(Tutorial 1.4 begins further down on this page.)

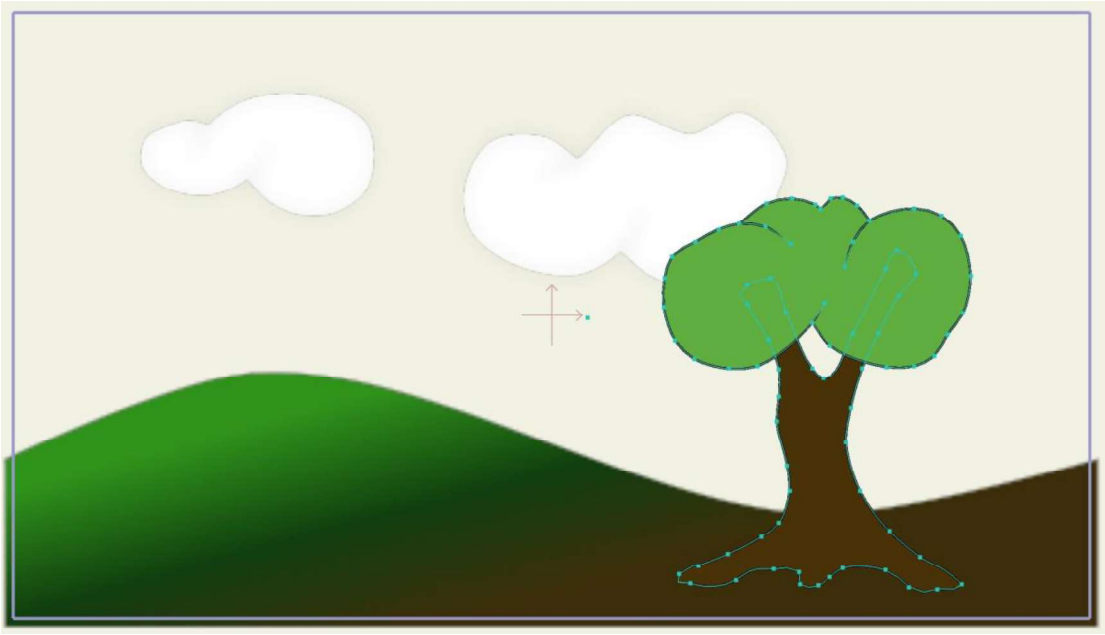
Tutorial 1.4: Bone Setup

Bones are an important tool you can use in Moho to help make animation easier. If you think of drawings in Moho (like the ones you made in previous tutorials) as soft rubber, then bones can be thought of as stiff wires inside the rubber that help you move and position objects. Bones are never displayed in a final rendering, they're just used as tools during the animation process.

Bones are not absolutely necessary for animation. They are very helpful for animating certain types of motion as we'll show in this and the next tutorial, but there are other ways to animate in Moho as well. As you gain experience using Moho, you'll learn when bones are appropriate and when they're not.

Importing an Object

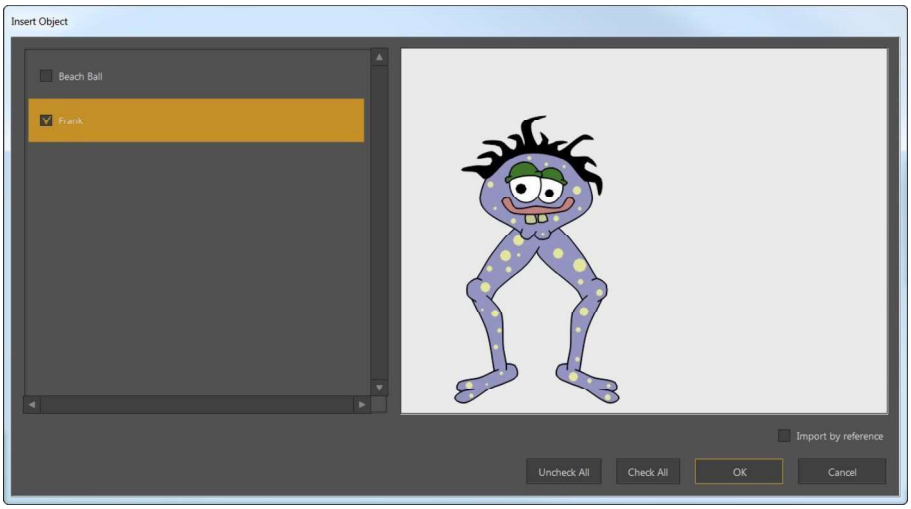
Launch Moho and open the project from the last tutorial.



