

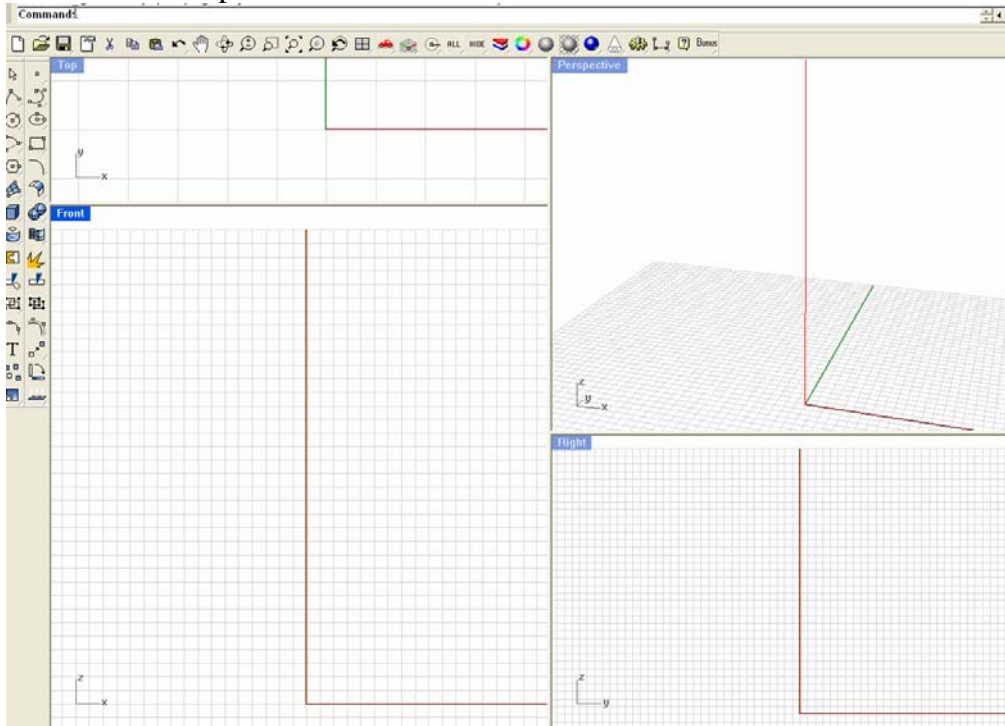
# Nutcracker directions

1. Set up the drawing so that the viewports appear like the example.

From the **Tools** menu, select **Options**, then select **Grid**.

Set the grid extents to 350 Set the minor grid lines to every 10 mm

Zoom the **Front** viewport to show the positive Y grid extents and adjust the viewport sizes to match the example.



2. In the **Front** Viewport draw a single vertical line 350 mm long starting at 0,0.

3. Place a background bitmap in the front view. Align it to the 350 mm line following these directions.

To place the bitmap

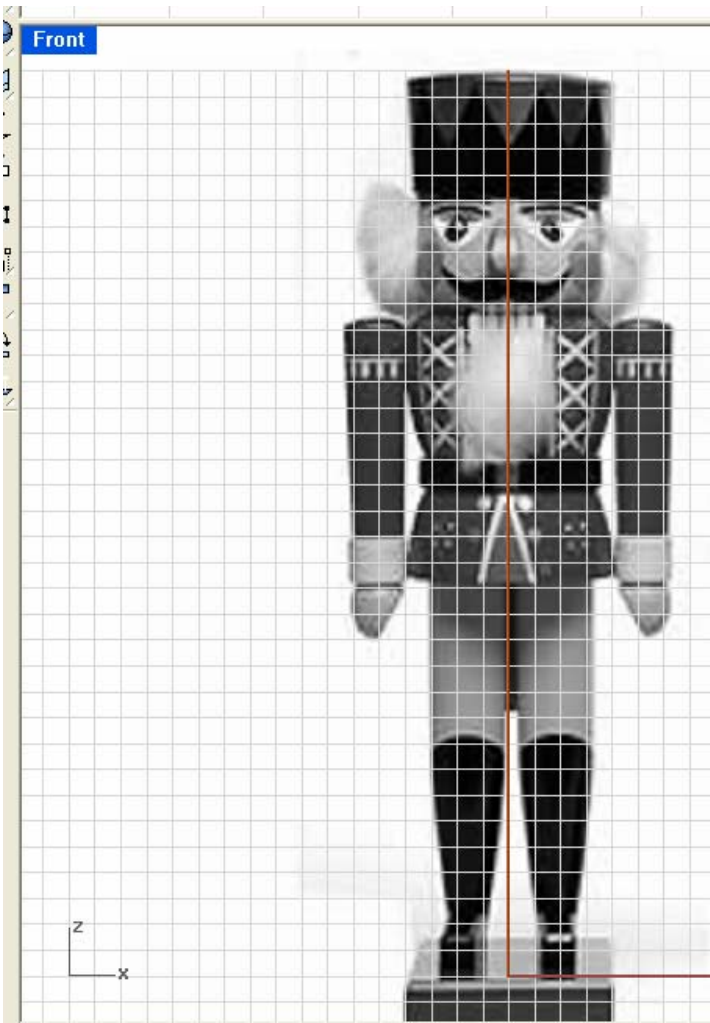
View menu: Background Bitmap > Place

- 1 In the Open Bitmap dialog box, select a bitmap file.  
Select the Nutcracker\_King\_RLG.bmp in the Nutcracker folder Click Open.
- 2 At the First corner prompt, click to place the first corner of the bitmap.  
Click approximately at -150,-30; to the left and below the vertical line
- 3 At the Second corner or length prompt, click to place the diagonal corner of the bitmap.  
Click at 140,350; at the top of the grid, and to the right of the vertical line.

