RETOPOLOGY

Introduction
Occasionally we need to convert a high resolution mesh into a low resolution version for animation or game development. Working entirely in Blender we can do this automatically using the Multiresolution modifier, but there are times when we must work with high resolution meshes from outside. For example, we may have a laser scan of an actor, or a mesh which has been bought from a commercial supplier.

The reasons and techniques for rebuilding mesh topology are important concepts to understand and valuable skills to learn. In association with normal mapping retopology enables detailed yet high resolution models to be translated to forms more suitable for animation or for assets that will be used interactively such as game characters.

Technique
Retopo, as it’s often referred to, includes two distinct elements. The first is converting a mesh (high or low poly) to one where the edges run in patterns that support easy, reliable animation. The example of head topology on the right of the image below is optimized for the animation of expressions and speech.

So let’s start. Begin by opening the OldMan.blend which can be downloaded at http://users.soe.ucsc.edu/~yonge/blend-files/

Use Keypad-0 to go to orthogonal Front View. You’ll see that everything in the scene has been hidden except for the mesh.
Make a plane and rotate it so that it is vertical (R-X-90-Return). Color it so that you can distinguish it from the mesh. Move it in front of the face and scale it down to something like this:

Go into Edit mode and Vertex Select mode. Find the magnet icon (SnapTo) and activate it. Choose Face as the snap element, and Closest (which should show up as the default) as the type of face to snap to. Make sure that Project Individual Elements is active. This snaps all the parts of the new plane to the faces on the head.

Move the plane slightly; you will not see much if any change. But now look at it in a 3D view to see all the vertices are on the faces on the head model behind it. It’s sometimes easier to see this in wireframe mode and move the viewpoint around slightly.
Now we can start to rebuild the underlying high res figure as low resolution using the first image as a guide. Here's another example; see how the entire head is built up using only quads.

Another point to note in this image is that there are several poles – that is, vertices which have more or less than four edges attached to them. Poles are unavoidable when retopologizing, and we try to keep them to areas which will not deform much in animation (the temples, for example). The five pointed pole on the cheek in the new mesh here would be better placed further back, as it may lead to problems when the character smiles.

Go back to Front Ortho view and go to Edge selection mode. Extrude an edge to create a new face, and see how the two new vertices stick to the head mesh. Use R and S to rotate and size the edge to suit the topology. Create a ring of new faces, closing it by selecting matching edges on the opposing ends and hitting F to create a final face.
Now select the outer edgeloop with Alt-RMB, hit E for extrude and then S for scale.

In a 3D view you can see all the new vertices are on the surface of the head.

The faces on the side of the nose are too large, so – still in a 3D view this time – we can select individual vertices and move them. They will stay attached to the underlying mesh.
At this point we may want to add a Mirror modifier. When doing so remember to make the original mesh the Mirror Object so that the mirror plane is correctly centered:

From this point you have two choices. You can use Clipping to create a line of vertices down the geometric X center of the new mesh. Or if you don’t want a line of verts down the center of the model you can stop short of the mirror plane and then, after your major modeling is done, apply the mirror modifier. Select both open edgeloops either side of the old mirror line, hit Control-E for the Edge options, and choose Bridge Edge Loops. New connecting faces will be created between them.

Now the high and low polygon versions of the mesh can be used to create a normal map that will simulate high poly reflections off the low poly mesh.

Chris Yonge - 20150929