



Lets Talk: The Art of Facial Setup

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CodeDG2011

Facial setup can be a complex task, but when it is done right, it can be done quickly with flexible results. This class explores methods for setting up faces using a blend of bones and morph targets with the goal of having production-ready controls and flexibility for animators to do their jobs. When morph targets are blended with bone systems and compound targets, the result can be very organic and produce a natural system. Building targets that blend together can be time consuming, but with a few tricks it can be fast and easy to blend compound targets.

Learning Objectives

At the end of this class, you will be able to:

- Design and create complex facial systems
- Create animation control systems
- Analyze and choose appropriate methods and systems
- Prepare objects for rigging

About the Speaker

Paul Neale has been internationally known in the 3D Animation industry for almost two decades. His extensive involvement as Senior Director of Research and Development and Art Director of 3D has encompassed areas in TV series, feature film, special effects and high-profile games. Paul specializes in character rigging and modeling as well as writing plug-ins and scripted tools for system, software and production needs. In addition to his industry experience, Paul has been an Ontario College Professor for fifteen years where he brings his knowledge, professionalism and passion of 3D to his students. In 2008, Paul received Autodesk Masters Award for Contributions to CG Artistry. Paul Neale has been a Presenter for multiple Siggraph Master Classes as well as a Master Class at GDC. He has represented Autodesk as a regular Guest Speaker at trade shows and special events. Paul Neale has trained numerous companies over the years including Walt Disney Studios, UBIsoft.

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Getting Started

Facial rigging can be a time consuming task with many different solutions and consideration to take into account. Knowing where to start and what sort of system best fits your needs can only come with direct experience in both setting up and animating the rigs. Until you have animated your own rigs you don't really know if they work and are capable of creating the animations that you desire.

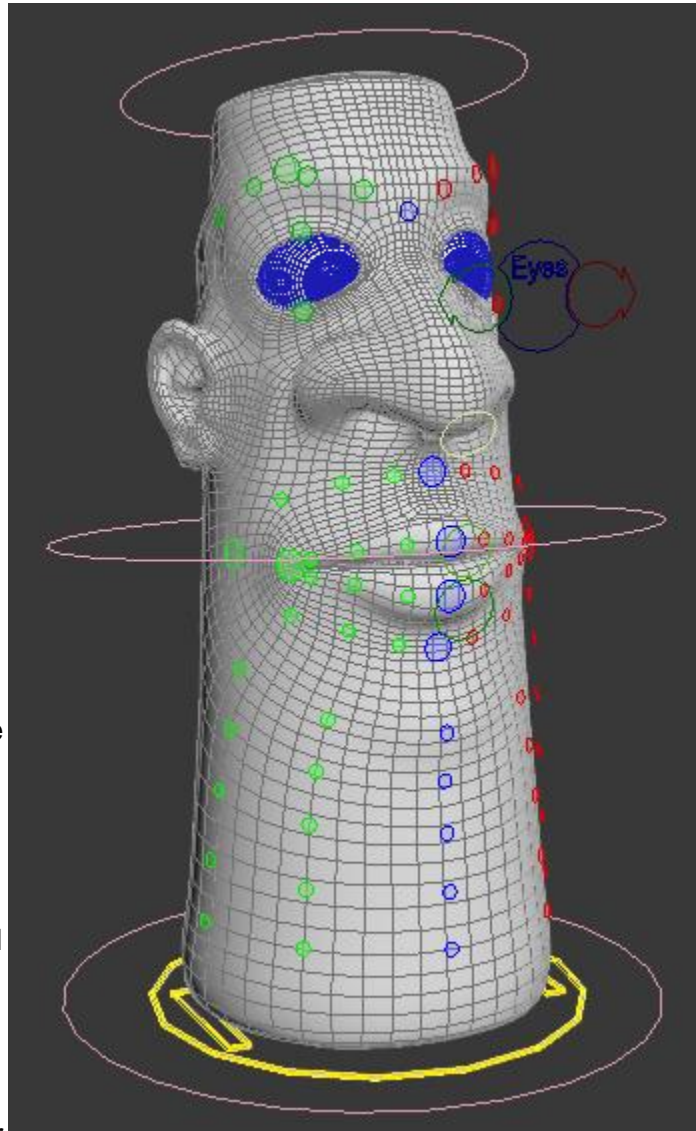
Knowing how the end rig will be used can help determine what rigging methods are best used. Real time productions such as games usual need to avoid using point based targets as they have a lot of over head to calculate and large data sets so bone based system are often used.

