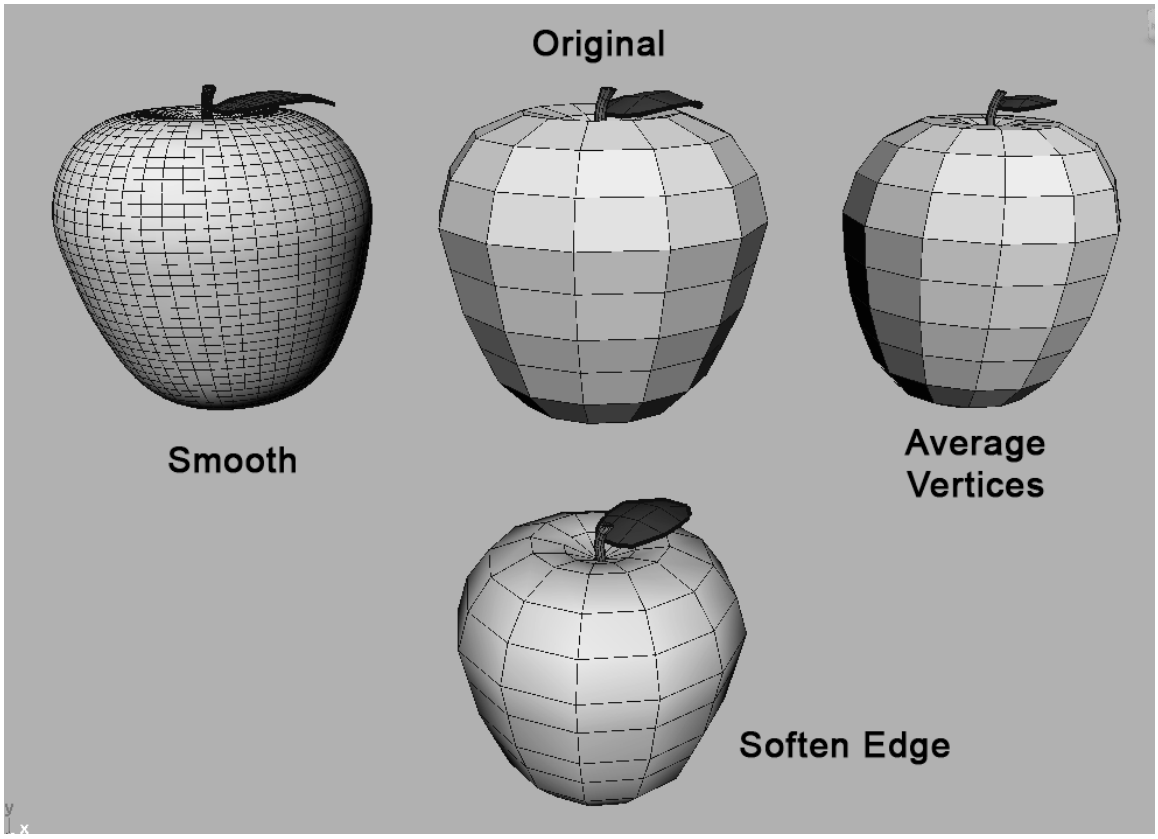
Tutorial 5 - Smoothie

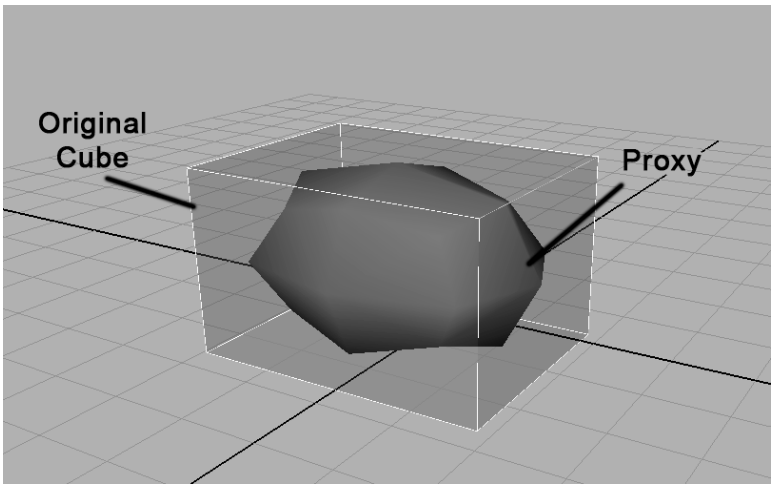
There may be times when your polygon mesh does not appear as smooth as you would like. Maya provides several methods for smoothing polygons:



* Mesh > **Smooth**: Maya modifies the polygon mesh by **adding new polygons** and smoothing out vertices and their connected edges.