Starting point for this tutorial

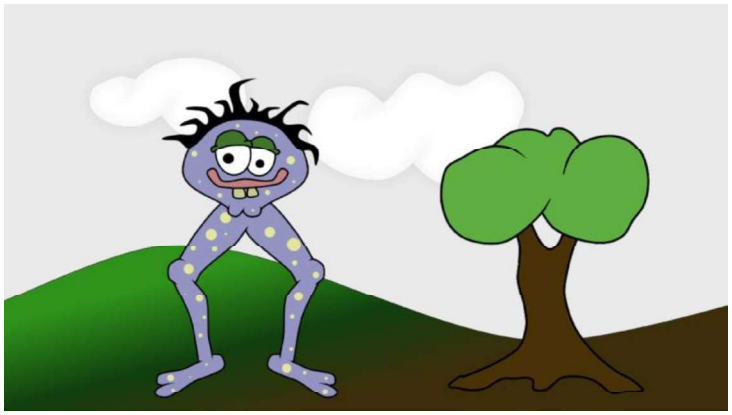
As you build a Moho project, there are times you may want to re-use objects you created before. There's an easy way to do this, and we'll use it now to add a character to the project.

Select the **File > Import > Moho Object**... command. In the file dialog that appears, navigate to your Moho custom content folder. From your custom content folder, locate the Tutorials/1 – Basics folder and open the file "Tutorial Extras." A dialog will open asking you which object you want to use from this project:



Insert Object dialog

Select the layer named "Frank" on the left side of the dialog. On the right side, you'll see a preview of Frank. Click OK. A new layer will be added to your project. This layer is a copy of the layer Frank from the "Tutorial Extras" project. Frank is fully drawn and filled in - you can see what the scene really looks like now by selecting **File > Preview**.

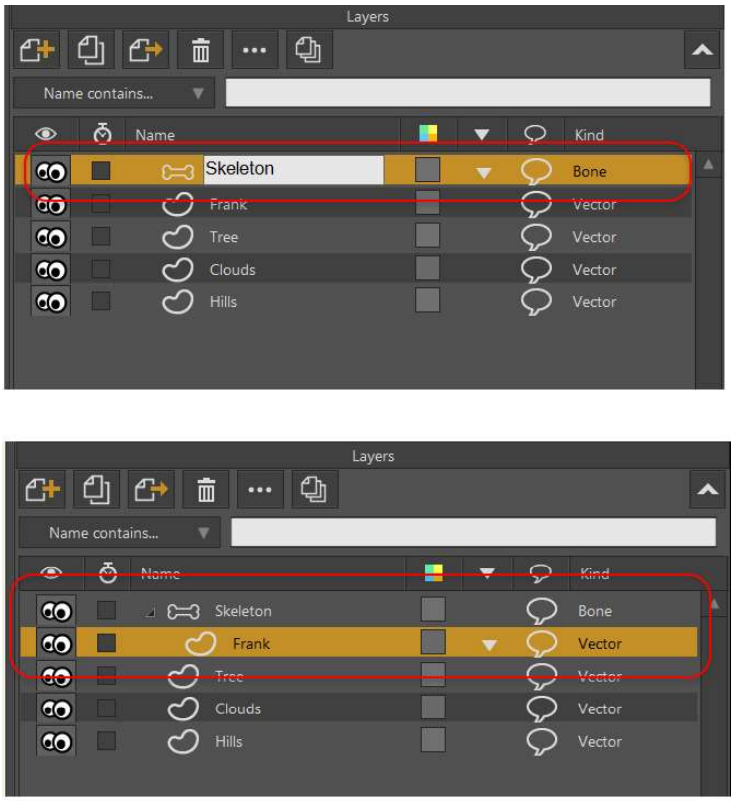


Frank added to the project

Adding Bones

Lets give Frank some bones to make him easier to animate. In the Layers window, click the new layer button. In the popup menu that appears, choose "Bone". Rename this new layer "Skeleton."

Drag the Frank layer upwards "into" the Skeleton layer. **This step is very important - you will know that you're dragging the Frank layer to the correct place when the Skeleton layer becomes highlighted.** Finally, click the Skeleton layer to make sure it's active. When this is done, the Layer panel should look like this:



Add a bone layer named Skeleton (top) and drop Frank inside the layer (bottom)

Make sure the layer "Skeleton" is selected in the Layer panel. Click the eyeballs icon on the left side of the Tree, Clouds, and Hills layers to temporarily hide them.