Target based system provide better control over the shapes that can be created and sculpting tools can be used to create them making the rigging process more of an artistic venture then a technical one. The biggest problem with target based systems is the end product is not as flexible to the animator

as only the shapes that the targets allow can be used. For this reason it is not uncommon for target based systems to have 50 to several hundred targets.

The most flexible solution is to use both in one rig and leverage the animation flexibility of bones and the precision of targets. The draw back to systems like this is they can be time consuming to create unless quick and clean methods are used to create both the bones and targets.

Setting up Bones:

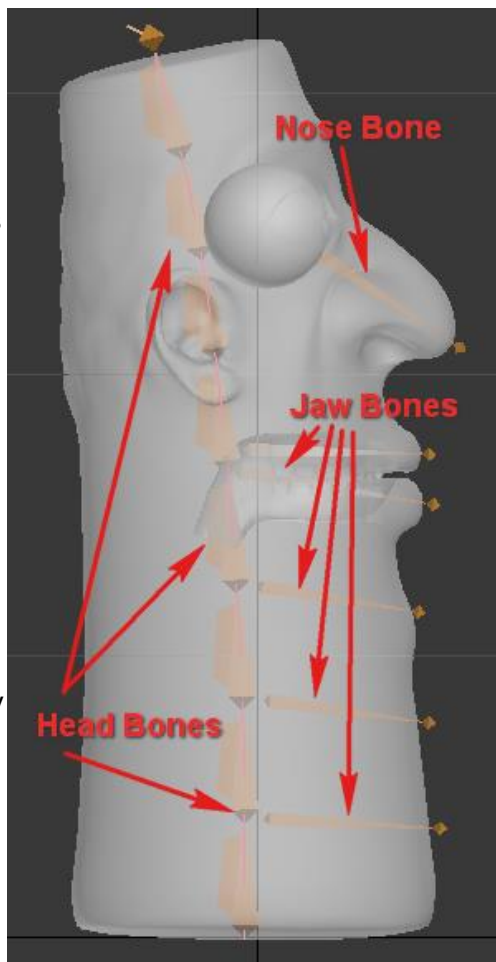


The facial rig starts with the bones in the head of the character. The character that we are using is one big head and we are going to treat it as a cartoon setup that needs to be able to squash and stretch. For this reason we will use several bones up the middle of the character and set it up as a spline IK system. Since this class is focused on the facial I will not cover the steps to production the spline IK. Once the head bone(s) are placed we can add a jaw bone from the left viewport. The jaw bone should start where the hing of the jaw is and end at the top of the chin. If you have a character with a large jaw and are looking for a more cartoony setup use more then one jaw bone so that it can be curved.

Once again in the case of this character there are several bones parallel to the jaw bone that are all reacting with it to make sure that when the mouth bone drops to chin and area below are pushed out of the way in a nice even flow.

A node and a bone in the top lip have also been added.

Skin the main mesh to the bones that have been created and ensure that the upper and lower lips are skinned with a nice smooth transition from one to the other.

