Introduction

This tutorial aims to show how to model a head with Editable Poly in MAX. It assumes you already have a good grasp of the basic modeling tools, understand things like welding, extruding, and so forth. If you need more step by step help for that, read the tutorial and reference manuals.

I highly recommend editable poly over edit mesh, since you can have N-sided polys without having to worry about hidden edges. In addition you should probably also be using Lazlo Sebo's "Meshtools" free helper scripts as linked off my links page. These tools allow you to use Editable Poly much easier with things like automatically connecting edges or points, erasing points, and selecting rings or loops of edges.

I already have a body modeling tutorial under my 3D Help page. That shows how to do a basic body with polys or mesh. I also have a spline head tutorial as well. Some people prefer splines, but many, such as myself, think the new poly tools are far easier. You don't have the control at each vertex for bezier handles, so you may add more edges in for polys, but it is much easier to get smooth results with, and the tools in my mind are far more advanced, (chamfer, extrude, Meshtools etc...)

NOTE: This page has a TON of large images...so it may take a while to load, or you may have to Right click on each image area and choose "Show Picture" if they don't show up the first time.

Modeling the Head

Doing realistic faces are a pain. If you are curious the techniques here the same as what I did for my anime girl as well, although I had started her with splines. My final result here underwent a number of tweaks at the end, including rebuilding some of the cheek are so that the edges ran a little nicer, and fixing the ear. Realize this if you try following this exactly step-by-step, since you may also have to tweak thing then in the end like I did.

One other important thing for head modeling usually is to have a reference image. Here I just took some pictures of my wife. I would say it's probably easy to find a friend, and someone who has a digital camera. So go, get some pictures and use that. Realize once again however there will be some perspective distortion on the photos, so that in the end you will need to stop using the photos exactly, and then go from there by eye.

In addition MAX has 2 ways to do background. I show both in this tutorial since I used both. One is the "Viewport Background" method, which is what I use first. This is nice since the image will show even in wireframe and is quite hires. However it will often complain when you zoom in about memory...and also is not quite good for lining up side and front view stuff.

The other method is simply putting a material with the bitmap onto a box, and showing the map in the viewport. This has no memory problems, and you can easily rescale and rotate the boxes to get the images to be exactly where you want. However it will only work in shaded mode.

With all this in mind, especially that my model here is far from perfect, and I learn as I go as well (so this tutorial isn't perfect either), here are the steps I took.
1. Bring up Viewport Background Dialog

As mentioned above, the first thing to do is to setup MAX to show your background reference pictures you took. Take your images, and make sure both of them are about the same width/height in something like photoshop.

Select a viewport such as a front or side viewport, then from the "Views" menu pull down the "Viewport Background" menu item to get the options dialog to appear for backgrounds.

2. Set Viewport Options

Click on the "Files" button and find one of your image files based on which viewport is active. Set the aspect ration to "Match Bitmap" so that the image doesn't scale oddly. Also set "Lock Zoom/Pan" so that as you move around the image stays put. Finally make sure "Active Only" is set since you only want this image in the one viewport. If the wrong view was selected, you can change it from the pulldown menu on the left. Press "OK" when done.
3. Setup both viewports

You should now have an image in one of your views. Repeat the steps above for the other viewport and image. You should have something that looks like the image here.

4. Viewport Menu

Don't forget that you can right click on the label/name of the viewport to get the viewport menu. From this you can turn on or off the grid, as well as on or off the background image if you don't want to see it.

5. Create a Box
We start by creating a basic box for the head (hence the term Box-Modeling). Go to the "Create Panel", choose the "Geometry" sub button and the "Standard Primitives" pulldown, and then click on box.

6. Position and Detail of Box

Create the box so that the center line is centered on the X axis. Make sure it has 4 segments for Length, Width and Height. After right clicking to finish the creation, you can move the box, and go to the modify panel to adjust it's parameters and size.

You should also
size and position the box so it is fairly close to the background images you created for the head, as shown here.

7. Convert to Editable Poly

Now we'll convert the box to a format we can work with. Right click on the box, an choose "Convert To:" and then "Convert to Editable Poly" from the menu.

8. Go to Vertex Sub-Object Mode
Now go to the "Modify Panel" and click on either the "vertex button", or expand out the modifier and click on the "vertex" submenu. This will put you into vertex editing mode for the box. Remember, if you have questions about how Editable Poly works and the basic modeling functions in MAX, you should read the tutorials and reference manuals.

9. Start Shaping the Box

Start Shaping the Box in a side view as shown here.

10. Adjust Box in Front View

Now switch to front view and continue to adjust the box shape making it a bit more round and more in contour with the face.