To align a background bitmap

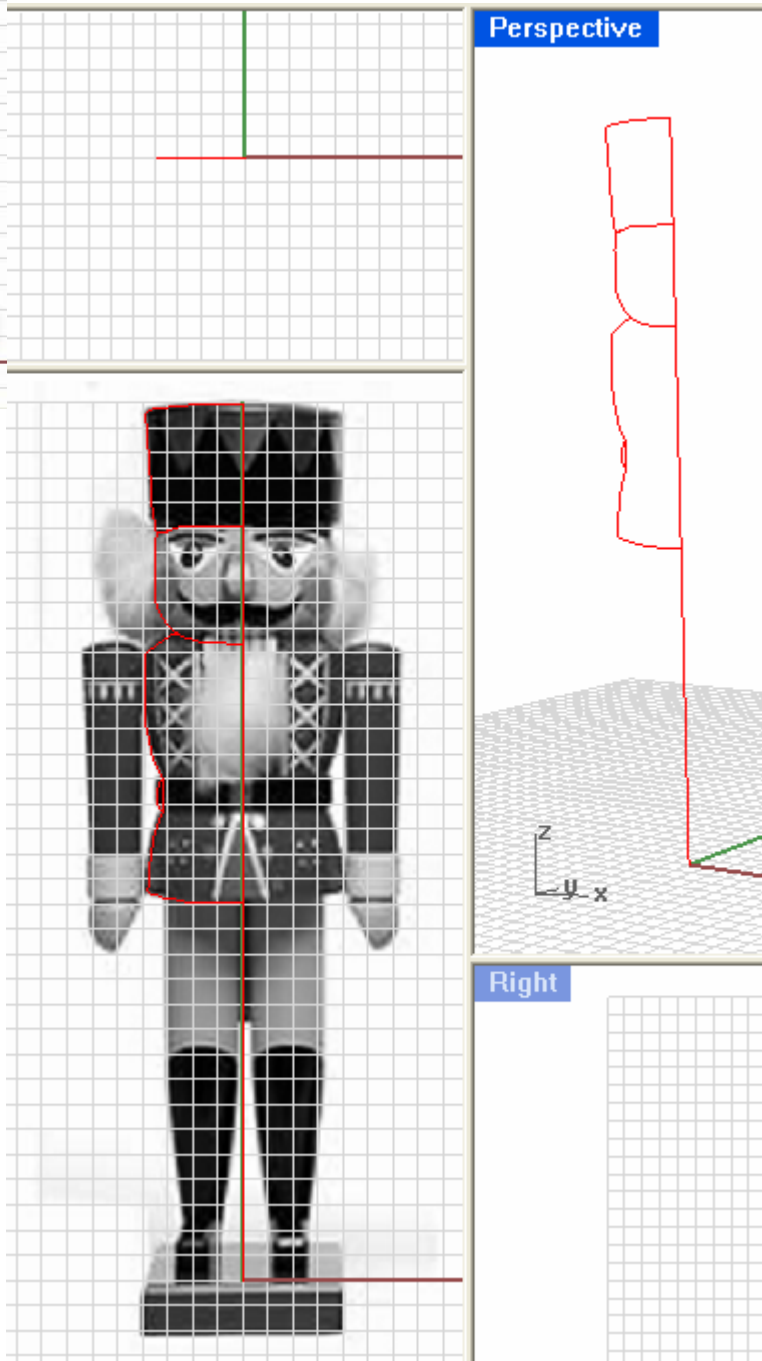
View menu: Background Bitmap > Align

- 1 At the Base point on bitmap prompt, pick a point in the center at the bottom of the nutcracker's feet
- 2 Turn Ortho on. At the Reference point on bitmap prompt, pick a point at the top center of the nutcracker's hat
- 3 At the Base point on CPlane prompt, pick the bottom end of the line you drew using the endpoint osnap.
- 4 At the Reference point on CPlane prompt, pick the top end of your line (endpoint osnap)



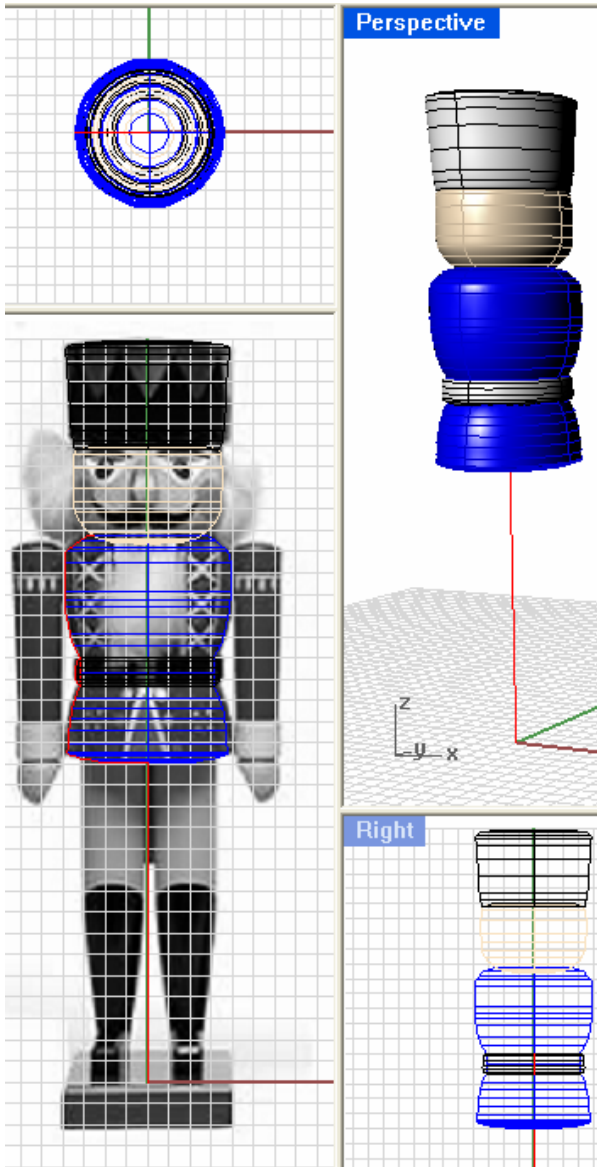
The bitmap is scaled so that the nutcracker is 350 mm tall from hat to foot. You may have to repeat the Background Bitmap Align step once or twice more to get the image centered over the line as close as possible. As in this example, the picture is not quite straight on, so not every element will be centered.

Save your Nutcracker file!



Use a control point curve to trace the outline of each part of the nutcracker. Only trace 1 side of each part, it's symmetrical. Make the curve end on the vertical line (use the near osnap).