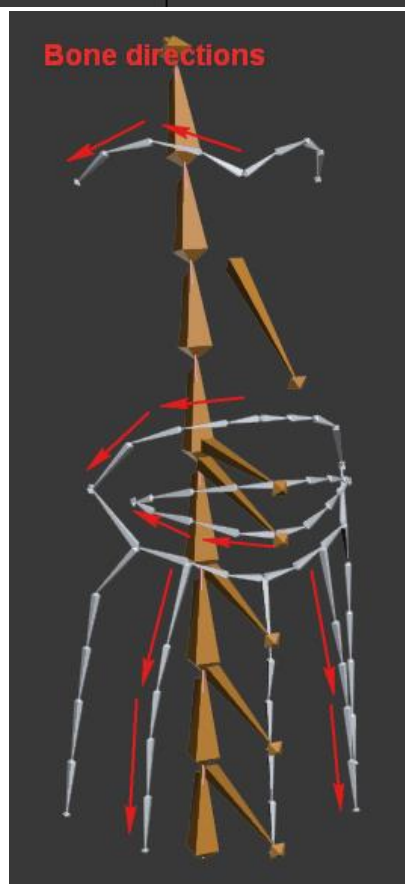


Facial Bone Setup:

Facial bones need to be setup in several areas. First around the mouth two rings can be created using the base mesh and the snap tools. The chains should flow out from the center to the corners of the mouth.

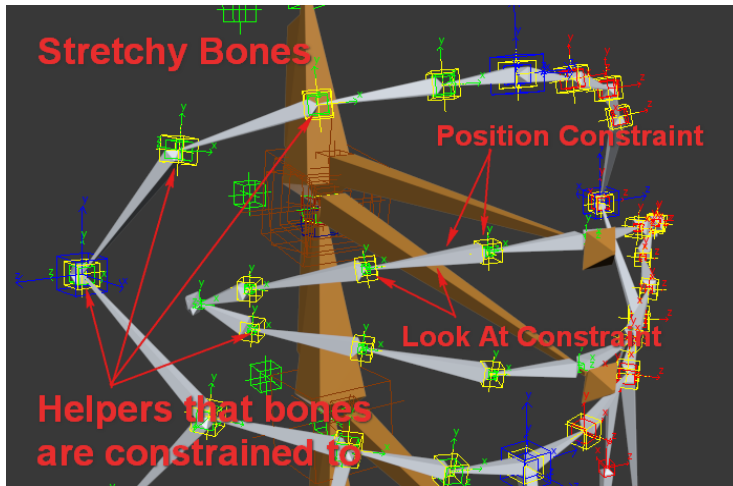
The brows will also be handled with bones for this character with two sets of bones spreading out from the center of the head.

The bone systems that are moving down from the lower lip will be used if any shaping needs to be done to the chin and lower areas of the body during animation.



Rigging the Facial Bones:

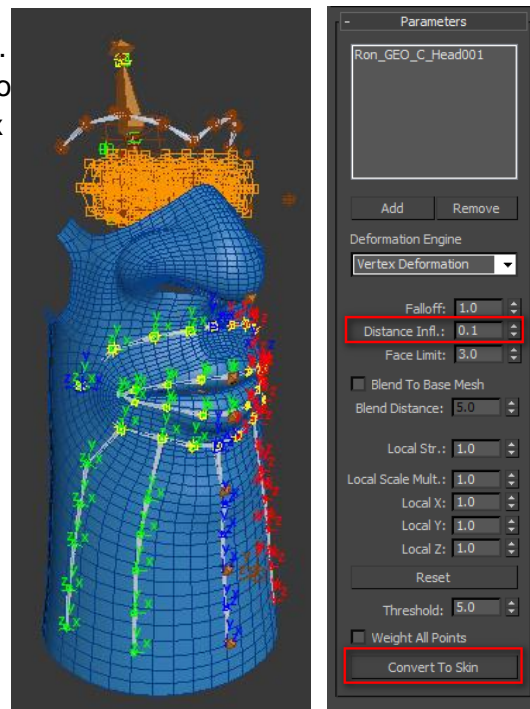
Each of the facial bones will be rigged with a stretchy setup where point helpers are placed at each joint and the bones are then position constrained to the one at its root and look at constrained to the one at its tip. When the point helpers move the bones will stretch between them.

