For example a value of 0.5m will create topological patches that are about 0.5m (assuming *Preserve Volume* is enabled). Lower values preserve finer details but will result in a mesh with a much more dense topology.

The voxel size also be adjusted from the 3D Viewport using `Shift-R`. Using this shortcut shows a grid that has the real size of the resulting voxel size. Holding `Shift` while adjusting the size allows better pressing while holding `Ctrl` adjusts the size linearly.

Sample Voxel Size Used to adjust the *Voxel Size* by picking an area of the mesh to match the denseness of polygons after the remesh operation.

Adaptivity Reduces the final face count by simplifying geometry where detail is not needed. This introduce triangulation to faces that do not need as much detail. Note, an *Adaptivity* value greater than zero disables *Fix Poles*.

Fix Poles Tries to produce less *poles* at the cost of some performance to produce a better topological flow.

Smooth Normals Applies the *Smooth Normals* operator to the resulting mesh.

Preserve

Volume Tells the algorithm to try to preserve the original volume of the mesh. Enabling this could make the operator slower depending on the complexity of the mesh.

Paint Mask Reprojects the *paint mask* onto the new mesh.

Face Sets Reprojects *Face Sets* onto the new mesh.

Voxel Remesh Performs the remeshing operation to create a new manifold mesh based on the volume of the current mesh. Performing this will lose all mesh object data layers associated with the original mesh.

See also:

Remesh modifier

Known Limitations

- Remeshing only works on the original mesh data and ignores generated geometry from modifiers, shape keys, rigging, etc.
- Remeshing will not work with the *Multiresolution Modifier*.

Symmetry

Reference

Mode Sculpt Mode

Tool *Toolbar → Tool → Symmetry*

Mirror Mirror the brush strokes across the selected local axes. Note that if you want to alter the directions the axes point in, you must rotate the model in Edit Mode and not in Object Mode.

Lock These three buttons allow you to block any modification/deformation of your model along selected local axes, while you are sculpting it.

Tiling Using this option allows you to seamlessly tile your strokes along the given axes. This allows to create repeating patterns.

Feather Reduces the strength of the stroke where it overlaps the planes of symmetry.

Radial X, Y, Z These settings allow for radial symmetry in the desired axes. The number determines how many times the stroke will be repeated within 360 degrees around the central axes.

Tile Offset X, Y, Z The offset allows the option to alter the tile size along all three axes. The default tile size is set to one unit.

Direction Determines which direction the model will be symmetrized.

Symmetrize Uses direction orientation to symmetrize. Since Dyntopo adds details dynamically it may happen that the model becomes asymmetric, so this a good tool for that.

Options

Reference

Mode Sculpt Mode

Tool *Toolbar → Options*

Display

Fast Navigate For multiresolution models, shows low resolution while navigating in the viewport.

Delay Viewport Updated Update the geometry when it enters view. This provides for faster navigation.

Use Deform Only Limits the activated modifiers on the active object to Deform Modifiers, and Multiresolution. Constructive modifiers (like Subdivision Surface, Mirror and other) get deactivated, because they could give inaccurate results.

Auto-Masking

Topology Brush affects only vertices connected to the active vertex under the brush.

Face Sets Affect only vertices that share face sets with active vertex.

Mesh Boundary Does not affect non-manifold boundary edges.

Face Sets Boundary Does not affect vertices which belong to a face set boundary.

Tip: The settings for above for auto-masking apply across all sculpt brushes. However, the Auto-Masking settings in *Advanced Brush Settings* apply per sculpt brush.

See also:

See the *Display* options.

Gravity

Factor Setting the factor allows you to add gravity to your brush strokes, giving it a draping effect.

Orientation Using another object, the gravity can be oriented to the set object’s local Z axis, changing the direction of the gravity.

Adaptive Sculpting

In order for sculpting to give accurate and predictable results, Blender needs geometry to work with. One way to accomplish this is starting off with a highly subdivided mesh. The other way involves using either of two adaptive sculpting methods to add geometry dynamically.

Dynamic Topology

Dynamic topology (aka dyntopo) is a dynamic tessellation sculpting method that adds and removes details under the brush. This works by first tessellating the mesh then applying the sculpting stroke on top of the tessellated mesh.

This makes it possible to sculpt complex shapes out of a simple mesh, rather than just adding details onto a modeled base mesh.

See also:

Dynamic Topology can be enabled in the *Dyntopo panel*.

Multiresolution Modifier

The Multiresolution Modifier can be used to dynamically subdivide the mesh. The more subdivision the more computing will be needed. With the Blender stack non-destructive data, multiresolution sculpting will help when you have a clean topology base mesh.

When sculpting with multiple resolutions you have the ability to sculpt in different levels of subdivision, this mean you can sculpt some details in subdivision level 1 and add more details in subdivision 2 and go back to subdivision 1 correct some mistakes. While this workflow is often used, the Multiresolution Modifier has some limitations. You may end up with some mesh distortions. As an advice, add as most details as possible before adding more subdivisions. Clay brush works better with multiresolution sculpting to sculpt secondary forms.

- Step up one multires level `PageUp`
- Step down one multires level `PageDown`
- Set multires level `Ctrl-0` to `Ctrl-5`

See also:

Read more about the *Multiresolution Modifier*.

Editing

Sculpt

Show & Hide

Reference

Mode Sculpt Mode

Menu *Sculpt*

Portions of the mesh can be hidden in Sculpt Mode to improve the viewport performance and to access parts of the mesh that would otherwise be difficult to access, because they are occluded by other parts. The hidden faces cannot be sculpted on. Hiding is shared between Edit Mode and Sculpt Mode (i.e. hiding/unhiding in one mode affects the other mode too).

Show All `Alt-H` Reveal all hidden parts.

Show Bounding Box `Shift-H` To reveal a hidden part of a mesh inside the selection.

Hide Bounding Box `H` To hide a part of a mesh inside the selection. This works similar to the *Box Select* tool.

Hide Masked Hides all masked vertices.

Set Pivot

Reference

Mode Sculpt Mode

Menu *Sculpt → Set Pivot*

Like Object and Edit Mode, Sculpt Mode also has a *Pivot Point*. This is because the basic move, scale, rotate transforms are also possible in Sculpt Mode.

Origin Sets the pivot to the origin of the sculpt.

Unmasked Sets the pivot position to the average position of the unmasked vertices.

Mask Border Sets the pivot position to the center of the mask's border.

Active Vertex Sets the pivot position to the active vertex position.

Surface Sets the pivot position to the surface under the cursor.

See also:

Object and Edit Mode Pivot

Rebuild BVH

Reference

Mode Sculpt Mode

Menu *Sculpt → Rebuild BVH*

Recalculates the *BVH* used by *Dyntopo* which can improve performance which might degrade over time while using Dyntopo.

Mask

Masking to control which areas of the mesh are influenced by sculpting.

Brush

To edit the mask, select the *Mask Brush* from the Brush panel.

Editing

Reference

Mode Sculpt Mode

Menu *Mask*

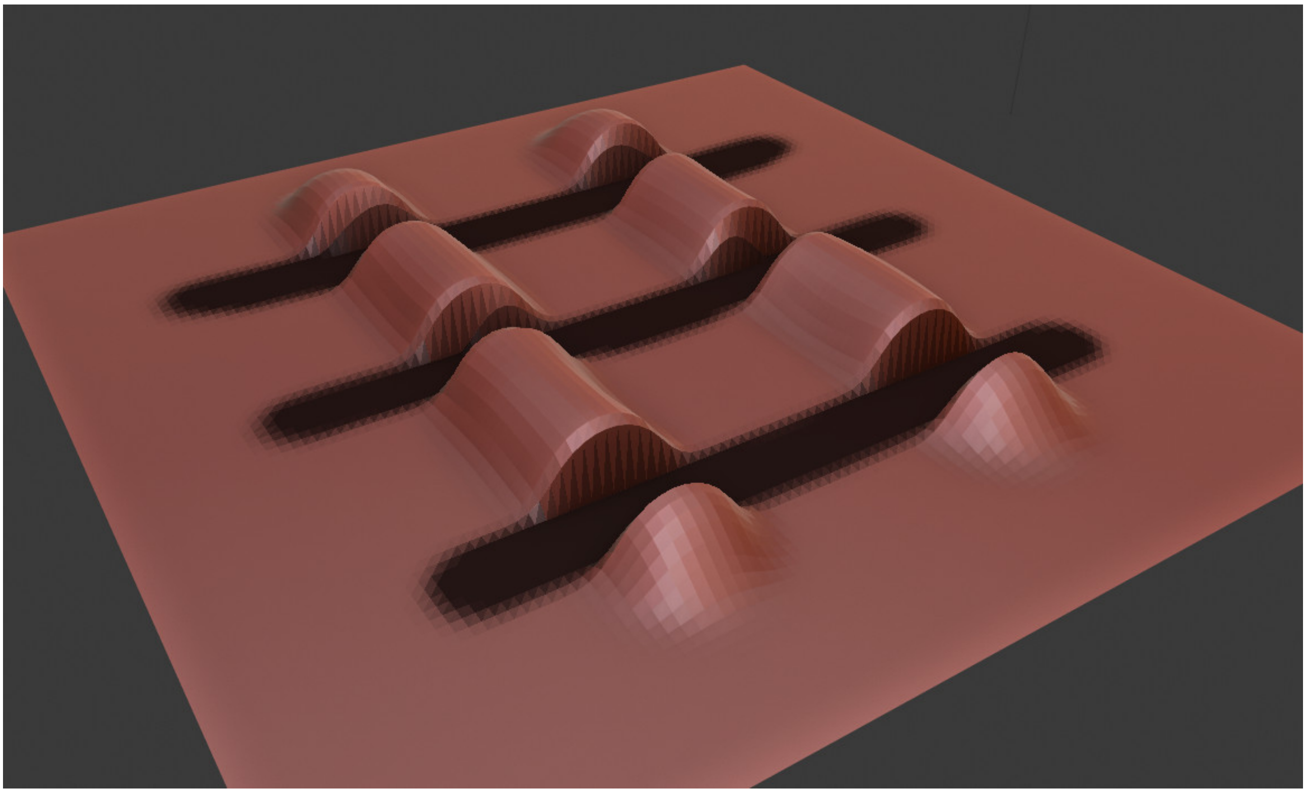


Fig. 1332: Black part is masked.

Masks can be edited across the entire model. Using `A` opens a pie menu to choose different operations.

Invert Mask

Reference

- **Mode** Sculpt Mode
- **Menu** *Mask → Invert Mask*
- **Hotkey** `Ctrl-I`

Inverts an existing mask.

Fill Mask

Reference

- **Mode** Sculpt Mode
- **Menu** *Mask → Invert Mask*

Fills the whole mask with a value of 1.

Clear Mask

Reference

Mode Sculpt Mode

Menu *Mask → Invert Mask*

Hotkey `Alt-M`

Fills the mask with a value of 0. To completely remove the mask data, see *Clear Sculpt-Mask Data*.

Box Mask

Reference

Mode Sculpt Mode

Menu *Mask → Box Mask*

Hotkey `B`

Works like the *Box Select* tool, it creates a rectangular mask region. Hold `Shift` to clear the mask of the selected region.

Lasso Mask

Reference

Mode Sculpt Mode

Menu *Mask → Lasso Mask*

Hotkey `Shift-Ctrl-LMB`

Can be used to create a free-form mask, similar to the *Lasso Select* tool.

Tip: To clear the mask of areas with the *Lasso Mask* tool, first invert the mask, apply the *Lasso Mask*, and then invert the mask back.

Mask Filters

Reference

Mode Sculpt Mode

Menu *Mask → Mask Filters*

Mask filters are operations that are applied to the whole paint mask.

Type

Smooth/Sharpen Mask Changes the crispness of the mask edge.

Grow/Shrink Mask Changes the size of the mask.

Increase/Decrease Contrast Changes the contrast of the mask.

Iterations The number of times that the filter is going to be applied.

Auto Iteration Count Use a automatic number of iterations based on the number of vertices of the sculpt.

Expand Mask by Topology

Reference

Mode Sculpt Mode

Menu *Mask* → *Expand Mask by Topology*

Hotkey `Shift-A`

Creates a mask radiating outwards from the active vertex in a uniform manner.

Expand Mask by Curvature

Reference

Mode Sculpt Mode

Menu *Mask* → *Expand Mask by Curvature*

Hotkey `Shift-Alt-A`

Creates a mask radiating outwards from the active vertex while following the curvature of the mesh.

Mask Extract

Reference

Mode Sculpt Mode

Menu *Mask* → *Mask Extract*

Creates a duplicate mesh object based on masked geometry.

Threshold Minimum mask value to consider the vertex valid to extract a face from the original mesh.

Add Boundary Loop Creates and extra boundary loop on the edges of the geometry, making it ready for adding a Subdivision Surface modifier later.

Smooth Iterations Smooth iterations applied to the extracted mesh.

Project to Sculpt Project the extracted mesh on to the original sculpt object.

Extract as Solid Adds a *Solidify Modifier* to the newly created mesh object.

Mask Slice

Reference

Mode Sculpt Mode

Menu *Mask → Mask Slice*

Removes the masked vertices from the mesh.

Threshold Minimum mask value to consider the vertex valid to extract a face from the original mesh.

Fill Holes Fills concave holes with geometry that might have resulted from the *Mask Slice* operation.

Slice to New Object Create a new object from the masked geometry.

Dirty Mask

Reference

Mode Sculpt Mode

Menu *Mask → Dirty Mask*

Generates a mask based on the geometry cavity and pointiness.

Display Settings

Reference

Mode Sculpt Mode

Popover *Viewport Overlays – Sculpt → Mask*

The mask display can be toggled as a *viewport overlay*. In the overlay popover, the opacity of the mask overlay can be adjusted to make it more or less visible on the mesh.