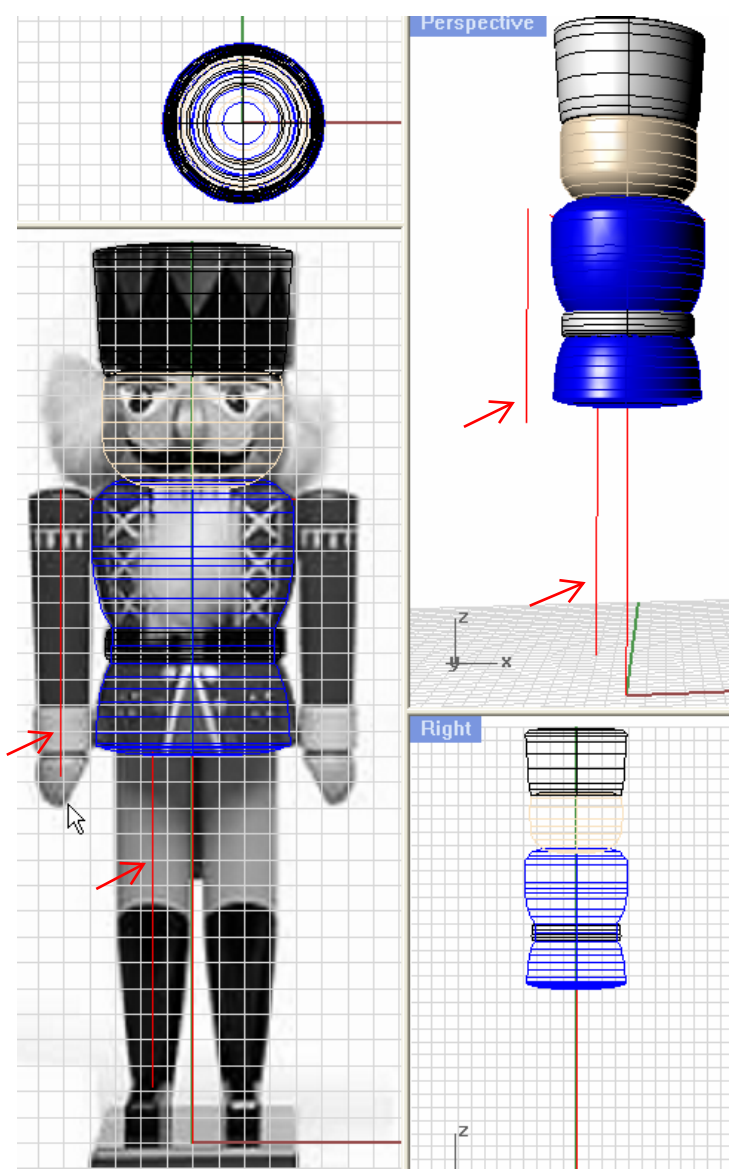
Save your Nutcracker file!

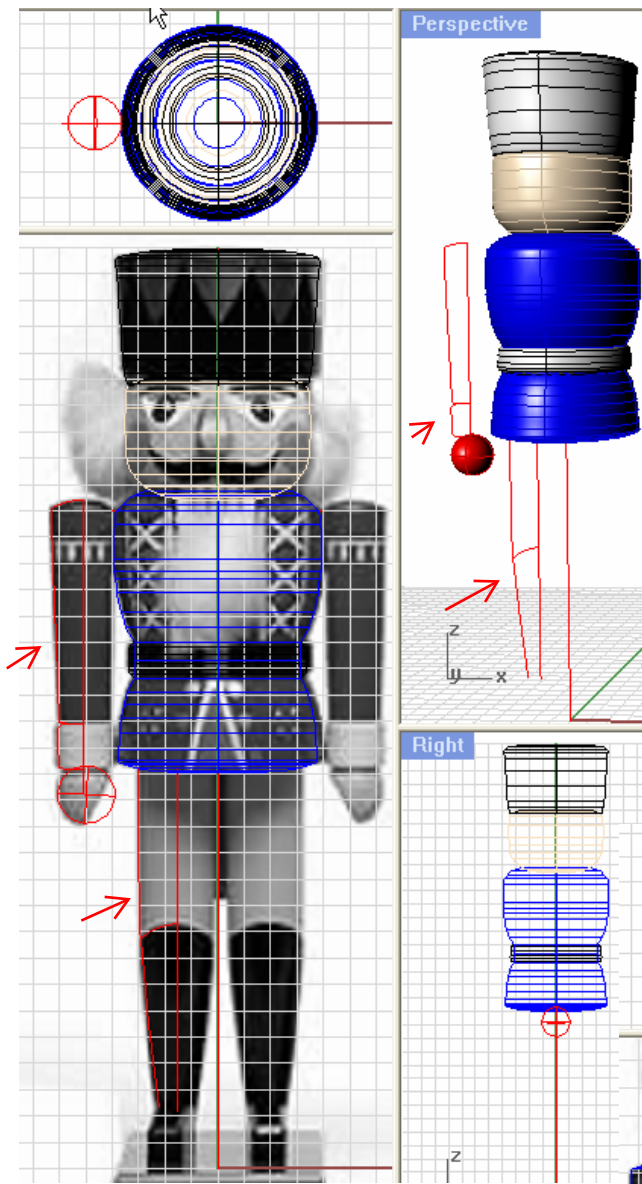


Revolve each profile curve to make 3d surfaces. Create and use a different layer for each part: Hat, Head, Tunic, Arms, Hands, Belt, Pants, Boots.

Save your Nutcracker file!

Draw two new centerlines, one for the arm and one for the leg.





