RIGGING EYES

Introduction

Note that this guide starts with a rigged and weight painted figure mesh like the one on the left. This has a single head bone that controls all the head vertices. It has two eyes made from UV spheres rotated 90 degrees to face their tops front, and they have concentric selections of faces given black and blue glossy submaterials. They also have a white mesh circle acting as a highlight. The eyebrows are simple subdivided blocks sunk halfway into the forehead. Both the eyes and eyebrows are separate objects from the character.

Procedure for the eyebrows

Let’s start with the eyebrows. Make appropriate shape keys for each of these for the required expressions. Remember that shape keys can be used to move the entire mesh up and down if needed.

Once the shape keys are made (you can always add to or edit them later) there are two ways to proceed.
Joining the eyebrows to the character mesh: the first way to rig eyebrows

Select the eyebrows first and then the character mesh, then use Control_J to join them to the mesh. The eyebrows’ material will disappear in the 3D window (their meshes aren’t UV mapped) but shape key controls still work. And when you render the figure the original material for the eyebrows is still there. However when you move the head with its bone the eyebrows stay in place.

This is because the mesh of the eyebrows isn’t controlled by the head bone. Take the combined eyebrows/body mesh into Weight Paint mode with the armature still in Pose mode. Make sure the head bone is selected, then add weight to the eyebrow meshes. As you do so you’ll see them jump into place as in the image on the right.

Move the head around a bit to make sure that every part of the eyebrows is fully weighted. Go back into Object mode and check to make sure that the shape keys work as before.

The second way to rig eyebrows

This keeps the eyebrows as separate objects, making them children of the figure’s armature.

Select both the eyebrows and then the armature, then use Control_P with Empty Groups (not automatic weighting). As with the first method, take the armature into Pose mode and select the head bone. Take each eyebrow in turn into Weight Paint mode and paint the full mesh red.

The advantage of this method is that it’s easier to change the shape keys (you can isolate the eyebrows) and that any modifiers active in the character mesh are not applied to the eyebrows when they become part of the mesh. The disadvantage is that you have to select them separately from the character mesh to change their shape key values during animation.

Rigging the eyes

The procedure is relatively straightforward. For it, we’ll keep the eyes as separate objects.

Make sure the eyes’ origins are at their geometric centers. Select one of the eyes and use Shift_S with Cursor to Selected to snap the 3D cursor to the exact center of the eye. Select the armature and take it into Edit mode. Use Shift_A to add a bone (there will be no selection menu as a new bone is all you can add to an armature).
The new bone will come in with its tip selected. Don’t change this selection, as you want the root to remain at the 3D cursor, in the precise center of the eye. In an Ortho side view move the tip of the eye bone to a point where it makes the bone horizontal and with the tip just in front of the eye, as shown in the left image.

Now select the bone by right clicking on the center pyramid and rename it 1_eye.L.bone (if it’s the character’s left eye).

Do the same for the other eye. Remember to select it and snap the 3D cursor to its center first. Name it 1_eye.R.bone.

Next, make a final bone centered between the eye bone tips. Make it about the same size as the eye bones but vertical. Call it 1_eye.target.

You should have something like the image right: bones emerging from both eyes with a target between them.

Still in Pose mode for the armature, select both eye bones and finally the head bone, then Con-
trol_P. Use Keep Offset. This means the position and rotation of the head controls the eye bones as well.

Before doing anything more with the eye bones, while they’re still pointing straight ahead, we need to make them control the eyes. Make sure both the eyes and the armature are in Object mode.

Select each eye in turn, then the armature, and use Control_P with Empty Groups to do this. Take each eye into Weight Paint mode and, with the bone for that eye selected in Pose mode, paint them red from their original blue.

Note that if the eye is purple in Weight Paint mode and you can’t paint it, you’ve probably tried to parent the eye with the armature in Pose or Edit mode. Make sure both are in Object mode for the parenting process.

Now, with both of the eye bones and the eyes aligned looking forward, we can set up the eye bone hierarchy. At present if we rotate the head bone in Pose mode the eye bones follow, and the eyes look where the head is facing, as above. The eyes need to follow the target, not the direction of the head.

Keep the rotation of the head in Pose mode as it will show you when you’ve successfully completed the next step.

Select each eye bone in turn and - still in Pose mode - choose Damped Track in the Bone Constraints tab in Properties as above. The armature should be the target and the eye target the bone, as right.

Now your character’s eye should jump to look at the base of the target. Note that the eye bone points to the base of the eye target bone.
Do the same for the other eye bone. Finally, select both eye bones and hide them with the H key shortcut (you can see them again by using Alt_H).

After this you have a character with eyes that can focus and follow a target in the scene.