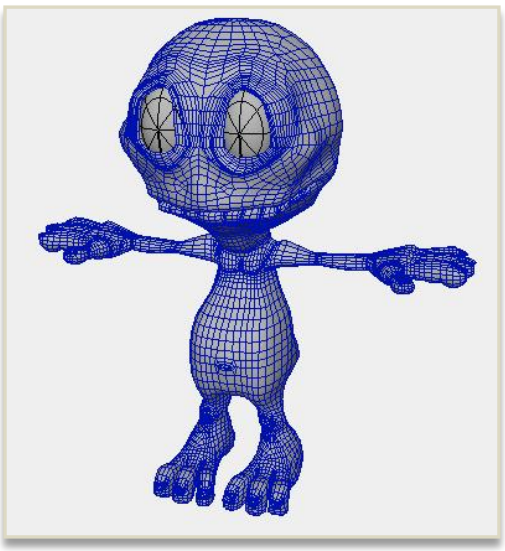
Polygonal "Box" modelling an Alien Greeblie

By Alan Maxwell



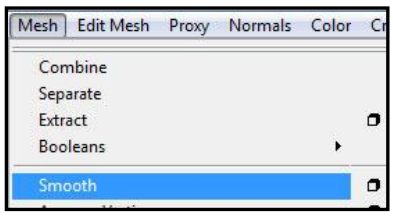
Above: The results of following this box modelling / low poly exercise.

Introduction

In this exercise you will be modelling an Alien character using standard polygon modelling techniques.

Box modelling is a generic term for polygon modelling starting from a simple cube or box primitive. Some Artists are capable of modelling highly realistic human faces starting from nothing more than a simple 4 side polygon just using the create polygon tool. As you will soon see there is a smooth function in Maya which can make even the chunkiest of box shapes into an organic form. We will be keeping low poly for most of the process. This helps us shape out and determine the form more quickly than getting bogged down with highly detailed mesh. For example if you need to connect a head to a body and there are only 8 to 12 verts to join ...well that is so much quicker to acheive than joining 40.

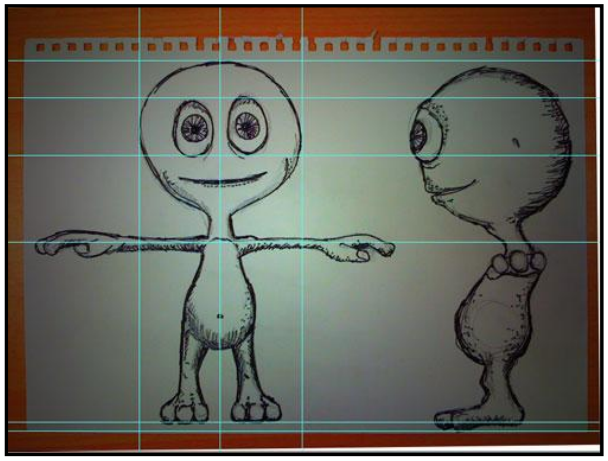
Smoothing



In old school modelling, a character is constructed looking pretty 'boxy"to begin with and at various points in the creation you would perform a ***Mesh >Smooth*** which give you an indication of what the model would look like when finished.

In recent versions of Maya 2008 and up there is a preview *smooth (tap 3 on your keyboard)* which lets you instantly see what the model looks like smoothed. I can assure you it is a mistake to model purely in preview smooth. Work with hard polys and check with preview smooth along the way but dont rely on it all the time.

In Maya 2009 and 2010 if you are rendering in Mental Ray the preview smooth will render as smoothed in appearance. Normally speaking in Maya software it will render as unsmoothed polys with hard faceted edges.



On close inspection you can see that even my original reference art does not line up on the same page.The best reference art for modelling comes from photographs of actual plasticine or clay sculptures.Top views are hard to draw accurately. With an actual macquette a top view is photograph is easy to acquire.

Some Old school modellors dislike letting Maya generate a smoothed version of the mesh and prefer to have complete control over where the edge loops fall. They will literally determine every edge loop on the final model.

Preset Scene File

For this exercise we will provide you with the prepared artwork in this case set up in a basic maya scene file which is ready for you to get down to the business of modelling. In Maya 2010 it's now possible to load discrete artwork for left side rightside and rear views. This is very powerfull if you are modelling from clay/ plasticine sculptures or other hard models to begin with.

We will be creating an all-in-one "water tight"mesh for the character. That said we will add eyeballs and teeth as separate standalone objects.

I will be quite detailed in the begining stages of modelling the character then gradually less so. This is because you should be able to keep working with less assistance once having grasped the basic principles.

Overview of the modelling process

We will create a polygon box place it at the creature's pelvis according to the reference art. From there we will extrude downward to form the legs and upward to form the body. The head we will

create seperately from a sphere primitive. We will then combine the head with the body via the neck. From there we model the feet and hands with three fingers and toes.

One thing you will qiuckly learn about Maya is that you only really need to model half a character. This is because we can easily mirror one half over to make a whole. This also applys to UVs, rigging, painting weights and all sorts of other technical things you don't about know yet! Make half, paint half, rig half and mirror it!

Modelling half a character is also really beneficial when you are working on the characters head where you have to create lips, inside of the mouth, the throat and eyeball areas. Suddenly everything is really accessible. You can model cleanly, move around 360 degrees it's great. Additionally when working in side ortho view you don't inadvertantly mess up the vertices in other parts of the model through bad selections. This is often the case when you encounter the legs. It's easier to work on one leg than through the model than two legs.

When working with half a model and mirroring it across it becomes critical that the vertices line up perfectly down the y axis. If you don't get it right you get an air gap in the model. The solution for this is make sure your first polygonal cube is perfectly centered around the world axis. Create it at world zero and resist moving it left, right, up or down. Split it perfectly down the center and mirror it across in –x and all is good.

Work flow Tips

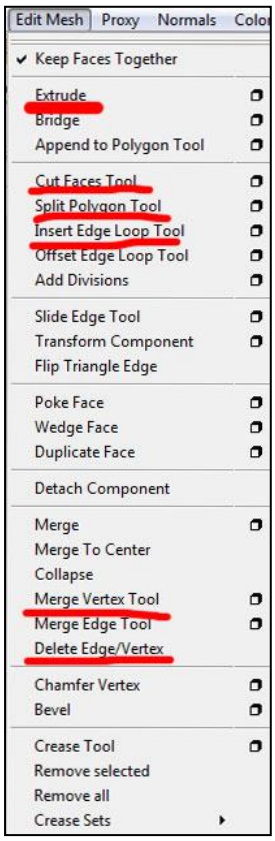
1) Get into the habit of switching the orthographic views constantly as you model. (Typically 3-views being top, front and side.)

2) Tap 4 for a wire frame view to line up verts with the reference artwork. You can also model using x-ray shading. I personally prefer 4 *(wireframe)* and 6 *(coloured shaded view).*

3) Turn on wireframe on shaded so you can see your construction lines as you model without having the model selected.

4) Build a custom shelf with all your main modelling tools added, such as Extrude, Split Polygon tool, Insert Edge loop tool, Merge Vertices, Delete Edge/ Vertex and so on .

5) Evaluating your model with test renders is important at various stages along the modelling process. I can highly recommend using a GI Joe MEL script with 16 or 64 directional lights this will give you nice speedy renders and let you sense how your character is shaping up.