Clear Sculpt-Mask Data

Reference

Mode Object/Edit Mode

Menu *Properties → Object Data → Geometry Data → Clear Sculpt-Mask Data*

Completely frees the mask data layer from the mesh. While not a huge benefit, this can speed-up sculpting if the mask is no longer being used.

Face Sets

Face sets are another way to control the visibility state of the mesh in Sculpt Mode. They are designed to work in modes where brushes are the primary way of interaction and they provide much more control when working with meshes with complex shapes and overlapping surfaces. Geometry can be assigned to a face set and each face set is represented as a different color in the 3D Viewport. A pie menu to edit face sets can be accessed with W.

Face Set from Masked

Reference

Mode Sculpt Mode

Menu *Face Sets → Face Set from Masked*

Creates a new face set from *Masked Geometry*.

Face Set from Visible

Reference

Mode Sculpt Mode

Menu *Face Sets → Face Set from Visible*

Creates a new face set from all visible geometry.

Face Set from Edit Mode Selection

Reference

Mode Sculpt Mode

Menu *Face Sets → Face Set from Edit Mode Selection*

Creates a new face set corresponding to the Edit Mode face selection.

Init Face Sets

Reference

Mode Sculpt Mode

Menu *Face Sets → Init Face Sets*

Initializes all face sets on the mesh at once based off one of several mesh attribute properties.

Mode The mesh data attribute used to define the boundaries for the face sets.

By Loose Parts Creates a new face set per discontinuous part of the mesh.

By Materials Creates a face set per *Material Slot*.

By Normals Creates face sets for Faces that have similar *Normals*.

By UV Seams Creates face sets using *UV Seams* as boundaries.

By Edge Creases Creates face sets using *Edge Creases* as boundaries.

By Edge Bevel Weight Creates face sets using *Bevel Weights* as boundaries.

By Sharp Edges Creates face sets using *Sharp Edges* as boundaries.

By Face Maps Creates a face set per *Face Map*.

Threshold The minimum value to consider a certain attribute a boundary when creating the face sets.

Grow/Shrink Face Sets

Reference

Mode Sculpt Mode

Menu *Face Sets → Grow/Shrink Face Sets*

Tool *Edit Face Set*

Hotkey `Ctrl-W`, `Ctrl-Alt-W`

Expands or contracts the face set under the cursor by adding or removing surrounding faces.

Extract Face Set

Reference

Mode Sculpt Mode

Menu *Face Sets → Grow/Shrink Face Sets*

Creates a new mesh based on the selected face set. Once the operator is initiated, hover over the face set and `LMB` to create the new mesh. After the operator is finished the new mesh will be selected in Object Mode.

Invert Visible Face Sets

Reference

Mode Sculpt Mode

Menu *Face Sets → Invert Visible Face Sets*

Hides all geometry that is part of a face set and makes all hidden geometry that is part of a face set visible.

Show All Face Sets

Reference

Mode Sculpt Mode

Menu *Face Sets → Show All Face Sets*

Shows all hidden geometry that is part of a face set.

Randomize Colors

Reference

Mode Sculpt Mode

Menu *Face Sets → Randomize Colors*

Generates a new set of random colors to render the face sets in the 3D Viewport.

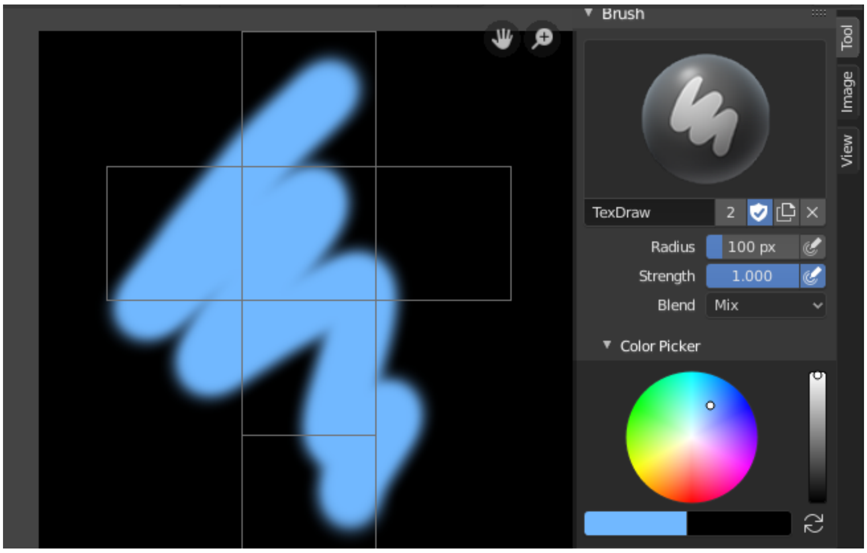
Texture Paint

Introduction

A UV texture is a picture (image, sequence or movie) that is used to color the surface of a mesh. The UV texture is mapped to the mesh through one or more UV maps. There are three ways to establish the image used by the UV texture:

1. Paint a flat image in the Image Editor onto the currently selected UV texture, using its UV map to transfer the colors to the faces of the mesh.
2. Paint the mesh in the 3D View, and let Blender use the currently selected UV map to update the UV texture (see *Projection Painting*).
3. Use any image editing program to create an image. In the Image Editor, select the UV texture and load the image. Blender will then use that texture's UV map to transfer the colors to the faces of the mesh.

Blender features a built-in paint mode called *Texture Paint* which is designed specifically to help you edit your UV textures and images quickly and easily in either the Image Editor or the 3D Viewport. Since a UV texture is just a special-purpose image, you can also use any external paint program, like GIMP or Krita.



TexDraw 2

Radius 100 px

Strength 1.000

Blend Mix

Fig. 1333: Texture painting in Blender.

Since a mesh can have layers of UV textures, there may be many images that color the mesh. However, each UV texture only has one image.

Texture Paint works in both a 3D Viewport and the Image Editor. In the 3D Viewport in Texture Paint Mode, you paint directly on the mesh by projecting onto the UVs.

Tip: Memory Optimization

Texture Paint is fast and responsive when working in the 3D Viewport and when your image is sized as a square where the side lengths are a power of two, e.g. 256×256, 512×512, 1024×1024, etc.

Getting Started

The object to be painted on must first be *unwrapped*. UVs can be added traditionally, with standard *Unwrapping Tools*, or by adding *Simple UVs* in Texture Paint mode.

Note: When no UV layers can be detected, Blender will display a warning message.

Once you have unwrapped your model to a UV map, you can begin the texturing process. To use texture paint you may do any of the following:

- Activate the Texture Paint workspace. Here the 3D Viewport has the Texture Paint Mode enabled and the Image Editor is already switched to Paint mode.
- In the 3D View, select Texture Paint Mode from the mode selector in the header, and you can paint directly onto the mesh.
- In the Image Editor, switch the mode to Paint (shown to the right).

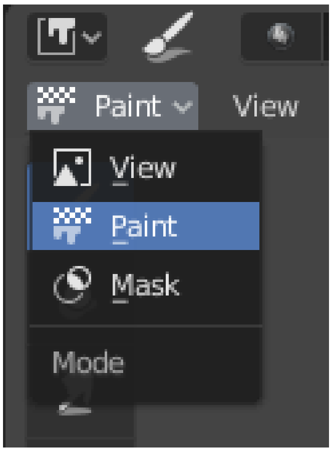


Fig. 1334: Enabling Paint mode.

Once you enable Texture Painting, your mouse becomes a brush. As soon as you enable Texture Painting or switch to Texture Paint Mode, different tools become available in the Toolbar.

In the Image Editor, you paint on a flat canvas that is wrapped around the mesh using UV coordinates. Any changes made in the Image Editor show up immediately in the 3D View, and vice versa. To work with the UV layout (for example, to move coordinates) you must go back to View mode.

A full complement of brushes and colors can be selected from the Sidebar region in the Image Editor. Brush changes made in either panel are immediately reflected in the other panel. However, the modified texture will **not** be saved automatically; you must explicitly do so by *Image Editor → Image → Save*.

Texture Preview

If your texture is already used to color, bump map, displace, alpha-transparent, etc., a surface of a model in your scene (in other technical words, is mapped to some aspect of a texture via a texture channel using UV as a map input), you can see the effects of your painting in the context of your scene as you paint.

To do this, set up side-by-side areas, one Area in 3D Viewport set to *Texture* shading option, and in the second Area the Image Editor loaded with your image. Position the 3D Viewport to show the object that is UV-mapped to the loaded image. In the image to the right, the texture being painted is mapped to the "Normal" attribute, and is called "bump mapping", where the grayscale image is used to make the flat surface appear bumpy. See Texture Mapping Output for more information on bump mapping.

Saving

If the header menu item Image has an asterisk next to it means that the image has been changed, but not saved. Use the *Image* → *Save Image* option to save your work with a different name or overwrite the original image.

Note: UV Textures

Since images used as UV textures are functionally different from other images, you should keep them in a directory separate from other images.

The image format for saving is independent of the format for rendering. The format for saving a UV image is selected in the header of the File Browser, and defaults to `PNG (.png)`.

If Packing is enabled in the File Browser's header, or if you manually *Image* → *Pack Image*, saving your images to a separate file is not necessary.

Using an External Image Editor

If you use an external program to edit your UV texture, you must:

1. Run that paint program (GIMP, Krita, etc.).
2. Load the image or create a new one.
3. Change the image.
4. And re-save it within that program.
5. Back in Blender, you reload the image in the Image Editor.

You want to use an external program if you have teams of people using different programs that are developing the UV textures, or if you want to apply any special effects that Texture Paint does not feature, or if you are much more familiar with your favorite paint program.

Known Limitations

UV Overlap

In general overlapping UVs are not supported (as with texture baking).

However, this is only a problem when a single brush stroke paints onto multiple faces that share a texture.

Perspective View & Faces Behind the View

When painting onto a face which is partially behind the view (in perspective mode), the face cannot be painted on. To avoid this, zoom out or use an orthographic viewport.

Perspective View & Low Poly

When painting onto a face in perspective mode onto a low-poly object with normals pointing away from the view, painting may fail; to workaround disable the *Normal* option in the paint panel.

Typically this happens when painting onto the side of a cube (see Bug report T34665).

Texture Paint Tools

Draw The normal brush, paints a swath of color.

Soften Uses a "blur effect" to soften or sharpen the image.

> **Direction**
>
> > **Soften** Is used to paint a blur effect.
> >
> > > **Kernel Radius (2D only)** Blur radius in pixels.
> >
> > **Sharpen** The Sharpen tool enhances the contrast of the image as you paint over it.
> >
> > > **Sharp Threshold** The Threshold will only apply sharpening to only those pixels that differ more than the threshold value from their surrounding pixels.
> > >
> > > **Kernel Radius (2D only)** The kernel size controls how big an area the tool searches over is while calculating that difference.
>
> **Blur Mode** The blur kernel type controls how neighboring pixels are weighted when calculating the blur effect.
>
> > **Gaussian** Gaussian will sample the pixels near the center of the brush most.
> >
> > **Box** Box samples all surrounding pixels equally.

Smear When you click, takes the colors under the cursor, and blends them in the direction you move the mouse. Similar to the "smudge" tool of *Gimp*.

Clone Copies the colors from the specified image (or location of the same image) to the active image.

> In 3D projective painting the clone cursor can be set with `Ctrl-LMB`. In 2D painting the clone can be moved dragging it with `RMB`.
>
> **Clone from Paint Slot (3D projective only)** Use another image as clone source, instead of using the 3D cursor position as the source in the same image.
>
> > **Source Clone Slot** This allows you to select an image as a clone source.
>
> **Image (2D only)** Image used as a clone source.
>
> **Alpha (2D only)** Opacity of the clone image display.

Fill It can be used to fill large areas of the image with the brush color. The tool fills adjacent pixels that have a color value similar to the pixel you clicked on.

> **Fill Threshold (2D only)** Determines how much the color must be similar to the color of pixel you click to be filled. A low *Threshold* only fills very similar in color pixels. A higher *Threshold* fills pixels within a broader range of color.
>
> The *Gradient* type of the Color Picker allows the use of a gradient to fill the image.
>
> To apply the gradient with the *Fill* brush click `LMB` and drag to define the gradient line, or radius if a radial gradient is used (depending on the *Gradient Fill Mode*).

Gradient Fill Mode Linear, Radial

Note: Overrides

For projective texturing it will bypass some options for projective painting to paint the model. This means that occluded, backfacing and normal culled faces will always get filled, regardless of whether the options are activated in the *External* panel.

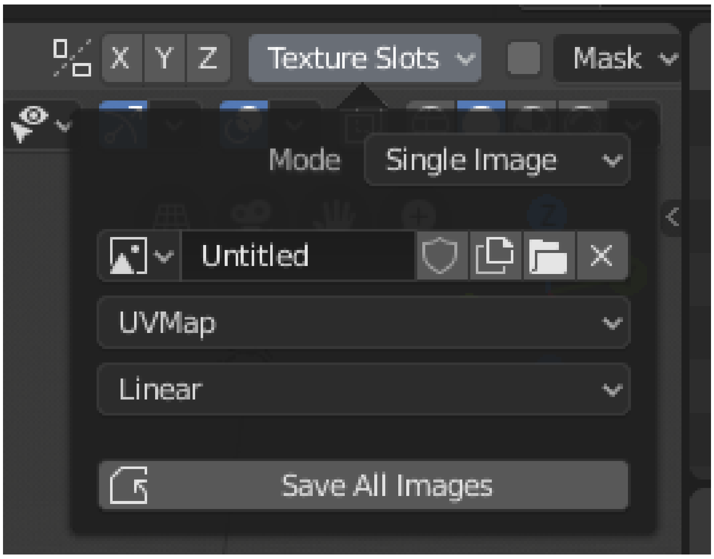
Mask The mask feature maps an image to the mesh and uses the image intensity to mask out certain parts of the mesh out during painting. The mask options can be found in the *Mask panel*. It's only available for 3D projective painting.

