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Smooth Laplacian Modifier

The *Smooth Laplacian* modifier allows you to reduce noise on a mesh's surface with minimal changes to its shape.

It can also exaggerate the shape using a negative *Factor*.

The *Smooth Laplacian* is useful for objects that have been reconstructed from the real world and contain undesirable noise. It removes noise while still preserving desirable geometry as well as the shape of the original model.

This modifier is based on a curvature flow *Laplace Beltrami* operator in a diffusion equation.

Hint

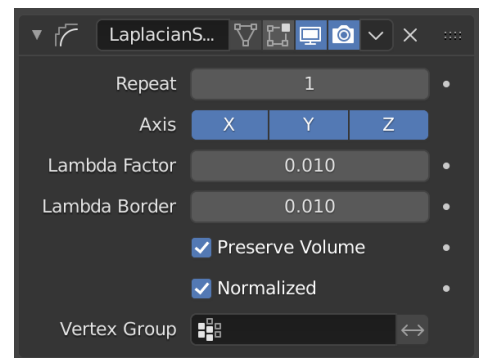
Meshes with a great number of vertices, more than ten thousand (10,000), may take several minutes for processing. You can use small portions of the mesh for testing before executing the modifier on the entire model.

Options

Repeat

Repetitions allow you to run the smoothing operation multiple times. Each repetition causes the flow curvature of the mesh to be recalculated again, and as a result it removes more noise with every new iteration using a small *Factor* < 1.0 .

When on 0, no smoothing is done.

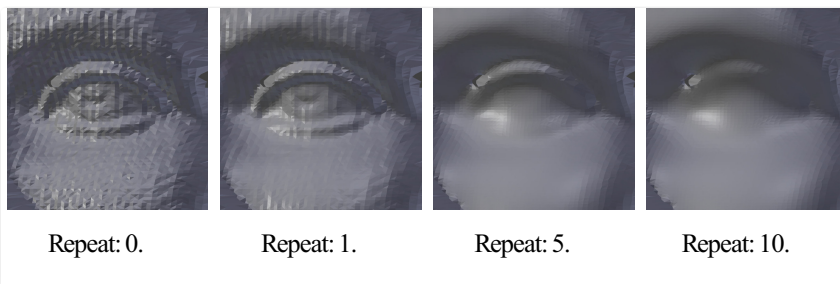


The Smooth Laplacian modifier.

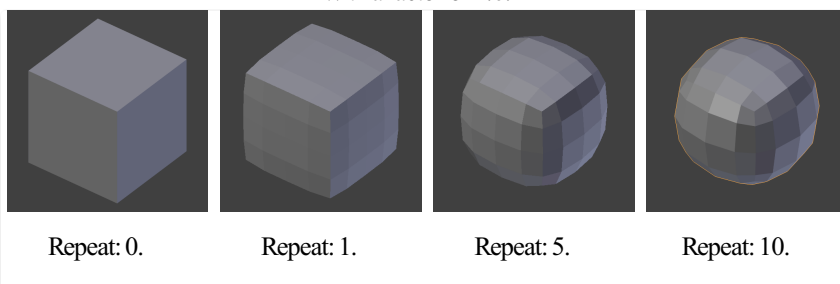
Note

More repetitions will take longer to calculate. So beware of doing so on meshes with a large number of vertices.

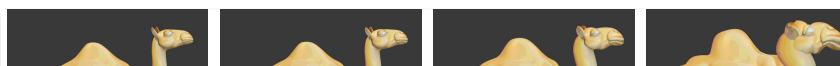
With a factor of 0.5.

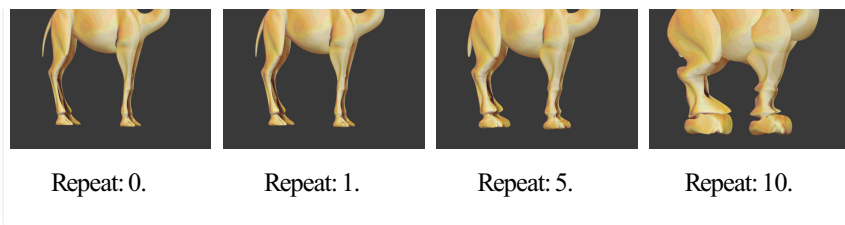


With a factor of 2.0.



