Tutorial: Rigging Calamity Jane

Now, let's focus on setting up Calamity Jane's skeleton. We'll start with the spine.

1. Activate the Joint Tool under Skeleton > Joint Tool. From the Front view, place the first joint in the pelvis region, about 4.88 units high from the floor plane. Hold the Shift key and place three more joints about 0.3 units apart, up the spine in a straight line.
2. Place the next joint a little above the clavicle beneath the base of the neck.
3. The next joint should go at the top of the neck, about even with the lower lip in the front view.
4. Place the last joint at the top of the head.
5. Now, switch to the Side view. The joints we've just placed for the spine are going up in a straight line, but we want them to curve along the back.
6. Press the Insert key on the keyboard. This activates edit pivot mode. For geometry and most other objects, this will let you reposition an object's pivot point. For joints, however, this will let you move the joint without moving other joints within the chain.
7. Position each of the previously placed joints as shown in Figure 3.8, setting them along the path of the spine.
8. Rename these joints **Pelvis**, **BackWaist**, **BackLow**, **BackMid**, **BackHigh**, **Head**, and **Hat**, in the order they were placed.

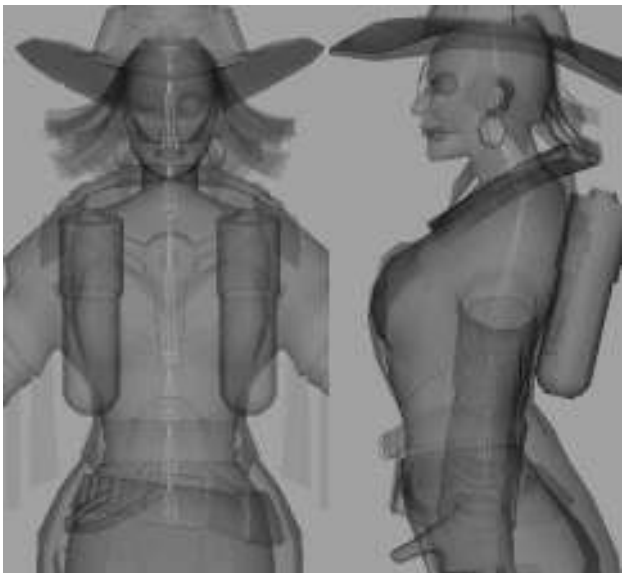


Figure 3.8 The spine joints set along Jane's back

Creating Leg and Feet Joints

We'll continue the skeleton by placing the leg and feet joints.

1. In the Front view, place a joint at the approximate location of the left hip.
2. Place the next joint at the middle knee and a third at the ankle.
3. Switch to the Side view and, much like with the spine, reposition these joints as shown in Figure 3.9, with a slight bend in the knee.
4. Rename these joints **LHip**, **LKnee**, and **LAnkle** in the order they were placed.
5. Select the LHip joint and Shift+click the Pelvis joint. Go to Edit > Parent (or the **p** shortcut key) to parent (or link) the leg joint chain to the spine's hierarchy.

Note: To unparent something, select it, and press P (Shift+p) or go to Edit > Unparent.

6. In the Side view, place three joints in a horizontal line, the first at the base of the heel, the second at the point where the toe starts to bend upward, and the third at the tip of the toe.
7. Rename these **LHeel**, **LBall**, and **LToe,** respectively. Select the LHeel joint and Shift+click the LAnkle joint. Press **p** to parent the foot joint chain to the leg's hierarchy (Figure 3.10).
8. Back in the Front view, you can see the newly placed joints positioned at the origin, between the character's legs. Move these to the right, centering them in the foot.

