

## Chapter 09

# Rigging For Motion Capture

Rigs for motion capture are mostly simplistic, but like any other part of the CG process complexity can be added to them depending on the needs of the pipeline. In this chapter we are going to focus on creating a simple rig inside **Maya** that can be taken into **Motion Builder** to integrate the solved animation from the actor. This rig will also be able to take motion capture corrections and enhancement to the motion data that gets applied to it. Finally the rig will allow us to transfer animation data from **Motion Builder** back into **Maya** where it was created (Figure 09\_01).

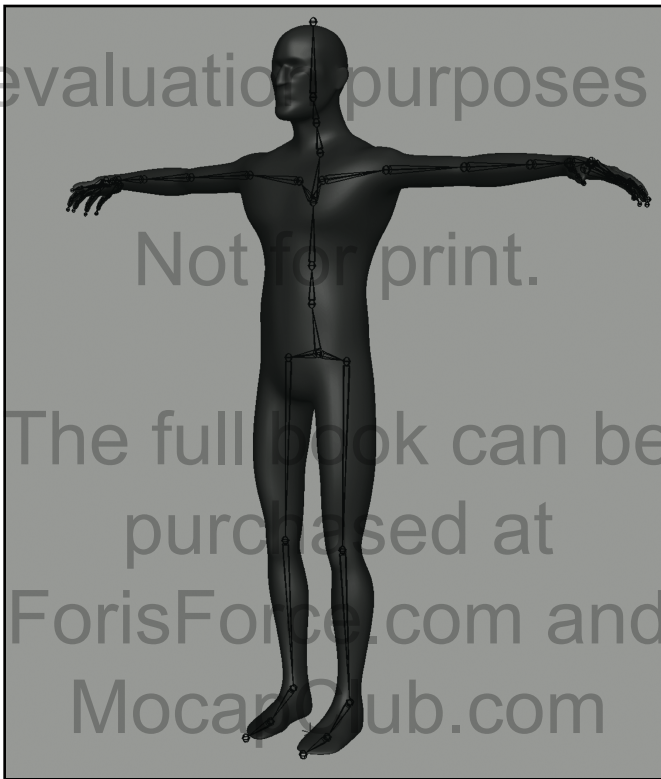


Figure 09\_01.

Launch **Maya** and open the “Chapter09”<sup>6</sup> file.

Bone orientation is key to the success of a Rig. To help with this situation we are going to use guides to help with the bone creation process. Lets start with the spine, neck and head. Go to the create menu and select the *EP Curve Tool* option box and check on the *1 Linear* radial button (Figure 09\_02).

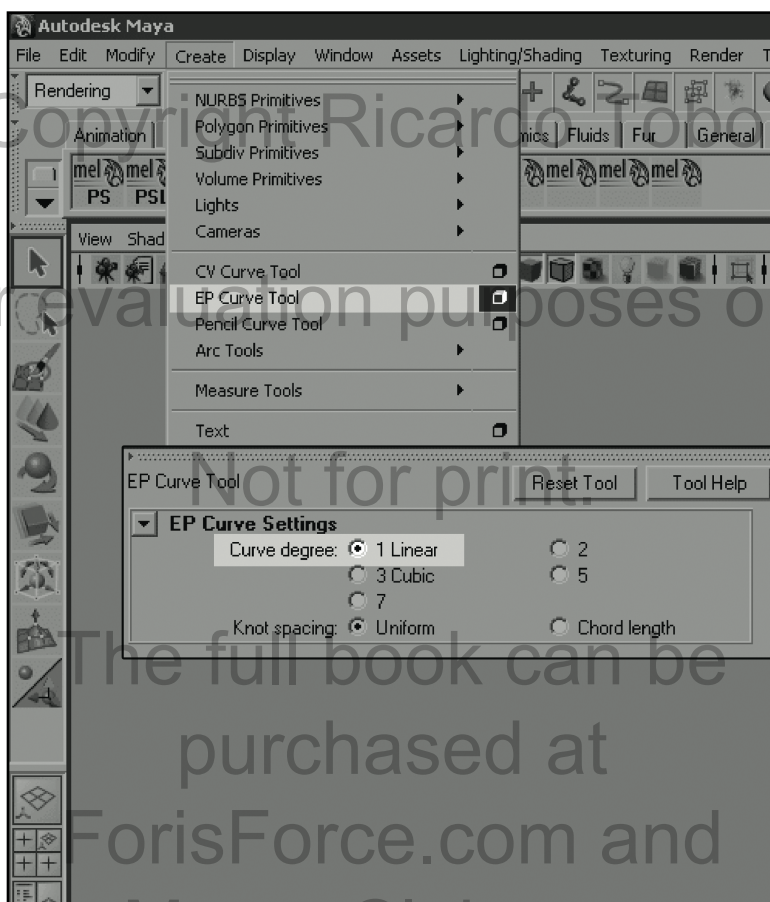


Figure 09\_02.

<sup>6</sup> Download the files from [www.MocapClub.com/TheMocapBook.htm](http://www.MocapClub.com/TheMocapBook.htm)



On the side view click on the start of the spine, the middle of the lower back, the beginning of the ribcage, the start of the neck, the middle of the neck, the base of the head and the end of the head. Feel free to jump into component mode (*F9*) and change the position of the *Curve Points* to fit the anatomy of the character better (Figure 09\_03).



Figure 09\_03.

*Note: If the spine of your character needs more spine or neck bones feel free to draw an EP Curve with more components.*

Template the “MocapGuyGeo” layer (Figure 09\_04). Go to the Skeleton menu and select the *Joint Tool*. With the “C” key pressed down click and drag on top of the curve, you would see the joint slide along it. Click and drag on the different sections to create a hierarchy as figure 09\_04 shows (Figure 09\_04). Select the first bone in the hierarchy and rename it “Hips” in the *Channel Box*. Rename the rest of the bones in the hierarchy “Spine”, “Spine1”, “Spine2”, “Neck”, “Neck1”, “Head” and “Head End” (Figure 09\_04).