11. Delete Half of the head.

Now select half of the polys or points, and delete half of the head, leaving the centerline. This way we can
work on the head, but we only have to deal with half of it. We'll mirror and instance over soon.

12. Adjust More

Continue to adjust the box so things are more rounded and correct in relation to the images. Try to place one of the edges in side view along the middle of the mouth.

13. Cut Eye Edges

Now go into edge or poly sub-object mode, and cut the existing edges as shown. You could use Meshtools to select the edges and then use the "Connect-1" item, or use MAX's regular cut tool.
14. Position and Adjust Eye Points

Now take your existing points and adjust them to line up with the images in your background. This should go around the general socket shape, not the eyelid itself.

15. Cut Eye Lid Circle

Now use Cut or Connect again to create an inner ring for the eye. You can delete the interior edges, so that you have one large polygon. This makes it easier to see what is going on. Since it will be extruded into the head later, it doesn't matter if it is one big poly. Adjust the eye points for this ring to match the lids.
16. Cut Vertical Detail

Now cut through another vertical segment for more detail in the eye and face. This is one really good place to use Mesh tools, since you can easily select those horizontal edges, and hit "Connect-1" and be done.

17. Adjust Eye Position

Now move the new eye points so they are lined up as well. In addition usually one of your viewports will be off from the other. Figure out which one you will use mostly, and line up the general position in the opposite first, then focus on the real image and move it into place. Here I got my eye pretty much correct in front view, then decided I would use the Side View as my primary reference, and moved it into location for that.

18. Add Horizontal Detail

Now add another ring around your model below the eye.
19. Add Another Eye Ring

Then add another ring around the eye as shown. Note the ring does not connect on the center line.

20. Extrude Twice for Nose

Now we have some detail so we can extrude the start of a nose. Select the three polys in front, and extrude two times as shown. This will become the nose.
21. Delete Interior Faces

Now because we will eventually mirror and weld this head to another side, we'll need to be careful of deleting any faces that would be on the "inside" of the model. So rotate around, select the faces that would be inside later, and delete them.

22. Collapse Edges On Top of Nose

Right now we have a box sticking out of the head which doesn't look very good. The nose really blends off from the top. So select the 4 edges on the outside of the nose, and use the "Collapse" button to collapse it down.

23. Shape the Nose

Now using your reference images, get the basic shape of the nose with the new points. We'll add more detail later.
24. Add 2 more rings
Now Connect-2 or Cut two more rings around the polys toward the bottom of the face.

25. Shape the Mouth
With the edges you just created and the original above, adjust the points so you get the basic countour of the mouth as shown here in both viewports.
26. Cut Chin Detail

My model has a fairly pronounced chin, so I cut two more times to add that detail in. You'll probably 1 one or 2 cuts just to get the basic shape detailed in below the mouth anyhow.

27. Shape Chin

Now adjust the newly created edges to follow the contour of the model.

28. Add Mouth Detail

Returning to the mouth, cut two more edges as shown to add more detail to the mouth shape.
29. Shape the Edges

Adjust the shape of the edges down closer to the lip to make the model correct.

30. Cut More Lip Detail

Now cut another edge for the middle of the lips to bring them out, then move them into position, and collapse the corners as needed.
31. Add 3 Rings to Eye

Now add another 3 rings to the eye. Once again with Meshtools you can easily select one of the cross section edges, do a Edge Ring command to select all the cross sections, and then do a Connect-3 to create all 3 rings at once.

32. Adjust Eye Edges

Now shape the new edges so you have a closer ring for the eyelid, and then the other two defining the eye lid top/bottom a little more.
33a. Mirror the Head

Now we'll use the mirror tool to create an instance of the head so we can see the whole thing while we work. Make sure the head mesh is selected, and choose the Mirror Tool from the toolbar.

33b. Mirror Options

Adjust the options to mirror on the X axis. Set "Instance" mode as well. This will make the two halves share the same data, so that if one is adjusted the other updates as well. This way you can continue to model on only one half, but the entire model will be updated. Press "OK" when done.

34. Mirror Results

You should now have a mirrored copy of your model. Slide it over if needed. As you can see, we now have the start of a head, although it is lacking in detail.

Now would be a good time to save your work if you haven't. Also note that I have some messy polys around the cheek and mouth. You may want to look at the end result of how I adjusted my edges for my
model. This would be a good place to fix how some of the edges are flowing, since there is less detail still. I didn't adjust my edges until later, so it was a little harder.

35. Create BKG Boxes

At this point I got sick of how the background viewport images were working, so I decided to go with boxes like I used in my body modeling tutorial. Create 2 boxes, one for side and one for front view.

36. Create New Material
Now open up the material editor, and click on an empty slot. Enter a name for the material, like "frontBKGimage", and then click the button to create a Diffuse/Color map.

