Rigging: Building the Reverse Foot Roll

By Epona Schweer, 2009

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What the heck is a Reverse Foot Roll?

The reverse foot roll setup lets you build into your rig the ability to roll your character/creatures foot forward (imagine standing on your toes) or bend from the ball of your foot (preparing to step, waggling toes, etc). This is achieved by creating a joint chain for the foot that follows the REVERSE direction to your original skeleton chain. Hence Reverse Foot Roll.

Before you Start: You need bones and an IK!

Before you can create a joint chain with the reverse direction to your original skeleton, you need an original skeleton! So go create one!! You need at least three bones in your foot to do this – ankle, ball and toe.

You also need to have added an IK (RP Solver) between the Hip and the Ankle.

Step 1: Create your Reverse Roll Joints

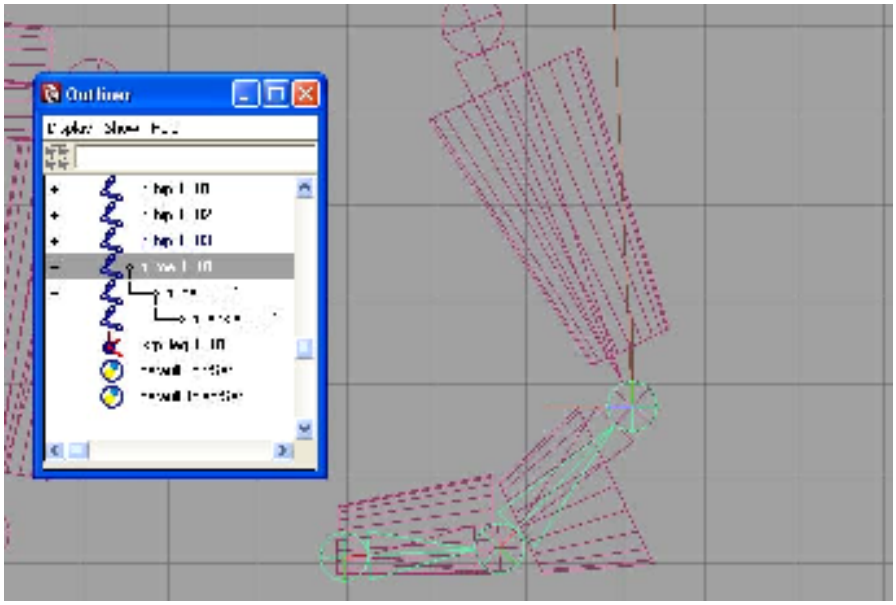
Your aim is to create three new joins for the toe, ball and ankle that are SEPARATE from your original skeleton, directly ON TOP of those original joints, and in the REVERSE direction.

a) Using your Joint Tool, start by placing a joint immediately on top of the original toe, then the ball, then the ankle. Hit Enter to finish.

b) You should now have a joint chain of three joints going UP where your original skeleton goes down. Use the Joint Orient tool to make sure the orients of your new joints match the orients of your original joints (ex: Joint Orient with orientation set to XZY and second axis world rotation set to –x)

c) Make sure that each joint is EXACTLY on top of the original joints by selecting each, hitting the Move Tool, hitting Insert on your keyboard and holding down V to snap on top of the original joint. Hit insert again to finish. (You may need to turn polygon selection off so you don't accidently snap to polygonal verts).

d) Rename the new joints with the prefix "rr" for Reverse Roll, ending with the same identifier as the joint it's sitting on top of (ex: rr_ankle_L_01)



Step 2: Constrain the Original Joints to

the new Reverse Roll Joints

a) Start by Parent Constraining your leg's IK Handle to the Reverse Roll ankle joint (ex: select the rr_ankle_L_01, shift select the IK Handle and add a Parent Constrain. Make sure you have maintain offset turned ON)

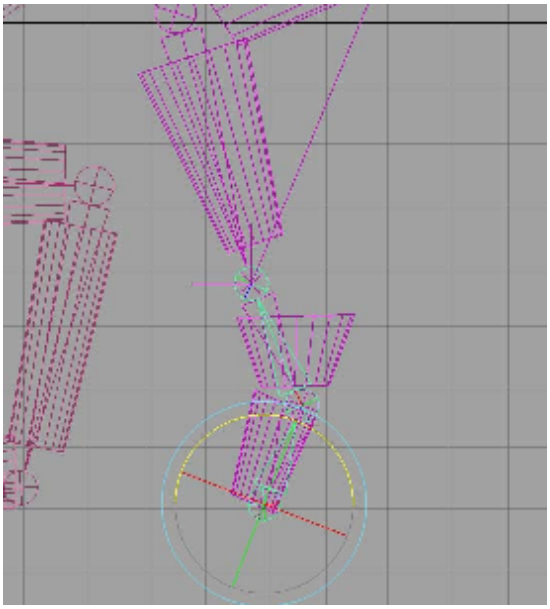
b) Orient Constrain the original ankle joint to your Reverse Roll ball joint (ex: select the rr_ball_L_01, shift select the jt_ankle_L_01 and add an Orient Constrain. Make sure you have maintain offset turned ON)

c) Orient Constrain the original ball joint to your Reverse Roll toe joint (ex: select the rr_toe_L_01, shift select the jt_ball_L_01 and add an Orient Constrain. Make sure you have maintain offset turned ON)

