Clean Topology checklist

by Amy Gallan

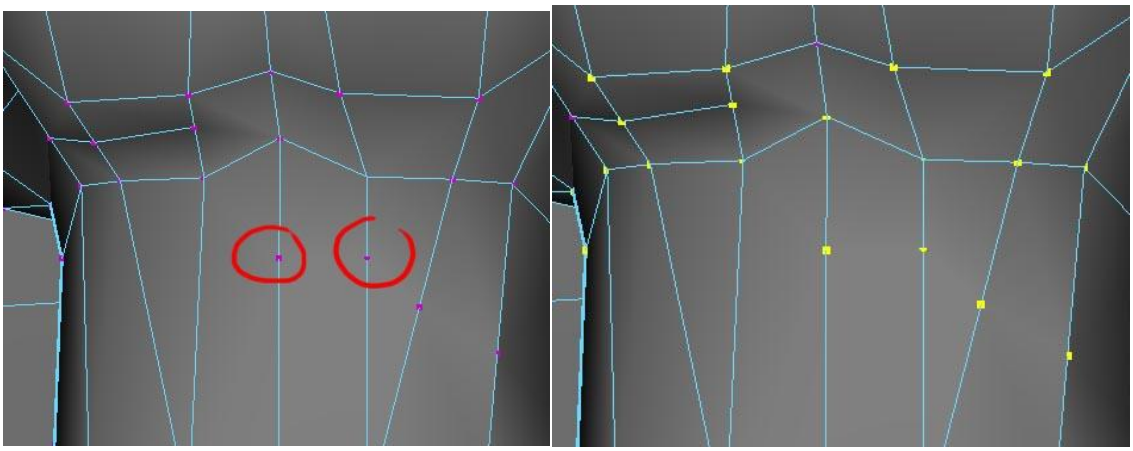
As a modeller there are many ways to create objects and construct your mesh, every artist will model differently and produce varying quality. However there are some things that a modeller can do to their mesh that are just bad meshflow and outright mistakes.

So before you finish off any model make sure you go through and check for the following.

1: Ensure that you do not have any verts that are not connecting into another edge.

Each vert should have at least 3 edges running into it to be valid.

To eliminate and excess vertices, marquee select every vertex in your mesh and press backspace on your keyboard. Don't worry, it is impossible to delete any vertices that have more than two edges running into them, so don't fret if you include the surrounding verts in the selection.

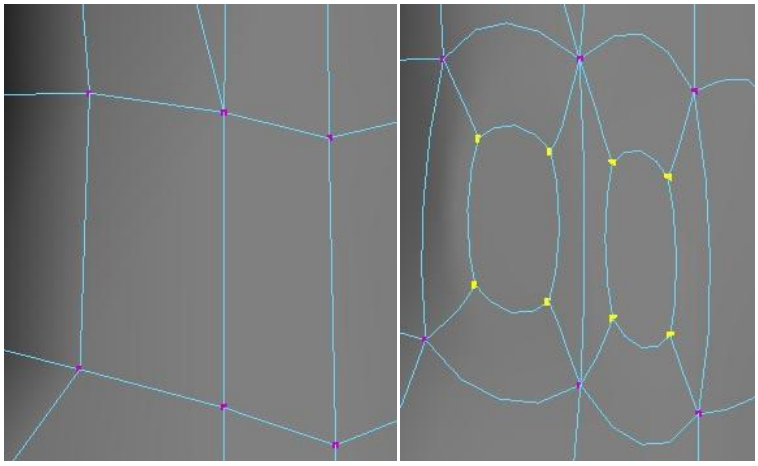


NOTE: Before deleting, de-select any vertices on corner edges as these will delete as well.

2: Ensure that you do not have any overlapping vertices, edges or faces.

These are very common to appear during the modelling process if you are not careful. Particularly when using tools such as extrude or vert snapping, without either separating the new faces or merging verts properly. Not eliminating overlapping geometry can produce some nasty results on your mesh and affect everything from smoothing to rigging or even simply just selecting your geometry.

