Subdivision Surface Modifier

The *Subdivision Surface* modifier (often shortened as slang to "Subdiv" or "Subsurf") is used to split the faces of a mesh into smaller faces, giving it a smooth appearance. It enables you to create complex smooth surfaces while modeling simple, low-vertex meshes. It avoids the need to save and maintain huge amounts of data, and gives a smooth "organic" look to the object.

As with any modifier, order of execution (position in the modifier stack) has an important bearing on the results.

Keep in mind that this is a different operation than its companion, Smooth Shading. You can see the difference between the two in the grid image below.

Subdivision levels 0 to 3, without and with Smooth Shading.

> **Tip**
>
> The *Subdivision Surface* modifier does not allow you to edit the new subdivided geometry without applying it, but the Multiresolution modifier does (in Sculpt Mode).

> **Note**
>
> This modifier uses the OpenSubdiv library as a backend.

Options

Catmull-Clark

Subdivides and smooths the surfaces to create a more pleasant looking mesh. According to its Wikipedia page, the "arbitrary-looking formula was chosen by Catmull and Clark based on the aesthetic appearance of the resulting surfaces rather than on a mathematical derivation."

Simple

Only subdivides the surfaces, this often does not provide any smoothing unless the surface is non-coplanar (the same as the Subdivide operator, in Edit Mode). To work around this behavior for non-coplanar geometry, triangulate to ensure all geometry is coplanar.

Simple mode can be used, for example, to increase the base mesh resolution when using displacement maps.

The Subdivision Surface modifier.

Levels Viewport, Render

The number of subdivision levels shown in the 3D Viewport or the final render.

> **Warning**
>
> Higher levels of subdivisions results in more vertices, which means higher memory consumption (both system RAM, and video memory for display). This can cause Blender to hang or crash if not enough memory is available.
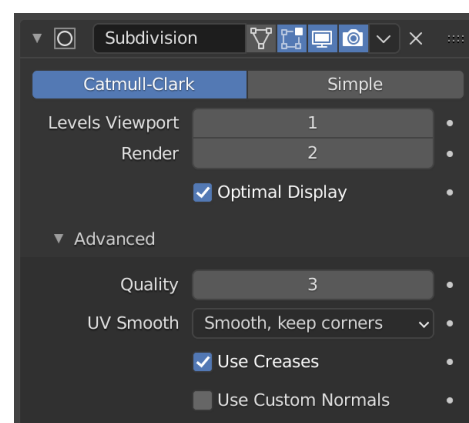
> **Tip**
>
> The right combination of these settings will allow you to keep a fast and lightweight approximation of your model when interacting with it in the 3D Viewport, but use a higher quality version when rendering.
>
> Be careful not to set the *Viewport* subdivisions higher than the *Render* subdivisions, this would mean that the quality in the 3D Viewport will be higher than the rendered.

Optimal Display

When rendering the wireframe of this object, the wires of the new subdivided edges will be skipped (only displays the edges of the original geometry).

Advanced

Use Limit Surface

Places vertices at the surface that would be produced with infinite levels of subdivision (smoothest possible shape).

Quality

When *Use Limit Surface* is enabled this property controls how precisely vertices are positioned on the limit surface (relatively to their theoretical position of an infinitely subdivided mesh). It can be lowered to get a better performance.

Using higher values does not necessarily mean real improvement in quality, ideal results might be reached well before the maximum *Quality* value.

> **Note**
>
> This value can affect the accuracy of [Edge Creases](#); using a higher *Quality* value will allow for a wider range of crease values to work accurately

UV Smooth

Controls how subdivision smoothing is applied to UVs.

None:
UVs remain unchanged.

Keep Corners:
UV islands are smoothed, but their boundary remain unchanged.

Keep Corners, Junctions:
UVs are smoothed, corners on discontinuous boundary and junctions of three or more regions are kept sharp.

Keep Corners, Junctions, Concave:
UVs are smoothed, corners on discontinuous boundary, junctions of three or more regions and darts and concave corners are kept sharp.