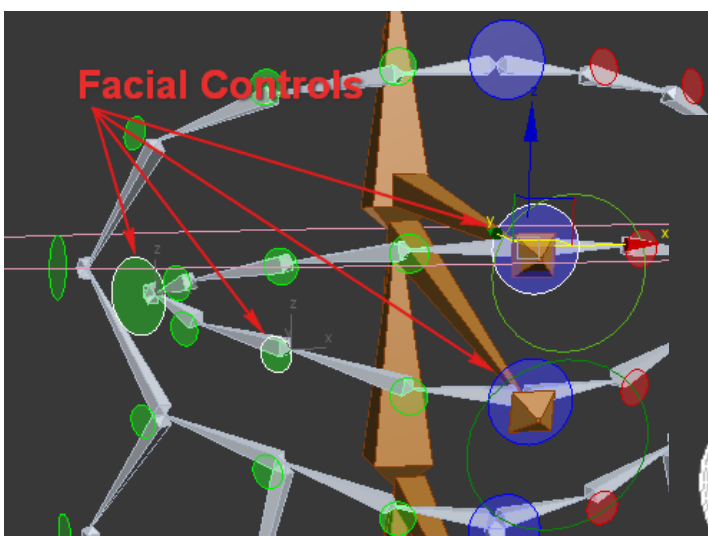


Each of the point helpers are then linked to a point that is attachment constrained to surface that is a partial copy of the rendering mesh. The Proxy mesh is skinned to the same setup of spine, jaw, nose and chin bones as the main mesh is. This can easily be done by skin wrapping the proxy to the main mesh and then converting to skin. The Skin wrap modifier needs to be

removed from the stack or circular dependency warnings will occur as the rest of the rig is completed. Before converting to skin set the Distance Infl value to 0.1 so that each vertex is only weighted to one vertex in the base mode.

The next step is to add control objects to the facial bones so they can be pose. For each of the point helpers that are linked to the attachment constraint helpers add a circle and link it into the hierarchy between the two. The circles will now control the position of the point helpers and they in turn control the position of the bones.





Re-Skinning the main mesh:

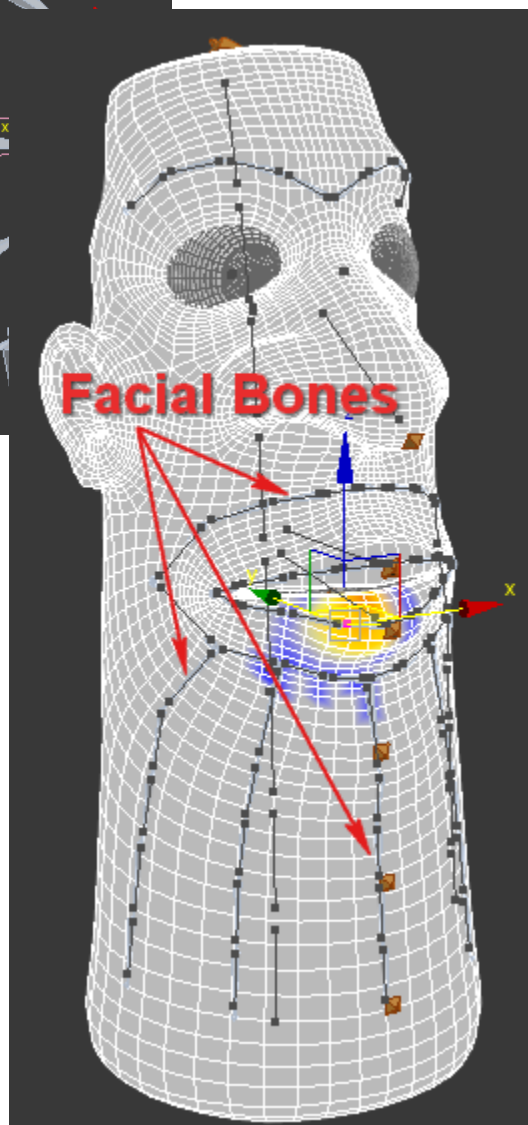
We already skinning the main mesh to the spine, nose, jaw and chin bone but now we need to add the facial bones in to the main mesh. Add all the facial bones to the skin modifier of the main mesh and begin weighting them. The goal is to have the whole mouth and chin area not to be skinned to the spine, jaw and chin bones any more. The facial bones are now via the skinning on the proxy mesh.