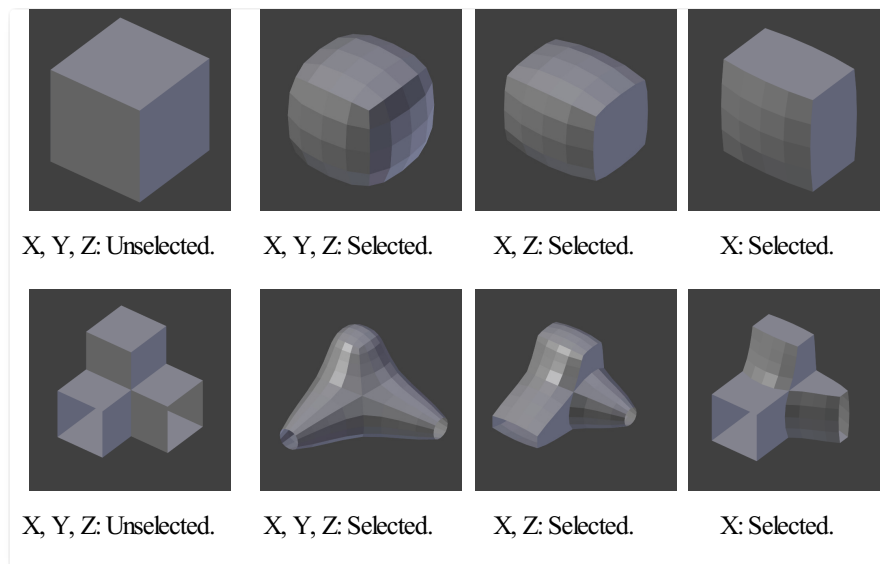
With a factor of -0.5.





Axis

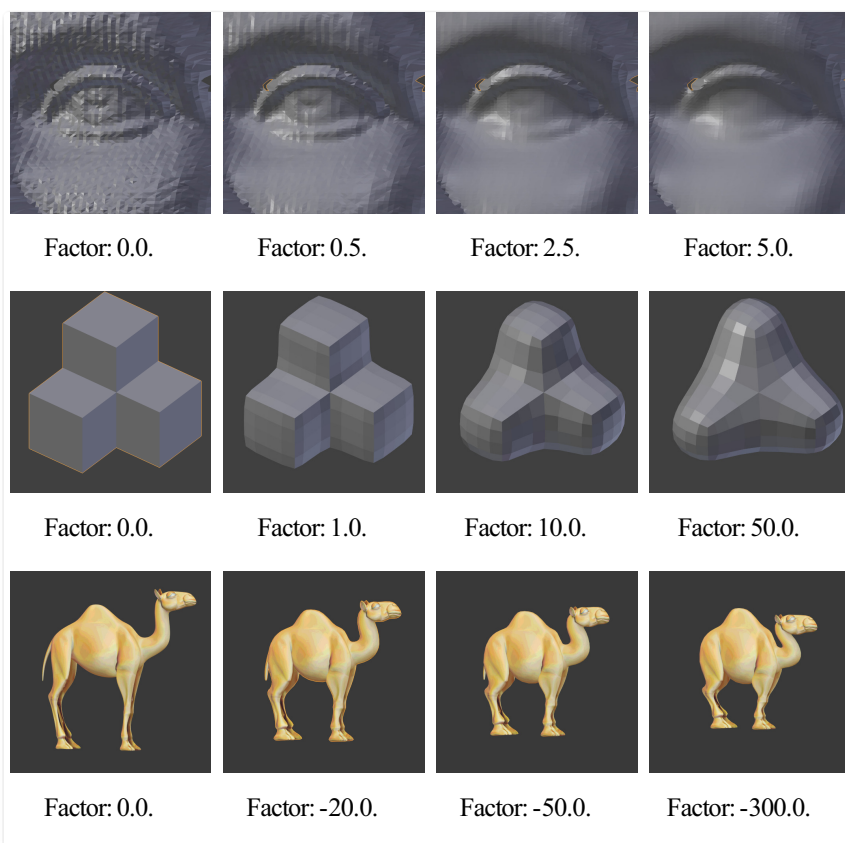
Toggle buttons to enable/disable deforming vertices in the X, Y and/or Z axes directions.



Lambda Factor

Controls the amount of displacement of every vertex along the flow curvature.