An easy way to identify that you have overlapping faces, verts or edges is by going to the mesh smooth preview. To do this press '3' on your keyboard. The overlapping edges will separate slightly to make it easier to select.



To eliminate any overlapping geometry in your mesh select every vert, and go to the

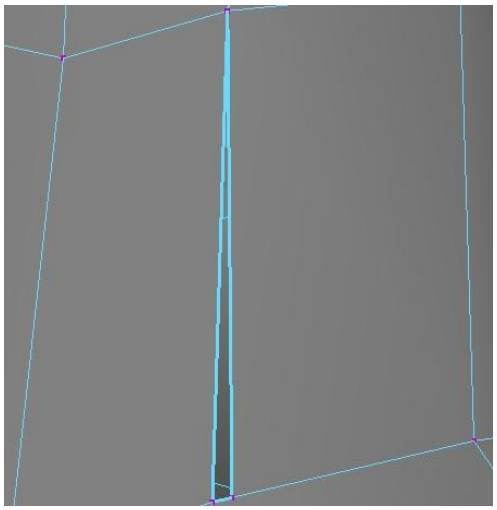
Edit mesh > Merge > Options.

Set the threshold to be a very tiny value eg: 0.01 (depending on the scale of your scene)

Click merge.

This will merge any overlapping verts together to make one vert. Just ensure that no other surrounding verts have accidently merged together as well.

3: Ensure your mesh does not have any holes

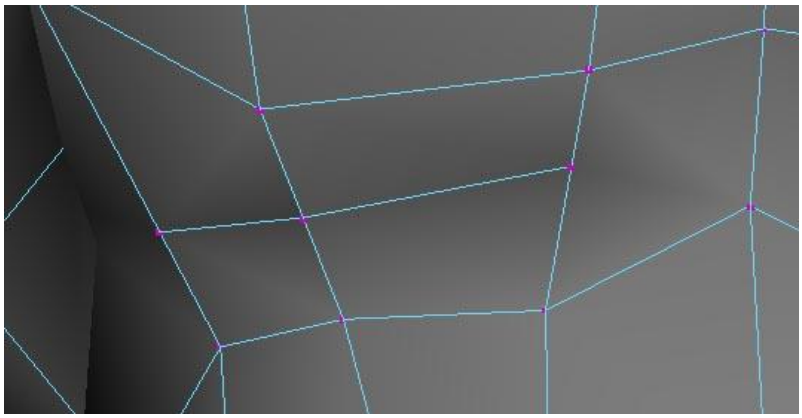


Sometimes your mesh can reveal holes where faces have been deleted or edges and verts not properly merged.

A good way to show up holes in your mesh is by going to the smooth preview view, which will widen the gaps.

Make use of the Merge vertex tool, Fill hole or Append to poly tool will help to fix these gaps.

4: Ensure that your model has flowing edge loops.



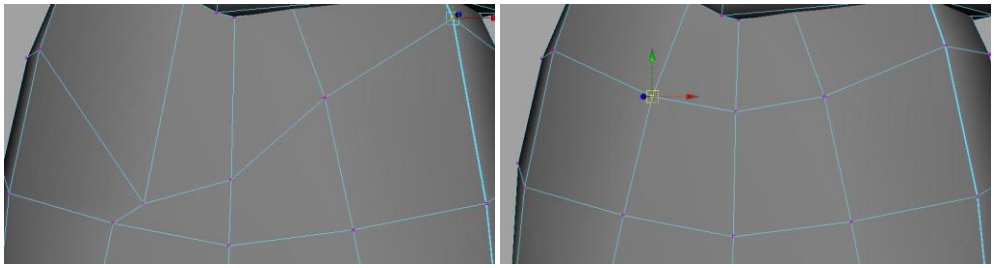
You can identify the areas where mesh flow comes to a confusing junction but using the select contiguous edges tool.

Select > Select contiguous edges

Double click on an edge to select all edges continually running. The selection will stop when an edge flow either stops in the middle of a face, or if it comes to a vertex junction the spreads off into many other edge directions.