Keep Boundaries:
UVs are smoothed, boundaries are kept sharp.

All:
UVs and their boundaries are smoothed.

Boundary Smooth

Controls how open boundaries (and corners) are smoothed.

All:
Smooth boundaries, including corners.

Keep Corners:
Smooth boundaries, but corners are kept sharp.

Use Creases

Use the [Weighted Edge Creases](#) values stored in edges to control how smooth they are made.

Use Custom Normals

Interpolates existing [Custom Split Normals](#) of the resulting mesh. Otherwise, new faces will have the overall normal orientation of that original face

Keyboard Shortcuts

To quickly add a *Subdivision Surface* modifier to one or more objects, select the object(s) and press `Ctrl - 1`. That will add a Subdivision Surface modifier with *Viewport* subdivisions set to 1. You can use other numbers too, such as `Ctrl - 2`, `Ctrl - 3`, etc, to add a modifier with that number of subdivisions. Adding a *Subdivision Surface* modifier in this fashion will not modify the *Render* subdivisions.

If an object already has a *Subdivision Surface* modifier, doing this will simply change its subdivision level instead of adding another modifier.

Control

Catmull-Clark subdivision rounds off edges, and often this is not what you want. There are several solutions that allow you to control the subdivision.

Weighted Edge Creases

Weighted edge creases for subdivision surfaces allows you to change the way the *Subdivision Surface* modifier subdivides the geometry to give the edg a smooth or sharp appearance.
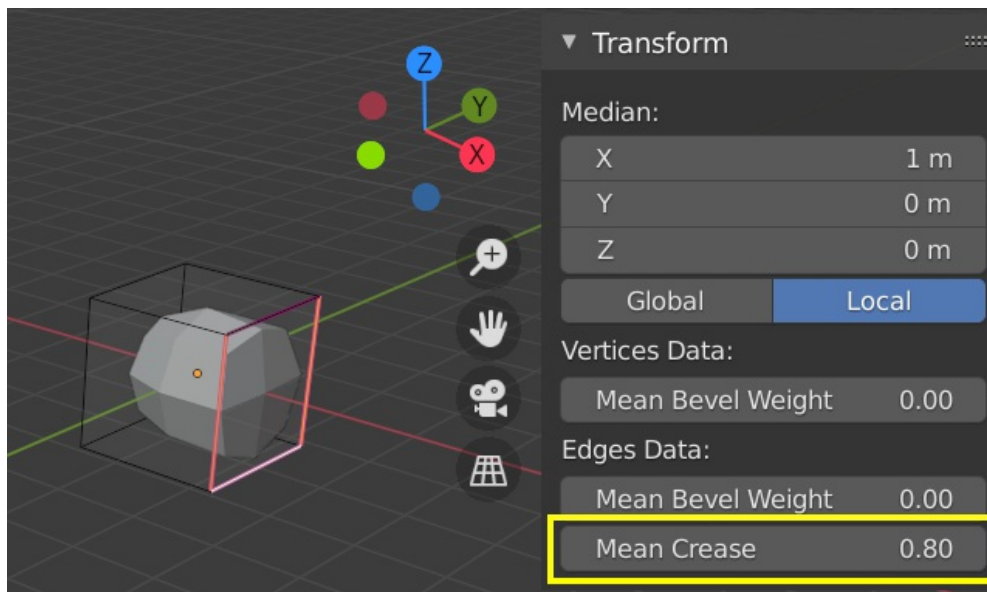
A subdivided cube with creased edges.