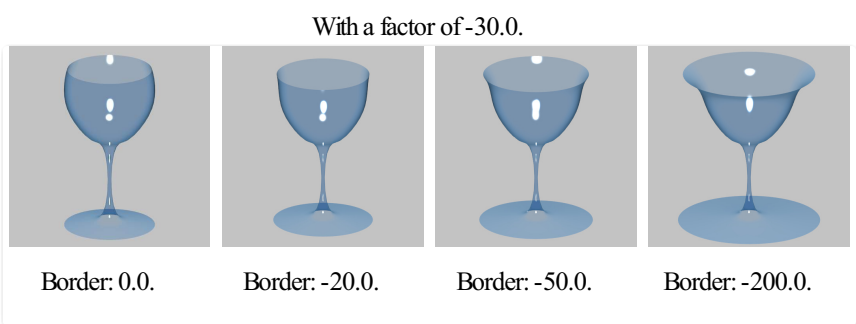
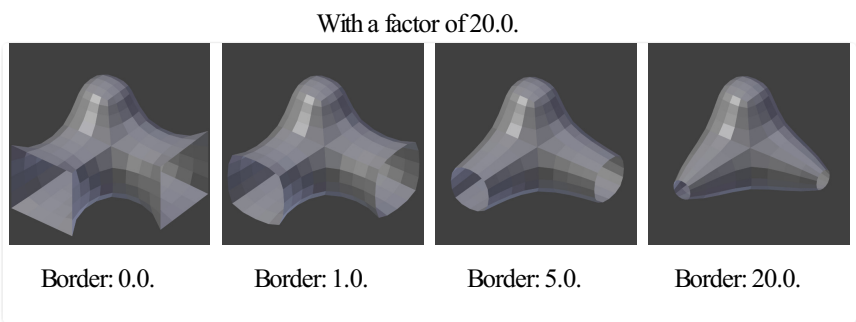
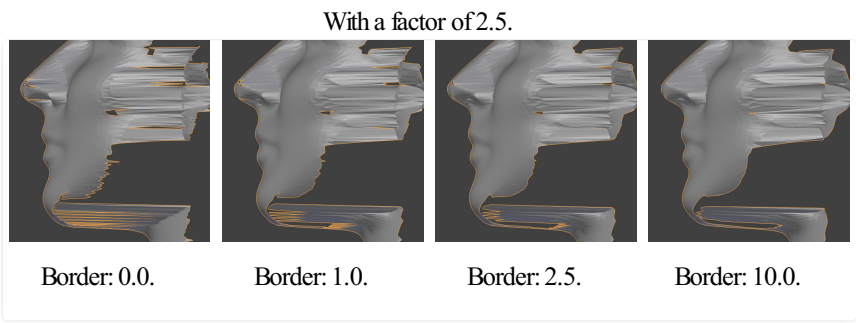
- Using a small *Factor*, you can remove noise from the shape without affecting desirable geometry.
- Using a large *Factor*, you get smoothed versions of the shape at the cost of fine geometry details.
- Using a negative *Factor*, you can enhance the shape, preserving desirable geometry.
- When the *Factor* is negative, multiple iterations can magnify the noise.



Lambda Border

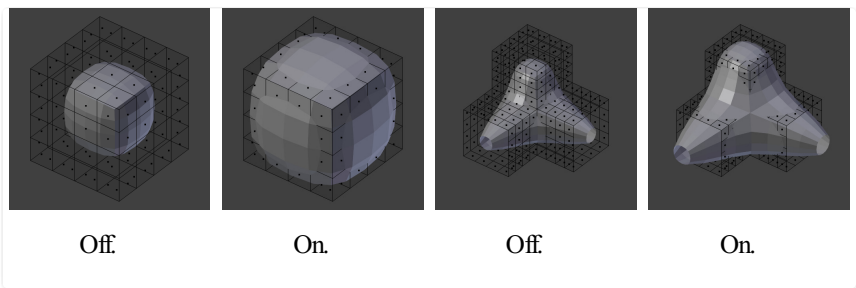
Since there is no way to calculate the curvature flow on border edges, they must be controlled separately. Border edges are smoothed using a much simpler method, using this property to control the influence.

Positive values will smooth the vertex positions, while negative values will “enhance” them by transforming them in the opposite direction.



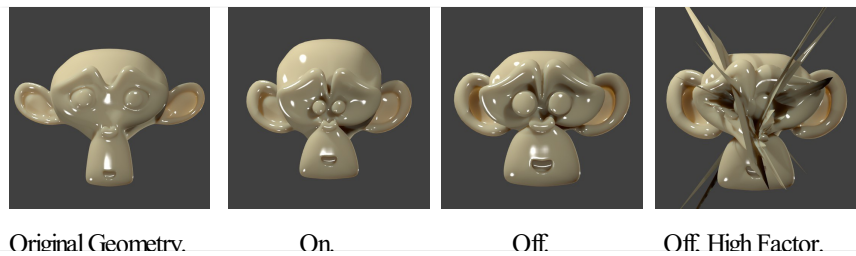
Preserve Volume

The smoothing process can produce shrinkage. That is significant for large *Factor* or large *Repeat* values. You can use that option to reduce that effect.