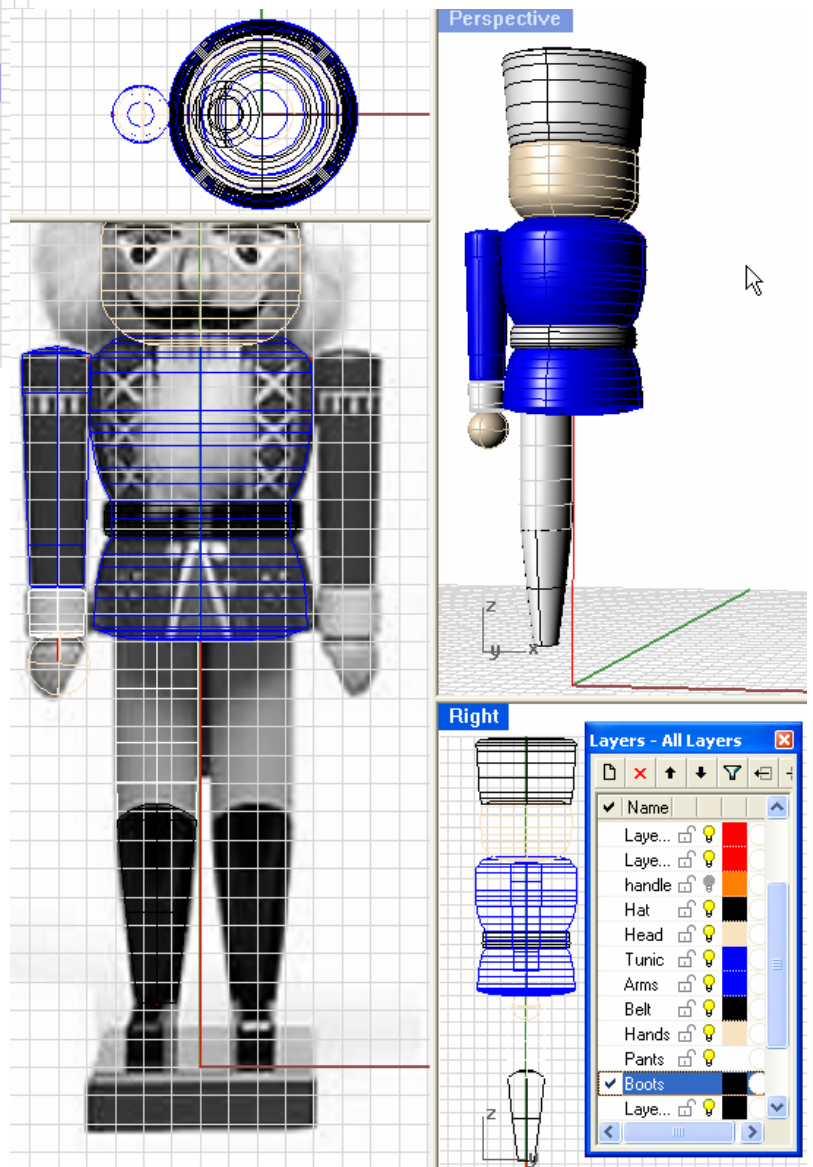
Draw control point curves for the profile of the arm, cuff, leg, and upper boot. Do not include the shoe portion of the lower boot unless you want a circular foot.

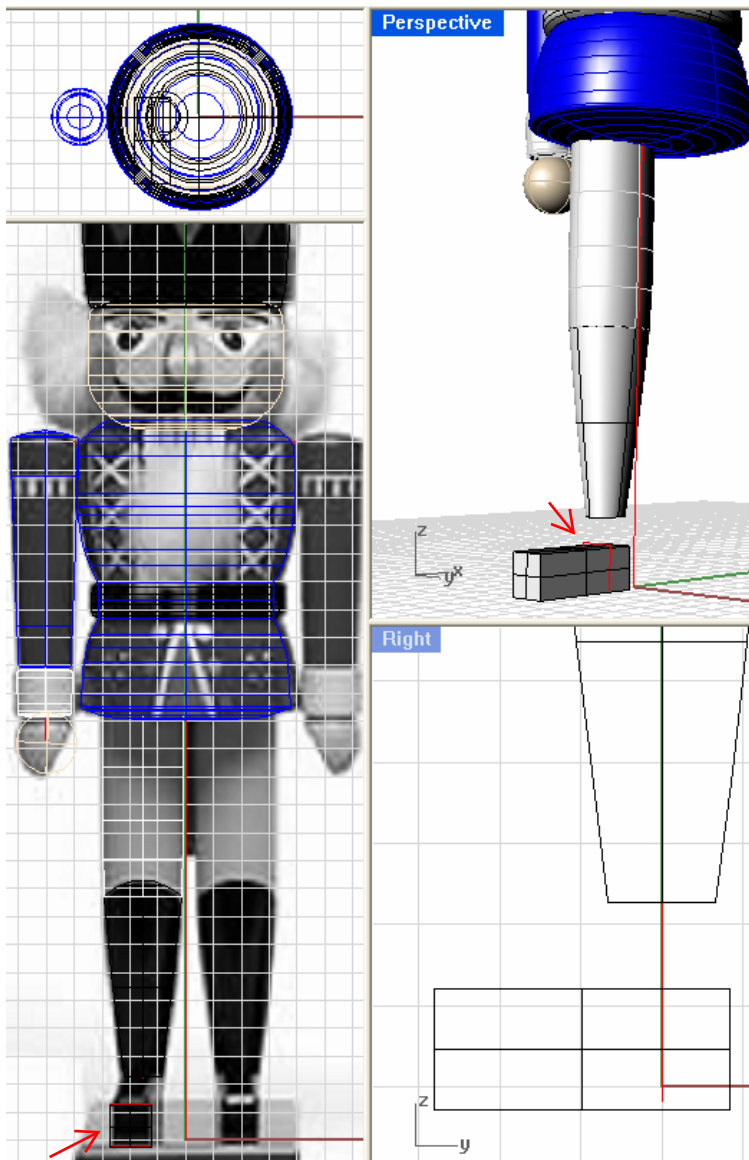
Draw a solid sphere for the hand.

Save your Nutcracker file!

Revolve each part of the arm and leg using a different layer for each distinct part. This will make for easier rendering later.

Save your Nutcracker file!

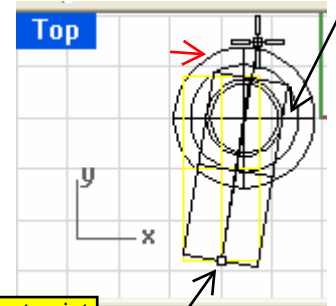




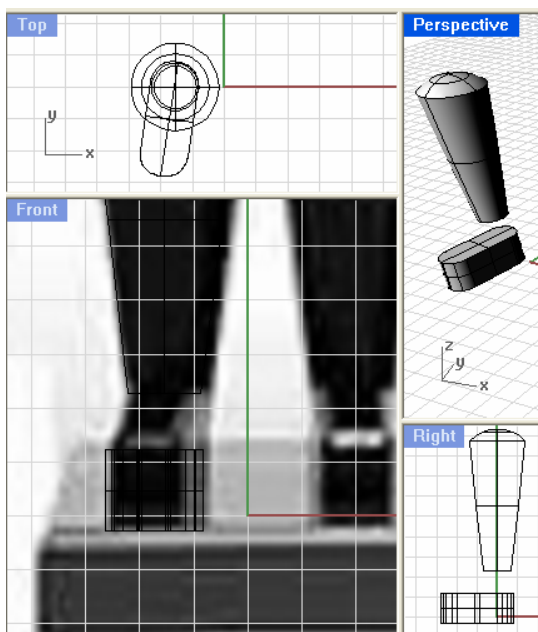
Draw a rectangle around the toe area of the left boot. From the solid menu use Extrude Planar Curve > Straight. Then adjust the position of the block until it is lined up with the back of the pant leg and the “ankle” will be in the right place.