* Mesh > **Average Vertices**: Maya averages the values of the vertices to produce a **smoother surface without modifying the topology**. Average Vertices is useful when you want to maintain the existing polygon count in a mesh. Unlike Mesh > Smooth, Average Vertices does not increase the number of polygons in the mesh.

* Proxy > **Subdiv Proxy**: Displays both a smoothed version of the polygon mesh as well as the original unsmoothed version so you can edit and animate the mesh more easily. Subdiv Proxy smooths the selected polygon mesh by adding polygons and keeps the original non-smoothed mesh as a proxy. A node connection is made between the proxy and smoothed version of the mesh so that changes to the proxy's shape or topology update the smoothed version of the mesh.



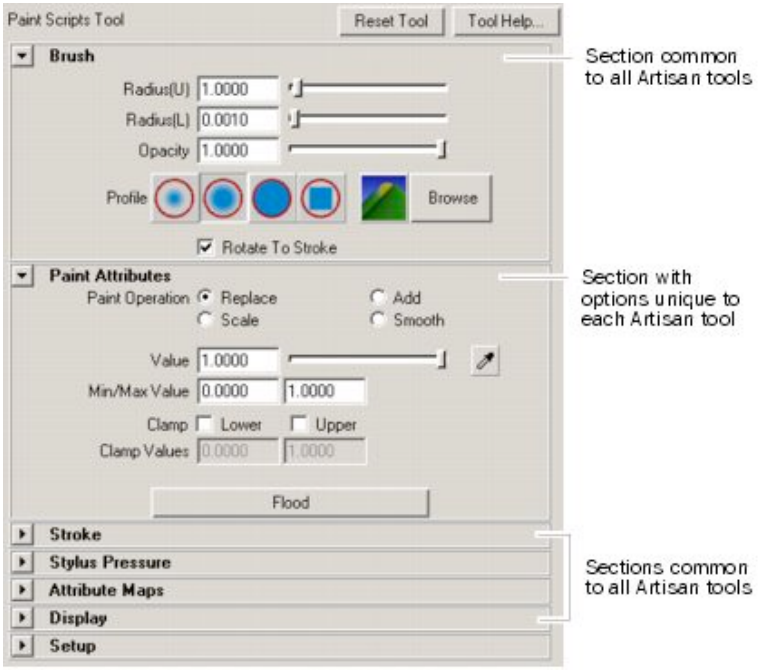
Subdiv Proxy is useful for reshaping and/or animating a coarser version of a polygonal model (with fewer components to worry about) while seeing what the smoothed version will look like.

* Mesh > **Sculpt Geometry Tool**: The Sculpt Geometry Tool can smooth the polygon mesh by letting you manually modify the position of polygon vertices using a brush paradigm. This lets you smooth local regions of the mesh and does not modify the topology.

Sculpt Geometry Tool is a brush tool that uses the Maya Artisan interface. This group of tools is called Artisan tools. Artisan tools let you manipulate your geometry in a more artistic manner by allowing you to paint their values and properties with the brush tool.

The Flood operation applies the specified settings over the entire surface or mesh.

Note: you can use the Sculpt Geometry Tool for more than smoothing.