Mask Value Mask weight, a value of zero means not masked, while one is completely masked.

Tip: Use the face selection mask to isolate faces. See *Face Selection Masking* for details.

Tool Settings

Texture Slots



Mode Single Image

Untitled

UVMap

Linear

Fig. 1335: Texture Slots settings.

The combination of images associated with UV maps is called "slots".

Selecting a *Paint Slots* or *Canvas Image* will also display the corresponding image in the Image Editor.

Mode The slot system includes two painting modes:

Material This mode tries to detect the slots from the materials of the mesh.

For the Cycles renderer, all textures (*Image Texture* node) in the material's node tree are added in the slots tab.

Active Paint Texture Index A *List view* of slots. Activate a certain slot to use it for painting by LMB click on it.

Single Image You can just select an existing image and painting will use the active UV layer for painting.

Image Allows you to select the image used as a canvas.

New Create a new image.

UV Map Allows you to select the UV layer for painting. (Same as the currently active UV map in the mesh's *UV Maps* panel.)

Texture Filter Type Set the interpolation mode of the texture. This can be Linear or Closest.

Save All Images Repack (or save if external file) all edited images. Same as in the *Image Editor*.

Add Simple UVs The *Add Simple UVs* does a simple cube unwrap followed by a pack operation. It's still recommended to make a custom unwrap.

Brush Settings

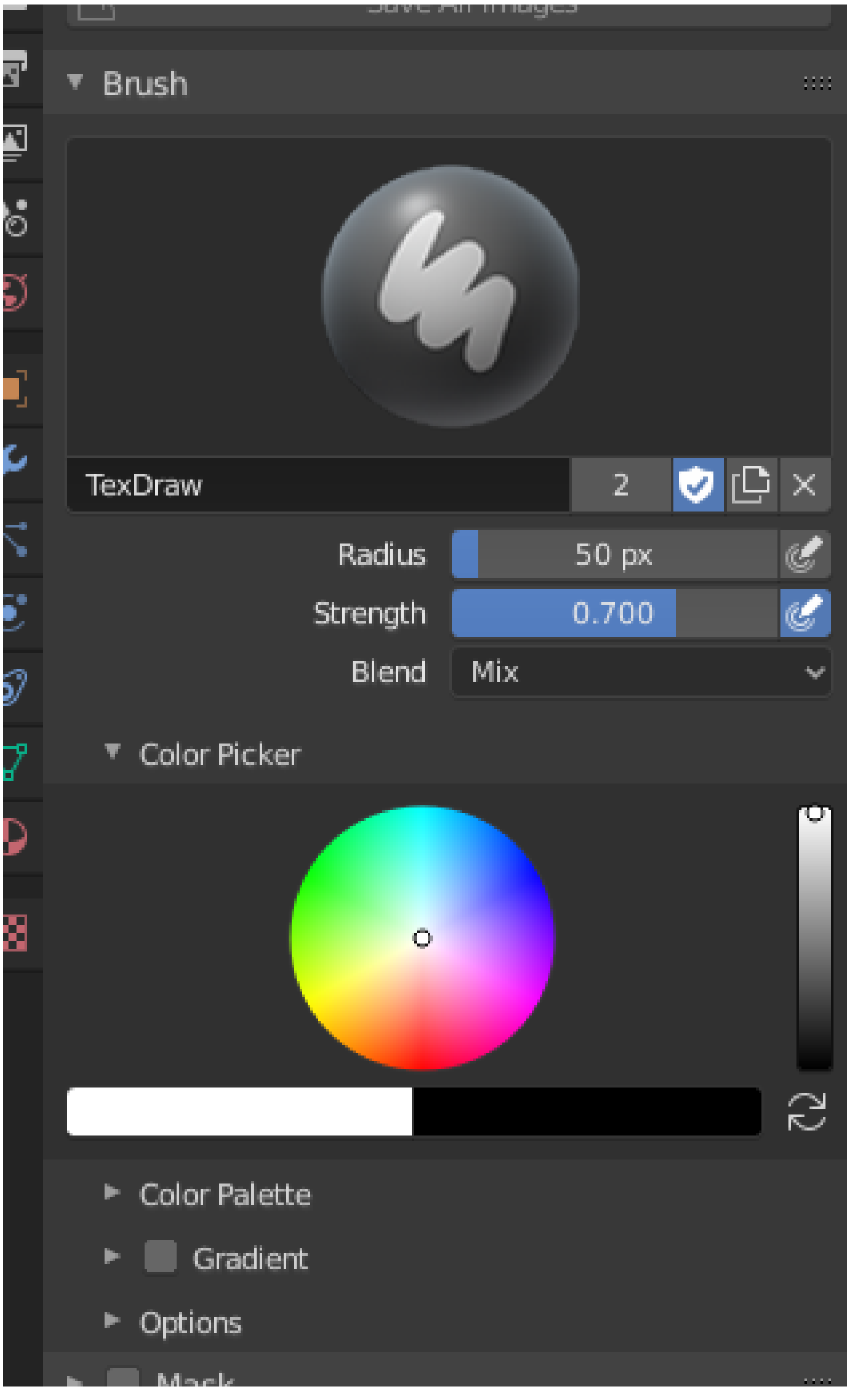


Fig. 1336: Brush settings.

Blend Set the way the paint is applied over the underlying color. See *Color Blend Modes*.

- Add Alpha: makes the image more opaque where painted.
- Erase Alpha: makes the image transparent where painted, allowing background colors and lower-level textures to show through. As you "paint", the false checkerboard background will be revealed. Using a table pen's eraser end will toggle on this mode.

> **Tip:** In order to see the effects of the Erase and Add Alpha mix modes in the Image Editor, you must enable the alpha channel display by clicking the Display Alpha or the Alpha-Only button. Transparent (no alpha) areas will then show a checkered background.

Radius This option controls the radius of the brush, measured in pixels. F allows you to change the brush size interactively by dragging the mouse and then LMB (the texture of the brush should be visible inside the circle). Typing a number then enter while using F allows you to enter the size numerically.

Size Pressure Brush size can be affected by enabling the pressure sensitivity icon, if you are using a *Graphics Tablet*.

Use Unified Radius Use the same brush *Radius* across all brushes.

Strength How powerful the brush is when applied.

Size Pressure Brush *Strength* can be affected by enabling the pressure sensitivity icon, if you are using a *Graphics Tablet*.

Use Unified Radius Use the same brush *Strength* across all brushes.

Color Picker

Color

The color of the brush. See *Color Picker*.

Press S on any part of the image to sample that color and set it as the brush color. Hold Ctrl while painting to temporally paint with the secondary color.

Swap Colors (cycle icon) X Swaps the primary and secondary colors.

Use Unified Color Use the same brush color across all brushes.

Gradient

A gradient can be used as a color source.

Gradient Colors The *Color Ramp Widget* to define the gradient colors.

Mode

Pressure Will choose a color from the color ramp according to the stylus pressure.

Clamp Will alter the color along the stroke and as specified by *Gradient Spacing* option. With *Clamp* it uses the last color of the color ramp after the specified gradient.

Repeat Similar to *Clamp*. After the last color it resets the color to the first color in the color ramp and repeats the pattern.

Color Palette

Color Palettes are a way of storing a brush's color so that it can be used at a later time. This is useful when working with several colors at once.

Palette A *Data-Block Menu* to select a palette.

New + Adds the current brush's primary *Color* to the palette.

Delete - Removes the currently selected color from the palette.

Move (up/down arrow icon) Moves the selected color up/down one position.

Sort Sort Colors by Hue, Saturation, Value, Luminance.

Color List Each color that belongs to the palette is presented in a list. Clicking on a color will change the brush's primary *Color* to that color.

Advanced

Accumulate This will allow a stroke to accumulate on itself, just like an airbrush would do.

Affect Alpha When this is disabled, it locks (prevents changes to) the alpha channel while painting (3D only).

Anti-Aliasing ***2D Painting Only*** Toggles *Anti-Aliasing* around the brush, this is useful if you are working with pixel art or low resolution textures.

Texture

See the global brush settings for *Texture* settings.

Texture Mask

See the global brush settings for *Texture Mask* settings.

Stroke

See the global brush settings for *Stroke* settings.

Falloff

See the global brush settings for *Falloff* settings.

Cursor

See the global brush settings for *Cursor* settings.

Mask

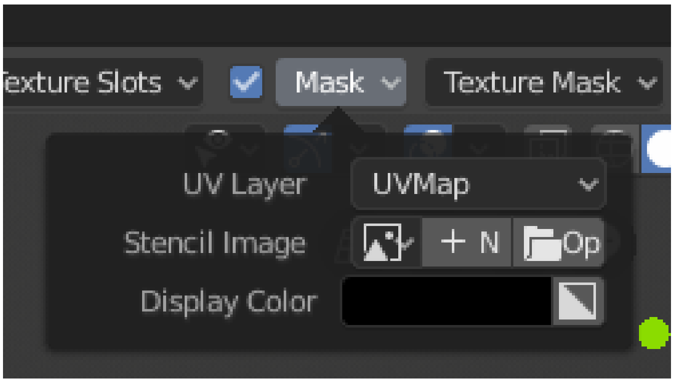


Fig. 1337: Mask settings.

Stencil Mask

The mask can be deactivated by the checkbox in the header.

Stencil Image Image used as a mask. See *Data-Block Menu*.

UV Layer Allows you to select the UV layer for the mask image.

Display Color Mask color in the viewport. See *Color Picker*.

Invert Stencil (black/white icon) Inverts the mask.

Cavity Mask

Cavity masking means that the brush will be masked if there is a cavity or a hill on the mesh surface depending on the mesh options. The cavity algorithm is vertex-based.

Symmetry

Reference

Mode Texture Paint Mode

Tool *Toolbar → Tool → Symmetry*

Mirror Mirror the brush strokes across the selected local axes. Note that if you want to alter the directions the axes point in, you must rotate the model in Edit Mode and not in Object Mode.

Options

Bleed Seam Bleed extends the paint beyond UV island bounds to avoid visual artifacts (like bleed for baking).

Dither Amount of dithering when painting on 8 bit images.

Occlude With Geometry occlusion active only exposed (not hidden by other mesh parts) pixels are affected. This also allows for 3D stencils to be used to mask out areas of the surface too.

Backface Culling With backface culling enabled you can only paint on the front side of faces.

See also:

See the *Brush Display* options.

External

Screen Grab Size Size of the captured image for reprojecting.

Quick Edit Edit a snapshot of the viewport in an external image editor.

Apply Project edited image back onto the object.

Apply Camera Image Project an edited render from the active camera back onto the object.

Tiling

Reference

Editor Image Editor

Mode Paint Mode

Menu *Sidebar → Tools → Tiling*

Wraps the stroke to the other side of the image as your brush moves off the opposite side of the canvas. Very handy for making seamless textures.

X left/right

Y top/bottom

Vertex Paint

Introduction

Vertex Painting is a simple way of painting color onto an object, by directly manipulating the color of vertices, rather than textures, and is fairly straightforward.

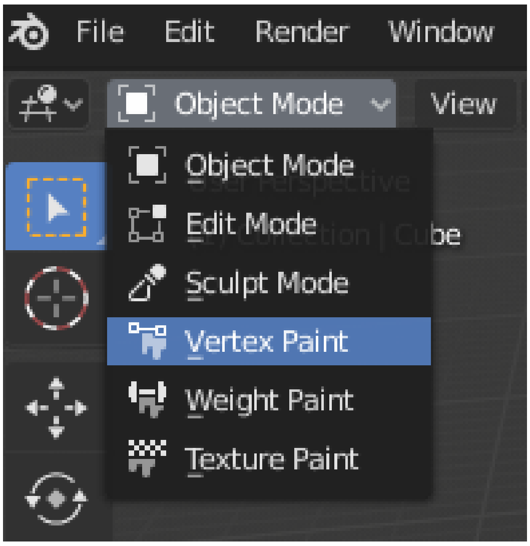


Fig. 1338: Vertex Painting Mode.

When a vertex is painted, the color of the vertex is modified according to the settings of the brush. The color of all visible planes and edges attached to the vertex are then modified with a gradient to the color of the other connected vertices. Note that the color of occluded faces is not modified.

You can also the use *Attribute Node* to access vertex color information in the material node tree.

Vertex Paint Tools

Draw Paints a specified color over the object.

Blur Smooths out the colors of adjacent vertices. In this mode the Color Value is ignored. The strength defines how much the colors are blurred.

Average Smooths color by painting the average resulting color from all colors under the brush.

Smear Smudges colors by grabbing the colors under the brush and “dragging” them. This can be imagined as a finger painting tool.

Annotate Draw free-hand annotation.