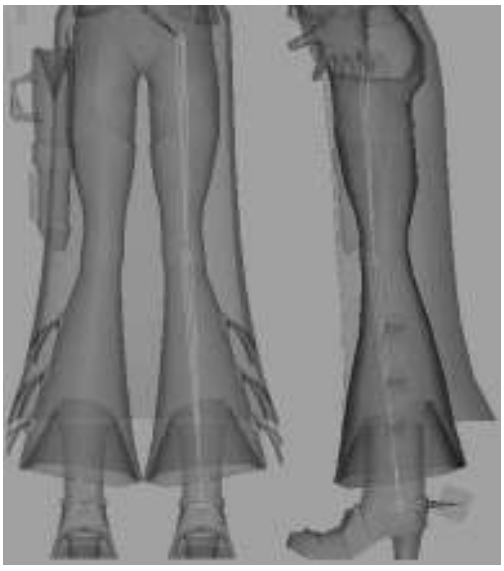


Figure 3.9 The leg joints in place

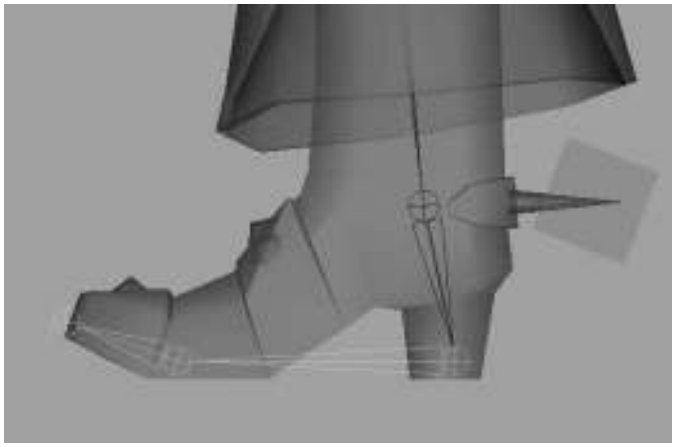


Figure 3.10 The foot joints in place

Set Preferred Angle

Eventually the knee will need to bend, and we want it to bend naturally. The best way to make it do so is to directly tell it what angle we want it to bend. We do this by setting a joint's preferred angle.

1. Select the LKnee joint. Rotate it backward, as if Jane was pulling her leg back.
2. Right-click and hold, which opens the joint's marking menu. Move your cursor up and select the Set Preferred Angle option.
3. Rotate the knee back to its original position.

Setting Up the Arm Skeleton

Next, we'll place the joints for the arms and hands.

1. In the Front view, place a joint at about the left-middle chest.
2. Place a second joint where the arm merges into the coat, the next at the elbow, and one more at the wrist.
3. Rename them **LClavicle**, **LShoulder**, **LElbow**, and **LWrist**, respectively.
4. Parent the LClavicle joint to the BackMid joint to attach it to the skeleton's hierarchy.
5. Go to the Persp view now, and you can see that the arm joints are behind the arm geometry. Move them forward and rotate them to place them within the arm's mesh. Take a look at Figure 3.11 and note the slight bend in the elbow.