Above underlined are poly modelling tools usefull to ad to your shelf.

Step by step

So let's get started, open the maya scene file "***AlienOriginsv01.mb***". Here you can see reference artwork for front and side views of the Alien Model. These are 1K square images with alpha channels to render the white paper areas transparent.

We will be working under the Polygons menu set.

Fig. 1: Make sure you are working under the Polygons menu set.

Like I said we want our starting shape to be set perfectly, at world zero. Go up to ***Create > Polygon Primitives > Interactive Creation*** and see that it is not checked. This will mean the objects you create will be perfectly set at world zero.

Then head up to the main menu bar and go ***Create > Polygon Primitives > Cube > (Options tool box).*** As shown below in fig 2.

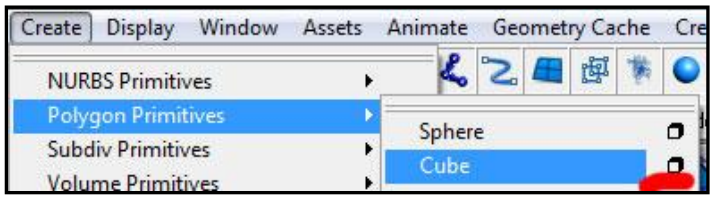


Fig. 2: Set divisions for the width of the poly cube to three.

Set the width divisions to 3 and height and depth both to values of 1.

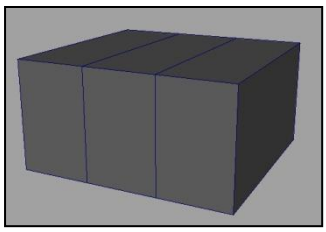


Fig. 3 : Above the starting point for the Alien is a simple cube with 3 divisions in width. The outside faces will be extrude down for the legs and the central area the crotch.

Hey Presto! You have created the basis for the character. With the cube still selected tap **r** on your keyboard to invoke the scale tool. Scale the cube down on the Y axis so the front faces appear more square than rectangular.

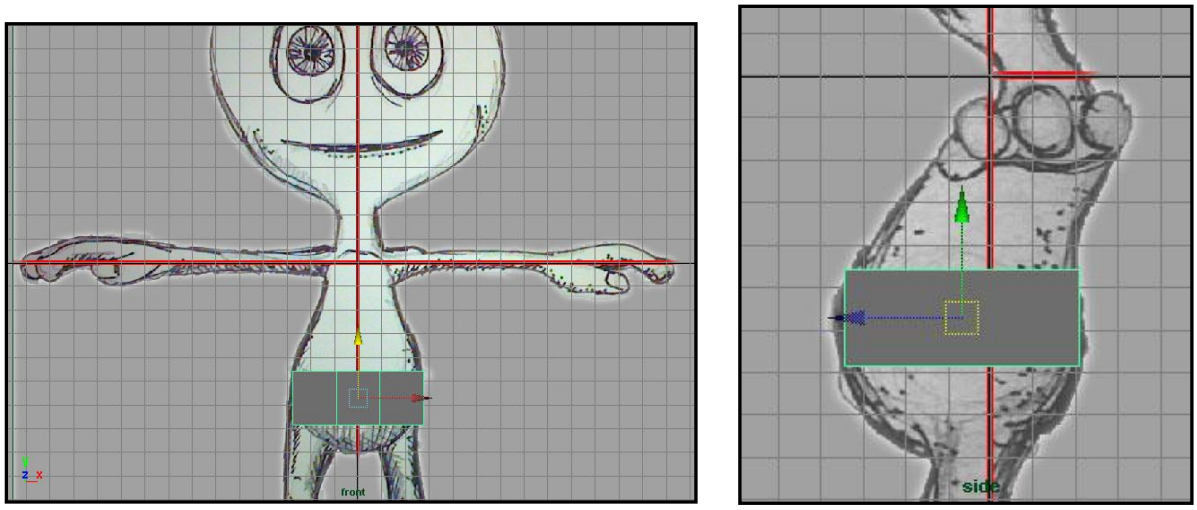


Fig. 4: Position the poly cube around the pelvis region.

Now tap **w** to invoke the move tool and move the block down on the y axis. Position and scale around the pelvis. But be careful not to nudge it to the left or right.

Check the side view and move it accordingly.

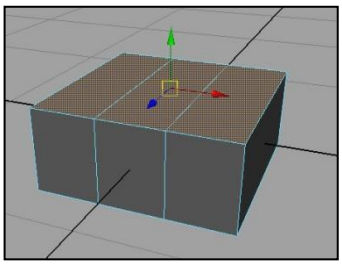
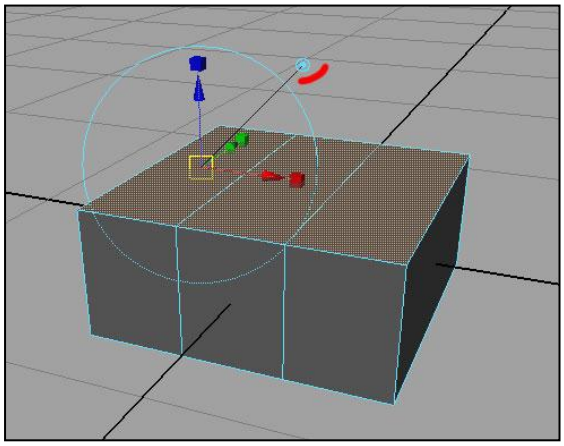


Fig. 5 At right: Faces selected ready to extrude up to the next level.

Right Mouse Button (RMB) click on the cube to bring up a sub menu. Select ***Faces***. Then LMB + Shift select the three top faces of the cube while in the perspective view.

From the main menu bar select***, Edit Mesh > Extrude***. Now switch to the front ortho view and lift the faces upwards on the Y axis.



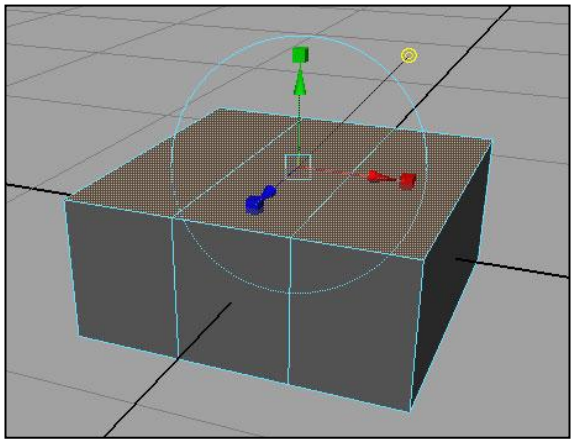
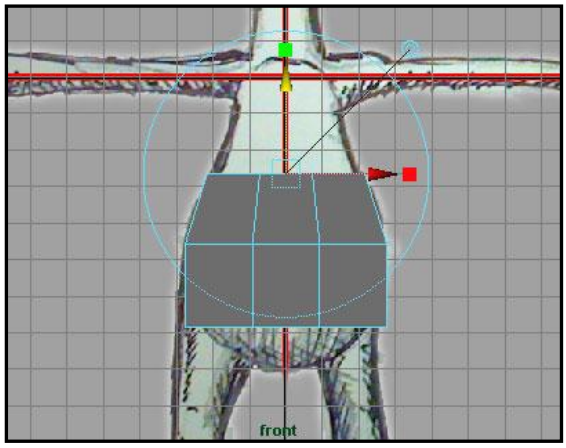


Fig.6 & 7: LMB click on the universal manipulator icon, to center the extrude, then hoist away! Alternatively tap w.