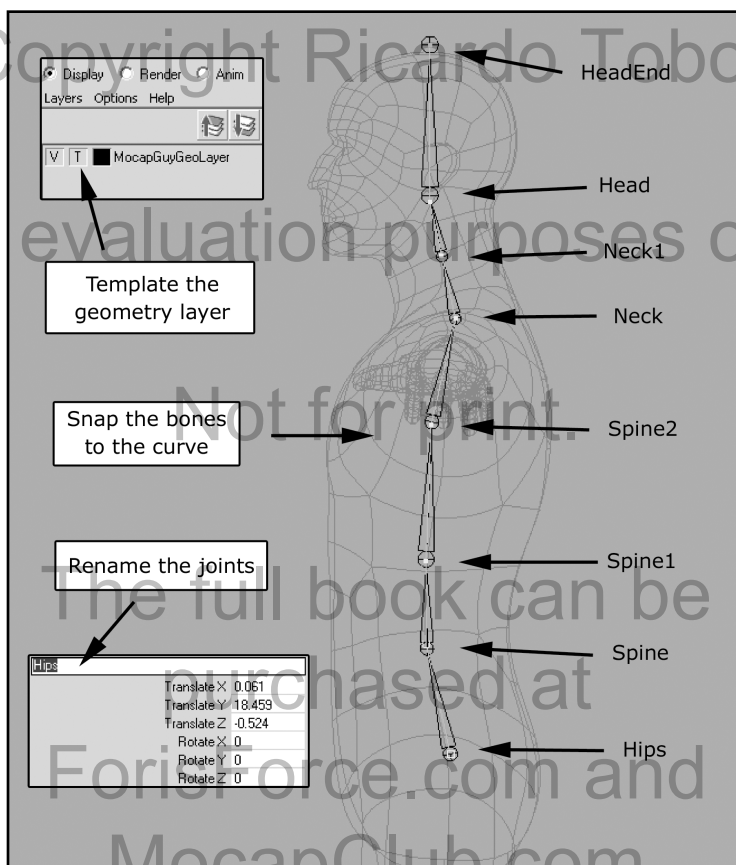


Figure 09\_04.

*Note: if you have additional bones in the spine, continue naming them spine3, spine4, etc. Apply the same logic for the neck.*

Let's now create the left arm. Go to the top view and draw a linear *EP Curve* from the shoulder to the elbow to the palm. In the front view place the curve so it fits inside the arm. Feel free to adjust the components in the top view so they fit the elbow better, however be sure to leave the position of the curve components untouched in the front view. Doing this will assure that the curve and later the bone hierarchy stays coplanar, this means that all the bones in the chain live in the same plain. This will give us optimal results when we add our IK controllers in **Motion Builder** (Figure 09\_05).

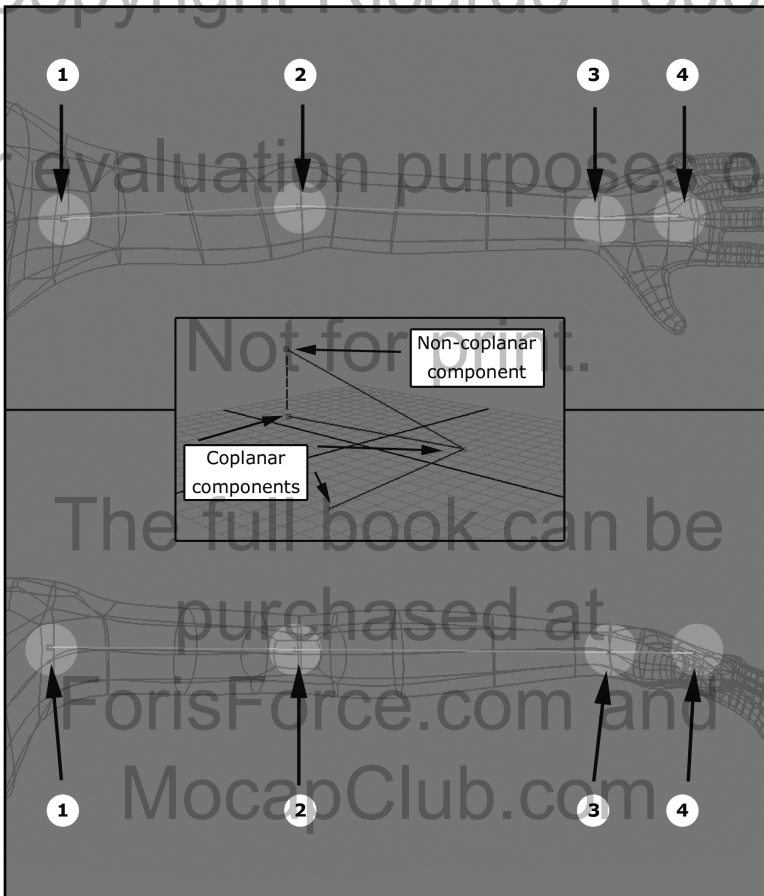


Figure 09\_05.

On the top view, draw the arm skeletal hierarchy while holding the “C” Key so the bones snap to the guide curve. Rename the bones in the hierarchy “LeftArm”, “LeftForeArm”, “LeftForeArmRoll”, “LeftHand” and “LeftHandEnd” (Figure 09\_06).

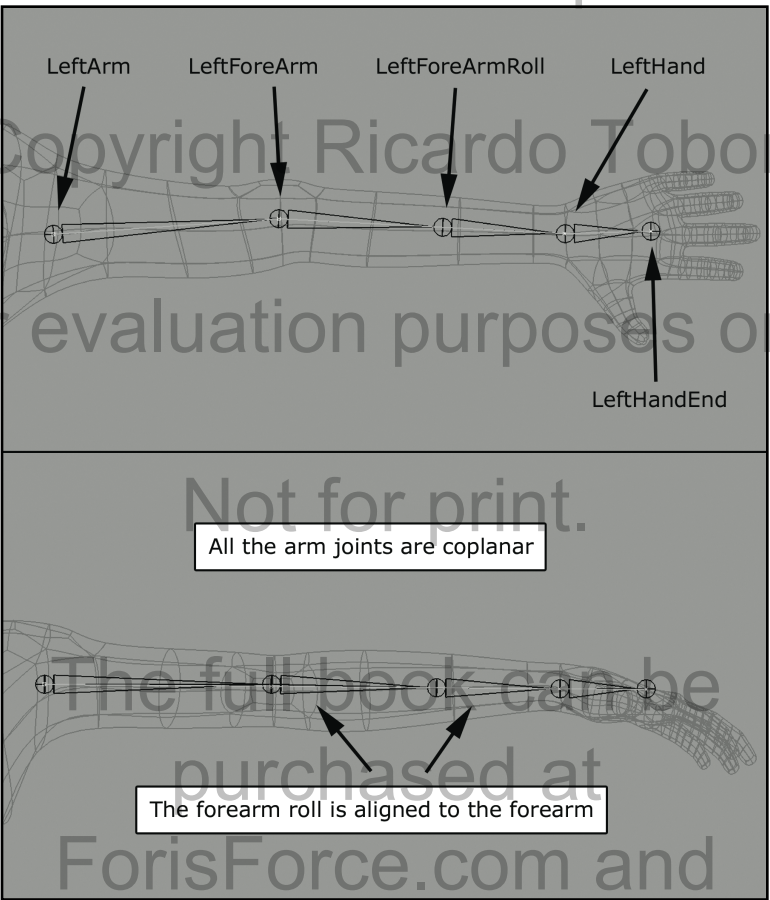


Figure 09\_06.

