

CSCI 181 : 10 : Computer Animation Design I : Fall 2006

Workflow for creating Blendshapes

At it's most basic, what you are doing is creating a duplicate version of your model for each expression. You will create one duplicate that has only the left eyebrow raised, and another with the right eyebrow raised. Both models need to be completely identical, except for the vertices that you want to move. Later, you will "blend" between the base model and a percentage of the duplicate. In this example, you would have control over each eyebrow separately, which is needed for good expressions.

1. Finish your base model completely. You can't add vertexes or move any vertexes on your base model or the blendshapes won't work properly. In other words, if you make all your blendshapes, and then decide the mouth isn't right and you change the mouth on the base model, whenever you apply a blendshape, the mouth would revert back to the shape it was when you made the blendshape originally.
2. Duplicate your model, name it a new name, i.e. *L_EyebrowUp*, and then move vertexes to create the expression you want. Be careful not to move vertexes that are not part of the expression.
3. Select *L_EyebrowUp* in Object mode, and then shift-select the base model. Then go to Deform > Create Blend Shape. Making sure the options are reset to default.
4. Test the Blendshape by going to Window > Animation Editor > Blend Shape.
5. While you are in the Animation Editor > Blend shape it's actually better to delete the Blend slider you just created. It can interfere with future blend shapes. This is similar to how we deleted Smooth proxies as needed.
6. Rinse and repeat for multiple blendshapes.

Note: You will need to create two blendshapes for the upper eyelid blink, one will be an inbetween shape to prevent the eyelid from penetrating the eye. See the handout for details.

Using Clusters to speed up Blendshapes

As you know, modeling vertex by vertex can be painstaking. The above scenario works fine for basic models and simple blendshapes, if it works for you, go for it.

If you are working on a more complex model, with detailed facial expressions it's best to use the Cluster technique. We are going to use 'Clusters' of vertexes that we define to make it easy and actually fun to create multiple models/expressions. You may even want to use Clusters as a modeling tool in general.

Note: The workflow is slightly different using this technique. We create the duplicate *AFTER* we have altered our base model using Clusters. The Cluster can be easily returned to it's start position so that we know the base model is in it's original state before we create each duplicate. It will make more sense as you go along:

1. Finish your base model as above.
2. Select the vertexes you will want to change for your expression, i.e. above the eye. Select a few more pixels than you think you will need to allow the change room to "fade out".
3. While in Vertex mode, go to Deform > Create Cluster. A little C should appear, that is the center of your cluster of vertexes.
4. Name your Cluster appropriately, i.e. LeftBrowCluster
5. Hit CTRL-A to see the channel editor if it's not open. Grab the cluster and move it around, taking note of the coordinates as they change. Rotate and Scale the cluster, again watching the coordinates.
6. Once the model is deformed correctly, select the base model and hit CTRL-D to create a duplicate.
7. Rename your duplicate and move it out of the way.
8. Now comes the fun part, to get your base model back to normal, just select the Cluster and enter 0,0,0 for Translate/Rotate and for Scale return it back to 1,1,1. This returns your model to it's base state.

9. You can now create more clusters, and use them alone or in combination with existing clusters to create the expressions needed for your model. Each time making a duplicate, and “Zeroing out” your clusters to get them back to the initial base state before going on to model the next expression.

Relocate the center pivot of your Cluster

For the eye, you may want to use this trick to Rotate your eyelid cluster around the eye:

1. Select your eyeball (not the lid mesh) and in the Attributes Editor find Pivots (it's in the first node)
2. Check Display Rotate Pivot
3. Select your eyelid Cluster, on the Mac hit the “Home” key, PC it's the “Insert Key”. The axis should change to lines only
4. Turn on snap to points in the Status line (magnet with a dot) and move the cluster pivot to snap on top of the eyeball's center pivot.
5. Hit “Home” or “Insert” to go back to normal mode. What you just did was move the “center” of the Cluster to the center of the eyeball. Now when you Rotate the Cluster, it will rotate around the center of the eyeball. Making it easy to open and close your eyelid.

Painting Cluster weights

The one detail that is missing above is that the clusters don't necessarily deform your model as naturally as you would like. What you need is to paint a “falloff” value for your cluster, where the cluster gradually loses it's influence on your model.

1. Before you start, move and or scale your cluster in a way that is close to what kind of distortion you want. Also, switch to Shading > Smooth Shading so that you are not in wireframe mode.
2. Select your base model and Right-click to bring up the menu, select Painting > Clusters and select your cluster.
3. The object should turn to black, with white in the area around your cluster. Black means NO influence and White means 100% influence. Grey areas in between are the falloff where it gradually loses influence.
4. Your curser should now be a circle, which is a paint brush for painting weights.
5. Open the Tool setting tab on the right and Reset the paint tool. Experiment with painting and tool setting to see how it affects your model. Try hitting the Flood button and see how it smoothes things out. Next paint using a Value of 1 and Replace on the part of your model you want to move the most.
6. Painting weights is an organic process, you have to play around to see how it works. I like to start by setting the Opacity to 1, select the Replace option with a Value of .5 and then hit Flood. This makes the whole area a middle grey. Next I will change Opacity to .2, select Add with a value of .3 and start painting in the areas I want to make white. After a while, I'll select Smooth and hit Flood to smooth it all, and then go back to Adding white.
7. Hold down the 'b' key and click left to right to quickly resize your brush.

Painting weights is something you will do a lot of as you create more complex models and add bones to them, it's a very powerful and intuitive tool once you get the hang of it.

Note: The workflow we are using creates clusters and cluster weight maps on the base model only. The duplicates do not have any of these, which is better for creating blendshapes. The big advantage of this technique is that the model can have 5 or 10 clusters which you can easily use to “mold” complex expressions on your base. You then hit CTRL-D creating your blendshape and then set all your clusters back to 0 to move on to the next shape. Some blendshapes you will probably want for a realistic face:

RightEyeBlink RightEyewideopen RightBrowUp RightbrowScowl RightLowerLidup Jawdown
Smile O Frown RightCornerMouthUp RightCornerMouthdown Cheeksinflated