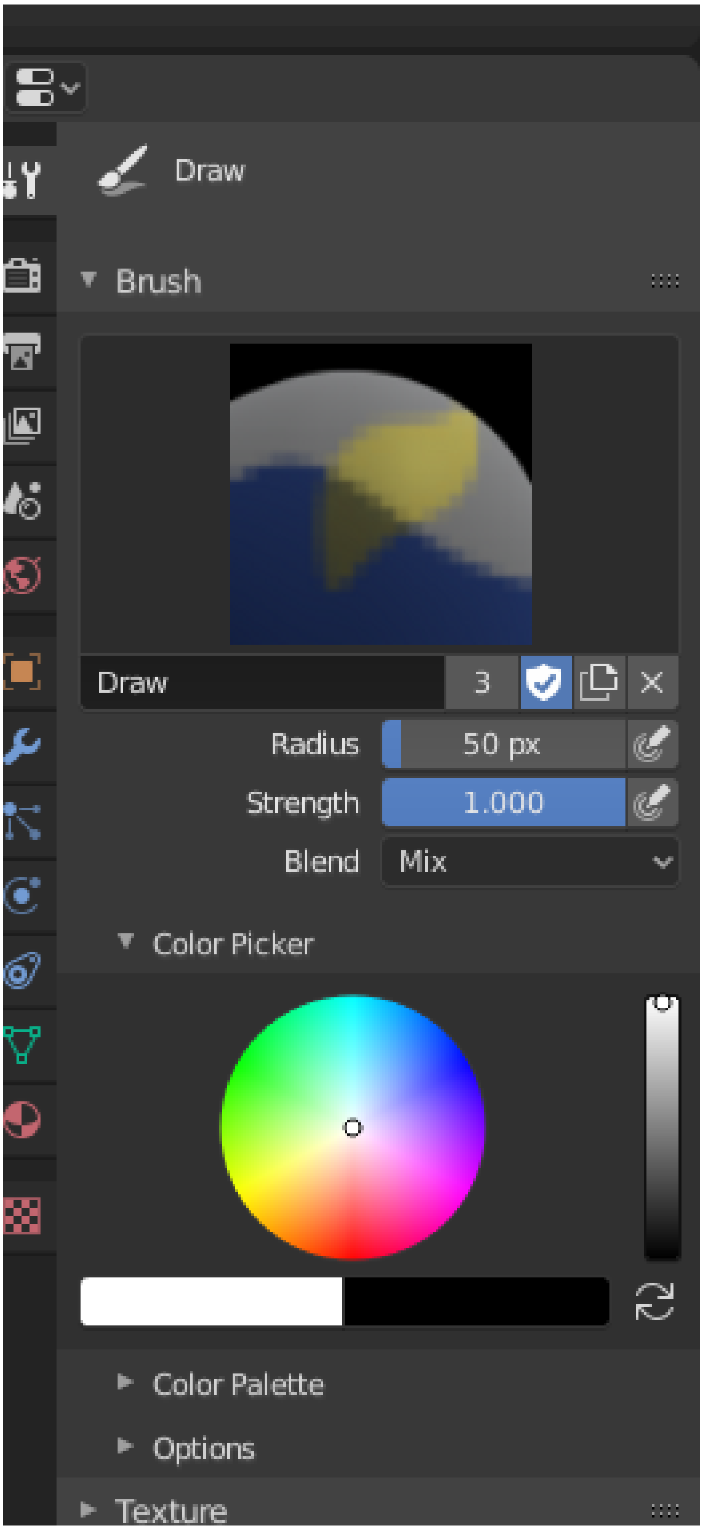
Annotate Line Draw straight line annotation.

Annotate Polygon Draw a polygon annotation.

Annotate Eraser Erase previous drawn annotations.

Tool Settings

Brush Settings



Draw 3

Radius 50 px

Strength 1.000

Blend Mix

Fig. 1339: Vertex Painting options.

Radius This option controls the radius of the brush, measured in pixels. F allows you to change the brush size interactively by dragging the mouse and then LMB (the texture of the brush should be visible inside the circle). Typing a number then enter while using `F` allows you to enter the size numerically.

Size Pressure Brush size can be affected by enabling the pressure sensitivity icon, if you are using a *Graphics Tablet*.

Use Unified Radius Use the same brush *Radius* across all brushes.

Strength How powerful the brush is when applied.

Size Pressure Brush *Strength* can be affected by enabling the pressure sensitivity icon, if you are using a *Graphics Tablet*.

Use Unified Radius Use the same brush *Strength* across all brushes.

Color Picker

The color of the brush. See *Color Picker*.

Press `S` on any part of the image to sample that color and set it as the brush color. Hold `Ctrl` while painting to temporally paint with the secondary color.

Flip (cycle icon) `X` Swaps the primary and secondary colors.

Note: Note that Vertex Paint works in sRGB *space*, and the RGB representation of the same colors will be different between the paint tools and the materials that are in linear space.

Advanced

Affect Alpha When this is disabled, it locks (prevents changes) the alpha channel while painting.

Accumulate This will allow a stroke to accumulate on itself, just like an airbrush would do.

Front Faces Only Only paint on the front side of faces.

Texture

See the global brush settings for *Texture* settings.

Stroke

See the global brush settings for *Stroke* settings.

Falloff

See the global brush settings for *Falloff* settings.

Cursor

See the global brush settings for *Cursor* settings.

Symmetry

Reference

Mode Vertex Paint Mode

Tool *Toolbar → Tool → Symmetry*

Mirror Mirror the brush strokes across the selected local axes. Note that if you want to alter the directions the axes point in, you must rotate the model in Edit Mode and not in Object Mode.

Editing

Reference

Mode Vertex Paint Mode

Menu *Paint*

Set Vertex Colors `Shift-K` Fill the active vertex color layer with the current paint color.

Smooth Vertex Colors Smooth colors across vertices.

Dirty Vertex Colors

Blur Strength Blur strength per iteration.

Blur Iterations Number of times to blur the colors (higher blurs more).

Highlight Angle Clamps the angle for convex areas of the mesh. Lower values increase the contrast but can result in clamping. 90 means flat, 180 means infinitely pointed.

Dirt Angle Clamps the angle for concave areas of the mesh. Higher values increase the contrast but can result in clamping. 90 means flat, 0 means infinitely deep.

Dirt Only When active it won't calculate cleans for convex areas.

Normalize Choose optimal contrast by effectively lowering *Highlight Angle* and increasing *Dirt Angle* automatically. Disabling *Normalize* allows getting consistent results across multiple objects.

Vertex Color from Weight Converts the active weight into grayscale vertex colors.

Invert Invert RGB values.

Levels Adjust levels of vertex colors.

Hue Saturation Value Adjust vertex color HSV values.

Bright/Contrast Adjust vertex color brightness/contrast.

Weight Paint

Introduction

Vertex Groups can potentially have a very large number of associated vertices and thus a large number of weights (one weight per assigned vertex). *Weight Painting* is a method to maintain large amounts of weight information in a very intuitive way.

It is primarily used for rigging meshes, where the vertex groups are used to define the relative bone influences on the mesh. But we use it also for controlling particle emission, hair density, many modifiers, shape keys, etc.

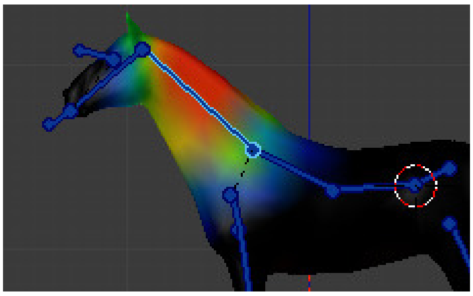


Fig. 1340: Vertex group in Weight Paint Mode.

You can enter Weight Paint Mode from the Mode selector `Ctrl-Tab`. The selected mesh object is displayed slightly shaded with a rainbow color spectrum. The color visualizes the weights associated to each vertex in the active vertex group. By default *blue* means unweighted and *red* means fully weighted.

You can assign weights to the vertices of the object by painting on it with weight brushes. Starting to paint on a mesh automatically adds weights to the active vertex group (a new vertex group is created if needed).

The Weighting Color Code

Weights are visualized by a gradient using a cold/hot color system, such that areas of low value (with weights close to 0.0) are displayed as blue (cold) and areas of high value (with weights close to 1.0) are displayed as red (hot). And all in-between values are displayed as rainbow colors (blue, green, yellow, orange, red).

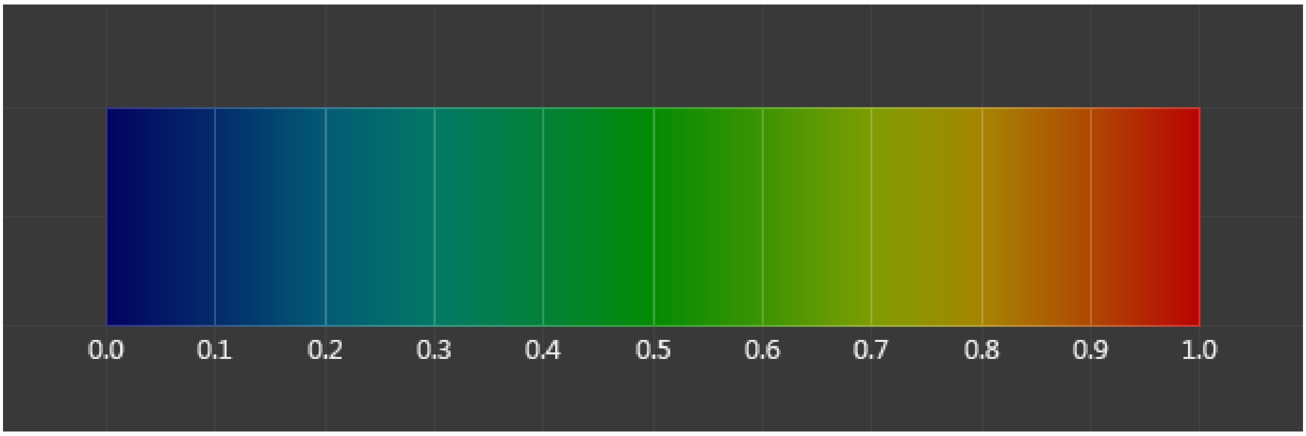


Fig. 1341: The color spectrum and their respective weights.

In addition to the above described color code, Blender has a special visual notation (as an option) for unreferenced vertices: They are displayed as black. Thus you can see the referenced areas (displayed as cold/hot colors) and the unreferenced areas (in black) at the same time. This is most practicable when you look for weighting errors. See *Options*.

Note: You can customize the colors in the weight gradient by enabling *Custom Weight Paint Range* in the *System* tab of the *Preferences*.

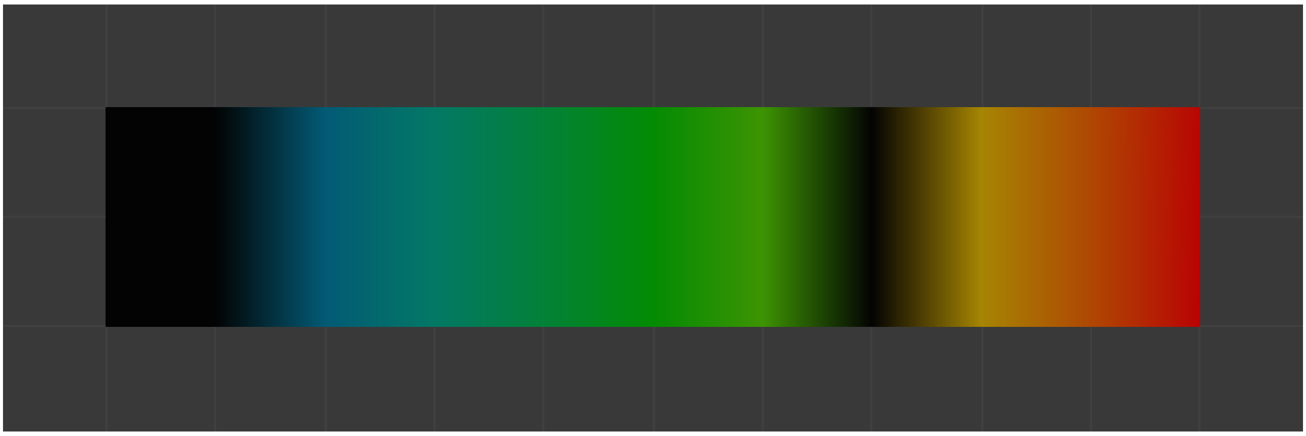


Fig. 1342: Unreferenced vertices example.

Normalized Weight Workflow

In order to be used for things like deformation, weights usually have to be normalized, so that all deforming weights assigned to a single vertex add up to 1. The *Armature* modifier in Blender does this automatically, so it is technically not necessary to ensure that weights are normalized at the painting stage.

However, while more complicated, working with normalized weights has certain advantages, because it allows use of certain tools designed for them, and because when weights are normalized, understanding the final influence of the current group does not require knowing weights in other groups on the same vertex.

These tools are provided to aid working with normalized weights:

Normalize All In order to start working with normalized weights it is first necessary to normalize the existing weights. The *Normalize All* tool can be used for that. Make sure to select the right mode and disable *Lock Active*.

Auto Normalize Once the weights are initially normalized, the *Auto Normalize* option can be enabled to automatically maintain normalization as you paint. This also tells certain tools that the weights are supposed to be already normalized.

Vertex group locking Any vertex group can be locked to prevent changes to it. This can be done via the lock icon in the vertex group list, or using bone selection and the *locks pie menu*.

This setting prevents accidental edits to groups. However, since it is also respected by *Auto Normalize*, in the normalized weight workflow it has a more significant meaning of locking the current influence of chosen bones, so that when you paint other bones, the weight is redistributed only between the unlocked groups.

In locations affected by more than two bones this allows more precise tweaking and rebalancing of weights by temporarily focusing on a subset of bones. This can also be aided by the *Lock Relative* option, which displays weights as if re-normalized with the locked groups deleted, thus making it appear as if the locked groups didn't even exist.

Multi-Paint Finally, the *Multi-Paint* option allows treating multiple selected bones as if they were one bone, so that the painting operations change the combined weight, preserving the ratio within the group. Combined with locking, this allows balancing between one set of bones versus the rest, excluding a third set that has its influence not affected in any way due to locks.

Technically, this option does not require the normalized workflow, but since non-normalized weights can add to more than 1, the weight display behaves best with *Auto Normalize* enabled.