With the left arm done, creating the right one is somewhat automatic, naming conventions included. Select the “LeftArm” bone and under the *Skeleton* menu click the *Mirror Joint* option box. Specify the *Mirror across* option as YZ and under *Mirror function* select *Behavior*. In the *Replacement names of duplicate joints* enter “Left” for *Search for* and “Right” for *Replace with*. Press the *Mirror* button to generate the hierarchy on the opposite side (Figure 09\_07).

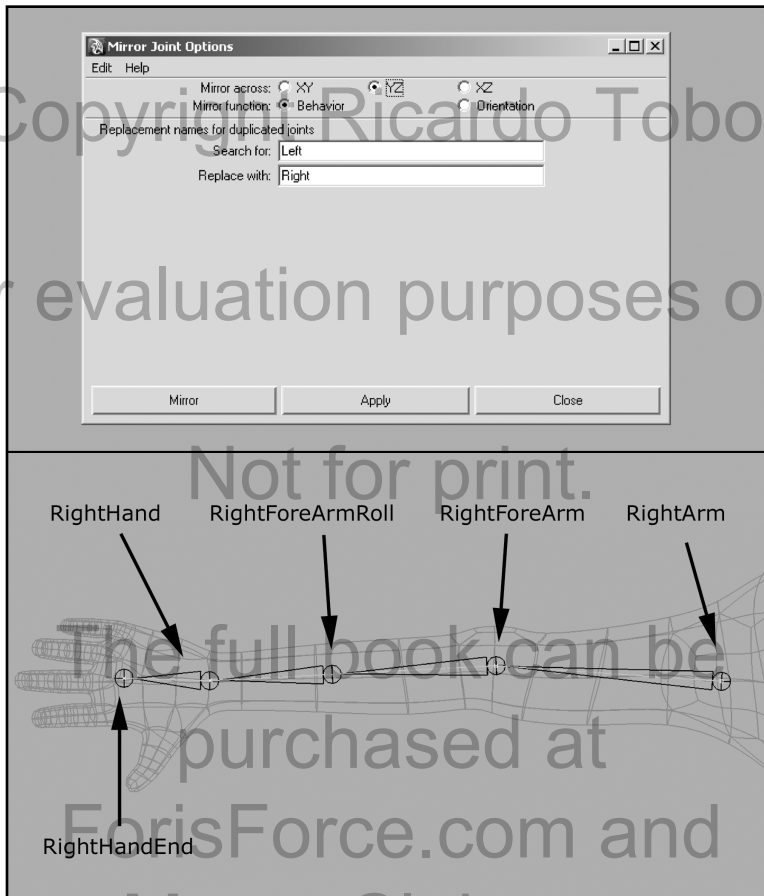


Figure 09\_07.

We are now going to create the left leg. The placement of the root of this lower extremity is particularly important for both mechanical as well as deformation purposes. This creates the need of additional guides for the creation of the body part. Go to the side view and create a circle by navigating to the *NURBS Primitives* options under the *Create* menu. Rotate, translate and scale the circle until it encompasses the hips of the model. The center of the circle now indicates where the root of the leg should be placed (Figure 09\_08).

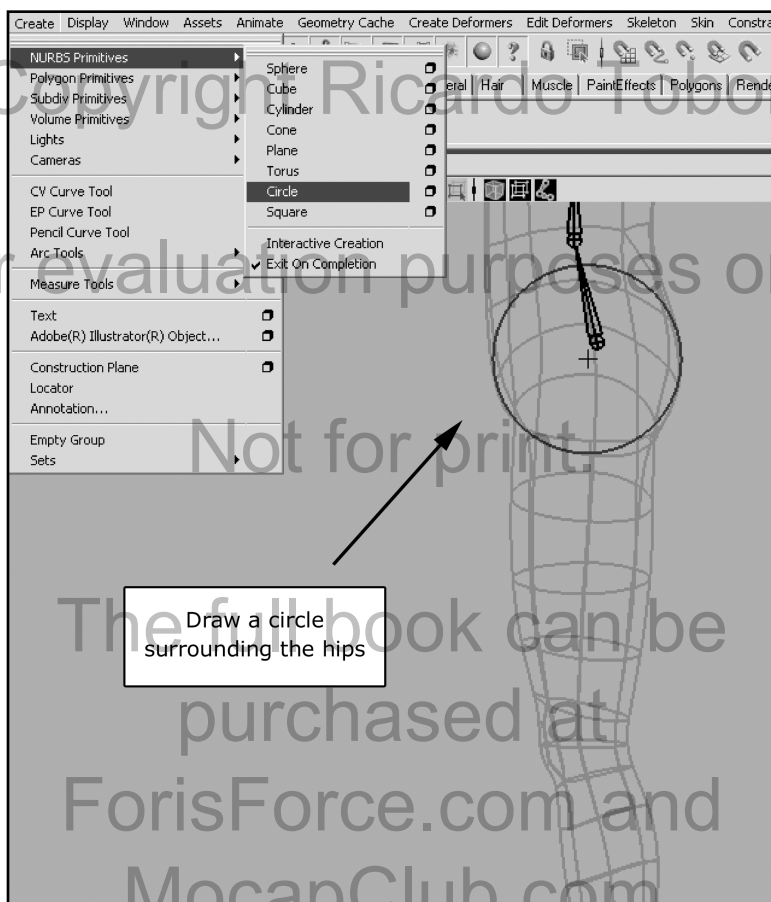


Figure 09\_08.



Draw a linear *EP Curve* from the center of the hip circle, to the knee, to the ankle, to the ball off the foot, to the tip of the toe. This is a similar technique to the one illustrators use to draw their figures (Figure 09\_09). Draw the leg skeletal hierarchy while holding the “C” Key so the bones snap to the guide curve. Rename the bones in the hierarchy “LeftUpLeg”, “LeftLeg”, “LeftFoot”, “LeftToeBase”, “LeftToeEnd”. Mirror the leg to generate the hierarchy on the opposite side (Figure 09\_09).