It is helpful to turn off all the layers except the boot, so you can see the alignment in the top view as well.

Line up edge of box with smallest circles at bottom of the leg



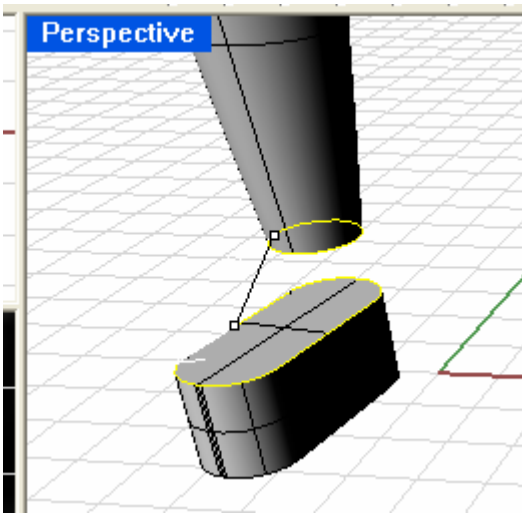
In the Top viewport, rotate the block so the back edge is centered under the leg.



Analyze the length of the front edge of the block to determine its width. Divide that measurement in half, and round down to determine the radius of the fillet.

Use Fillet Edge from the Solid menu to round off each corner.

Save your Nutcracker file!



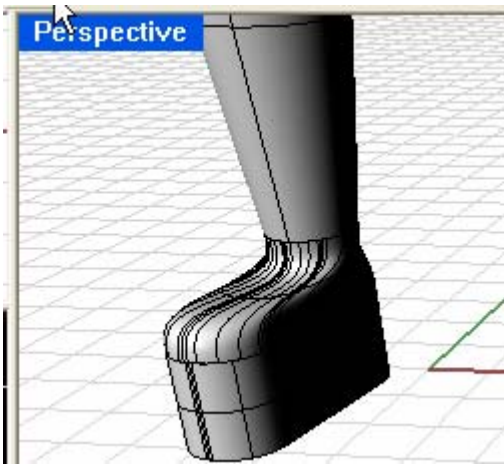
Use the Surface > Blend Surface command to create the rest of the boot.

Pick the bottom edge of the leg for the first edge.

Pick the 8 edges around the top of the “shoe” for the second set of edges.

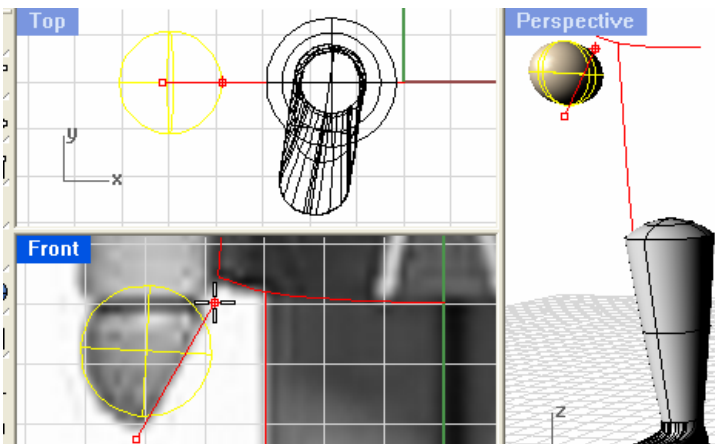
As you select the edges, be sure to always pick the vertically oriented edge.

Don’t overlook the short edge between the fillets.



The boot should turn out as at left. Any problems are probably from not picking edges that are all oriented vertically, or missing edges.

Save your Nutcracker file!



From the Surface menu select Plane > Cutting Plane.

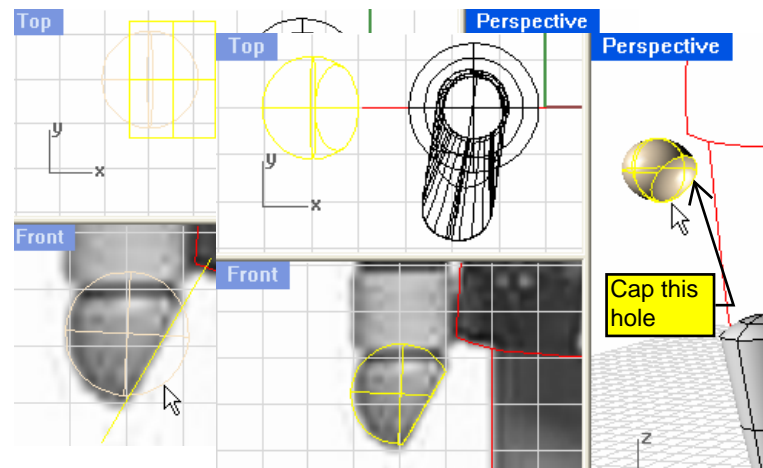
Select the sphere, then place the cutting plane line across the “palm” of the hand.