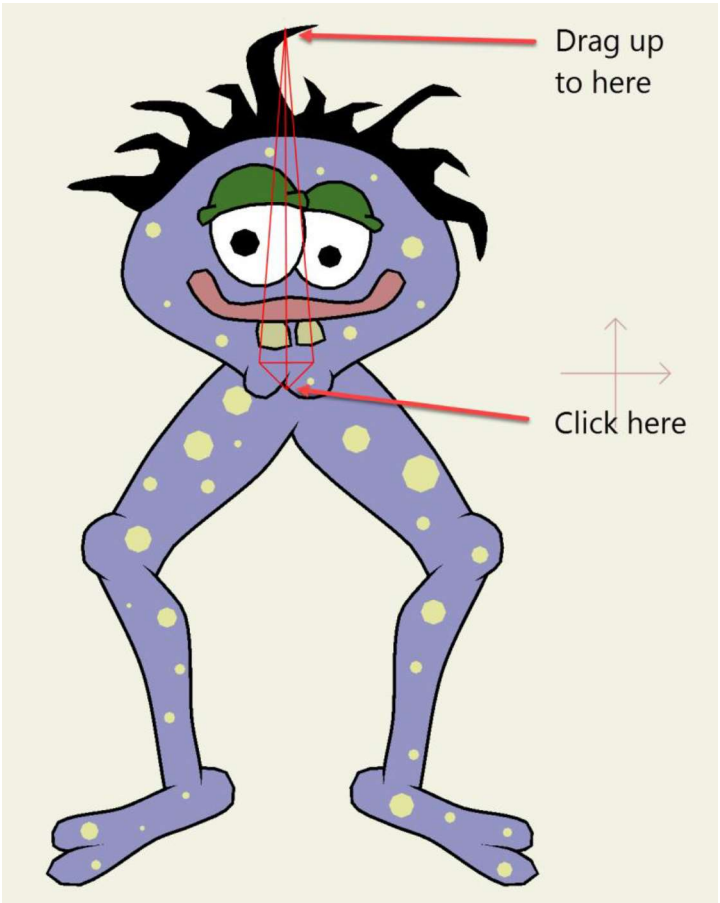
Hide the Tree, Clouds, and Hills layers

Finally, use the Pan and Zoom tools to zoom in on the contents of this layer. Your window should now show something like this:

Zoomed in on Frank

With the Skeleton layer selected, add a bone to Frank by selecting the **Add Bone** tool and clicking and dragging upwards as shown below:

This will be the main control bone - you could think of it as Frank's spine. It should look like this:



First bone added

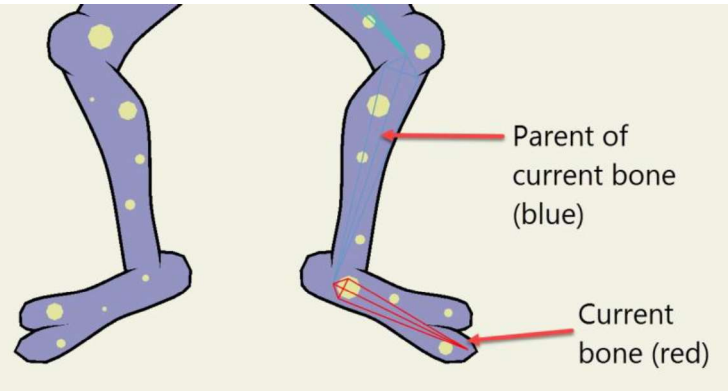
Click and drag out three more bones as shown below. It's important that you draw these three bones in order from top to bottom: thigh, shin, and foot.

Right leg bones

When a bone is selected, it is drawn in the highlighted color, red.

When you add a new bone, it becomes the "child" of the currently selected bone. The parent-child relationship for bones means that the child can move around without affecting the parent, but if the parent moves, the child will move with it. This is why it was important to draw the previous three bones in order: the thigh bone's connected to the spine bone, the shin bone's connected to the thigh bone, and the foot bone's connected to the shin bone (at least in Frank's body).