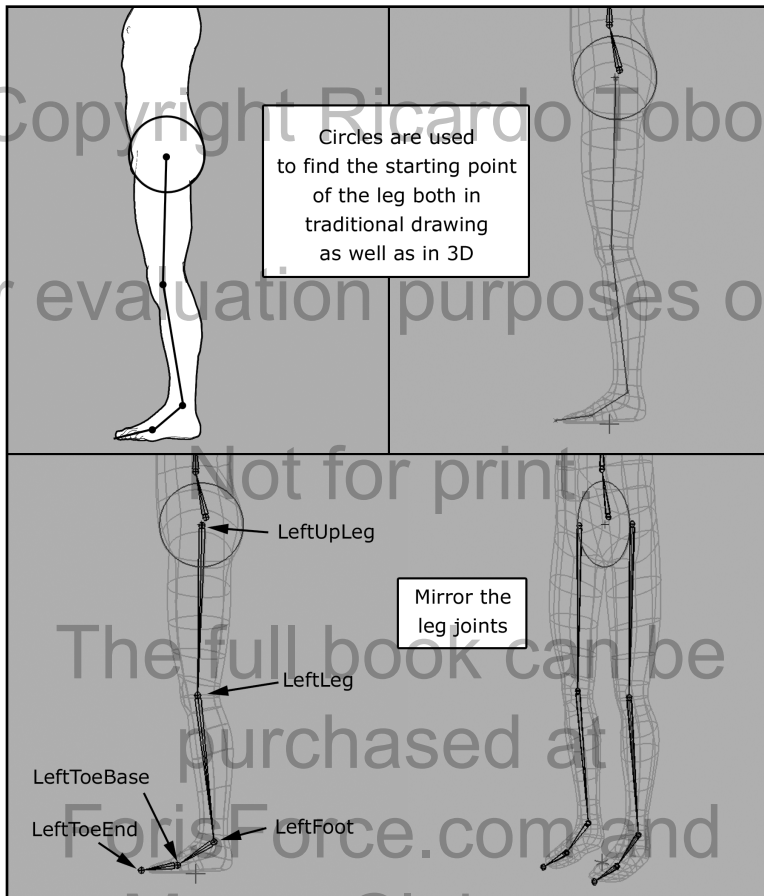


Figure 09\_09.

Lets now take care of the shoulder. We will not need any guides for this hierarchy since it is a simple 2-bone chain. With the *Join Tool* active click a few inches below and to the left of the “Neck” bone. While pressing and holding the “V” key click on top of the “Left Arm” bone (this will snap the position of the end of the shoulder hierarchy to the beginning of the arm chain). Select the end joint of the shoulder skeleton and delete it. Rename the shoulder bone “LeftShoulder”. Mirror the shoulder to generate the opposite shoulder (Figure 09\_10).

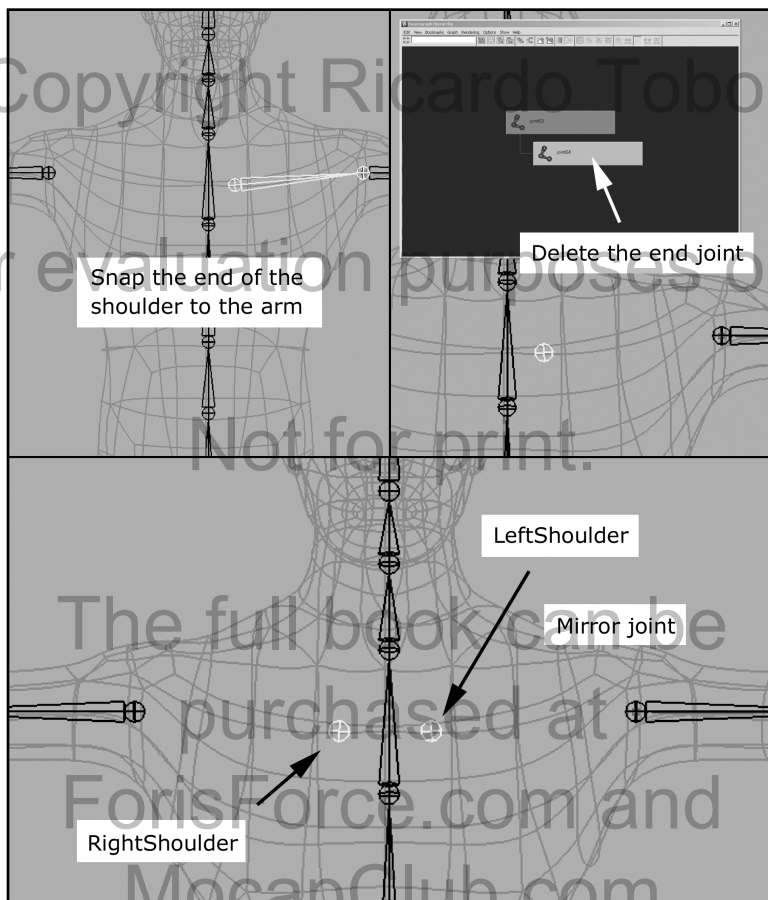


Figure 09\_10.

We are now going to draw the fingers. Go to the top view and draw a linear *EP Curve* running through the index with components at every bending section of the finger. In the perspective view translate the components in the Y-axis so they fit inside the geometry of the finger (Figure 09\_11).

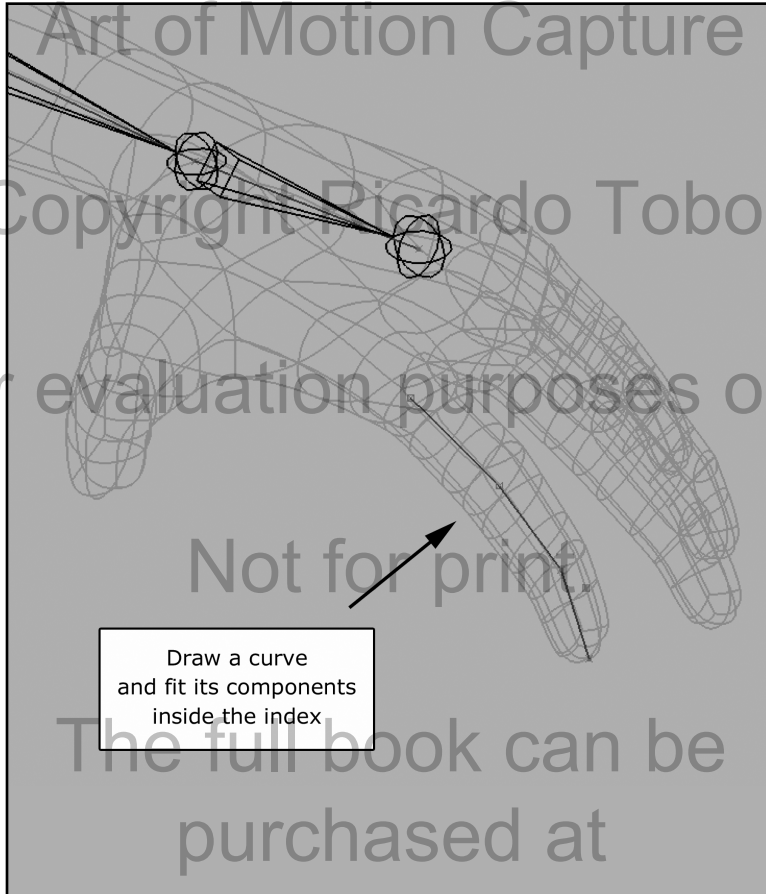


Figure 09\_11.

Draw the index skeletal hierarchy while holding the “C” Key so the bones snap to the guide curve. Rename the bones in the hierarchy “LeftHandIndex1”, “LeftHandIndex2”, “LeftHandIndex3” and “LeftHandIndexEnd”. Mirror the index to generate the hierarchy on the opposite side (Figure 09\_12).