Sometimes these are unavoidable and can still work, however try to avoid these situations if at all possible or if the meshflow has no real purpose. For example, many edges running into a single point in areas such as the knee and elbow deformation zones serves a purpose, and as long as it is clean, can remain in the mesh.

5: Check your edge flow to ensure that your edges are following gradual contours

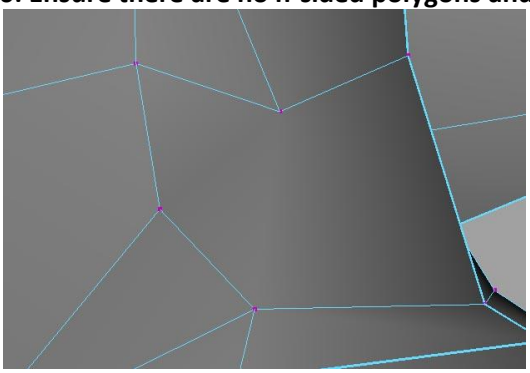


Check for any irregularities in the way your edges contour together. Each vertex and edge should have a relationship with its neighbour so that the overall mesh remains clean and flowing.

Neaten up any conflicting contours and irregular angles in your mesh that do not serve any purpose to the overall shape.

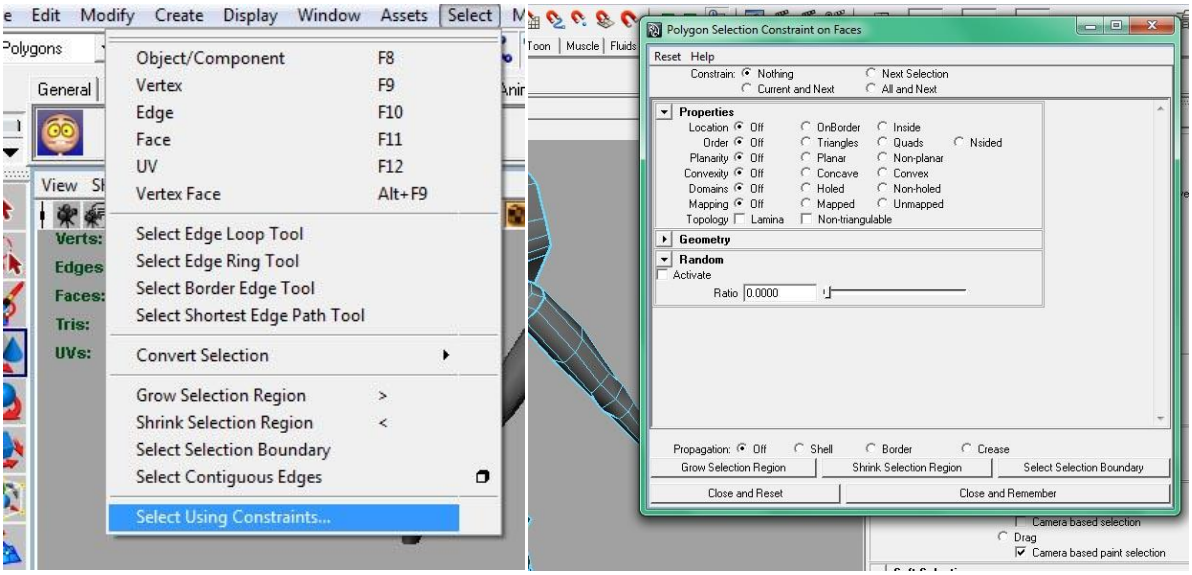
A neat way to move verts around when cleaning contours is **the 'Move along edge function'**. You can move a vert locked along the existing edge of your mesh by **holding down 'C' on your keyboard and middle mouse dragging** in the direction of your neighbouring edge. This will lock the movement to only the edge, try practicing this.

6: Ensure there are no n-sided polygons and there are minimal tris in your mesh.