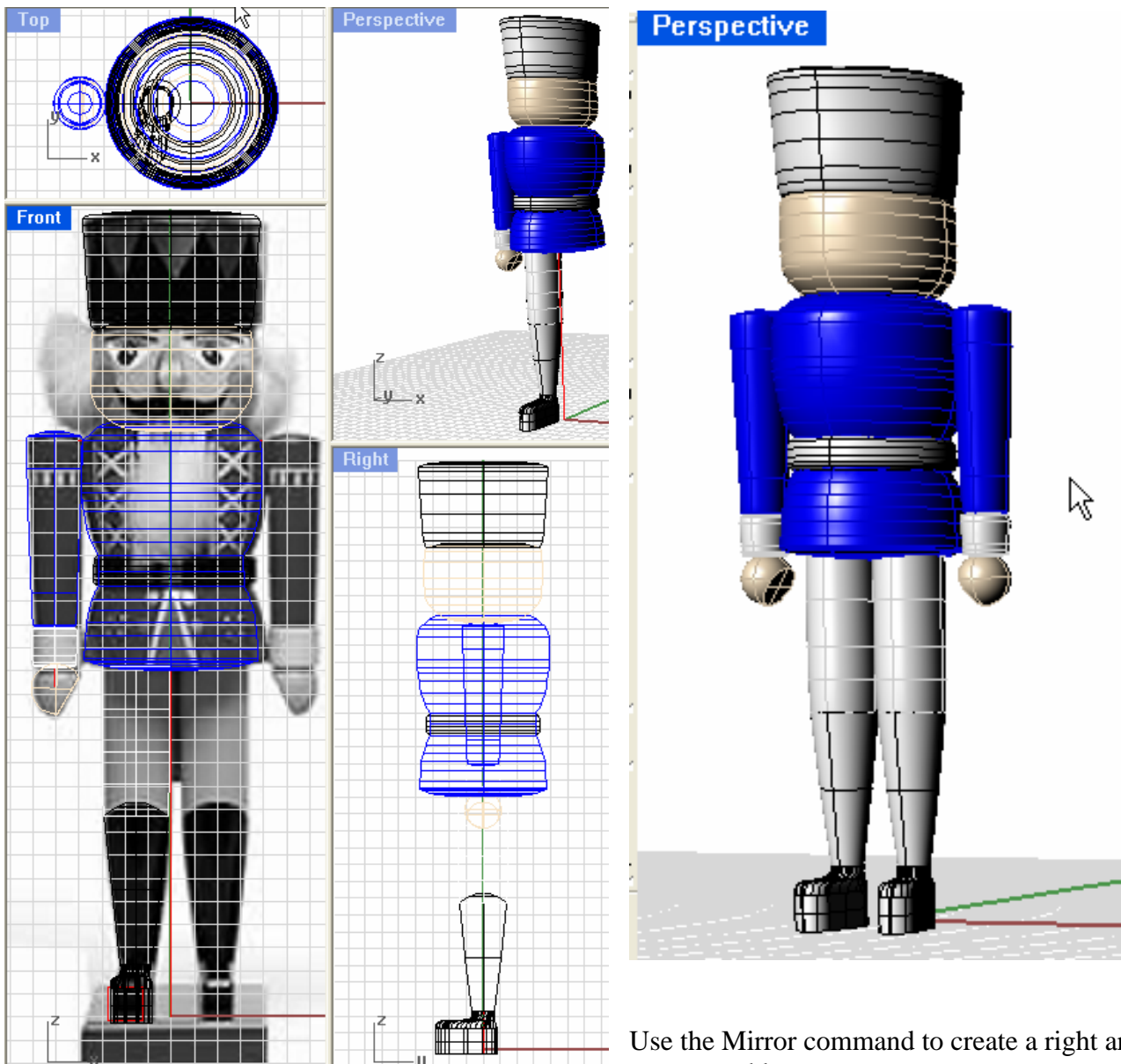
Save your Nutcracker file!

Use the cutting plane to trim away the palm of the sphere.

Complete the hand by using Cap Planar hole from the Solid menu

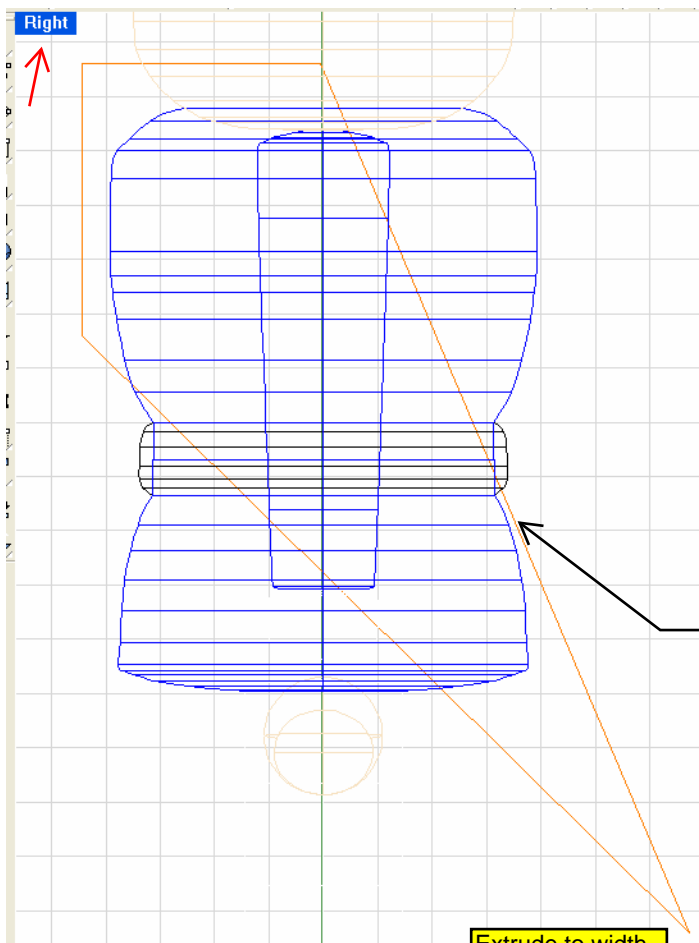
Turn all of the layers back on to view the nearly complete nutcracker.





Save your Nutcracker file!

Your nutcracker is now ready for the Animation steps.

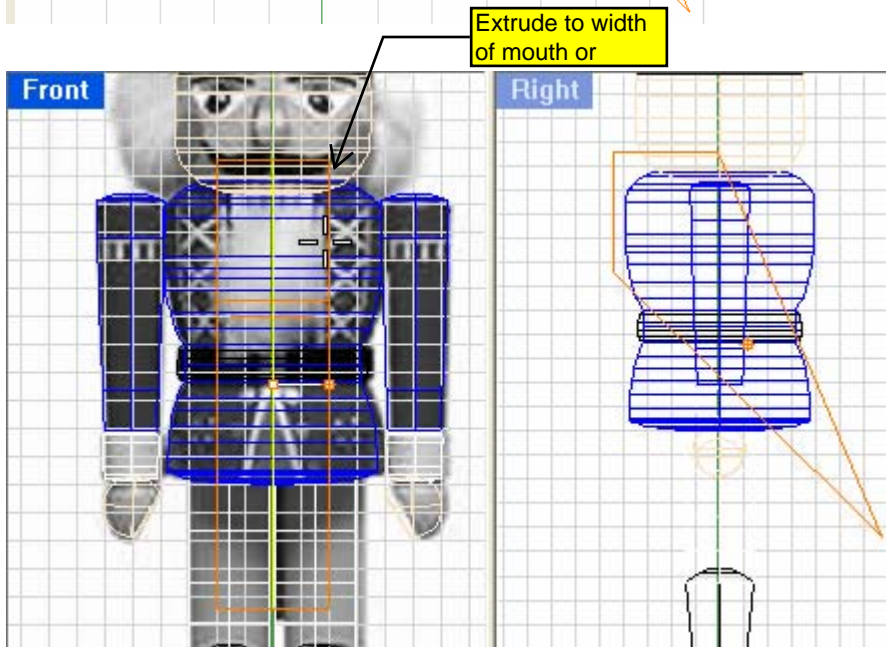


Make a new layer called Lever

Draw a polyline in the wedge shape illustrated. The first point is in the lower center of the head. With Ortho on, pick the 2<sup>nd</sup> point to the left, beyond the front of the chest, and the 3<sup>rd</sup> point is straight down and below the middle of the chest. The 4<sup>th</sup> point is located so the line passes just behind the legs.