37. Choose Bitmap

Choose "Bitmap" for the diffuse material map type and hit OK.

38. Choose the File
A file chooser dialog appears. Select the proper image for the material and hit "Open".

39. Assign Material and Show in Viewport

Now choose the "Assign Material" button, or drag it onto the proper box. Then hit the "Show Map In Viewport" button to make it show up in shaded views.
40. Go up to top level of Material

Now choose the "Go Up A Level" button or use the "Material/Map Navigator" and choose the top level material again.

41. Copy Material and Modify

Now drag and drop a copy of the original material over to another empty slot. Rename this material and then go down into the map for it and choose the other image. Then apply this material onto the other box as you did earlier.

42. Head Properties
As you can see, you have to be in shaded mode to see the background now. This makes it hard to see what is happening. We can adjust the object to be transparent two ways. First shown here is setting the object to "See-Through". The second is by applying a material that has less than 100% opacity. I prefer the latter, but will show both here.

Select both of the head meshes, right click and choose "Properties".

43. Object Properties

Check "See-Through" under Display Properties. Then hit OK.
44. Scale and Set Boxes

Now since you can see through the model you can now scale and adjust the boxes to be the proper proportion and size. Since my original front photo was at an angle, I also rotated the box a little to help with that as well.

45. Skin Material

The other way and method I prefer is to instead use a transparent material. Set your object's See-Through back to off. Then in the material editor, create a new material. It's a good idea to set specularity and Glossiness up so that you can see errors in your model through the highlights. Then adjust the opacity of the model to around 55. You can easily set this back to 100 or back down as needed while you work.

46. Extrude Nose

Revisiting the nose, select the side two polyhons and extrude outwards to get the side flange.
47. Add More Detail to Mouth

Add another two rings around the mouth for more detail.

48. Continue refining the model

Continue to work on the model. Here I have added more detail to the nose, mouth and chin, including another vertical slice through the mouth.
49. Add Meshsmooth

It's a good idea to add the Meshsmooth modifier before things get too far to see how the model really looks. I tend to use an iterations of 2 for final detail rendering. Chances are once added, your model will shrink in a bit. Go back down to the Editable Poly and compensate by pulling the model out a bit where needed.

50. Continue Adding Detail to Mouth and Nose

Continue refining the model. Here I have added more detail to the mouth and nose. This includes cutting a polygon on the bottom of the nose and extruding up and in to create the nostril.
51. Cut Side for Ear.

Now we'll start on the ear model. Pick a polygon on the side and extrude it slightly. Then bring it back in flat again. Then cut this polygon into 4 parts.

51a. Ear Diagram.

Ears are pretty complex. Depending on how much time and detail you want, it can take a while to get right. For what it is worth, my initial steps and model here didn't quite give me exactly what I needed, so I ended up tweaking the ear quite a bit later on. However the next few steps will give you a pretty good starting point.

The diagram brings out 4 key points. If you manage to get these 4 points, then your ear model will generally be correct looking. #1 is the front ear curl. This should actually continue down and into the inside of the ear a bit more than on the diagram. #2 is the opening coming
out of the ear with the hole behind it. This smoothly comes out of the front-side of the head. #3 is the cartilage that hangs down. There is usually a ridge on the top edge of it before it turns into the ear itself. And #4 is a "Y" shaped ridge inside the ear. This last detail is important to have for the ear to look correct.

52. Extrude and Cut

Now extrude the 4 polys once, and then add another cut across the entire thing.

53. Chamfer Edge

Now select the middle edge and chamfer it. This will create the start of a nice ring in the ear.
54. Add Cuts from Corners

Now to keep things 4 sided and add the detail we want, divide the diagonal edges and then connect them to the corner as shown.

55. Select the Outer Ring

Adjust the points so you have more of a ring. Note that I probably should have added one more horizontal cut above so that the front of the ring goes into the ear more. Select the ring except for the front section.
56. Extrude Ring

Extrude the ear ring out a few times, scaling in the points a bit as you go. This creates a nice lip for the ear.

57. Ear Tweak

Adjust the points so the lower part become more of the cartilage area.
58. Cut Y Shape for Ear
Now divide the edges in the ear for more 4 sided polys. And then cut as needed so you get the start of the Y shape for the ear.

59. Extrude Y Shape
Now extrude the Y shape out once. Then adjust the points, particularly at the ends so it blends in a bit more.
60. Extrude Ear Wedge

Now select the polys that are flat on the ear still and extrude that to create the ear wedge. In reality here, I probably should have only take the lower two, so that the lip part above could have curled back into the ear better.

61. Extrude Ear Wedge Side

Now take the side polygon and extrude it back. This will make the wedge a bit bigger.
62. **Tweak Ear Wedge**

Now adjust the ear wedge points so you have one smooth wedge coming out as shown.