Tip: For example, when dealing with a bone loop, e.g. mouth or an eye, selecting the loop with *Multi-Paint* exposes the falloff between the loop as a whole and surrounding bones, while locking the surrounding bones and using *Lock Relative* displays the falloff between bones within the loop. Thus the complex two-dimensional falloff of each bone can be viewed and edited as two independent one-dimensional gradients.

Weight Paint Tools

Draw Paints a specified weight over the object.

Blend The brush *Blend Modes* defines in which way the weight value is applied to the vertex group while painting.

Mix In this Blending mode the Weight value defines the *target weight* that will eventually be reached when you paint long enough on the same location of the mesh. And the strength determines how many strokes you need to place at the target weight. Note that for strength = 1.0 the target weight is painted immediately and for Weight = 0.0 the brush just does nothing.

Add In this Blending mode the specified weight value is *added* to the vertex weights. The strength determines which fraction of the weight gets added per stroke. However, the brush will not paint weight values above 1.0.

Subtract In this Blending mode the specified weight value is *subtracted* from the vertex weights. The strength determines which fraction of the weight gets removed per stroke. However, the brush will not paint weight values below 0.0.

Lighten In this Blending mode the specified weight value is interpreted as the target weight. Very similar to the Mix Blending mode, but only weights below the target weight are affected. Weights above the target weight remain unchanged.

Darken This Blending mode is very similar to the Lighten Blending mode. But only weights above the target weight are affected. Weights below the target weight remain unchanged.

Multiply Multiplies the vertex weights with the specified weight value. This is somewhat like subtract, but the amount of removed weight is now dependent on the Weight value itself.

Blur Smooths out the weighting of adjacent vertices. In this mode the Weight Value is ignored. The strength defines how much the smoothing is applied.

Blur Smooths out the weighting of adjacent vertices. In this mode the Weight Value is ignored. The strength defines how much the smoothing is applied.

Average Smooths weights by painting the average resulting weight from all weights under the brush.

Smear Smudges weights by grabbing the weights under the brush and “dragging” them. This can be imagined as a finger painting tool.

Gradient Applies a linear/radial weight gradient; this is useful at times when painting gradual changes in weight becomes difficult. Blends the weights of selected vertices with unselected vertices.

Weight The gradient starts at the current selected weight value, blending out to nothing.

Strength Lower values can be used so the gradient mixes in with the existing weights (just like with the brush).

Type

- Linear: `Alt-LMB` and drag.
- Radial: `Ctrl-Alt-LMB` and drag.

Sample

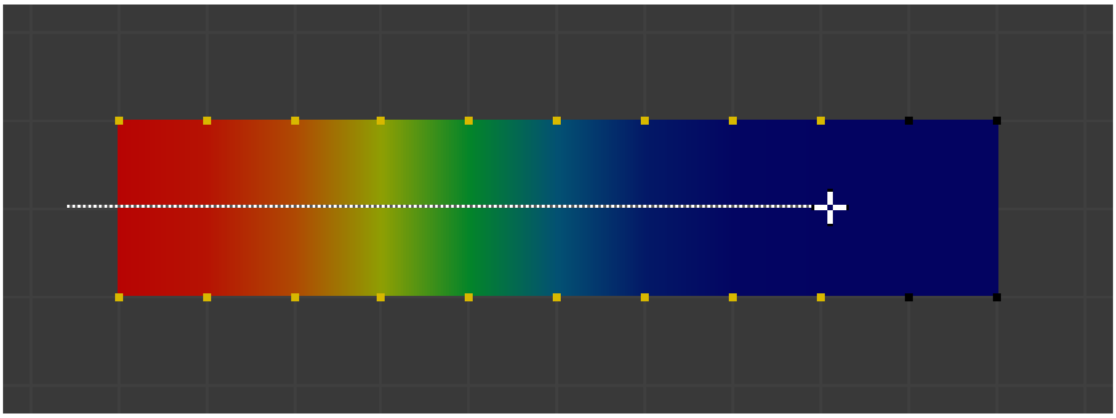


Fig. 1343: Example of the Gradient tool being used with selected vertices.

Weights Sets the brush *Weight* as the weight selected under the cursor.

Vertex Group Displays a list of possible vertex groups to select that are under the cursor.

Annotate Draw free-hand annotation.

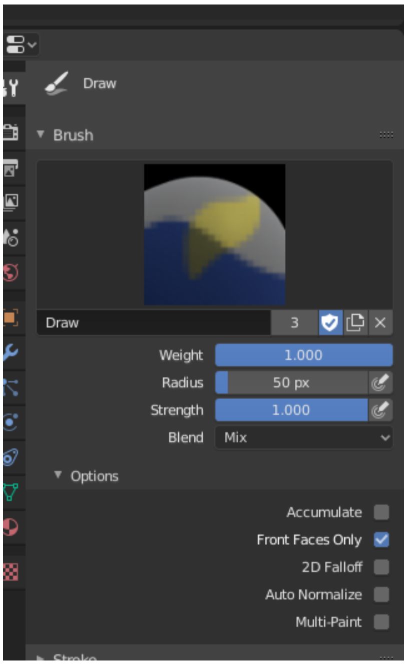
Annotate Line Draw straight line annotation.

Annotate Polygon Draw a polygon annotation.

Annotate Eraser Erase previous drawn annotations.

Tool Settings

Brush Settings



Draw 3

Weight 1.000

Radius 50 px

Strength 1.000

Blend Mix

Accumulate □

Front Faces Only ☑

2D Falloff □

Auto Normalize □

Multi-Paint □

Fig. 1344: Brush panel.

Painting needs paint brushes and Blender provides a Brush Panel within the Toolbar when it operates in *Weight Paint Mode*.

Weight `W` The weight (color) to be used by the brush. However, the weight value is applied to the vertex group in different ways depending on the selected Brush Blending mode (see below).

Use `Ctrl-LMB` to sample the weight value of clicked vertex. `Shift-LMB` lets you select the group from which to sample from.

Radius This option controls the radius of the brush, measured in pixels. `F` allows you to change the brush size interactively by dragging the mouse and then `LMB` (the texture of the brush should be visible inside the circle). Typing a number then enter while using `F` allows you to enter the size numerically.

Size Pressure Brush size can be affected by enabling the pressure sensitivity icon, if you are using a *Graphics Tablet*.

Use Unified Radius Use the same brush *Radius* across all brushes.

Strength How powerful the brush is when applied.

Size Pressure Brush *Strength* can be affected by enabling the pressure sensitivity icon, if you are using a *Graphics Tablet*.

Use Unified Radius Use the same brush *Strength* across all brushes.

Advanced

Accumulate This will allow a stroke to accumulate on itself, just like an airbrush would do.

Front Faces Only Only paint on the front side of faces.

Stroke

See the global brush settings for *Stroke* settings.

Falloff

See the global brush settings for *Falloff* settings.

Cursor

See the global brush settings for *Cursor* settings.

Symmetry

Reference

Mode Vertex Paint Mode

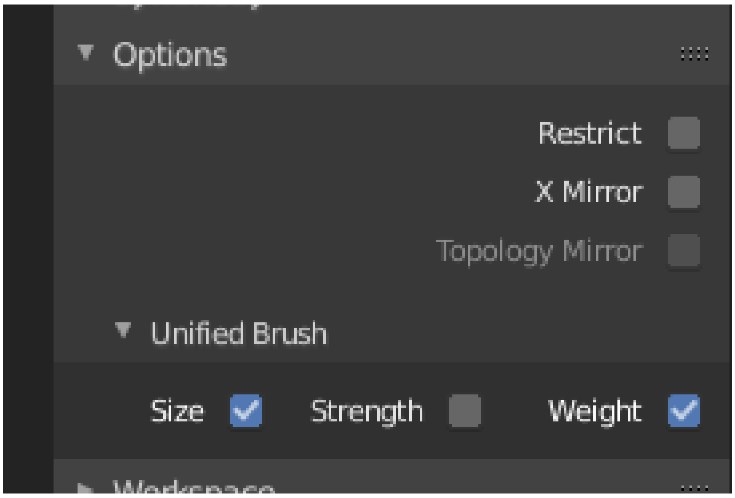
Tool *Toolbar → Tool → Symmetry*

Mirror Mirror the brush strokes across the selected local axes. Note that if you want to alter the directions the axes point in, you must rotate the model in Edit Mode and not in Object Mode.

Radial X, Y, Z These settings allow for radial symmetry in the desired axes. The number determines how many times the stroke will be repeated within 360 degrees around the central axes.

Vertex Groups X Symmetry Mirror the *left/right* vertex groups when painting.

Options



▾ Options

Restrict ☐

X Mirror ☐

Topology Mirror ☐

▾ Unified Brush

Size ☑ Strength ☐ Weight ☑

▸ Workspace

Fig. 1345: Paint options.

The weight paint options change the overall brush behavior.

Auto Normalize Ensures that all deforming vertex groups add up to one while painting. When this option is turned off, then all weights of a vertex can have any value between 0 and 1. However, when vertex groups are used as deform groups for character animation then Blender always interprets the weight values relative to each other. That is, Blender always does a normalization over all deform bones. Hence in practice it is not necessary to maintain a strict normalization and further normalizing weights should not affect animation at all.

This option works most intuitively when used to maintain normalization while painting on top of weights that are already normalized with another tool.

Lock-Relative Displays bone-deforming groups as if all locked deform groups were deleted, and the remaining ones were re-normalized. This is intended for use when balancing weights within a group of bones while all other bones are locked. With this option you can also temporarily view non-normalized weights as if they were normalized, without actually changing the values.

Multi-Paint Paint on all selected vertex groups simultaneously, in a way that preserves their relative influence. This can be useful when tweaking weights in an area that is affected by more than three bones at once, e.g. certain areas on a character's face.

This option is only useful in the *Armature* tab, where you can select multiple vertex groups by selecting multiple pose bones. Once at least two vertex groups are selected, viewport colors and paint logic switch to Multi-Paint mode, using the sum of the selected groups' weights if *Auto Normalize* is enabled, and the average otherwise. Any paint operations aimed at this collective weight are applied to individual vertex group weights in such way that their ratio stays the same.

Since the ratio is undefined if all weights are zero, Multi-Paint cannot operate on vertices that do not have any weight assigned to the relevant vertex groups. For this reason it also does not allow reducing the weight all the way to zero. When used with *X Mirror*, it only guarantees completely a symmetrical result if weights are initially symmetrical.

Tip: While Multi-Paint cannot directly paint on zero-weight vertices, it is possible to use the *Smooth Weight* tool to copy a reasonable non-zero weight distribution from adjacent vertices without leaving Multi-Paint mode or changing bone selection.

To do that, enable vertex selection, select target vertices, and apply one iteration of the tool using vertex groups from *Selected Pose Bones* with low Factor. After that simply paint on top to set the desired collective weight.

Restrict This option limits the influence of painting to vertices (even with weight 0) belonging to the selected vertex group.

X Mirror Use the X Mirror option for mirrored painting on groups that have symmetrical names, like with extension ".R"/ ".L" or "_R" / "_L". If a group has no mirrored counterpart, it will paint symmetrically on the active group itself. You can read more about the naming convention in *Editing Armatures: Naming conventions*. The convention for armatures/bones apply here as well.

Topology Mirror Use topology-based mirroring, for when both sides of a mesh have matching mirrored topology. See *here* for more information.

See also:

See the *Brush Display* options.

Using Vertex Groups

Vertex Groups for Bones

This is one of the main uses of weight painting. When a bone moves, vertices around the joint should move as well, but just a little, to mimic the stretching of the skin around the joint. Use a "light" weight (10 - 40%) paint on the vertices around the joint so that they move a little when the bone rotates. While there are ways to automatically assign weights to an armature (see the *skinning section*), you can do this manually. To do this from scratch, refer to the process below. To modify automatically assigned weights, jump into the middle of the process where noted:

1. Create an armature.
2. Create a mesh that will be deformed when the armature's bone(s) move.
3. With the mesh selected, create an *Armature* modifier for your mesh (located in the Properties, *Modifiers* tab). Enter the name of the armature.

Pick up here for modifying automatically assigned weights.

1. Select the armature in 3D Viewport, and bring the armature to *Pose Mode* with `Ctrl-Tab`, or the 3D Viewport header mode selector.
2. Select a desired bone in the armature.
3. Select your mesh with `LMB` and change immediately to *Weight Paint Mode*. The mesh will be colored according to the weight (degree) that the selected bone movement affects the mesh. Initially, it will be all blue (no effect).
4. Weight paint to your heart's content. The mesh around the bone itself should be red (generally) and fade out through the rainbow to blue for vertices farther away from the bone.

When you select a bone of the armature (which remains in *Pose Mode*), it will activate the corresponding vertex group and display related weights. You can only select one bone at a time in this mode (so `Shift-LMB` clicking does not work).

Tip: If the mesh skins the bones, you will not be able to see the bones because the mesh is painted. If so, turn on *X-Ray* view (*Properties* → *Armature tab*).

If you paint on the mesh, a vertex group is created for the bone. If you paint on vertices outside the group, the painted vertices are automatically added to the vertex group.

If you have a symmetrical mesh and a symmetrical armature you can use the option *X Mirror*. Then the mirrored groups with the mirrored weights are automatically created.

Tip: Selecting Deform Groups

When you are doing weight painting for deform bones (with an armature), you can select a deform group by selecting the corresponding bone. However, this vertex group selection mode is disabled when Selection Masking is active!