We will do this three times in all to reach the base of the neck. After you perform an extrude you can repeat the last command by tapping **g** on your keyboard.

In a perfect world rather than bothering with the main menu you will have made a custom shelf with your most commonly used modelling tools. To do this hold down ***Ctrl + Shift*** as you select the various tools to add them to your shelf.



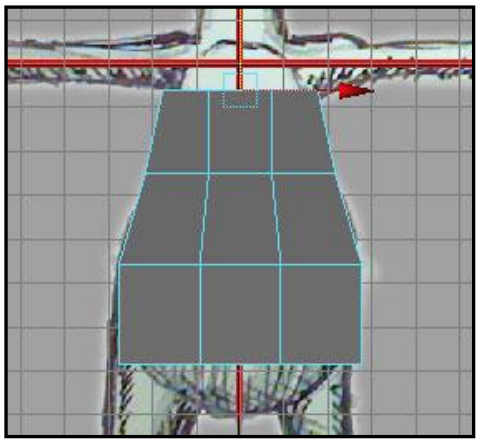
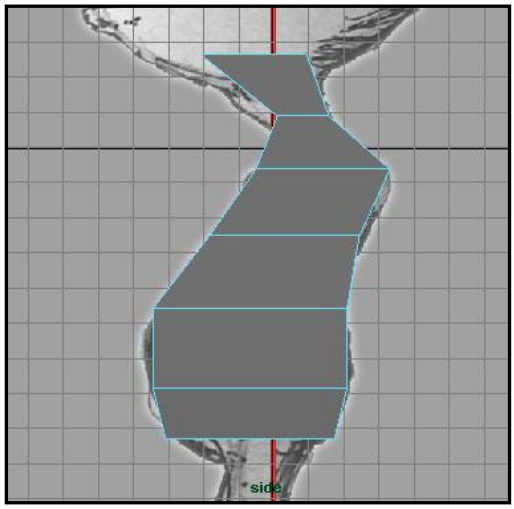


Fig. 8 As you extrude upward also scale in using the coloured box icons to match the edge of the torso.

Fig. 9 Scale the faces in to respect thde outline of the body.

The next extrusion goes under the arms. Perform another extrude up to the base o f the neck and one last time for the neck.



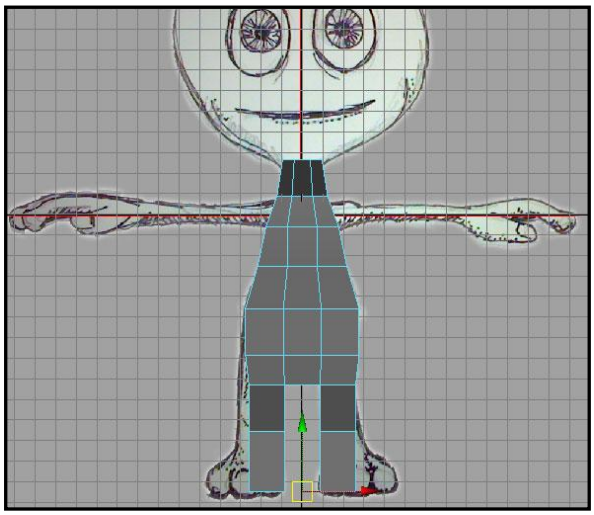


Fig. 11: Body and legs shaping up nicely.

Fig. 10 Above right: Remember to constantly switchback and forth to a Side view to respect the body shape.

Select the three of the faces underneath the body and pull down to match the bottom of the torso.

The next step is to extrud e down to create the characters legs.

Remember we want to keep the mesh proportional. We tend to favour square rather mesh rather than rectangular mesh shapes. This is because even sided polygons deform better when animating.

I like to make an analogy with chain mail. Chain mail is an interlinking metal mesh. If you draped a sheet of chain mail over a ball it will flow nicely. If the mesh was partly square links and part rectanglar of varying sizes it would not respect or conform to the ball shape as well as the regular constant mesh. Make sense? Hope so.

Right click on the cube shape and select vertices.

Marquee select the top vertices of the cube and scale them in. It's important to marquee select not single click on verts. Why? Because you are modelling in a broad sculptural way to begin with and marquee selection picks up the verts at the front and back of the model at the same time, its faster and more co-ordinated work flow.

Tap **r** on your keyboard to invoke the scale tool.

Continue scaling and repostioning vertices (front and back) in the front view to better match the avocado body shape of the alien.

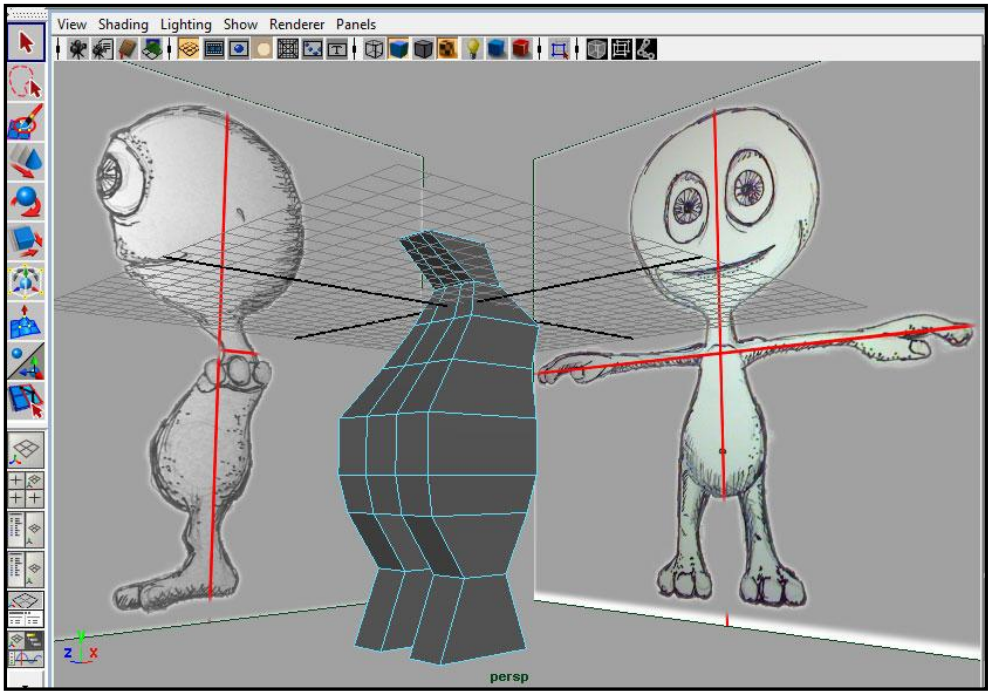
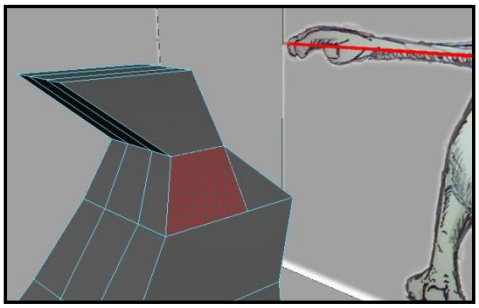


Fig. 12: Note if left unadjusted the perfectly flat sides of the model will lead towards square edged characters like those in Pixars "Up".