You can easily check for any n-sided polygons or tris in your mesh by going to

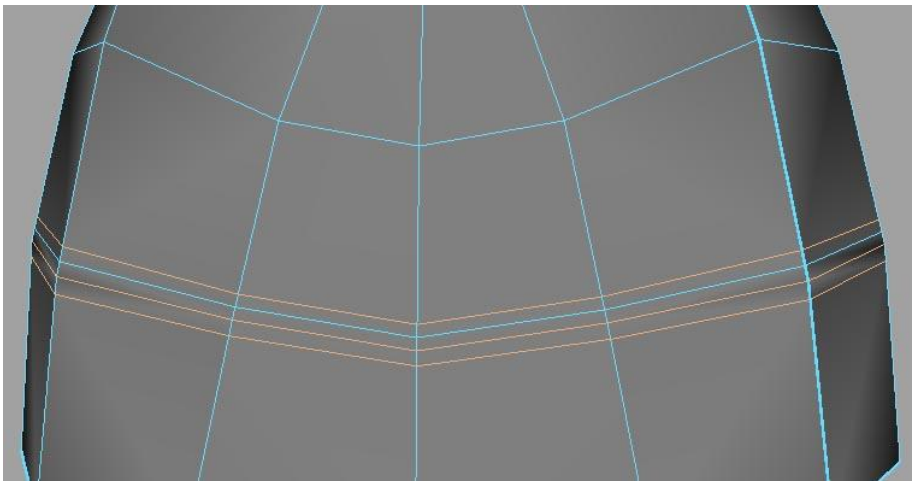
Select > Select using constraints



Make sure you are in select faces mode in the viewport and in the Select using constraints menu select ‘All and Next’ and then either ‘Tris’ or ‘N-Sided’. If you now inspect your model you will see only tris or n-sided faces selected.

Fix these faces into being 4-sided polygons if possible by retopologising your geometry in this area. You may need to split into your mesh, merge verts and/or delete edges.

7: Strategically optimise geometry particularly in deformation zones and if over the polygon limit.

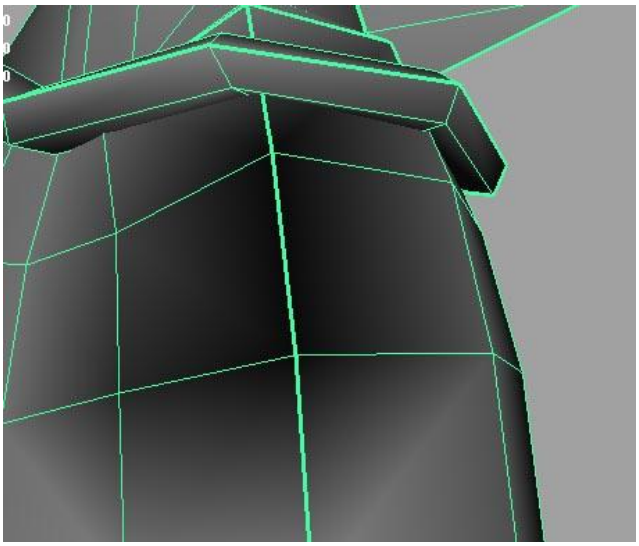


Analyse your model to identify areas of unnecessary geometry. Think about whether or not the shape would change if you were to take out certain geometry.

For example, lots of edge loops on areas with straight edges/contours serve little to no purpose.

Collapse selected edges in these cases or just select entire edge loops and delete edge/vertex.

8: Ensure your surfaces have correctly facing normals.



Surface normals are basically the way Maya calculates how light should react with a surface. Using normals, we can fake shadows, shape displacement, and even make edges appear sharp or smooth.

Playing with normals can be very powerful when becoming more experienced, however often when we create a model, the normals can develop some irregularities. These irregularities can appear as dark blemishes on your mesh, or jagged faces.

You can fix these irregularities by running some of the tools in the Normals menu.

With your entire mesh or certain edges, try using the average normals, set to face or conform. Using one of these or a combination of these should refresh your normals and fix most basic problems occurring in your surface shadowing.

The soften and harden edge tools can be used to make edges smoothed out or more rigid respectively.

By ensuring you constantly check your model against the above points you should be able to produce models that not only look great, but are clean and free of bugs! The more you practice these skills, the more valuable you will become as an artist, as well as being able to be proud of your nice clean mesh flow!

Have fun!