Vertex Groups for Particles

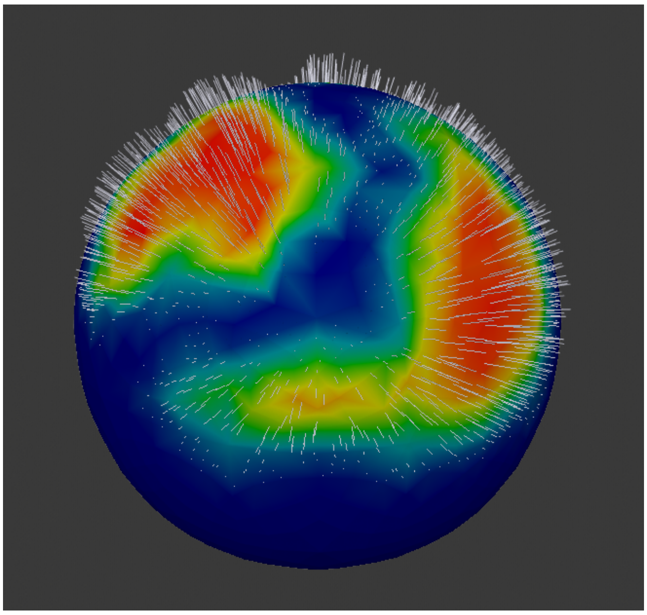


Fig. 1346: Weight painted particle emission.

In example faces or vertices with zero weight generate no particles. A weight of 0.1 will result in 10% of the amounts of particles. This option "conserves" the total indicated number of particles, adjusting the distributions so that the proper weights are achieved while using the actual number of particles called for. Use this to make portions of your mesh hairier than others by weight painting a vertex group, and then calling out the name of the vertex group in the *Vertex Groups* panel *Properties → Particles tab*.

Editing

Reference

Mode Edit Mode and Weight Paint Mode

Menu *Weights*

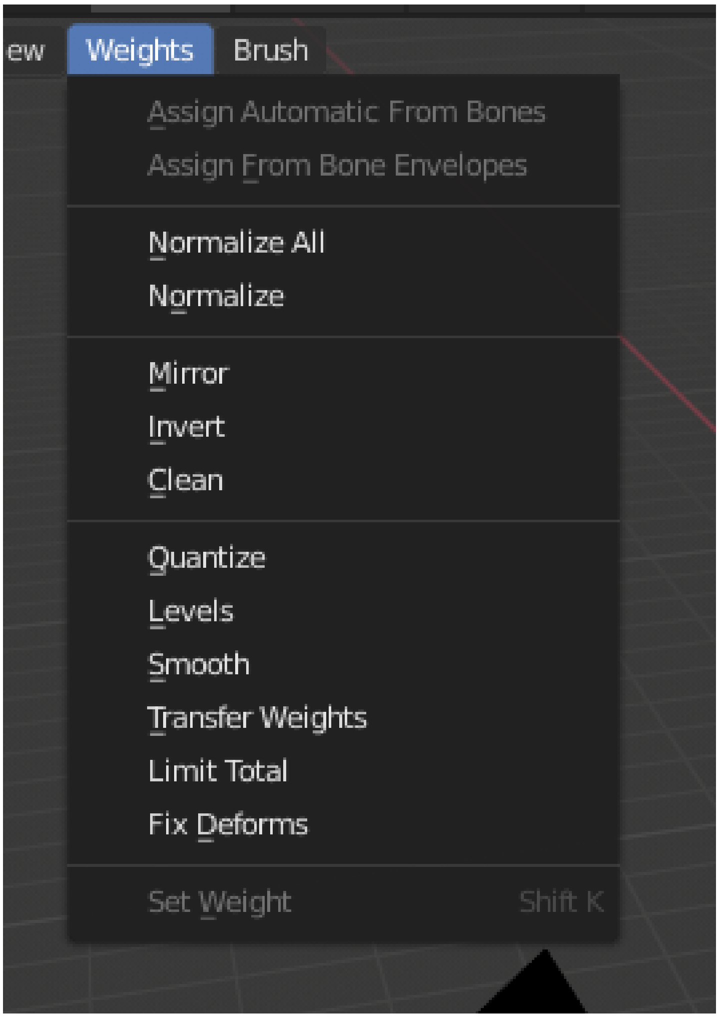


Fig. 1347: Weight Paint Tools.

Blender provides a set of helper tools for Weight Painting.

The Subset Option

Some of the tools also provide a Subset filter to restrict their functionality to only specific vertex groups (in the *Adjust Last Operation* panel, displayed after the tool is called) with following options:

- Active Group
- Selected Pose Bones
- Deform Pose Bones
- All Groups

All tools also work with Vertex Selection Masking and Face Selection Masking. In these modes the tools operate only on selected vertices or faces.

Assign from Bone Envelopes

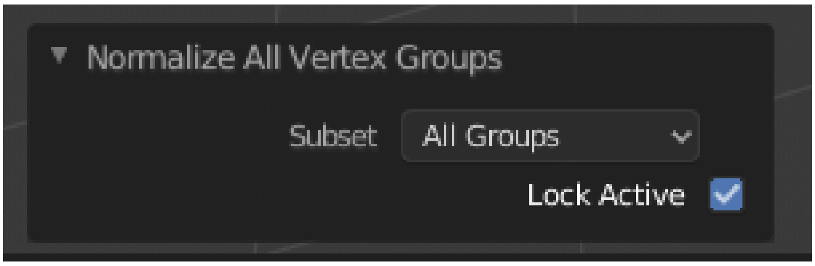
Apply the envelope weight of the selected bone(s) to the selected vertex group.

Assign Automatic from Bone

Apply from the selected bone(s) to the vertex group the same "auto-weighting" methods as available in the Parent armature menu.

Normalize All

For each vertex, this tool makes sure that the sum of the weights across all vertex groups is equal to 1. This tool normalizes all of the vertex groups, except for locked groups, which keep their weight values untouched.



▾ Normalize All Vertex Groups

Subset: All Groups

Lock Active ☑

Fig. 1348: Normalize All options.

Lock Active Keep the values of the active group while normalizing all the others.

Normalize

This tool only works on the active vertex group. All vertices keep their relative weights, but the entire set of weights is scaled up such that the highest weight value is 1.0.

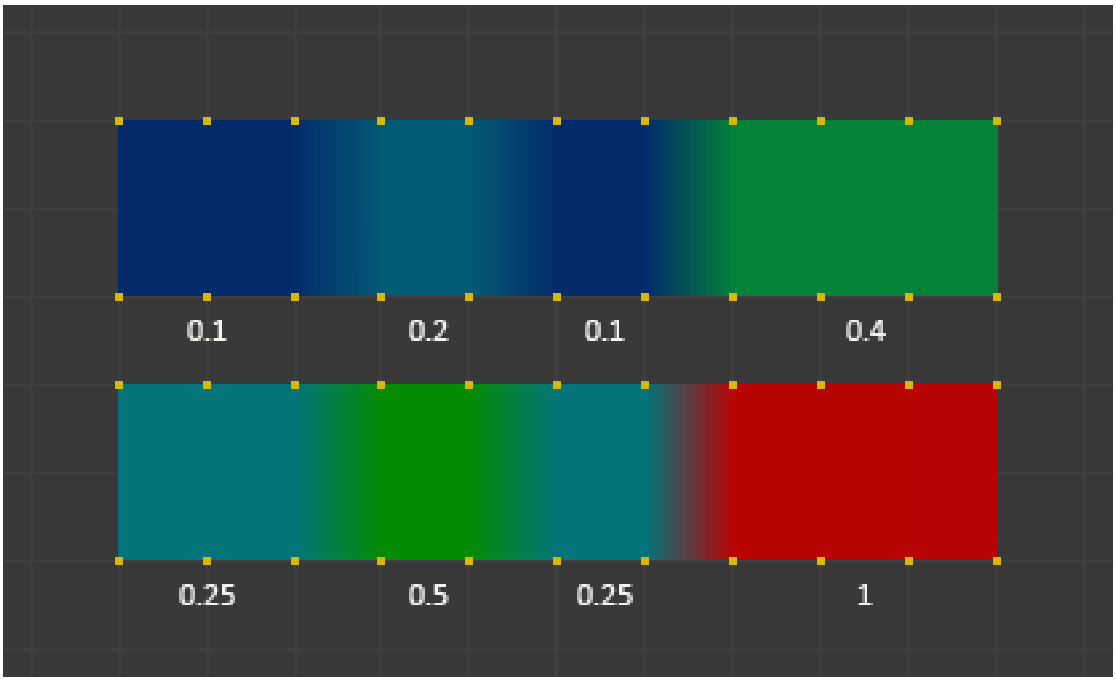


Fig. 1349: Normalize example.

Mirror

The *Mirror Vertex Group* tool mirrors the weights from one side of a perfectly symmetrical mesh to the opposite side. Only mirroring along local X axis is supported. Those vertices that have no corresponding vertex on the other side will not be affected. But note, the weights are not transferred to the corresponding opposite bone weight group.

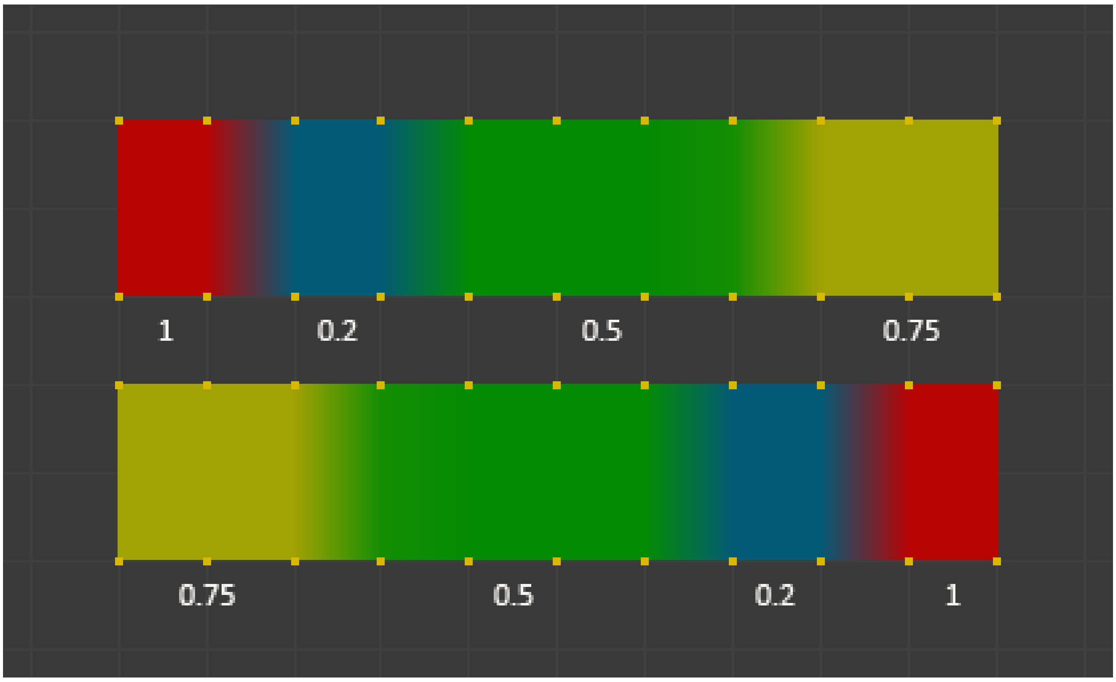
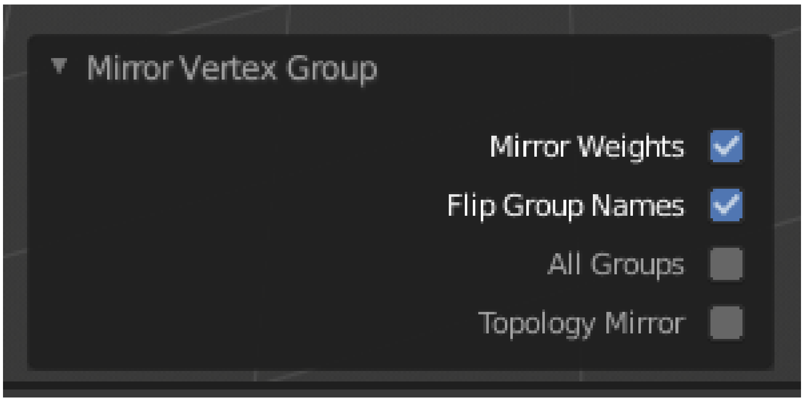


Fig. 1350: Mirror example.


Mirror Vertex Group

Mirror Weights ☑
Flip Group Names ☑
All Groups □
Topology Mirror □

Fig. 1351: Mirror options.

Mirror Weights With this option checked, every selected vertex receives the weight information of its symmetrical counterpart. If both vertices are selected, it will be a weight information exchange; if only one is selected, information from the unselected will overwrite the selected one. Information on weight is passed for the active group only, unless *All Groups* is checked, in which case it is passed for all groups.

Flip Group Names Works with selected vertices that belong to vertex groups with "symmetrical names" (with components like "L", "R", "right", "left"). All selected vertices that belong to the active group, or to the symmetrical of the active group, will have their assignation to that group replaced by an assignation to the symmetrical one; however, its weight will be preserved. If *All Groups* is checked, all assignations to these kind of groups will be replaced by the symmetrical counterpart, also keeping the old weights.

All Groups Operate on all vertex groups, instead of the active one.

Topology Mirror Mirror for meshes which are not fully symmetric (approximate mirror). See *here* for more information.

Tip: Mirror to Opposite Bone

If you want to create a mirrored weight group for the opposite bone (of a symmetric character), then you can do this:

1. Delete the target vertex group (where the mirrored weights will be placed).
2. Create a copy of the source bone vertex group (the group containing the weights which you want to copy).
3. Rename the new vertex group to the name of the target vertex group (the group you deleted above).
4. Select the target vertex group and call the Mirror tool (use only the Mirror weights option and optionally *Topology Mirror* if your mesh is not symmetric).