Add a vertical split to the row where we will extrude the arms from. Use the Split Polygon Tool to do this, as in the figure below.



Now select the face at the arm position and extrude it right out to the wrist position, we will model the hand and fingers a bit later. Regions like hands and feet and facial areas often have a higher mesh resolution than the rest of the topology. Reasons being - to aid better sculptural detail and improved animation /deformation down the track.

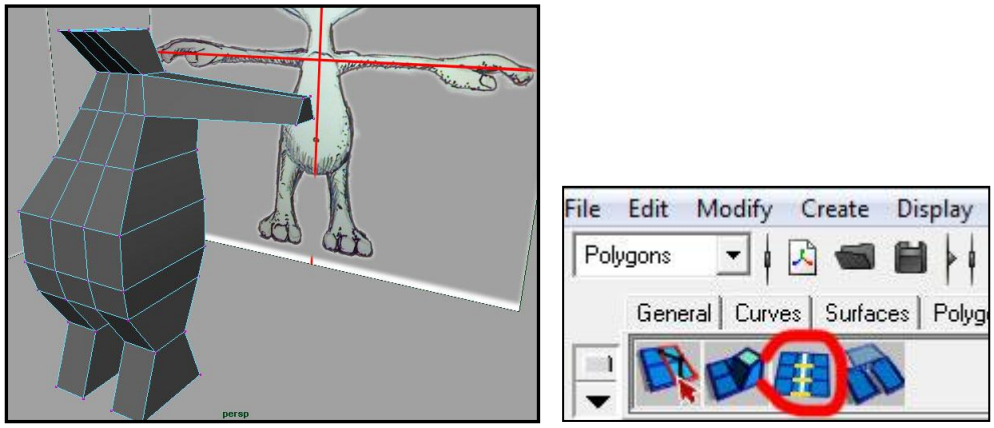


Fig.1 4 Us e the Insert Edge Loop Tool to define the elbow on the arm. At right the icon on my custom shelf.

Let's add the elbow using the Insert Edgeloop tool either from the main menu ***(Edit Mesh > Insert Edge Loop tool)*** or from your shelf. Put the loop right at the elbow joint. To follow up add a loop above and below the elbow joint that tapers from the fron t of arm out wider to the back of the elbow. You create the taper by working with the vertices.

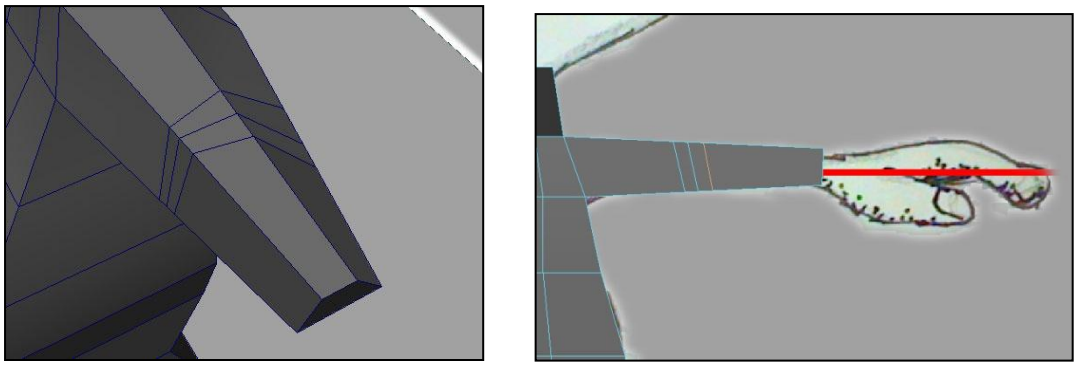


Fig. 15 & 16: Create edge loops either side of the elbow joint. Then taper the egeloops at the back of the elbow to widen.

RMB click on the overall geometry and select vertices. Narrow in the verts on the arm at the elbow.

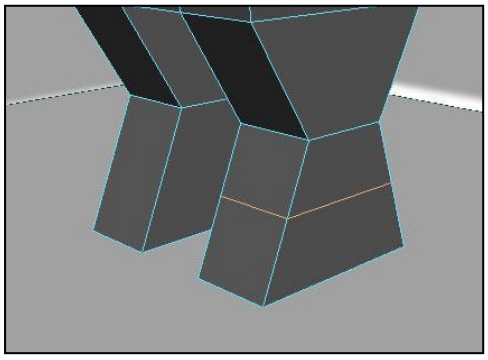


Fig. 17: Create an edge loop around the foot

Using the ***Insert Edge Loop tool*** add an edge loop around the foot region. Select the lower front face and extrude forward.

Now th e time is right to split the model in half using the ***Split Polygon Tool*** .

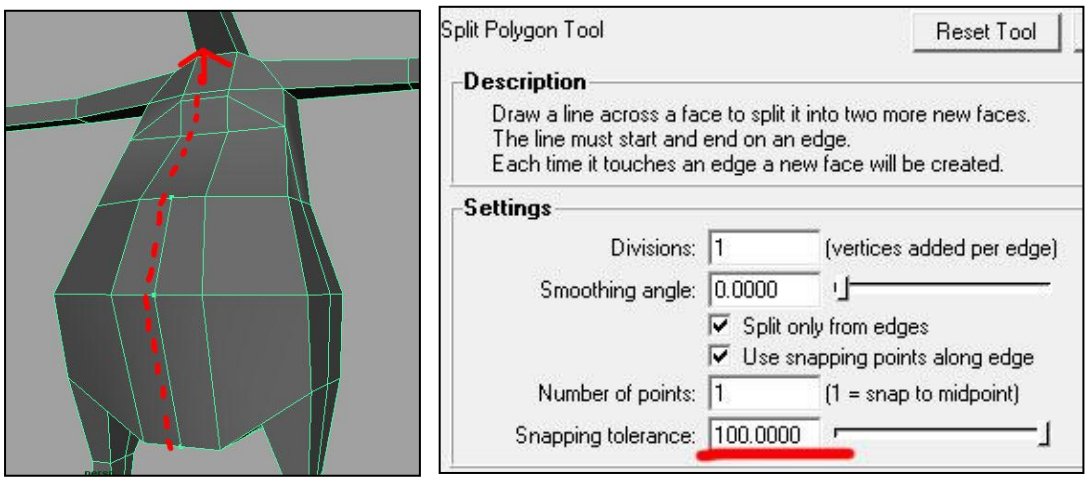


Figure 18. Using the split polygon tool to chop the model perfectly in half. Crank up the value of the Snapping tolerance ***to 100 in order to force the cut to the dead center of the faces.***