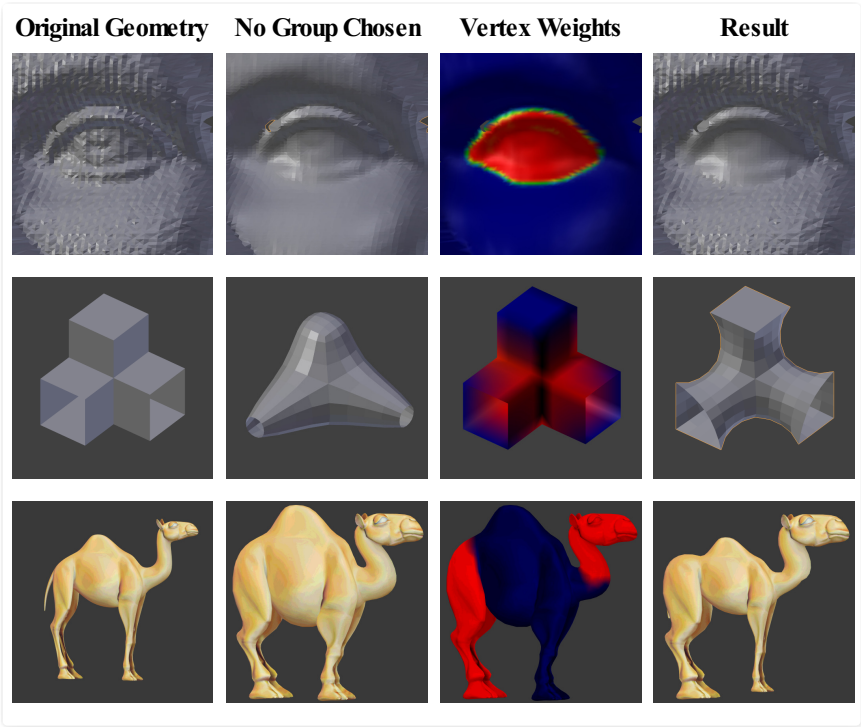
Normalized

When enabled, the results will depend on face sizes. When disabled, geometry spikes may occur.



Vertex Group

A vertex group name, to constrain the effect to a group of vertices only. Allows for selective, real-time smoothing or enhancing, by painting vertex weights.

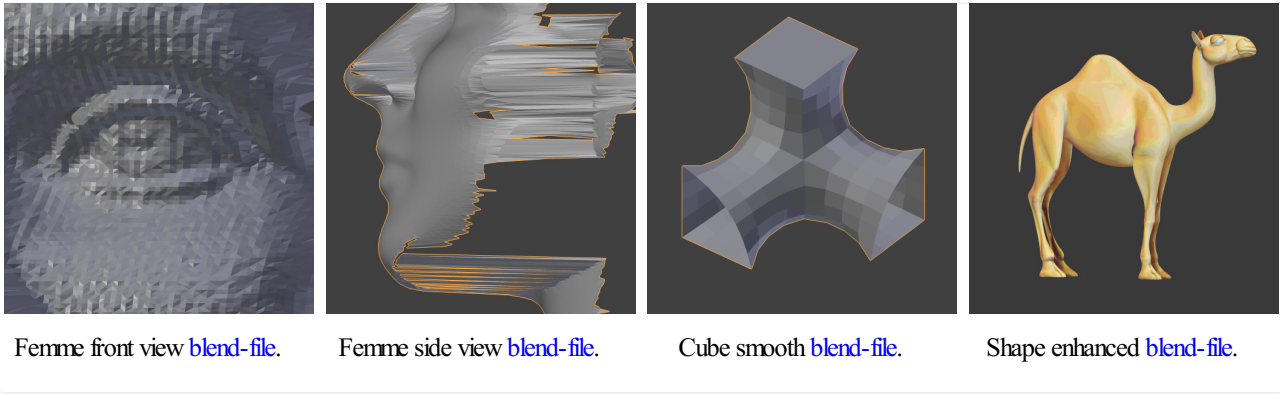


Invert <->

Inverts the influence of the selected vertex group, meaning that the group now represents vertices that will not be deformed by the modifier.

The setting reverses the weight values of the group.

Examples



See also

[Smooth Modifier](#).