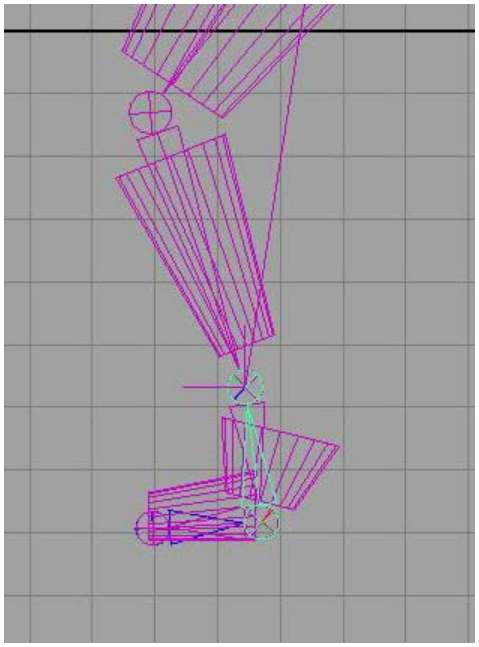
NOTE: You may need to work in the Outliner to do all of the above if you're finding it difficult to select joints in the viewport.

d) Text your connections by rotation the Reverse Roll Toe and the Reverse Roll Ball. Your movements should look similar to these:

TOE



BALL

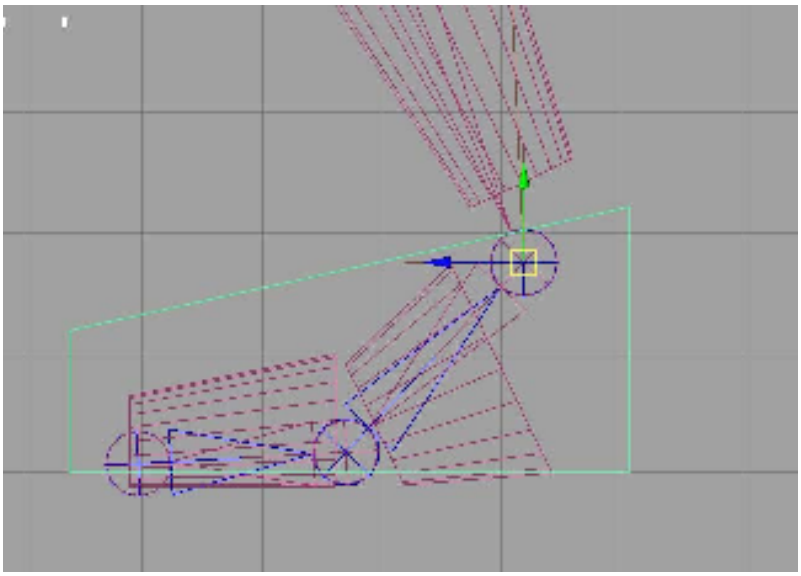


e) Undo those rotations and return to a default position so we can set up and connect the Reverse Roll Control Curves

Step 3: Setup and Connect Reverse Roll Controllers

a) Create control curves for your feet. They can be any shape, size or colour, but the two MUST HAVES are 1) the pivot MUST BE snapped to the ankle and 2) you should see part of the control sitting flat on the ground

b) Rename your Control Curves and Freeze Transformations (ex: ctrl_foot_L_01)



c) Start by selecting the root of your Reverse Roll joint chain (ex: rr_ball_L_01) and parent it to the Controller by hitting “p” on your keyboard.

d) Select your Controller and add three new attributes – toe twist, toe roll and ball roll (ex: select the controller and click Modify > Add Attributes. Enter **toe twist** for the name and leave the rest as default. Repeat this for **toe roll** and **ball roll**. You can always go to Modify>Edit Attributes and adjust each attributes minimum and maximum later). When you’re done you should be able to select your Foot Control and see the three new attributes in your channel box.

e) Open up your Connection Editor (Window > General Editors > Connection Editor) and make sure Show Non-Keyable is OFF in the Left Display and Right Display.