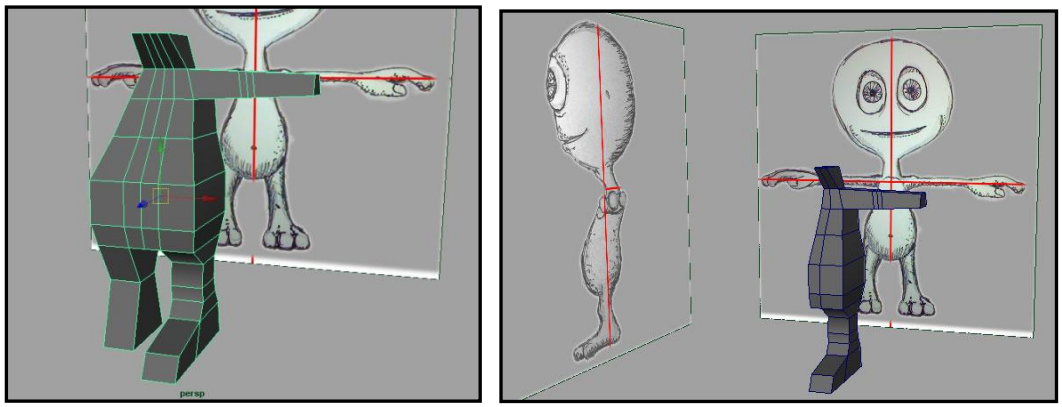


Figure 19. Now that I have a center line all the way around my model I can select all the faces on the left side of the model and delete them.

Good Safety Tip!

Over time I have noticed alot of beginners models have square edges on their heads and like the characters from Pixars film "Up". That is because they haven't walked the vertices of their models in at the front and back. Look at the crude sphere in fig 21. It's got a similar poly count to your model. However when smoothed - this rounds beautifully. If you ensure the verts of your character model are similarly placed when viewed from a top ortho view you will get a well rounded torso.

This is exactly the situation we find ourselves in at this point. The next figure will give you a clear idea where the vertices need to be moved to create a nice rounding from side to front.

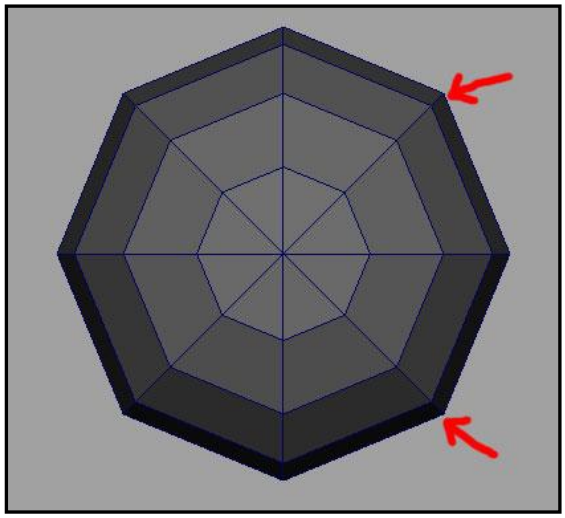
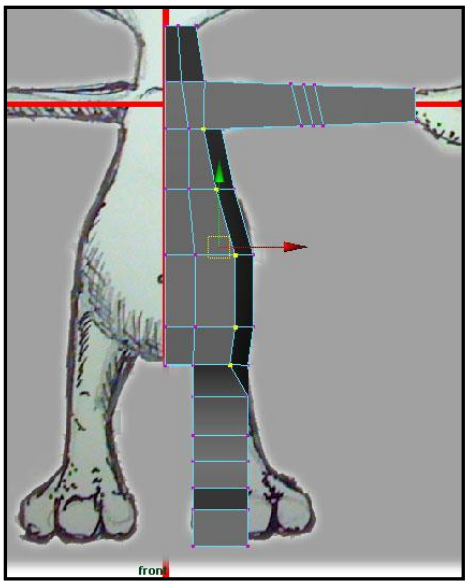


Figure 21: Note the position of the verts at front and back to make a perfect sphere.

Look at this top view of an 8 x8 sphere the verts at the front and back side of the sphere are inset from the middle point. This will smooth nicely, and this is what we want to replicate in our modelling on the Aliens torso.

Using the Insert edge loop tool lets divide the character in the middle on the side. Through the body, arm and leg.



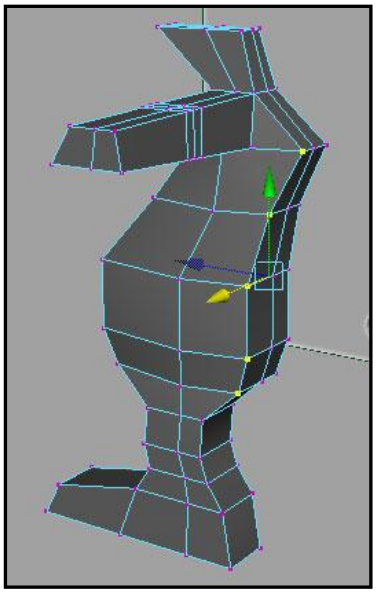


Figure 22 & 23: Hold down shift and single click on the verts on the front and back edges o f the character and walk them in on the X axis.

Saving

Saved yet? Crashed yet?

As you progress in your modelling you will want to save your work. Maya usually crashes just after you have done your best work... in order to teach you the lesson of saving often.

Never save over the same Maya scene file. Why?! Because it is possible through re writing to same maya scene file to create a corruption in that Maya file. The tears really start when you lose hours or days of work.

Bad file naming leads to confusion as to what is the latest and greatest file to use in your production.

To solve this, we use versioning. V01, v02, v03 and so on. Never use the word final in your modelling naming there is no such thing. I've seen so many muddled scene files where people have final model, final, final model, final model 3A, "Really-final, final model" and so on.

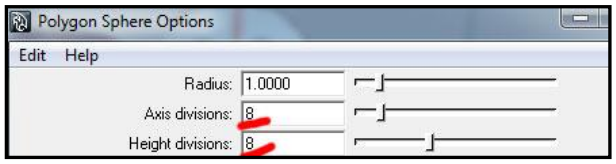
Just create another incremental version. It's not uncommon to have 20 or 30 versions of a character model. Sometimes you might even go back a few stages to get back to a place in your modelling you were before. A place where you were happier with the modelling.

There is also a saying with digital media "It it is not in two places it's no where". I had a student last year who had created a brilliant low poly character he had worked on it tirelessly for a few weeks. One night his car was broken into and the hard drive with his work was stolen . Good bye character! He was forced to make a new one for submission, sadly it never matched the quality of the first version.

So save the file using your name and a version number. There is no such thing as "final" in the naming of your maya models. Fo r this project use your first initial and surname , for example; ***fsmith_alienv01.ma*** That way your work is trackable back to you by your teachers or Supervisors.

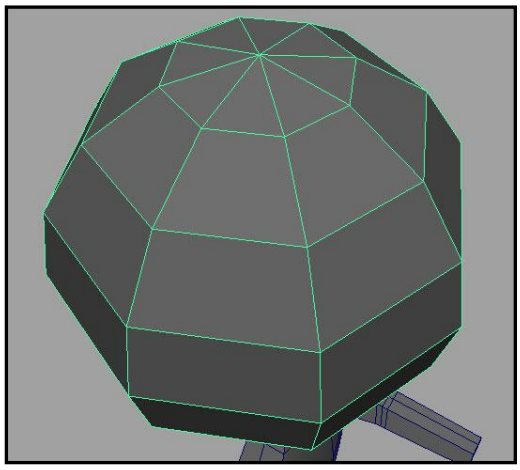
Creating the head

Most Character designs are based on combinations of spherical forms. *Oblate, (flattened spheres*) Ellipses and so on. So Really our best strategy is to resort to using spheres from the offset. Something deliberately low in poly faces so we can join them relatively easily to the rest of the body form.