Creating Targets for the Eyes:

Creating morph targets for eye lids can be time consuming if it is not done correctly. For cartoon characters like this one we need to be able to get nice curves in the eye lids to be able to show expression. This isn't something that we really have control over in the real world but it is all about creating expression when it comes to animation. The most control for eye lids would be to do them with bones, this can take even more time to setup as some eyes that I have had to rig for have taken 20 bones per lid to get the control that was needed, this also takes considerable time to Skin. If there isn't time or the necessity in production for this targets can be used to create nice "S" shapes in lids quickly and easily.

Start with a copy of the eyes and main mesh for the character and we can start to build the first target.

Using the Freeform modeling tools create a fully closed version of the top eye lid. Used on it own we will get two issues. First off is the animator isn't able to get the "S" shapes that they

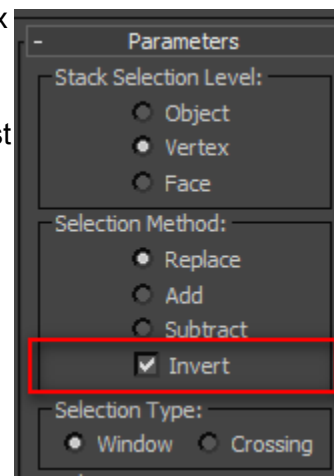
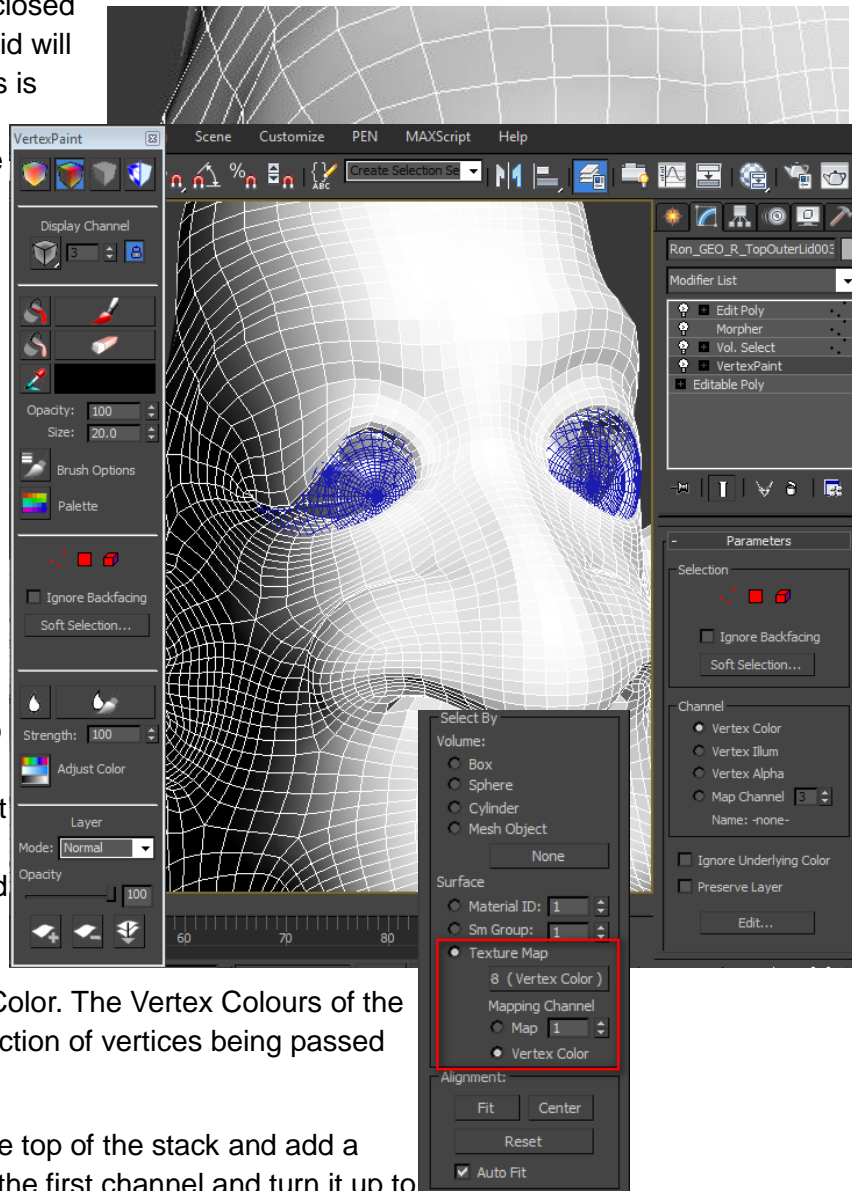