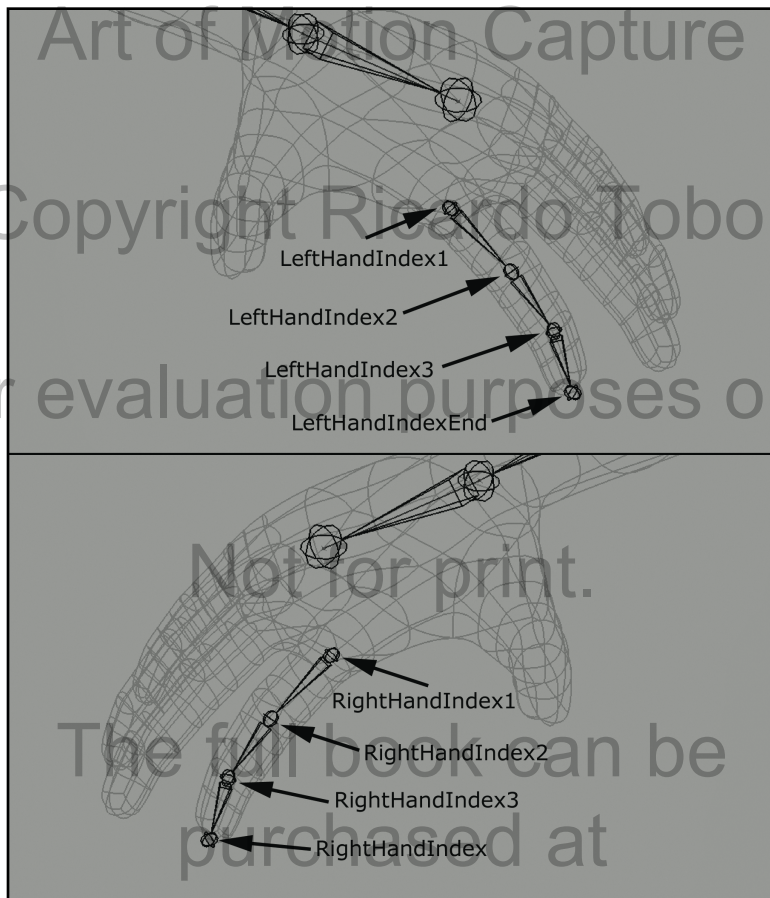


Figure 09\_12.

Repeat the process for the middle finger as well as the ring finger. Rename the hierarchies middle finger hierarchy “LeftHandMiddle1”, “LeftHandMiddle2”, “LeftHandMiddle3” and “LeftHandMiddleEnd”. Rename the ring finger hierarchy “LeftHandRing1”, “LeftHandRing2”, “LeftHandRing3”, “LeftHandRingEnd”. Mirror the middle and ring fingers to generate the hierarchy on the opposite side (Figure 09\_13).



Figure 09\_13.

The pinky is a little different than the fingers that we have drawn so far. From the top view draw a linear *EP Curve* running through the pinky but this time make sure to start it at the palm. Place components at every bending section of the finger. Draw the pinky skeletal hierarchy while holding the “C” Key so the bones snap to the guide curve. Rename the bones in the hierarchy “LeftHandPinkyPalm”, “LeftHandPinky1”, “LeftHandPinky2”, and “LeftHandPinky3”, “LeftHandPinkyEnd”. Mirror the pinky to generate the hierarchy on the opposite side (Figure 09\_14).

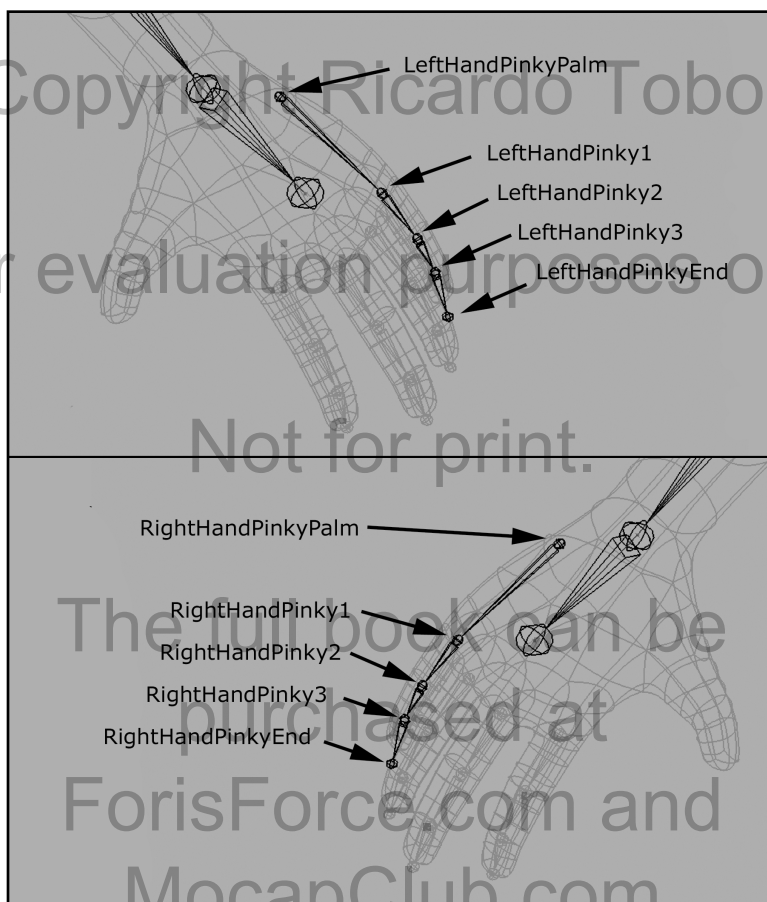


Figure 09\_14.



We now move on to the thumb. This finger like the pinky also has specific needs. The main thing to keep in mind with the thumb is that it does not rotate in the same direction as the others. Draw a linear *EP Curve* running through the thumb making sure to start at the palm. Draw the Thumb skeletal hierarchy while holding the “C” Key so the bones snap to the guide curve. Rename the bones in the hierarchy “LeftHandThumb1”, “LeftHandThumb2”, “LeftHandThumb3”, and “LeftHandThumbEnd” (Figure 09\_15).