Let's create the head using a polygon. Go to the main menu bar ***Create Polygon Primitives >Sphere> (options tool box)*** Set the ***Axis Divisions*** and ***Height Divisons*** to 8.

Like before you want the Sphere to be created perfectly at world zero. Raise it up on the Y axis scale the head to match the reference art. Work in front and side views but be careful not to nudge the head off center on the X axis.



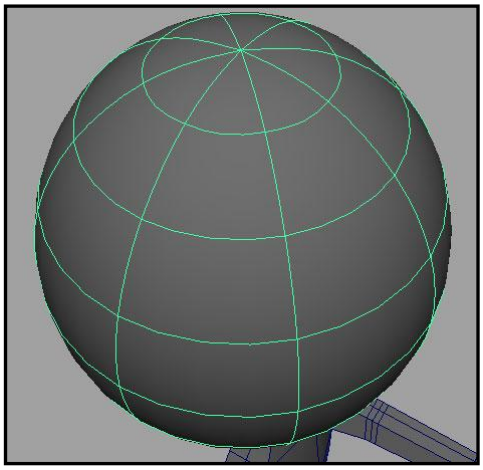
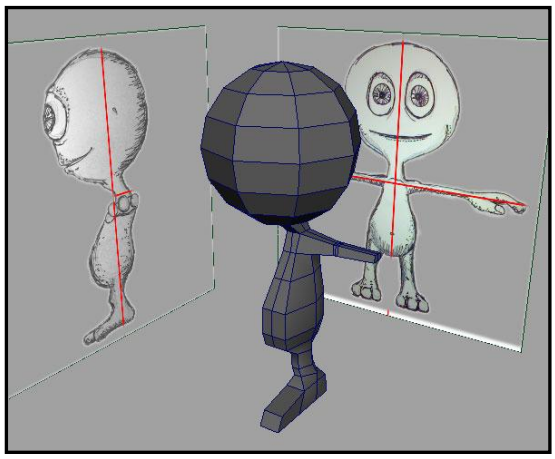
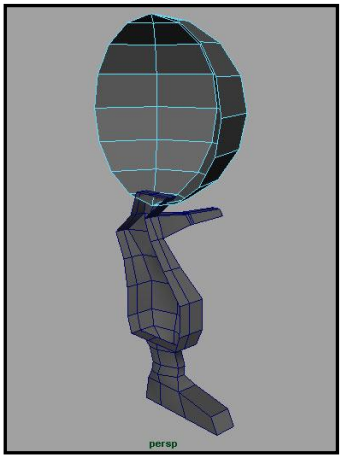


Fig.s 25& 26: At left the poly sphere in its raw 8x 8 state, at right with preview smooth.

From a Front ortho view marquee select the faces on the left side of the head sphere and delete them. Lets prepare to join the head to the body.





Use the Split Polygon Tool it make cuts on the head sphere. Use the shape of the neck to guide where the cuts go. Delete the faces on the sphere inside the neck area.

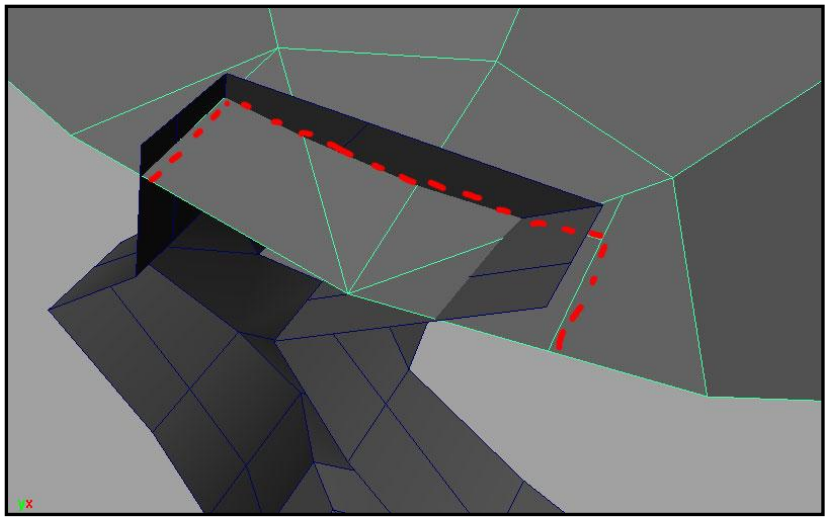


Figure 29: Using the split Poly Tool add cuts as indicated on the head sphere. Delete the faces then move towards joingin the verts of head and neck together.

Select the head and the body go to the main menu and choose ***Mesh > Combine***. Even though thetwo pieces of geometry are not physically connected Maya treats them as one despite the air gap. You can prove this by clicking on either the head or body and all the geo will highlight in green.

Eyes

To work on the face it is useful to have Eyeballs in place to model eyelids and brow against. I generally use Nurbs spheres templated on another layer from the character geometry so they can't be inadvertantly moved about. In reality eyes aren't perfectly spherical they have a corneal bump. Cartoon characters eyeballs can be spherical but are often oblate shapes.

In the main menu bar go ***Create > NURBS Primitives > Sphere***.

Roll the sphere forward 90 degrees on the X axis and minus 90 degrees on the Z axis to position the NURBS seam downward. Use the channel box to achieve this.

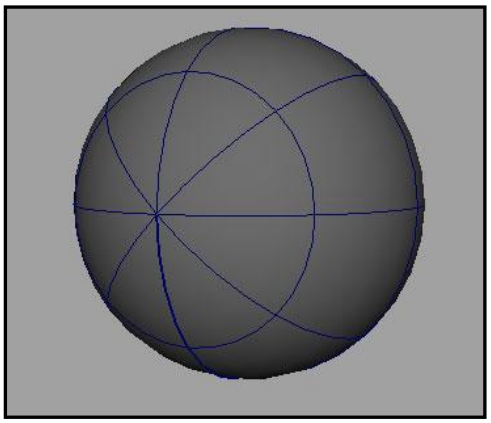


Fig. 31: The eyeball begins life as a NURBS sphere.

Position the eyeball so it is intersecting the head. Use the Split Poly Tool to walk around the eyeball shape and place cuts in the head geo. Delete the unwanted faces. This creates an aperture for the eye socket.

If you look at anatomical reference you will see the muscles around the human mouth and eyes are like circular strips of bacon. I like to get at least three major edge loops around the eyes and mouth areas.

End of Blocking

We have blocked out the main form of the character so now we can move towards a second pass refining our model. We will do much more "sculpting" of individual vertice in this pass. Developing

up facial details, hands and feet. Because of the detail required in tendons and finger knuckles it's typical that the mesh resolution will be higher in hands, feet and face compared to the body overall.

Forming the feet and toes

Follow the images below to create three toes emerging from the foot largely through the use of move and scale tools. I have elected to model all the fingers and toes individually in situ. In actual fact it is a common technique to just model one finger and one toe, duplicate, distribute and attach accordingly.

Split the leg through the middle so we can work up the knee and toes.