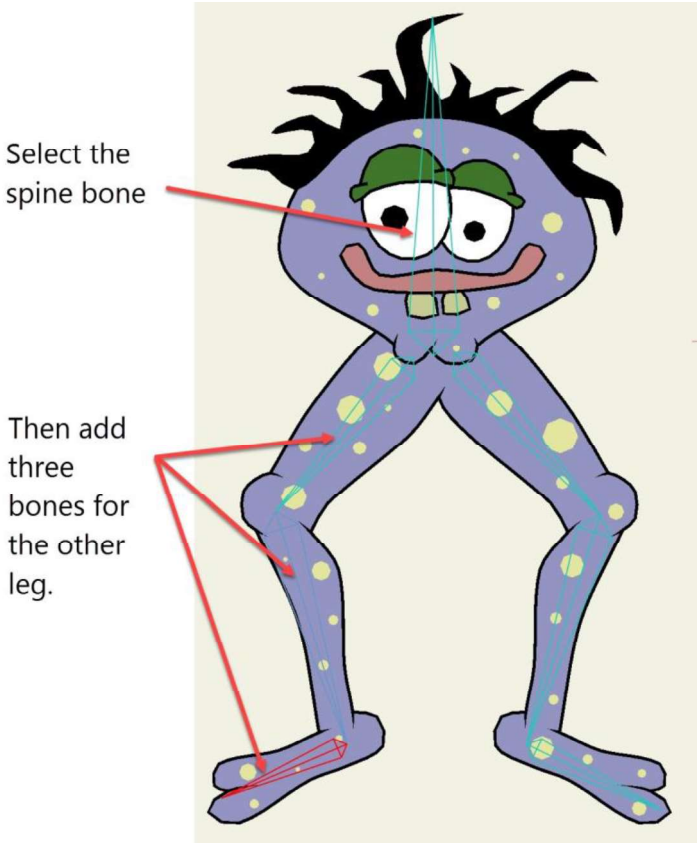
When a bone is selected, it's displayed in red. Its parent also gets displayed differently: in blue. The parent is highlighted like this for your information - sometimes you may connect bones in the wrong order and looking for the blue parent bone can help determine where things went wrong.



A current bone and its parent

OK, let's add bones to the other leg. But first, we need to select the spine again so that the second leg will also be attached to it. Use the **Select Bone** tool and click on the spine to select it.

Next, use the **Add Bone** tool to add three bones to the other leg as shown below:



Left leg bones

Testing Bones

There's a bone tool that lets you test how your skeleton structure is working. Let's try that now. Select the **Manipulate Bones** tool and click and drag any of the bones you created. Try dragging several of the bones around to see what happens.

Moving Frank's legs

Notice that Frank automatically moves with the bones. You may have also noticed that Franks looks quite "squishy" - when you move either of his legs, his head changes shape as well. The next step is to clean this up a bit by telling Moho which parts of Frank should move with which bones.

When you are on Frame 0, the Manipulate Bones tool doesn't permanently move the bones. Click the **Select Bone** tool and all the bones will snap back into their original places.

Adjusting Bone Strength

When you use a bone layer to control a character, every bone in the skeleton has some influence on every part of the character. We saw that in Frank - when you

move one of the legs, even the head moves a bit. This influence is strongest closest to each bone, so the head only moves a little bit, not as much as the leg itself.

We don't really want to see Frank's head move much at all when his legs move. Luckily, there's a way to control this: bone strength. Each bone has a "strength" value that controls how large its region of influence is. What we'll do next is adjust the strength of the bones that control Frank.

Select the **Bone Strength** tool and take a look at the bones.

Each bone has a semi-transparent region highlighted around it. (You also saw these regions when using the Manipulate Bones tool.) These regions show you the influence of each bone in the skeleton. A bone has the most influence inside its shaded region.

Regions of influence

With the Bone Strength tool active, click and drag side-to-side on each of the bones in Frank's skeleton to adjust its strength. The goal here is to adjust the region of each bone so that it just encloses the corresponding section of Frank's body. For example, the region around the shin bone should just enclose the shin, and not much more. Don't worry about being too precise - pretty close is good enough. For Frank's head, don't make the bone region enclose the entire head - that would make the

bone too strong. Adjust the bone strengths so that they look approximately like the following:

Adjusted bone strengths

Testing Bones (Again)

Once you adjust bone strengths, it's a good idea to test the skeleton again to make sure everything works correctly. Pick the **Manipulate Bones** tool from the toolbar and click and drag on Frank's shin bones just above the ankle.

If everything was set up correctly, Frank should be able to move like this:

Bones in action