The crease weight of selected edges can be changed in the *Transform* panel, Sidebar of the 3D Viewport. The scale-like dedicated tool `Shift - E` can also be used to adjust the crease weight. A higher value makes the edge "stronger" and more resistant to the smoothing effect of subdivision surfaces

Edge Loops
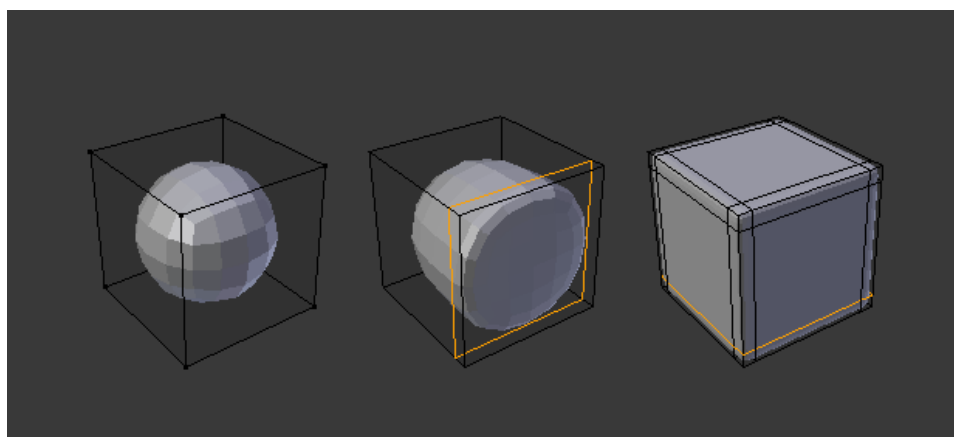
Subdivision Level 2 cube, the same with an extra Edge Loop, and the same with six extra Edge Loops.

The *Subdivision Surface* modifier demonstrates why good, clean topology is so important. As you can see in the figure, it has a drastic effect on a defau cube. Until you add in additional loops (with e.g. Loop Cut and Slide), the shape is almost unrecognizable as a cube.

A mesh with deliberate topology has good placement of edge loops, which allow the placement of more loops (or their removal) to control the sharpness/smoothness of the resultant mesh.

Known Limitations

Non-Contiguous Normals

Abrupt normal changes will prevent portions of the mesh from producing a smooth subdivision. Instead, these portions with non-contiguous normals will subdivided using the "Simple" subdivision method.

| Comparison of good normals and bad normals. | Side view of image on the left. |
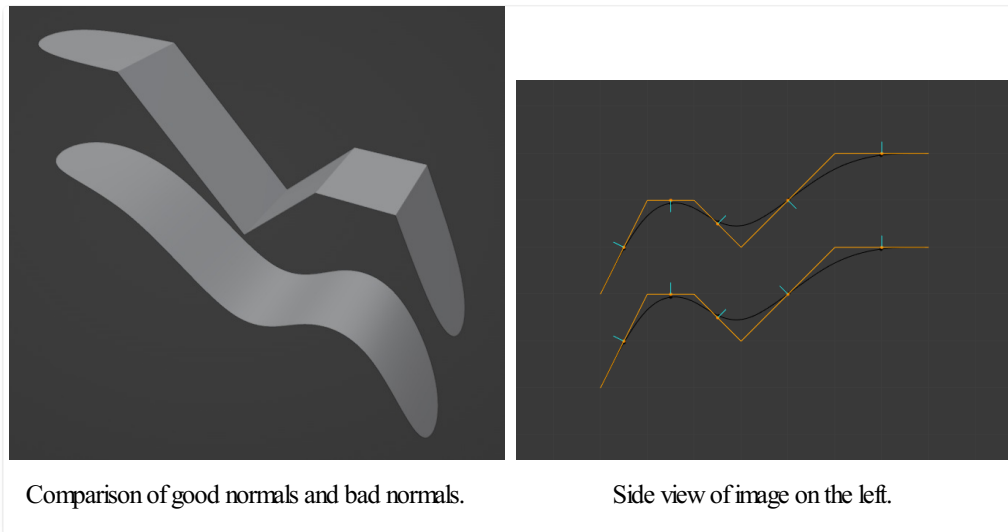
A quick way to fix this is to Recalculate Normals. If this does not work you may have to manually flip the normals.

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