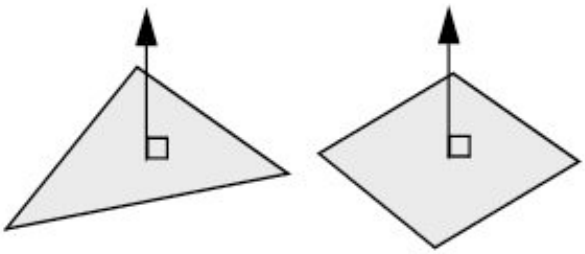


Artisan interface in the Maya Tool Settings Editor

Normals

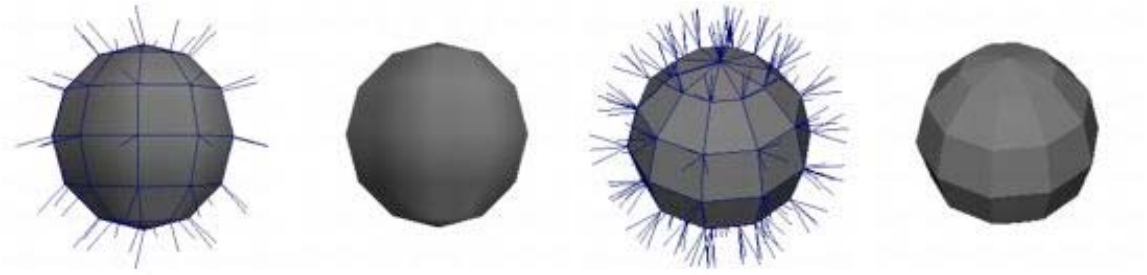
A normal is a theoretical line that is perpendicular to the surface of a polygon. In Maya, normals are used to determine the orientation of a polygon face (face normals), or how the edges of faces will visually appear in relation to each other when shaded (vertex normals).

The front of a polygon's face is graphically represented using a vector called the polygon's normal. A normal is a theoretical line representing the direction perpendicular to a polygonal surface.



The order of vertices around the face determine the direction of the face (whether a side of the polygon is the front or the back). This can be important because technically polygons are only visible from the front, though by default Maya automatically makes all polygons double-sided so you can see them from the back. You can turn this double-sided behavior off for meshes.
When you shade or render polygons, the normals determine how light reflects from the surface and the shading that results.

Vertex normals determine the visual smoothing between polygon faces. Unlike face normals, they are not intrinsic to the polygon, but rather reflect how Maya renders the polygons in smooth shaded mode.



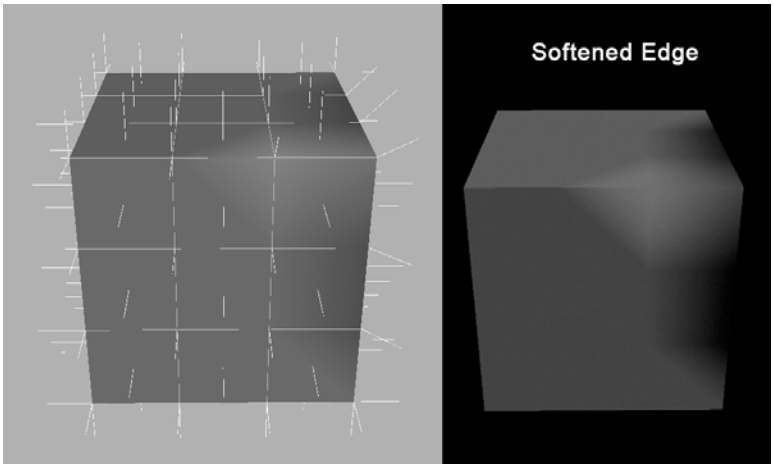
Vertex normals appear as lines projecting from the vertex, one for each face that shares the vertex.

When the vertex normals at a particular point on the mesh all point in the same direction (called soft or shared vertex normals), there is a soft edge transition between the faces in smooth shaded mode.

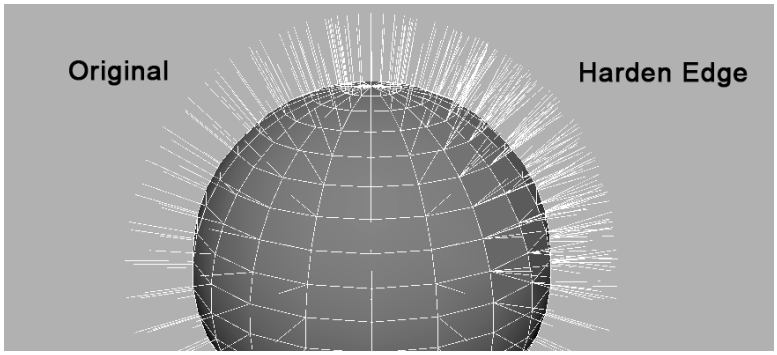
When the vertex normals point in the same directions as their faces (called hard vertex normals), the transition between faces is hard, creating a faceted appearance.

Soften edge

Manipulates vertex normals to change the appearance of shaded polygons to render with a softened appearance. Soften Edge sets the Normal angle to 180 degrees, making all selected edges render soft.



Harden edge
Manipulates vertex normals to change the appearance of shaded polygons to render with a hardened appearance. Harden Edge sets the Normal angle to 0 degrees, making all selected edges render hard.



When you harden an edge on a polygon mesh, you change the direction of the normals associated with the shared edge, which in turn affects the shading along those edges. When you crease an edge of a mesh that has an associated subdiv proxy, the edges on the smoothed high-resolution version are creased by physically modifying the polygon smoothing surrounding those edges.