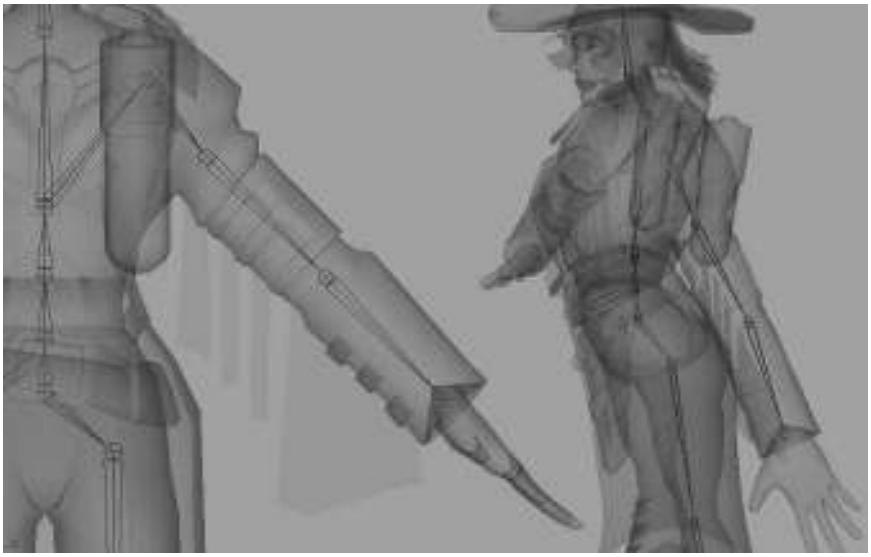


Figure 3.11 The arm joints placed along the arm mesh

Hand Skeleton

For Jane's hands, we'll use full articulation. This method creates an individual three-joint chain for each finger.

1. In the Front view, place four joints along the approximate locations of the three major knuckles and the tip of the finger, as in Figure 3.12. In the Persp view, reposition the joints to run along the middle finger.
2. You didn't read the above wrong. We *are* going to use three-joint chains for the fingers. The reason why the fourth joint is placed is to line up the previous three to run along the finger. The last joint in the chain is generally not aligned like this, so setting one extra joint along the chain aligns the previous one. There are ways of realigning a joint's rotation, but this is a bit of a shortcut. Now that we've placed four joints along the finger, we can select and delete the fourth joint, leaving the aligned three-joint chain behind.
3. Rename the joints **LFinger2A**, **LFinger2B**, and **LFinger2C** in the order they were placed.
4. Duplicate (Ctrl+D) the joint chain and move it to the index finger, repositioning the joints to align with the new finger's knuckles. Rename these **LFinger1A**, **B**, and **C**, respectively.
5. Duplicate the chain two more times, placing them along the ring finger and little finger, aligning the joints with the finger knuckles. Rename the ring finger joints **LFinger3A**, **B**, and **C**. Rename the little finger joints **LFinger4A**, **B**, and **C**.

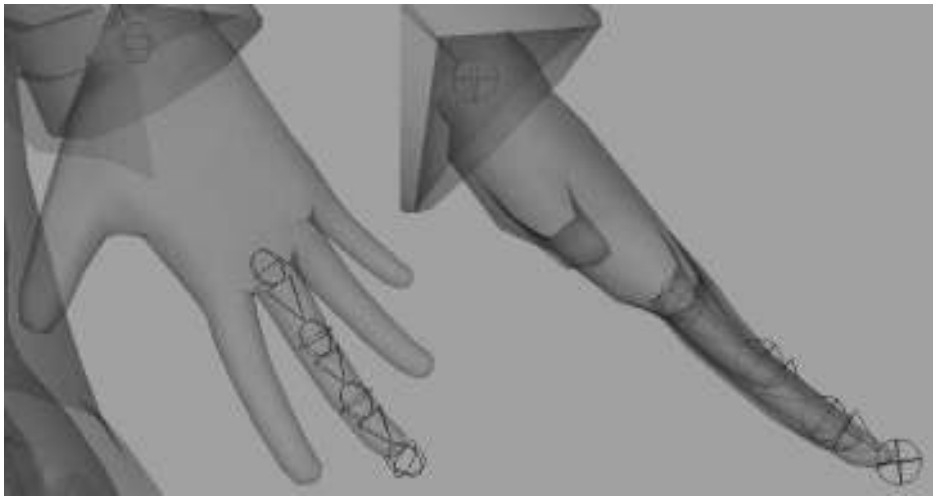


Figure 3.12 A four-joint finger chain in place

6. Duplicate the chain one more time, and position this new joint sequence along the thumb.

Unlike the fingers, the thumb only has two major rotation points—where it connects to the palm and about halfway up the thumb. So, with this in mind, delete the third joint in the chain, as only the two joints are needed.

7. Rename these joints **ThumbA** and **ThumbB**.

8. To connect all these fingers to the hierarchy, select each of the fingers labeled as A: LFinger1A, LFinger2A, LFinger3A, LFinger4A, and LThumbA. Shift+click the LWrist joint and press the p shortcut key, parenting the finger joint chains to the wrist (Figure 3.13).