- Select your Foot Control and load it into the Left Display
- Select your Reverse Roll Toe and load it into the Right Display
- In the Left Display, click on Toe Twist and connect it to the rotate axis in the Right Display that will control the twist rotations by clicking on that rotate attribute (in my case that’s Rotate Y)
- In the Left Display, click on Toe Roll and connect it to the rotate axis in the Right Display that will control the toe’s ability to roll forward by clicking on that rotate attribute (in my case that’s Rotate Z)
- Select your Reverse Ball Toe and load it into the Right Display
- In the Left Display, click on Ball Roll and connect it to the rotate axis in the Right Display that will control the ball’s ability to roll forward by clicking on that rotate attribute (in my case that’s Rotate Z)

d) Test that your connections work by selecting the Foot Control and either adding values to the Toe Twist, Toe Roll and Ball Roll attributes

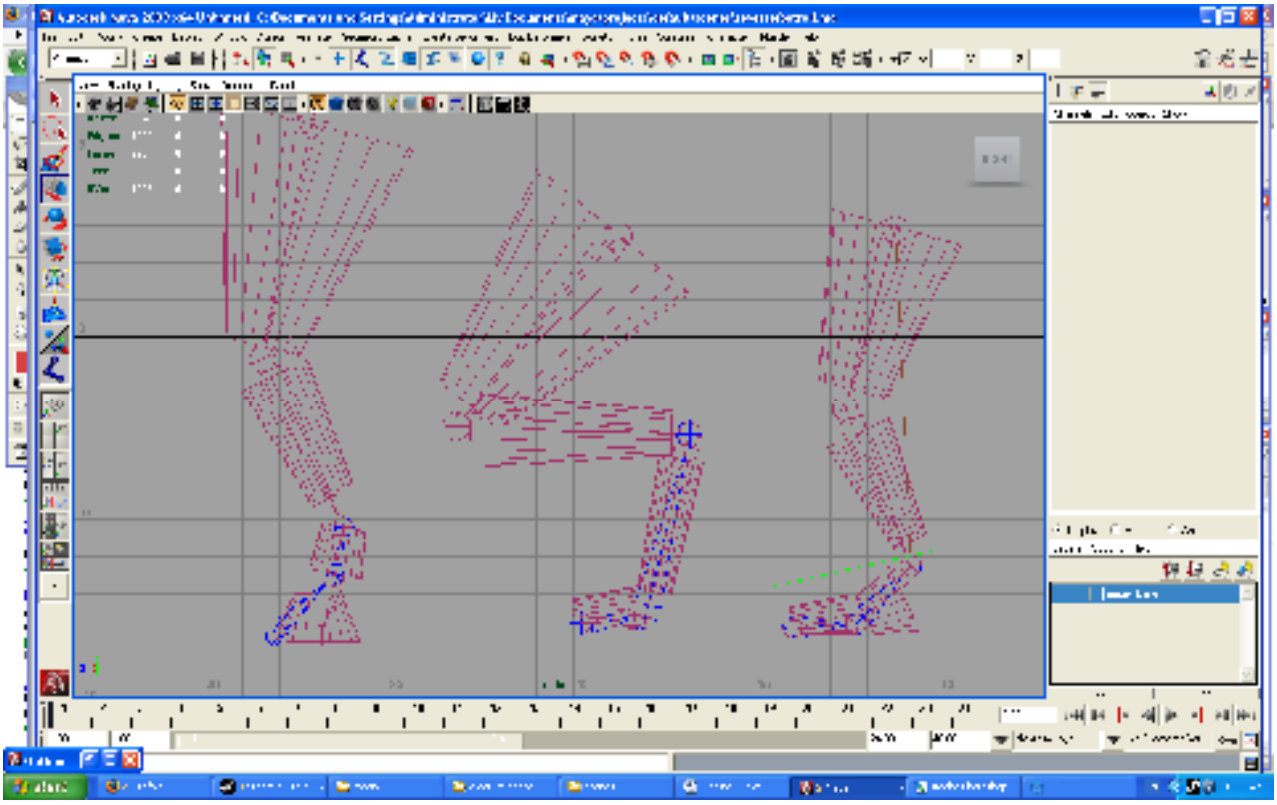
That’s it!! Have fun 8)

Taking it to a new level: Different types of feet and extra joints!!

What kind of creatures can I use this on?

You should be able to use this same Reverse Foot Roll theory for any time of creature so long as you have (AT MINIMUM) three joints to work with, the toe the ball and the ankle.

If you're working with a hoofed creature, then you may need to move the pivot of the Reverse Roll toe joint forward to the front edge of the hoof. See my picture below.



How Many Joints can I have in my foot?

Technically you can have as many joints as you want so long as you always Parent Constrain the IK Handle of your Leg to the Reverse Roll ankle joint, and you Orient Constrain the original foot joint to the joint right below it in the Reverse Roll joint chain. For example, I would:

Parent Constrain the leg IK Handle to rr_ankle_L_01
Orient Constrain the original ankle joint to the rr_ball_L_01
Orient Constrain the original ball joint to the rr_toe1_L_01
Orient Constrain the original toe1 joint to the rr_toe2_L_01
Orient Constrain the original toe2 joint to the rr_toe3_L_01
Etc etc

Remember to add an additional attribute to your Foot Control for each additional roll (ex: Toe Roll 1, Toe Roll 2, Toe Roll 3, Standing on Tippie Toes, etc OR Roll Forward Full, Roll Forward Partial and Standing on Tippie Toes)