Turn the control points on for the polyline and adjust point 4 so that the 4<sup>th</sup> line passes just above the bottom of the belt. Don't let that line cut through the lower body below the belt.

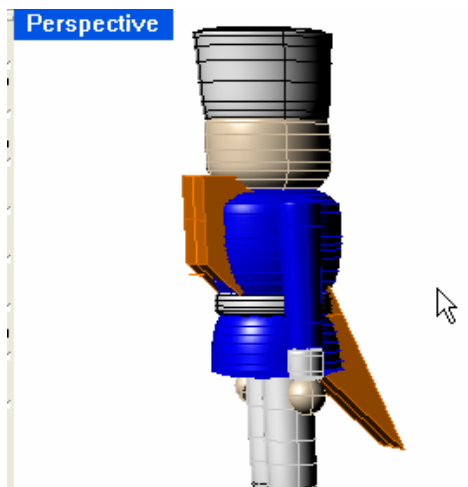
This line should not cut through the body below the belt area



Select the polyline.

Use Solid> Extrude Planar Curve> Straight. Click Cap = yes, and Both Sides = yes.

In the Front viewport, drag the edge of the solid out to the edge of the beard or mouth.



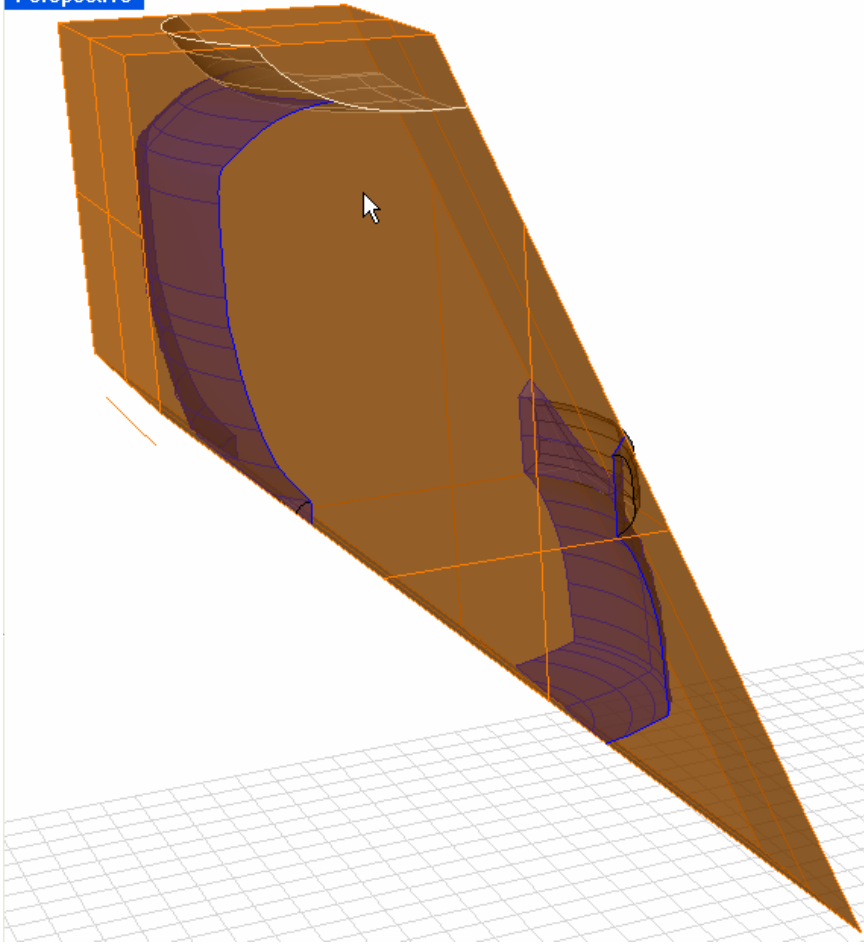
Save your Nutcracker file!

Use the Split command to separate the moving parts of Head, Tunic, and Belt.

the



Perspective

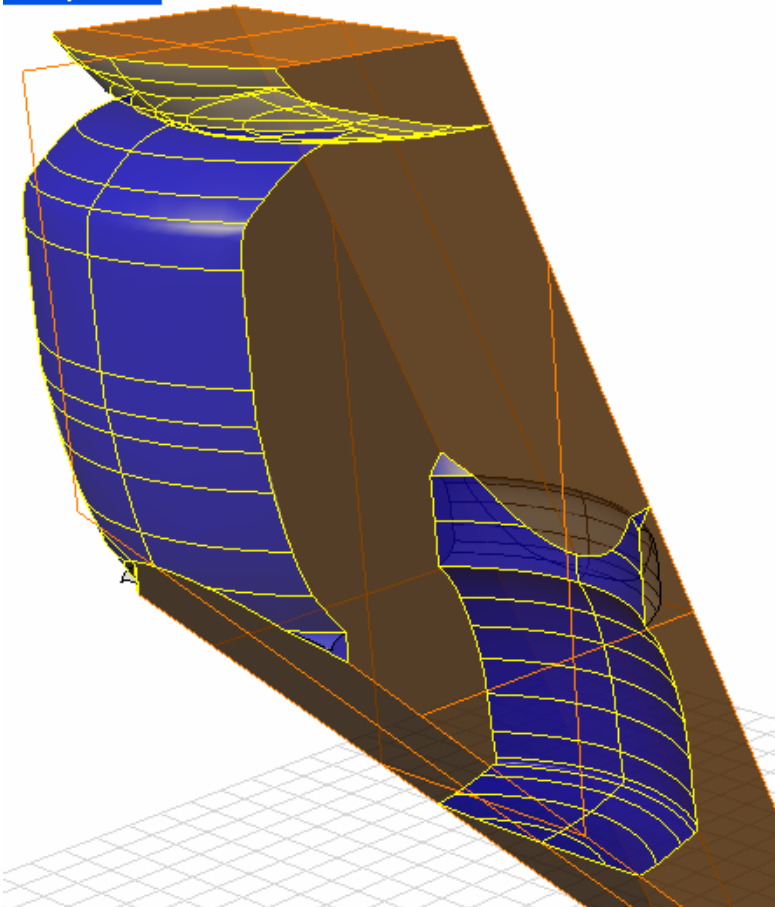


Turn off all layers except Head, Tunic, and Belt.