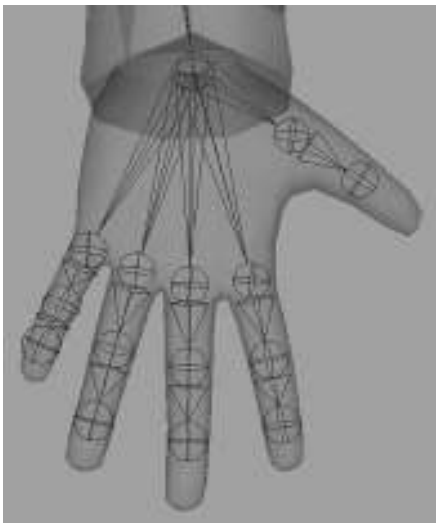
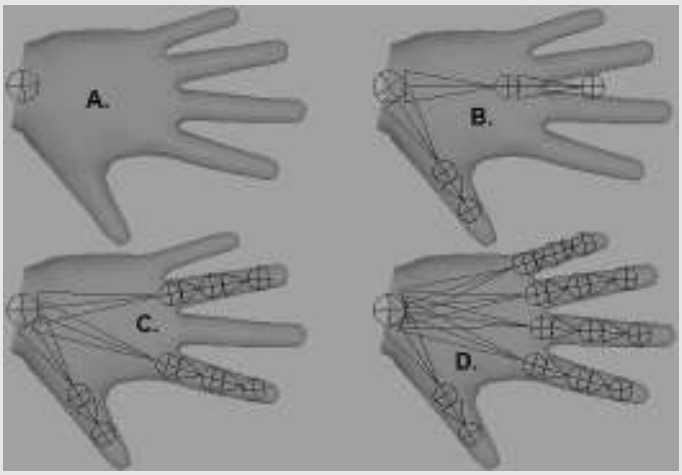


Figure 3.13
The completed hand skeleton

Hand Skeleton Formations

Depending on a game's limitations, a character's hands can be rigged several ways, all giving you different levels of control for different game-play scenarios.



A. No articulation This hand rig is seldom done these days, except in lower-powered 3D handheld games and Real-Time Strategy (RTS) games that have potentially hundreds of characters on the screen at once. This essentially is simply parenting the entire hand to the wrist, with no finger articulation at all. In this case, the hands are generally modeled to resemble a fist, since it isn't quite as strange visually if a character in a game has his hands in fists the entire time.

B. Single chain This hand setup is generally used when a hand's mesh consists of *mits* (or mittens). In this setup there are no individual fingers but a sectional piece of geometry that makes up all four fingers, looking much like a mitten.

C. Trigger finger In a game where the majority of the action takes place with projectile weapons, many times only the trigger finger of the four fingers would be rigged individually, while the remainder make use of a single chain of joints. In such cases, the three fingers might not be modeled individually either, depending on what kind of polycount the game in question gives to its characters.

D. Full articulation And of course, there is full hand articulation! This is what we'll use for Jane.

Local Rotation Axis

We laid out an extra joint for the fingers to align the rotation of the last joint we wanted to keep on the chain. We didn't do that for the arms, however, so the wrist

joint is *not* currently aligned with the rest of the chain. Select the LElbow joint, for example. Notice that the rotation handles are aligned with the path of the arm joints, letting you rotate the elbow naturally.

Now, select the wrist joint. Do you see the difference? The wrist joint's rotation handles aren't aligned with the wrist's angle, so rotating it is unnatural and can be confusing to animate. Let's change the joint's local rotation axis to align with the arm for easier animation.