63. **Finish Ear**

Although not shown here, you should also take a polygon behind the wedge, and extrude into the head to create the hole for the ear. Then continue to adjust the ear. My model here is off a bit. The front lip doesn't really curl back into the ear, the cartilage is missing a top ridge, the Y needs a bit more detail and adjusting, and the front part doesn't blend into the head smoothly. I adjusted this later, but you can do so now. Be sure to check the smooth version as you work.

64. **Extrude Neck**

Take the 6 polygons on the bottom of the head and extrude down several times
to create the neck. Make sure you delete interior faces after extruding down. Same idea as when we did the nose, make sure there are no polygons "inside" the model.

66. Progress

As you can see below this is the progress so far. I had a lot of incorrect proportions and problems at this stage. But much of the model detail is there.
66. Select Inner Mouth Squares

Take the mouth and create a row of polys that you can select. You may need to chamfer to have this. Then select those polygons. We will extrude this into the head to create the inner mouth cavity.
67. Extrude Inner Mouth

Take those polys and extrude in once, keeping fairly close to the lips. Then once more and make it scaled up vertically, then again once or twice more towards the back. Go in and cleanup the points to be flat again as needed for the inside.

68. Select and Delete Interior Polys

Once again we will have interior polygons that have to be deleted. This is the hardest to select since they actually face inside. You may wish to hide other polys to help in selecting them, or select a whole bunch and remove the ones you don't want.

You should have a selection similar to what is shown, then delete those interior polygons.

69. Final Open Mouth

The mouth should look similar to what is above. If you didn't delete the interior faces properly, then you will have garbage inside the mouth you will need to delete as mentioned in the previous step.
70. Progress 2

Below shows the progress after more adjustment. Here I started adding a little more detail to the nose tip as well as other adjustments. My model edges were still a bit messy however. The head was also a little too long.

71. Progress 3

At this point I adjusted the proportions a bit more and shortened the head. I also continued adjusting the mouth and nose and eyes.
72. Progress 4
Below shows the first test renders. Note that I still haven't welded the two halves together yet. I tend to save that until I am sure I am not going to tweak anymore. I posted this up and got more feedback. Based on input I decided to tweak the flow of the edges and to bring the chin in for the next round.
Here is the proper parameterization/flow of edges on the face. Note how I now have a much more natural and ring type pattern around the eyes, mouth, and chin. This involved connecting points and removing old edges. I also brought in the chin.
This large image below shows what I decided would be my final image. I was sick of tweaking more and more... heh. Here I had rebuilt the ear finally to have the proper detail and shapes. I also finished tweaking the mouth, nose and eyes.

There are still adjustments to the lips to round them out I might make. And making the ear blend in smooth a little more. But overall this is an okay model I think.

I welded the two halves together. You can do this by deleting the instance copy, then Mirroring the model again with "Copy" mode chosen. Then either manually attach and weld each vertex on the center line together... Or more easily, use the free "Weld Halves" script you can find on the network (try scriptspot.com) as linked off of my Links Page.
Closing

At this point you have a nice model. You can make the inner mouth polygons a different material ID. And then map the head with a cylindrical map. The map should be a vertical cylindrical map, like a coke can, with the green repeat seam in the -back- of the head. Then use a free utility like "Texporter" or Peter Watje's "Unwrap Utility" to save a TGA of the wireframe to paint on in Photoshop.

You may also wish to see my Body Modeling tutorial, and Eye Rigging and Modeling tutorial both found off of my 3D Help Page.

Special Thanks

Discreet for making such a cool program!
Rob Dollase, Mark Behm and Karl for their input and help.

About the Author

Michael Comet is currently a Rigger/T.D. at Blue Sky Studios in New York. Previously he was Video Team Lead Rigger and a 3D/Animator/Artist at Big Idea in Lombard, IL where he worked on 3-2-1 Penguins and Veggie Tales. Prior to that he was lead animator at the video game company Volition, Inc., where he animated most of the cinematic sequences for Descent: Freespace, and headed up much of the realtime character animation and cinematics R&D for their RPG title, "Summoner". He can be reached via email at comet@comet-cartoons.com, and has a personal homepage at: http://www.comet-cartoons.com/ which has more information and samples of his work.

About the Sample Images

This article, all images and text are Copyright ©2001 Michael B. Comet All Rights Reserved.

This article may be reprinted for personal use only. It may not be packaged or sold in part or in whole, either alone or as part of another package, book, magazine or any other item. Unauthorized duplication is strictly prohibited. This article and related artwork, samples or text, are not to be copied onto other sites without prior written consent from the author. When in doubt, ask.