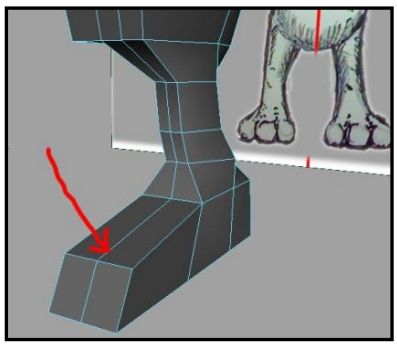
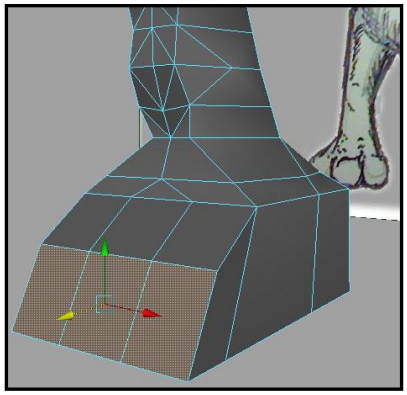
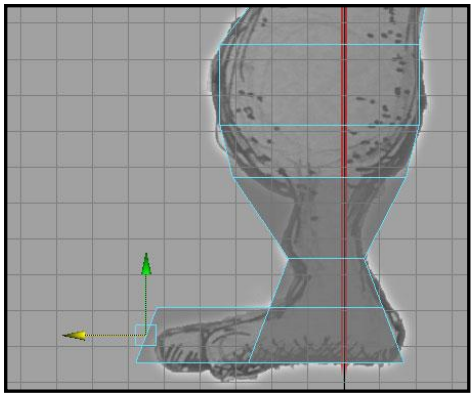


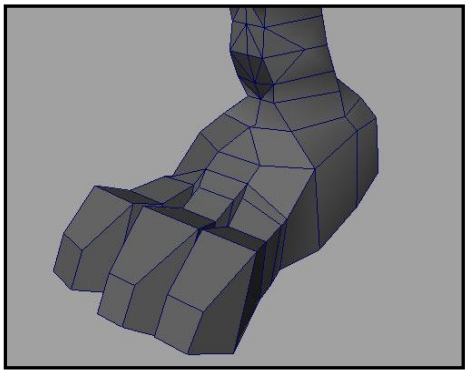
Fig. 32: The center divide of the foot is removed and it ist split to form three faces across the frontfro extrusion of the toes.

Now we need to arrange for three splits across the front faces of the foot to be used as the basis for forming three toes. Uncheck keep faces together so the toes can spread apart***. Edit > Keep Faces Together***. Extrude out the toes in several steps to create joints.





It's a good idea to model in the webbing space between fingers an d toes.



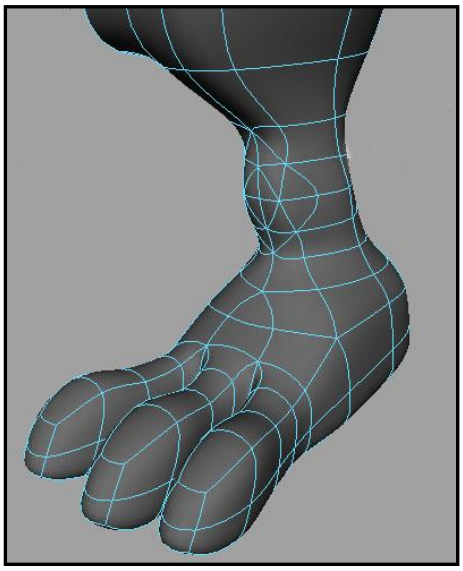


Figure 36: The smoothed foot ready for toenails.

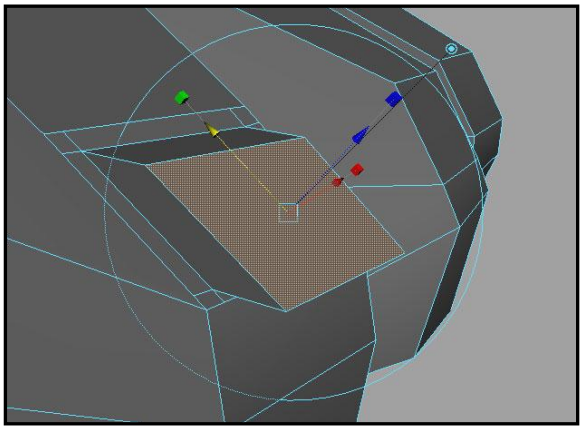


Fig. 37: A toenail extruded

Here I have extruded a toe nail upward and slid it forward and down on the foot. The vertices at the back of the toenail will be adjusted to transition more gently into the foot. Run a support edge near the leading edge of the toe nail, this is to better define the shape.

Forming the hand and fingers

There is a tradition of three fingers and a thumb in 2D cartoon animation to save on animating five fingers. Time is money you know?! Drawing and animating three fingers is expedient. On one early Mickey Mouse cartoon Mickey played a piano with gloves and the gloves stuck around til this very day. When Ray Harryhausen animated a giant Octopus for *" It Came From Beaneath The Sea"* he made a five tentacled octopus to save valuable time in completing animation.

Of course we only need make one arm and hand and mirror across to the other side.

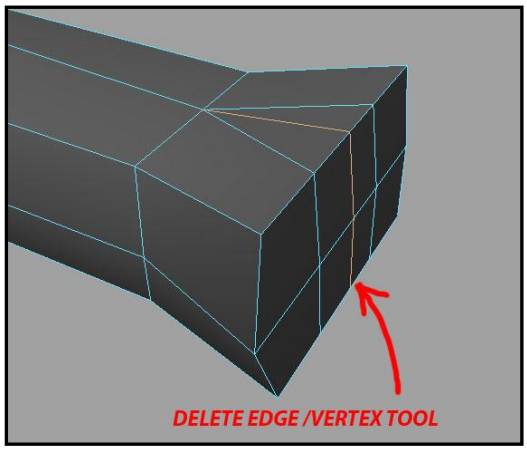


Fig. 38: The lips extruded

Here we create three splits in the nub of what will become the hand. The central division gets its edges selected and deleted as shown in the figure above.

Extrude the fingers out in three stages widening or narrowing each stage to mimic the knuckle joints. The thumb is usually the tricky element to model. It's a good idea to cross referenc e the bones of the human hand and musculature even when creating a cartoony hand such as thisto best understand how the thumb connects to the hand.

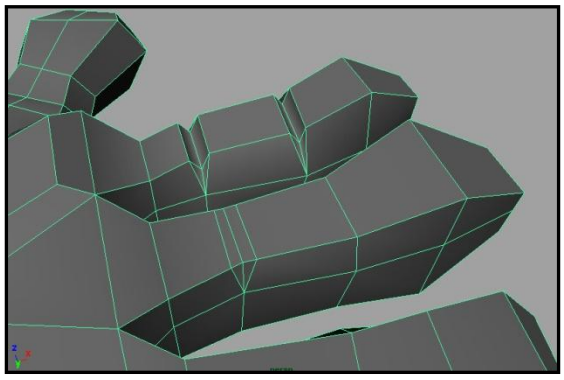


Fig. 39: Underside of the hand adding finger creases using the split poly tool. Switch between Hard Poly view (1 on your keyboard and Preview Smooth 3 on your keyboard.) Some people say triangles are "evil" but I beg to differ.