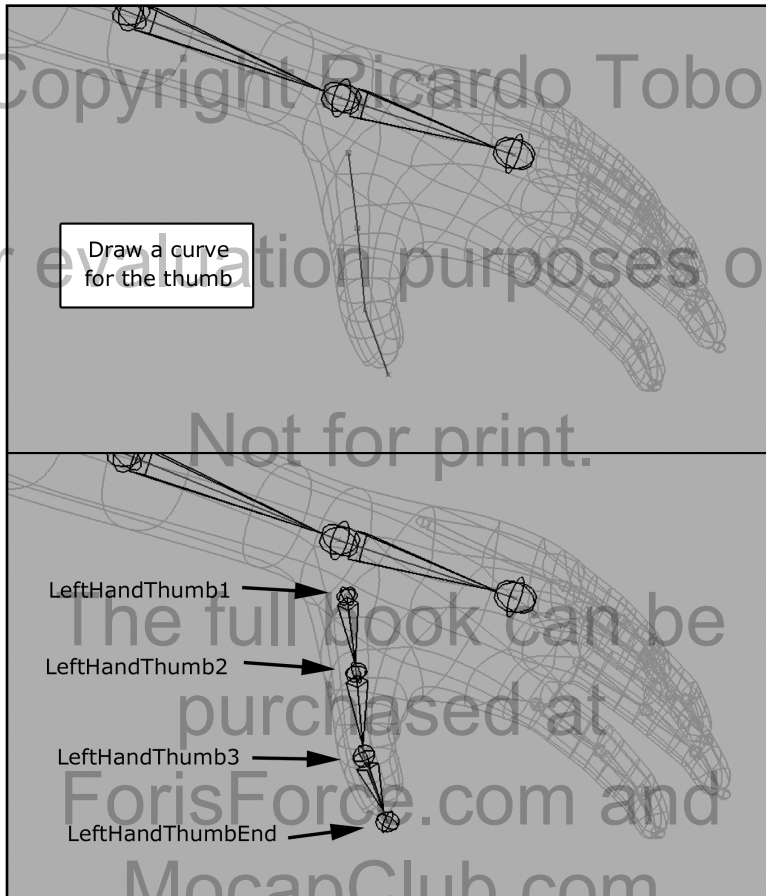


Figure 09\_15.

Although the thumb has been created, its mechanics are not accurate yet. With the “LeftHandThumb1” bone selected press the “F9” key to access component mode. Select the axis of every thumb finger, in the *Command Line* type “rotate -r -os 90 0 0,” and hit the *Enter* key to execute. All the thumb bones should now be properly oriented and the finger should rotate in the proper direction (Figure 09\_16).

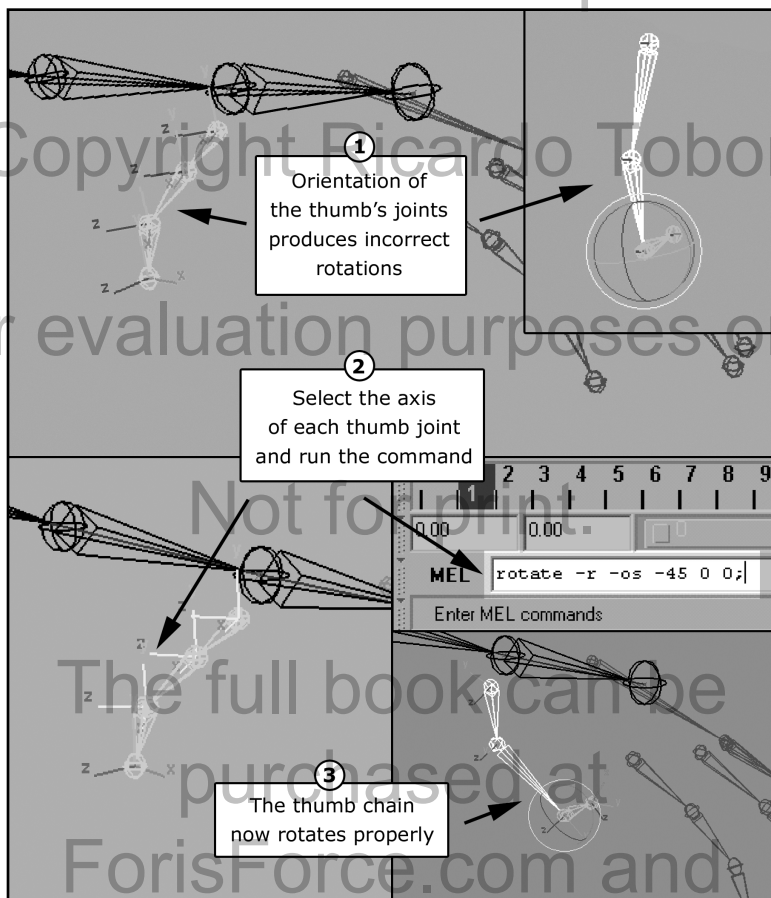


Figure 09\_16.

Now that we are done with the creation of the bones, let's put the hierarchy together. Open the *Hypergraph* by selecting its title from the *Window* menu. Select the "LeftUpLeg" node inside the *Hypergraph* window and middle click and drag it to the "Hips" node. Middle click and drag the "RightUpLeg" to the "Hips", the "LeftShoulder" to "Spine2", the "RightShoulder" to "Spine2", "LeftArm" to "LeftShoulder" and "RightArm" to "RightShoulder". Drag the root of every finger in the left side to the "LeftHand" and every finger root in the right side to the "RightHand". Your hierarchy should look something like figure 09\_17 (Figure 09\_17).

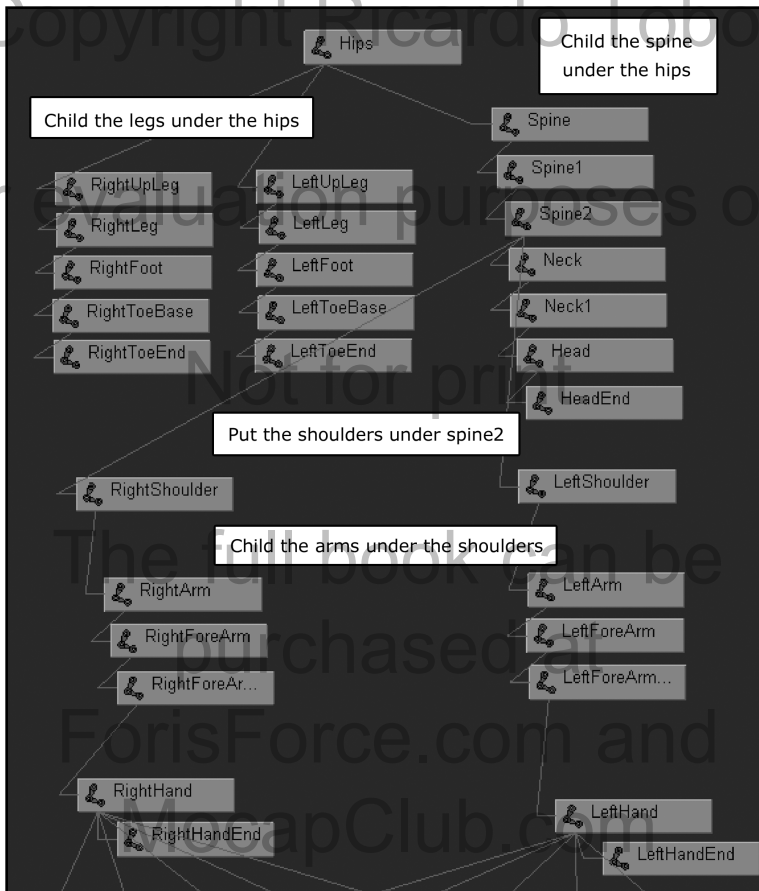


Figure 09\_17.