want and second in the half closed position the edge of the eye lid will be buried in the eye ball. This is because targets are a linear transition from the base pose to the target and our eye ball has a curve to it. We will correct this issue in further steps. Lets first get the curve working.

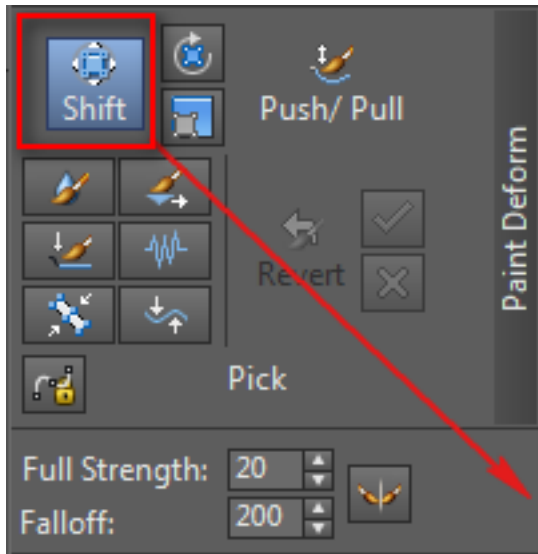
We will be adding several modifiers to the stack on top of the target that we just created. Vertex Paint modifier is added first and will allow us to paint the vertices of the target colours, in this case it will be black and white and will be used to select vertices. Next is the Volume Select modifier. Set it to select vertices and set the Select By to Texture Map and add a Vertex Color node to the map slot. Also set the Mapping Channel to Vertex Color. The Vertex Colours of the model will now control a selection of vertices being passed up the stack.

Add a Morpher modifier to the top of the stack and add a default shape of the head to the first channel and turn it up to 100. At this point the eye will have closed completely and we are where we started.

In the Vertex Color modifier fill the whole head with Black, enter the SO vertex level and select half the vertices in the lid on one side. Now fill those with white. The eye lid will only be morphing half of the lid but will not look that good. Exit the SO Vertex mode and use the blur button and press it several times to blur the result. Each press of the blur button will cause the target to have a nice blended "S" shape created. Blend it until the morphed half is just starting to morph the corner.



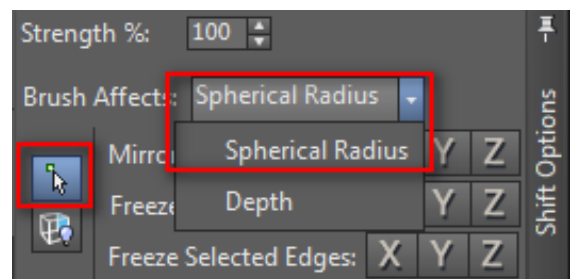
One of the hard parts usually about getting two targets to create an "S" shape is to make sure that when both are dialed up to 100 they create a perfect closure of the lid. If the two targets are created separately this just isn't possible as the combined values of the over lap of the targets can be causing some vertices to move faster or slower that what is desired. To create the oposite target using the system that we are developing is easy and fast. Make a copy of the target with the modifiers in tact and in the Vertex Select modifier check the Invert option on. The two targets now create a perfect blend when both dialed up.