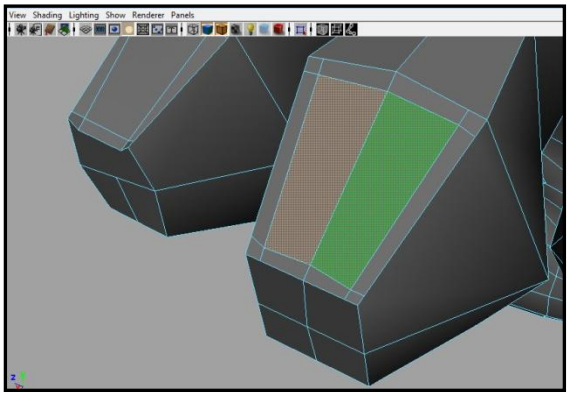


Fig. 40: Use split poly to mark in a shape of the fingernails. Select the faces and perform an extrude upward on Y axis.

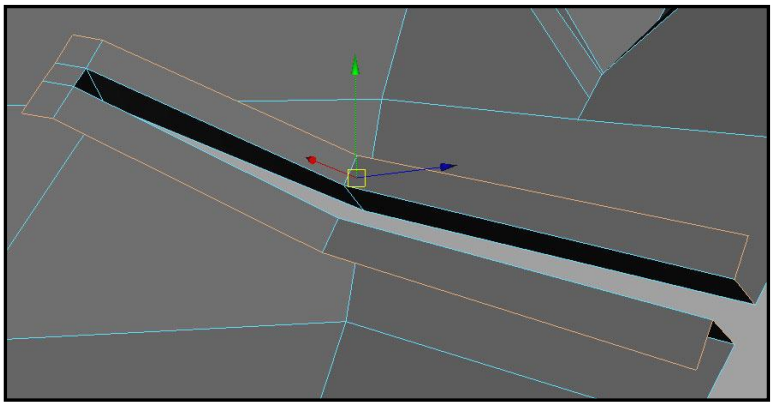


Fig. 41: The lips extruded as seen from inside the head

Antenna

If you want to add some antenna to the Greeblie pop into side ortho view and draw a curve with EP Curve tool. Draw a series of points from the head up and forward in a curve.

Go to perspective view. Select the curve and RMB Click on a face on each side of the head. Edit Polygons > Extrude Face.

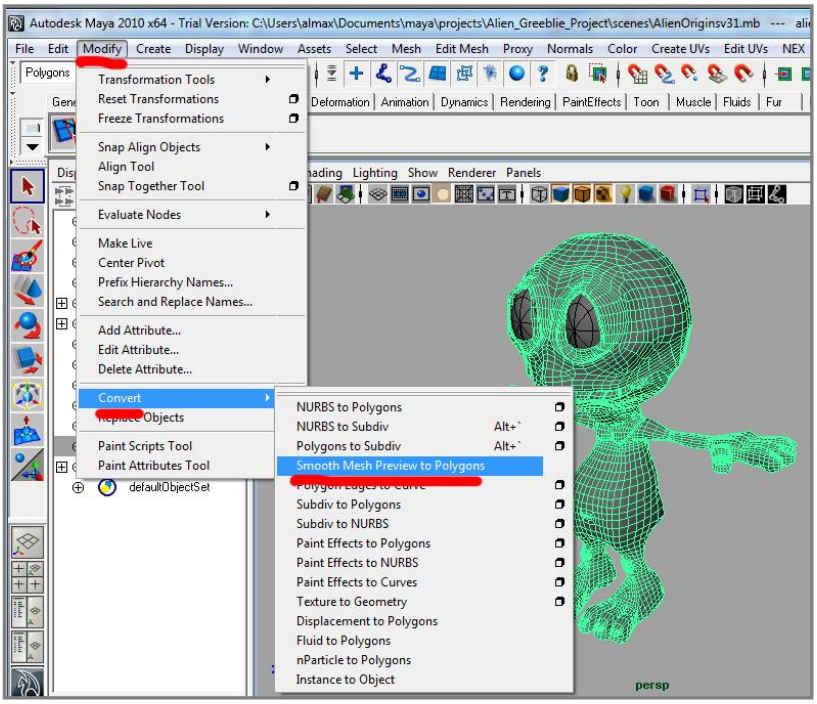
Final stages with your low poly model

With the character geo selected delete the history ***(Alt + D)***.The history is a record of all the modelling changes you have made in your character and deleting it frees Maya up immensely. Certainly makes for a lighter scene file.

Lift the character upward so it is standing on the grid and freeze transformations***. (Modify > Freeze Transformations.)*** This as you will see in the channel box gives the character zero values in all translations and roatations. This is the default position.

Save an unsmoothed version of your model and then proceed to smoothing the mesh.

Have a simple low poly version means you can generate a UV unwrap with ease, the higher the polys the more finnicky it can be.



Smoothing your low poly model

There are two ways to do this, firstly via the main menu ***Mesh > Smooth*** or.... In the Options tool box for that smooth tool you can determine the amount of divisons you want. Generally a divisions of 2 is plenty for a low poly through to mid poly model.

In the main menu go ***Modify > Convert > Smooth Mesh Preview to Polygons***.

This usually defaults to a divisions 2 smooth. You can go to the polyshape node in the attribute Editor after the conversion and set the divisions from 2 back down to 1.

This next section is entering into more advanced concepts and will be taught potentially at a different stage in your overall learning depending on course structure.

UV unwrapping & Textures

At this point you may stop modelling and move towards UV unwrapping and texturing prior to rigging the character ready for animation.

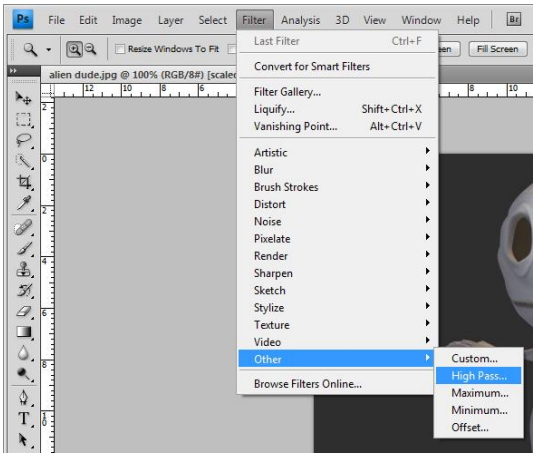
All textures on 3D characters and models are derived from a 2D source such as digital photos or paint work generally done in Photoshop or Bodypaint 3D.

The Uvs of your final model will have become convuluted through the modelling process so now we have to go through a process of cutting and projecting the Uvs so we can more easily create texture sheets to colour and detail your creations.

Uvs can be unwrapped directly in Maya and also through excellent unwrapping tools such as Headus UV Layout 2.0.

http://www.uvlayout.com/

Traditionally speaking the appearance of texture within your characters and models is generated by what is known as a bump map. The old school method is to use a grey scale image where bumpiness is controlled throughshades of grey. Anything brighter than 50% grey bumps outwards and anything darker than 50 % grey bumps inwards.



A perfect head start on creating an old school bump map is to take your colour texture map and in the Photoshop main menu select **Filter> Other> High Pass...** This will be a good startting point. In truth most maps require a certain amount of mental consideration and hand painting.