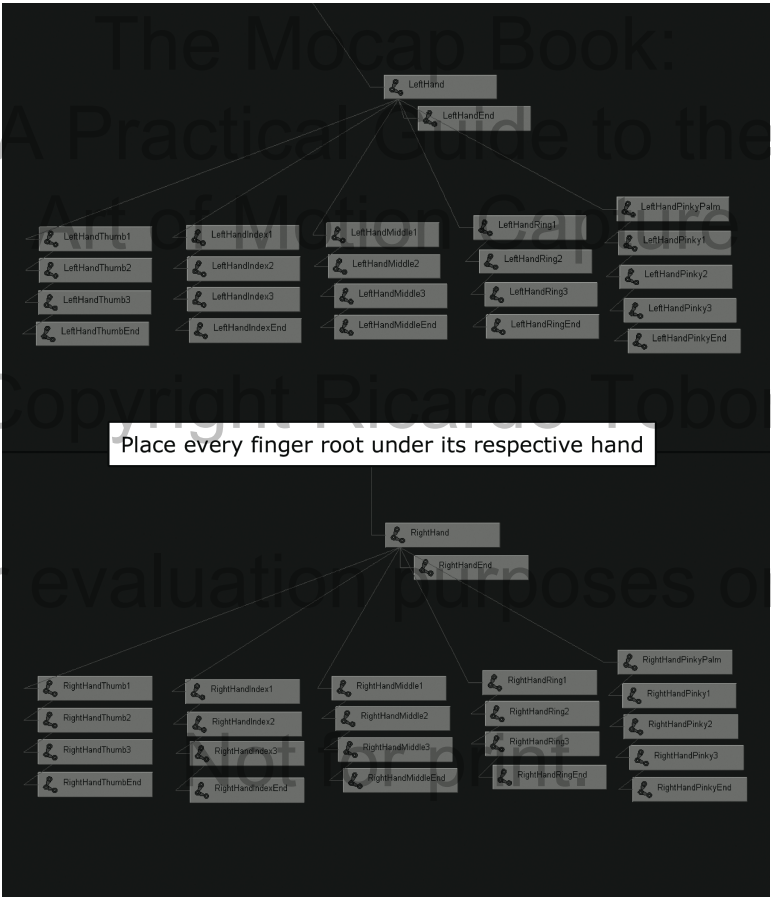


Figure 09\_18. The full book can be purchased at [ForisForce.com](http://ForisForce.com) and [MocapClub.com](http://MocapClub.com)

Hierarchy wise we only need one additional node to serve as reference for the rig so we can scale the entire thing up or down depending on the size of the scene. From the *Create* menu, select a *Locator*. Rename this new node “MocapGuy\_Reference”. Inside the *Hypergraph* middle click and drag it to the “Hips” node to the “MocapGuy\_Reference”. The hierarchy is complete and should look something like Figure 09\_19 (Figure 09\_19).

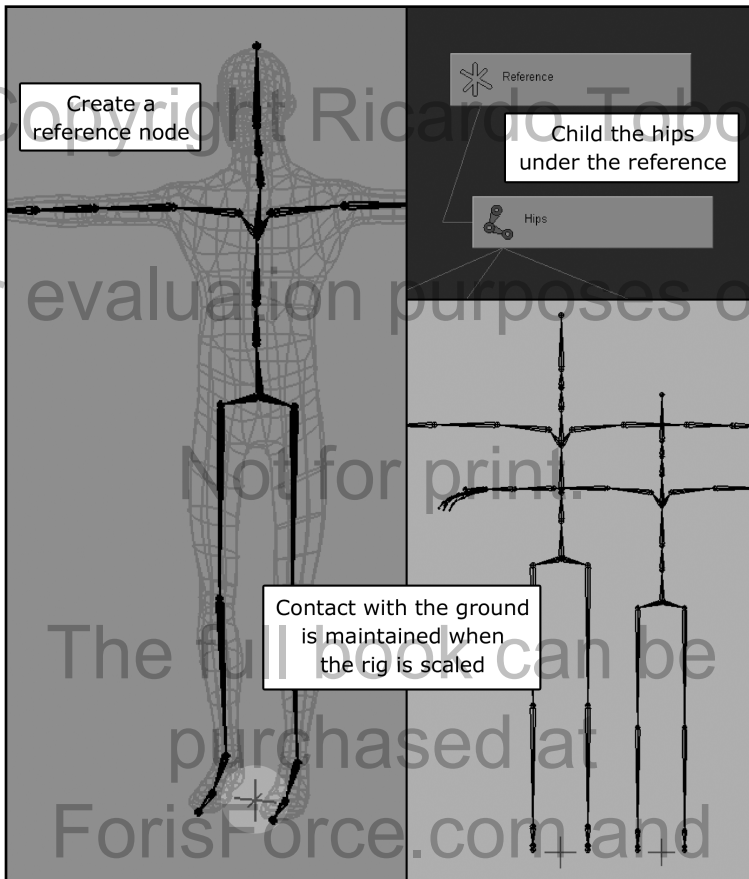


Figure 09\_19.

*Note: by leaving the reference in at feet level, step contact is maintained regardless of scale.*

We will not create any controllers for this rig inside of **Maya** since we are going to be generating all the controllers that we need to deal with motion capture inside **Motion Builder**.

Let's move on then to the skinning of the model to the skeleton. Select the "MocapGuy\_Geo" node and **Shift +** select the "Hips" node. Go to the **Skin** menu and select the **Smooth Bind** option box under the **Bind Skin** submenu. Under the **Bind to** option choose **Joint hierarchy**, on **Bind method** select **Closest in hierarchy**, on **Max influences** select 3, check **Maintain max influences** off and set the **Dropoff rate** to 7 (Figure 09\_20).