Add the two targets to a Morpher modifier on the main mesh and check to see the result. The two targets are creating a perfect blended "S" shape how ever when they are both at 50 the edge of the lid is buried in the eye ball because of the linear interpolation of the target. Dial one of the two targets to 50 and set the other at 0, Add an Edit Poly modifier to the top of the stack above Morpher and using the Freeform tools correct the eye lid making sure that it is just being pulled straight out from eye and

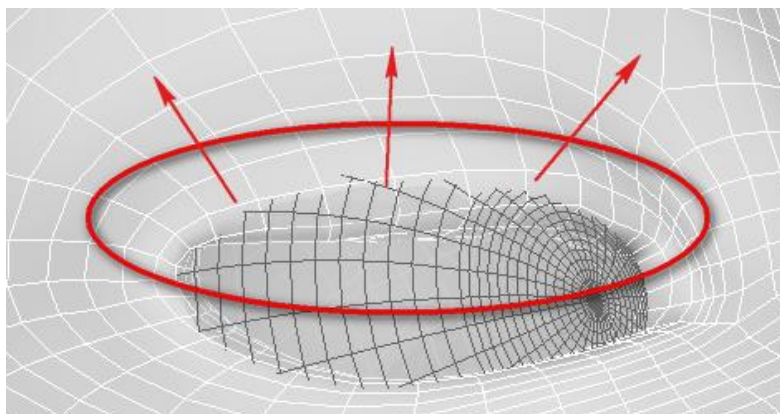
or down.

The Shift tool work well for shaping targets, make sure that in the settings for the Shift tool that you set the Brush Affects setting to Spherical Radius and if needed turn on the Selected Vertices only button so that other areas of the mesh are not effected.



not up

Use the Tools/Snapshot mesh tool to grab the result of the adjustments to a new target, correct the mid position for the other target and grab the result of it as well. Make sure to remove the



Edit Poly modifiers when done.

Add the two new targets to the same channel in Mophrer as the fully closed target. Press the down arrow to move the first target below the new target so they are in the correct order. This will create a Progressive morph channel where as the value goes from 0 to 100

each of the targets will be passed through. This creates a curve in the result and will stop the lid from passing into the eye. The version in this character is using three targets to control the curve and make sure that the eye lid follows the curve as closely as possible. The bigger the curve the more targets necessary to correct the curve. Make sure that the targets are evenly spaced and that they are in the correct order.

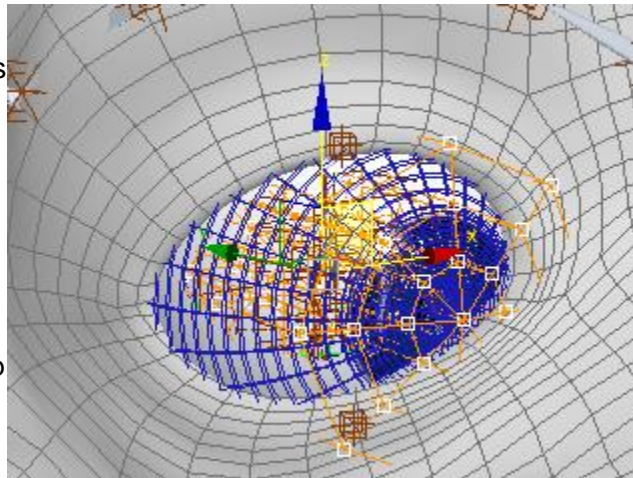
Eye Lid Displacement:

When an eye rotates the lens of the eye displaces the eye lid by a small amount. This can add realism into the eye even in a cartoon character and it is easy to setup.

Add an FFD Cylinder Space Warp to the scene and align it to the eye. Adjust it so the middle of the cylinder is pushing out from the eye around the lens. Apply the main mesh to the FFD with the Bind to Spacewarp button



. Link the FFD to the same controls as the eye ball so that it follows the eye.



One of the tricks to making this work is to not model the characters eye lids with any

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