Invert

Replaces each Weight of the selected weight group by × -1.0 weight.

Examples:

- Original 1.0 converts to 0.0
- Original 0.5 remains 0.5
- Original 0.0 converts to 1.0

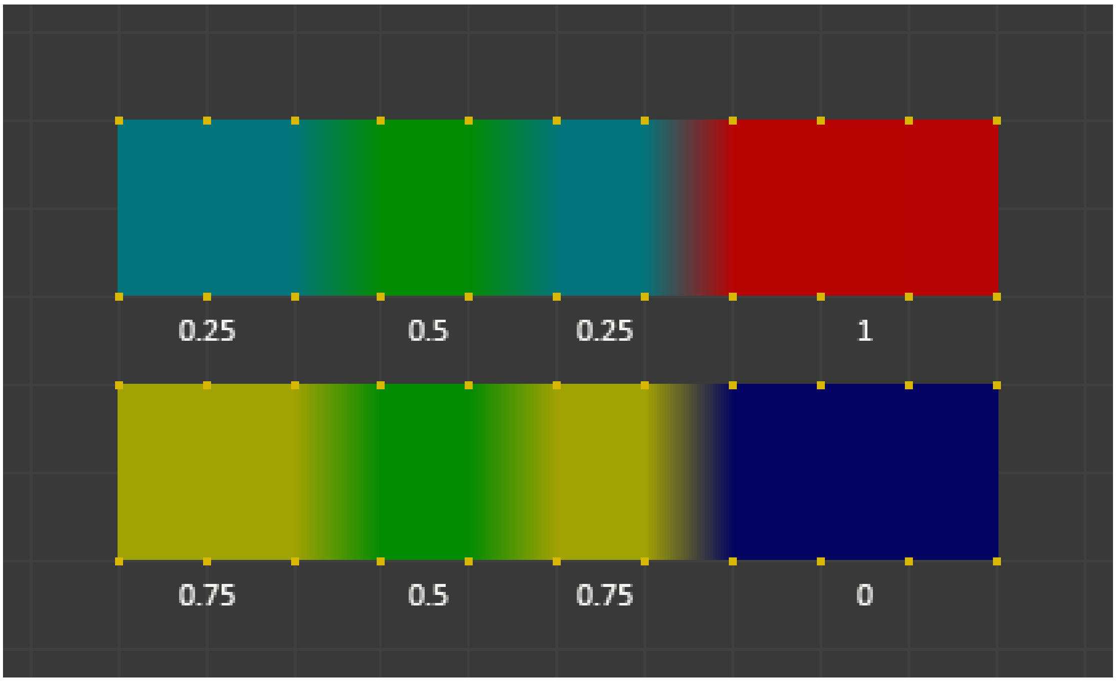
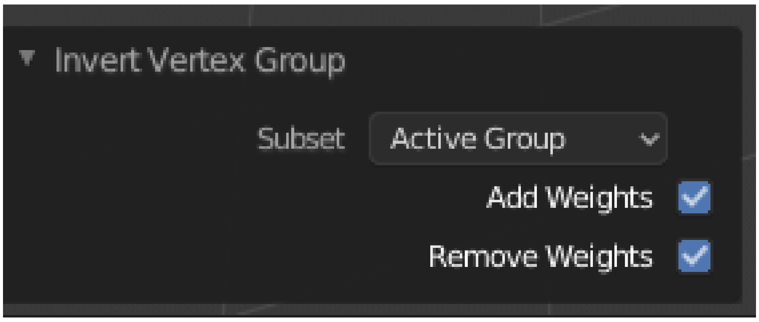


Fig. 1352: Invert.



Invert Vertex Group

Subset: Active Group

Add Weights ☑

Remove Weights ☑

Fig. 1353: Invert options.

Subset Restrict the tool to a subset. See above *The Subset Option* about how subsets are defined.

Add Weights Add vertices that have no weight before inverting (these weights will all be set to 1.0).

Remove Weights Remove vertices from the vertex group if they are 0.0 after inverting.

Note: Locked vertex groups are not affected.

Clean

Removes weights below a given threshold. This tool is useful for clearing your weight groups of very low (or zero) weights.

In the example shown, a cutoff value of 0.2 is used (see operator options below) so all blue parts are cleaned out.

Note, the images use the *Show Zero weights* Active option so that unreferenced Weights are shown in Black.

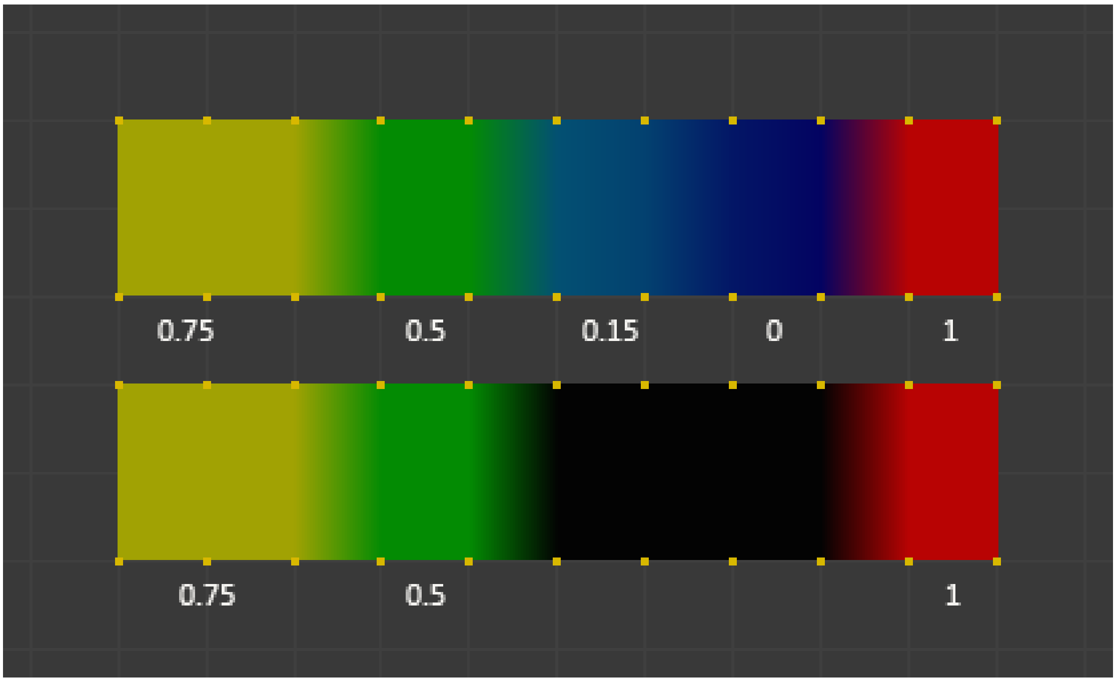
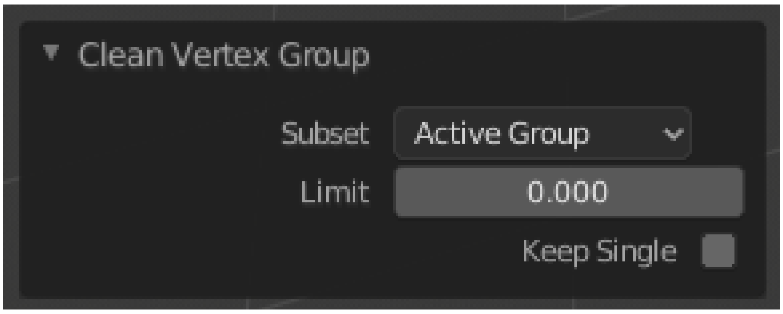


Fig. 1354: Clean example.



▾ Clean Vertex Group

Subset: Active Group

Limit: 0.000

Keep Single □

Fig. 1355: Clean options.

Subset Restrict the tool to a subset. See above *The Subset Option* for how subsets are defined.

Limit This is the minimum weight value that will be kept in the group. Weights below this value will be removed from the group.

Keep Single Ensure that the *Clean* tool will not create completely unreferenced vertices (vertices which are not assigned to any vertex group), so each vertex will keep at least one weight, even if it is below the limit value!

Quantize

This operator uses a process known as Quantization which takes the input weights and clamps each weight to a number of steps between (0 - 1), so there is no longer a smooth gradient between values.

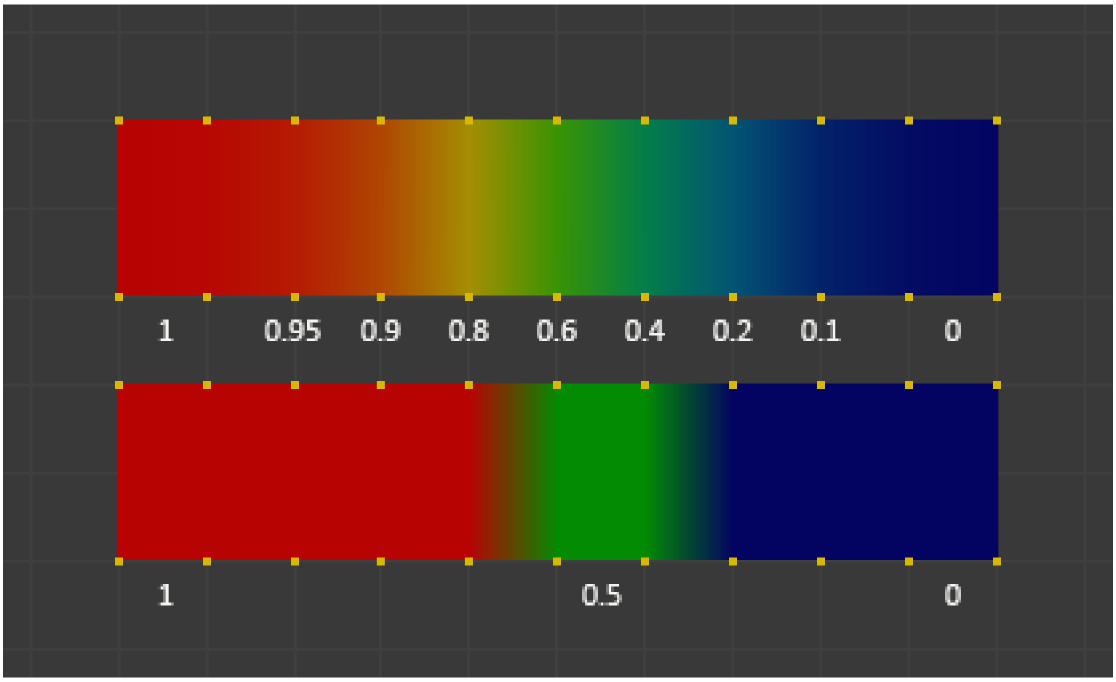


Fig. 1356: Quantize example (Steps = 2).

Steps The number of steps between 0 and 1 to quantize the weights into. For example 5 would allow the following weights `[0.0, 0.2, 0.4, 0.6, 0.8, 1.0]`.

Levels

Adds an offset and a scale to all weights of the selected weight groups. with this tool you can raise or lower the overall "heat" of the weight group.

Note: No weight will ever be set to values above 1.0 or below 0.0 regardless of the settings.

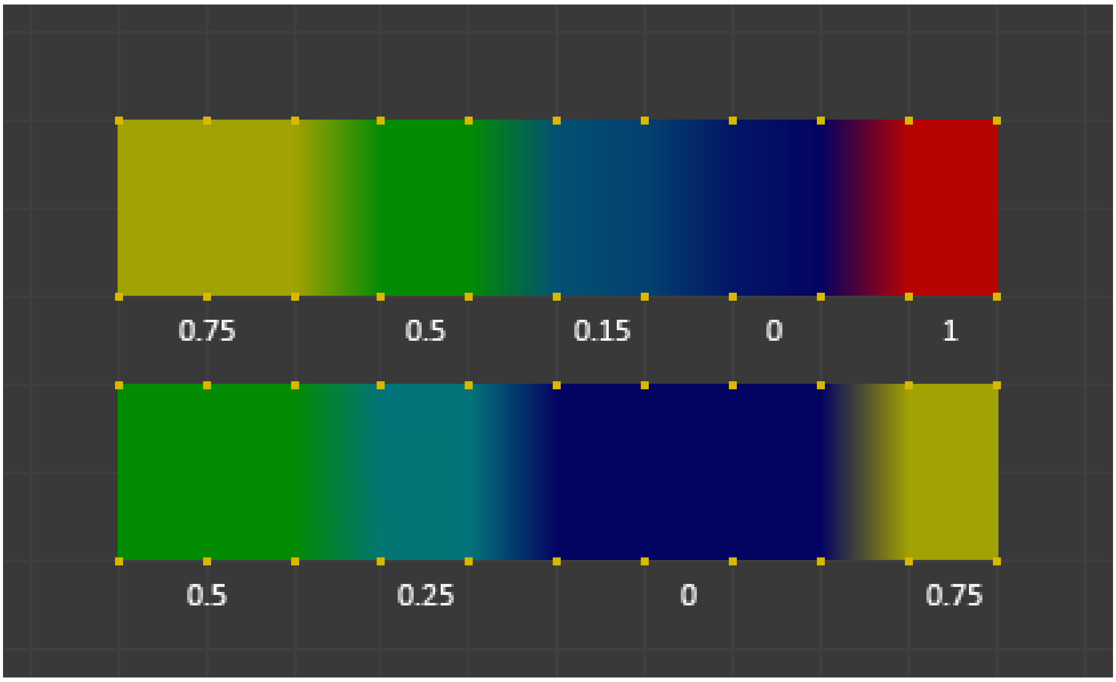
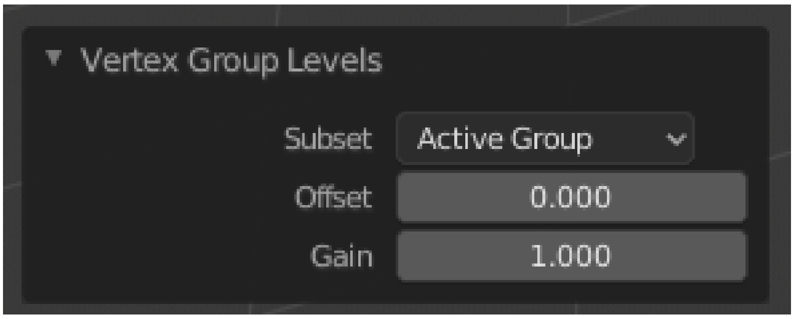


Fig. 1357: Levels example.