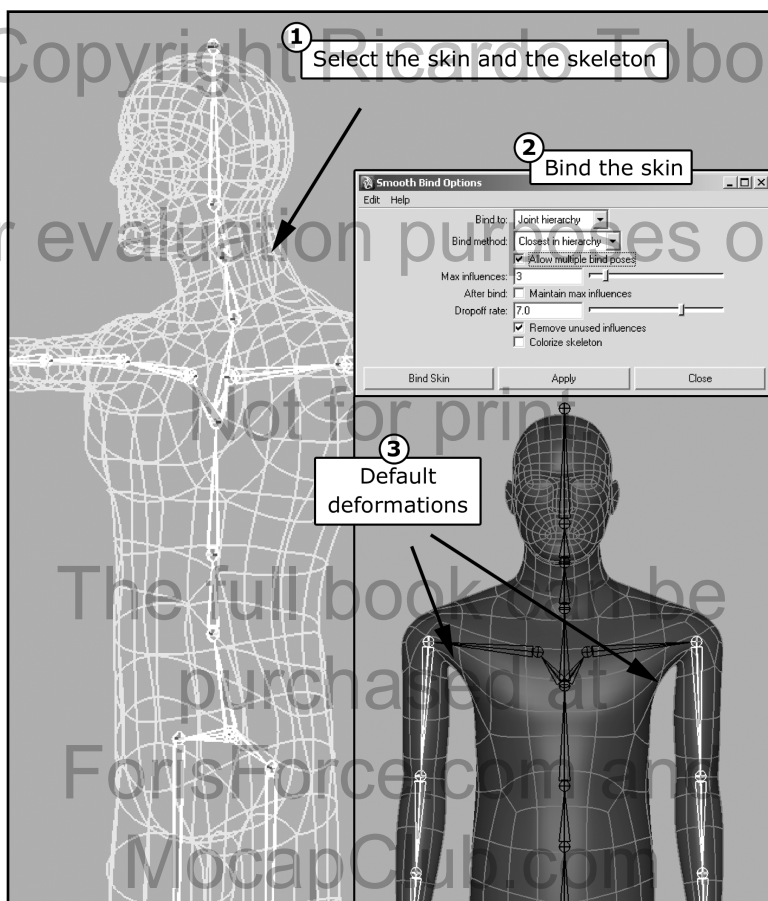


Figure 09\_20.



The next step would be to weight the skin of the model so we get better deformations, however, there is no real different between weighting a mesh to a motion capture rig and weighting a model to a hand animation rig. For this exercise we are going to import some pre-weighted maps so we can continue exploring motion capture. In the *Skin* menu select the *Import Skin Weights Maps* option inside the *Edit Smooth Skin* submenu. Use the pop-up window that appears to navigate to the “MocapGuy\_Weights” folder that you downloaded from “mocapclub.com”.

Select the “MocapGuy\_WeighMaps.weightmap” file and press import. Accept the warning dialog that appears. The skin of MocapGuy should look much better when you rotate the bones (Figure 09\_21).

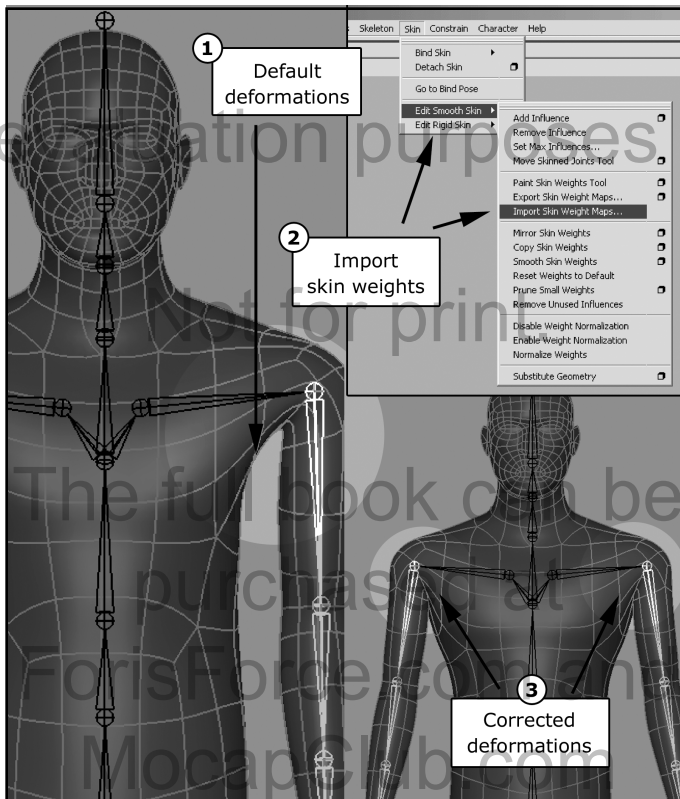


Figure 09\_21.

*Note: For more information on the weighting process refer to the Maya help docs (F1 Key), Chris Maraffi's "Mel Scripting a Rig in Maya" book or the "Hyper-Real" series from Autodesk (formerly Alias).*

The last thing that we need to do is export the rig so it can be opened in **Motion Builder**. Go to the **File** menu and select the **Export All** option. Navigate to the place where you want to save the file. Under the **File name** section type "MocapGuy", select **Fbx** from the **Files of type** option and press the **Export** button. Accept the new **FBX Exporter** window that pops up as the default settings will work for now. Close the **Warnings and Errors** window that appears. The file has been exported as an fbx and can now be opened in **Motion Builder** (Figure 09\_22).

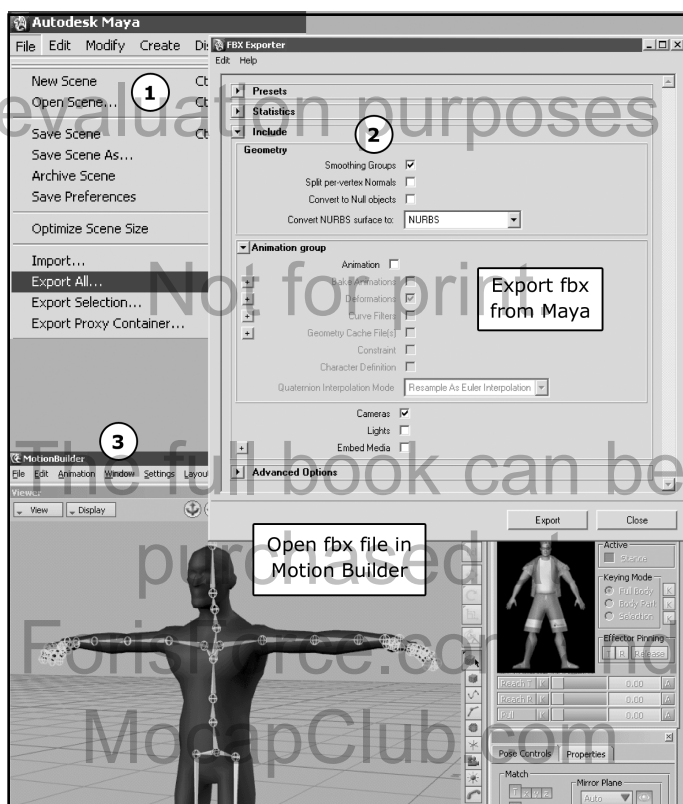


Figure 09\_22.