1. Select the LWrist joint. Press the F8 key to enter component mode, or press the Select by Component Type button in the status line of the interface. The skeleton will turn blue, indicating the switch to component mode.
2. To the right of the Select by Component Type button in the status line are the component selection masks. These determine what kind of components you are able to manipulate based on which are enabled. To select and manipulate the local rotation axis of an object, you'll need to enable the Select by Component Type: Miscellaneous mask, indicated by the question mark icon. Disable any other active masks.
3. You'll notice that the LWrist joint as well as each of the attached finger joints have a small translation axis at their positions. This small axis indicates the orientation of a joint's local rotation axis. Select the axis located on the LWrist, and rotate it to be aligned with the arm's orientation, as the finger joints are (Figure 3.14).

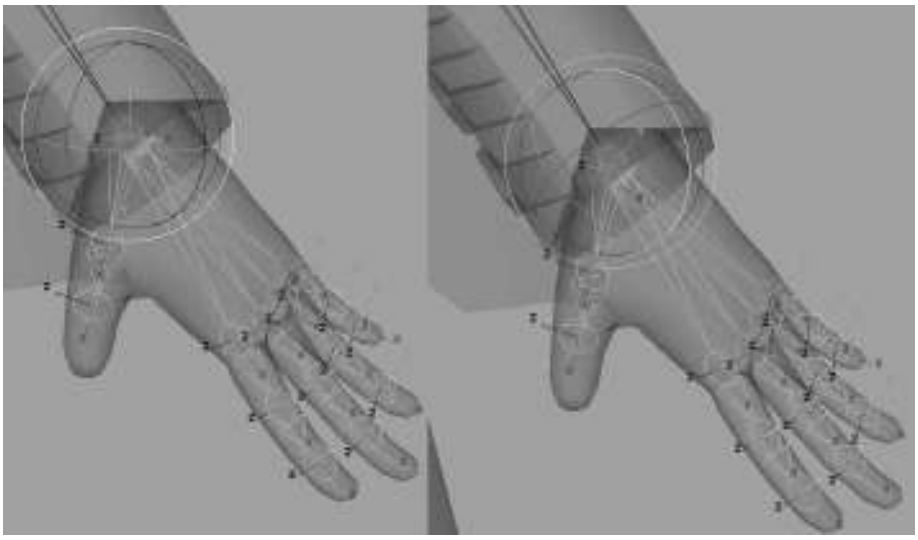


Figure 3.14 The LWrist joint's modified local rotation axis

Mirroring Joints

Now that we have the basic skeleton for the spine, left arm, and left leg complete, we can mirror the joint chains for the arm and leg on the right side.

1. Select the LClavicle joint. Go to Skeleton > Mirror Joint > Options. In the options, set the following:
   - Mirror Across: YZ
   - Search For: L
   - Replace With: R

   The Mirror Across option tells the selected joint chain to mirror across the YZ axis, from the positive X to the negative X.

   The Search For and Replace With options rename the mirrored joints, changing the L to an R.
2. Repeat the process with the LHip joint.

You should end up with a completed basic skeleton, with the right arm and leg in place and renamed with an R prefix.

Creating Specialized Joints

Calamity Jane is composed of a number of different unique components not found on a generic character: the fringe hanging from the arms of the coat, the tassels on the lower legs, the holster, not to mention the coat itself. We'll have to accommodate these things in the rigging of the character if we want to animate them accurately, especially for secondary animation as described in Chapter 2.

Let's start with the fringes under the arms. They need at least two bones: one for the fringe under the upper arm, another for the fringe under the forearm.

1. In the Front view, use the Joint Tool (Skeleton > Joint Tool) and place a joint at about the center of the leather fringe under the character's left upper arm. Press Enter.
2. Place another joint under the left lower arm, again at the center of the fringe. Press Enter.
3. Make sure they are positioned accurately in the Persp view. The ideal place for them would be at the point where their geometry is divided.
4. Rename these joints **LLeather1** and **LLeather2**, respectively. Parent the LLeather1 joint to the LShoulder joint. Parent the LLeather2 joint to the LElbow joint (Figure 3.15).
5. You can repeat these steps with the right arm's fringe, or you can delete the right arm and remirror the left arm across with these new joints added to the chain. Either way, make sure you rename them with an R prefix rather than the L.