Subset: Active Group
Offset: 0.000
Gain: 1.000

Fig. 1358: Levels options.

Subset Restrict the tool to a subset. See above *The Subset Option* for how subsets are defined.

Offset A value from the range (-1.0 - 1.0) to be added to all weights in the vertex group.

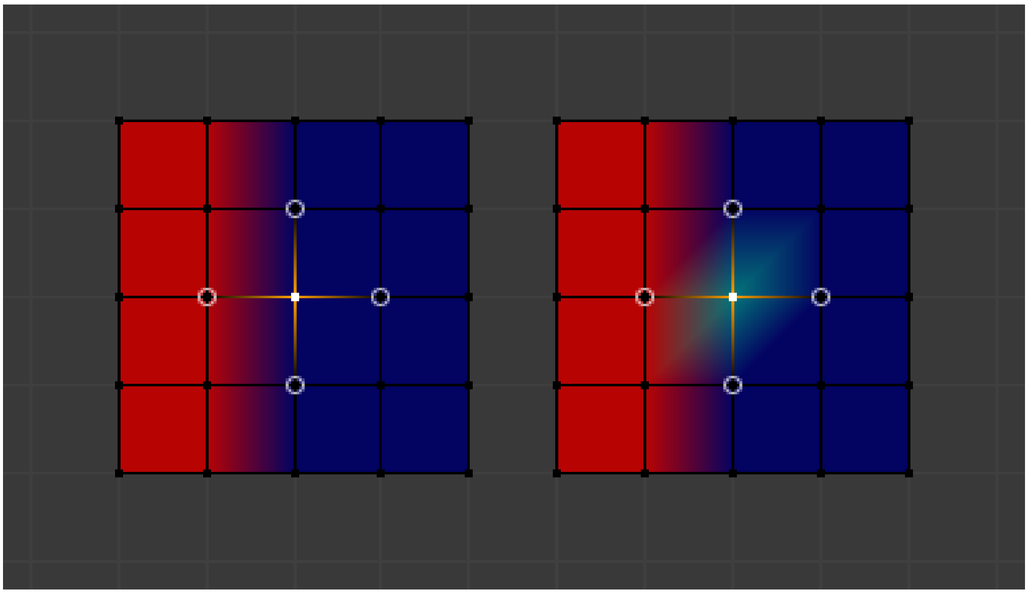
Gain All weights in the Subset are multiplied with the gain.

Note: Whichever *Gain* and *Offset* you choose, in all cases the final value of each weight will be clamped to the range (0.0 - 1.0). So you will never get negative weights or overheated areas (weight > 1.0) with this tool.

Smooth

Tip: The Smooth tool only works when "Vertex selection masking for painting" is enabled. Otherwise the tool button is grayed out.

Blends the weights of selected vertices with adjacent unselected vertices. This tool only works in vertex select mode.



To understand what the tool really does, let us take a look at a simple example. The selected vertex is connected to four adjacent vertices (marked with a gray circle in the image). All adjacent vertices are unselected. Now the tool calculates the average weight of all connected **and** unselected vertices. In the example this is:

$(1 + 0 + 0 + 0)/4 = 0.25$

This value is multiplied by the factor given in the Operator options (see below).

- If the factor is 0.0 then actually nothing happens at all and the vertex just keeps its value.
- If the factor is 1.0 then the calculated average weight is taken (0.25 here).
- Dragging the factor from 0 to 1 gradually changes from the old value to the calculated average.

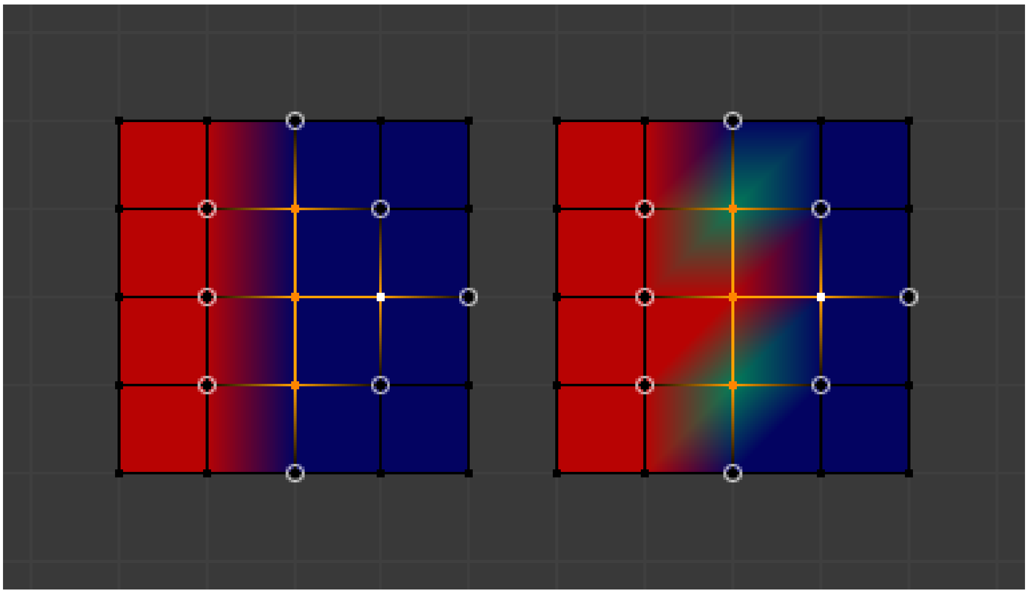
Now let us see what happens when we select all but one of the neighbors of the selected vertex as well. Again all connected and unselected vertices are marked with a gray circle. When we call the Smooth tool now and set the Factor to 1.0, then we see different results for each of the selected vertices:

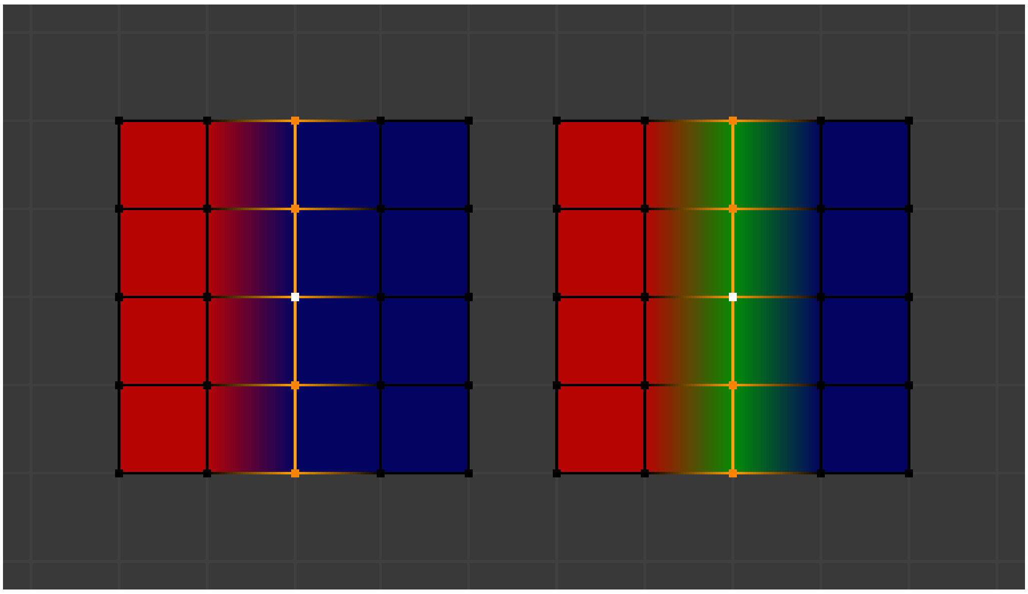
- The top-most and bottom-most selected vertices:

  are surrounded by three unselected vertices, with an average weight of $(1 + 0 + 0)/3 = 0.333$ So their color has changed to light green.
- The middle vertex:

  is connected to one unselected vertex with `weight = 1`. So the average weight is 1.0 in this case, thus the selected vertex color has changed to red.
- The right vertex:

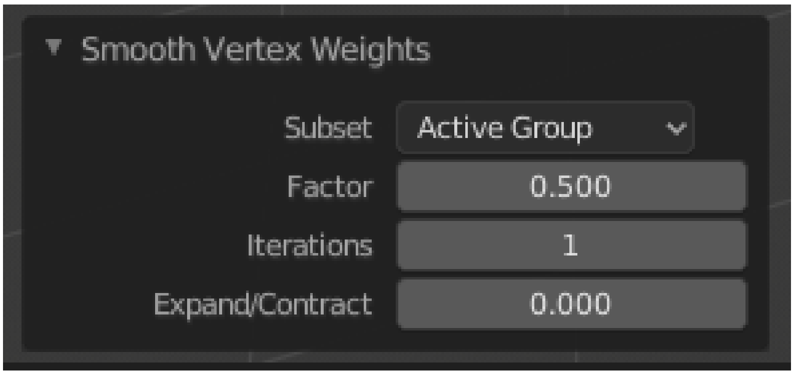
  is surrounded by three unselected vertices with average weight = $(0 + 0 + 0)/3 = 0.0$ So the average weight is 0, thus the selected vertex color has not changed at all (it was already blue before Smooth was applied).





Finally let us look at a practical example. The middle edge loop has been selected and it will be used for blending the left side to the right side of the area.

- All selected vertices have two unselected adjacent vertices.
- The average weight of the unselected vertices is $(1 + 0)/2 = 0.5$
- Thus when the *Factor* is set to 1.0 then the edge loop turns to green and finally does blend the cold side (right) to the hot side (left).



Subset: Active Group

Factor: 0.500

Iterations: 1

Expand/Contract: 0.000

Fig. 1359: Smooth options.

Factor The effective amount of blending. When Factor is set to 0.0 then the *Smooth* tool does not do anything. For Factor > 0 the weights of the affected vertices gradually shift from their original value towards the average weight of all connected **and** unselected vertices (see examples above).

Iterations Number of times to repeat the smoothing operation.

Expand/Contract Positive values expand the selection to neighboring vertices while contract limits to the selection.

Source The vertices to mix with.

All Smoothing will smooth both selected and deselected vertices.

Only Selected Smoothing will only smooth with selected vertices.

Only Deselected Smoothing will only smooth with deselected vertices.

Transfer Weights

Copy weights from other objects to the vertex groups of the active object.

By default this tool copies only the active (selected) vertex group of the source object to the active vertex group of target object or creates a new one if the group does not exist. However, you can change the tool's behavior in the *Adjust Last Operation* panel.

For example, to transfer all existing vertex groups from the source objects to the target, change the *Source Layers Selection* option to *By Name*.

Note: This tool uses the generic "data transfer", but transfers from all selected objects to active one. Please refer to the *Data Transfer* docs for options details and explanations.

Prepare the Copy

You first select all source objects, and finally the target object (the target object must be the active object).

It is important that the source objects and the target object are at the same location. If they are placed side-by-side, then the weight transfer will not work. (See the *Vertex Mapping* option.) You can place the objects on different layers, but you have to ensure that all objects are visible when you call the tool.

Now ensure that the target object is in Weight Paint Mode. Open the Toolbar and call the *Transfer Weights* tool in the *Weight Tools* panel.

Adjust Last Operation Panel Confusion

You may notice that the *Adjust Last Operation* panel stays available after the weight transfer is done. The panel only disappears when you call another Operator that has its own *Adjust Last Operation* panel. This can lead to confusion when you use Transfer weights repeatedly after you changed your vertex groups. If you then use the still-visible *Adjust Last Operation* panel, then Blender will reset your work to its state right before you initially called the *Transfer Weights* tool.

So when you want to call the *Transfer Weights* tool again after you made some changes to your vertex groups, then **always** use the *Transfer Weights* button, even if the *Adjust Last Operation* panel is still available. Unless you really want to reset your changes to the initial call of the tool.

Limit Total

Reduce the number of weight groups per vertex to the specified Limit. The tool removes lowest weights first until the limit is reached.

Hint: The tool can only work reasonably when more than one weight group is selected.

Subset Restrict the tool to a subset. See above *The Subset Option* for how subsets are defined.

Limit Maximum number of weights allowed on each vertex.

Fix Deforms

The *Fix deforms* tool is used to modify an object's nonzero weights so its deformed vertices are at a new defined distance. This is helpful to fix deformations because when complex models are deformed to their extreme poses, they are often visibly bumpy, jagged, or otherwise incorrectly deformed. Using this tool, you can smooth over the deformation.

To use the tool, select the vertices that you would like to move, either in Edit Mode or by using the vertex selection/mask. The operator can now be used and altered with these options:

Distance The distance to move to.

Strength The distance moved can be changed by this factor.

Accuracy Changes the amount weights are altered with each iteration: lower values are slower.

Note: Note that if it does not change, then there are no nonzero bone weights that are changed to make it closer to the intended distance.

Locks

Reference

Mode Edit Mode and Weight Paint Mode