Hide all remaining visible pieces of the head tunic and belt that are outside of the wedge.

Explode the Wedge so it is 6 individual surfaces

Perspective

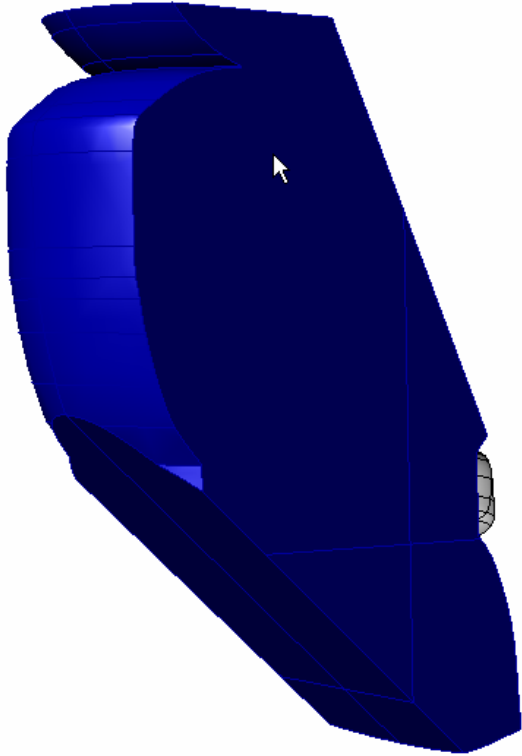


Using the Trim command, remove the excess parts of the wedge. Select the Head and Tunic surfaces as the cutting objects.

The belt will be part of the moving lever, but is not a cutting object for the wedge.

Save your Nutcracker file!

Perspective



With Lever as the current layer, join all surfaces together to make a closed polysurface. Do Not include the belt piece.

Change the color of Lever layer to the same as the Tunic.

Group the Belt with the Lever so these can be animated as one item.

Save your Nutcracker file!

Open the Bongo animator and select Timeline.

Pick the Lever group in the Right viewport.

Click on Animate on the lower right portion of the Timeline toolbar.

Scrub the timeline slider back and forth from zero to 99 two times.

Click on the Rotation button.

Click on the X axis button

Set the slider at 25

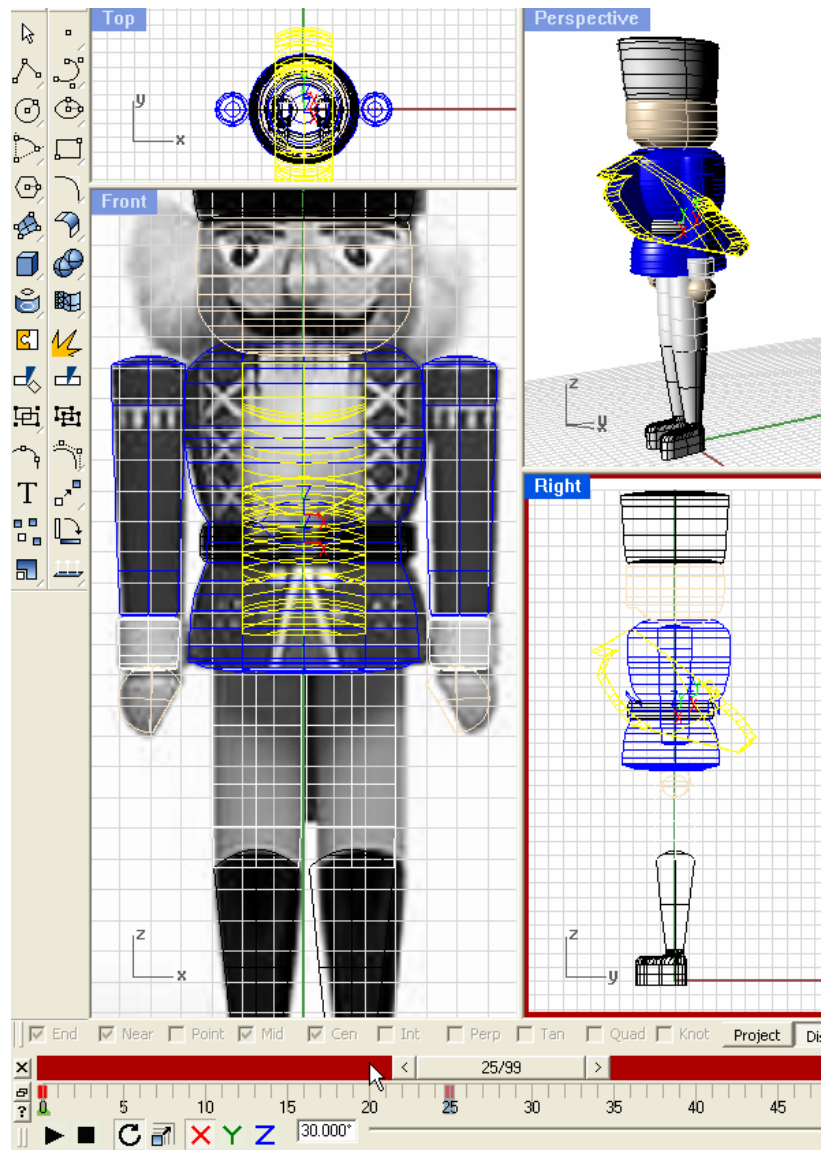
Type in 30° in the rotation angle box. The lever will rotate.

Move the slider to 50.

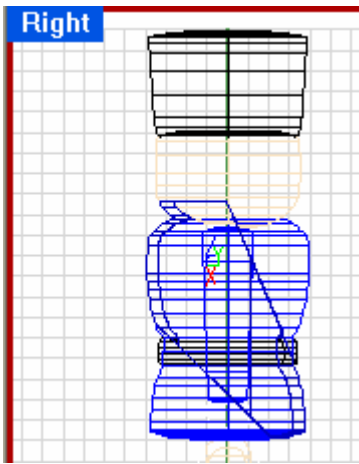
Change the rotation angle back to 0°

Repeat the last two steps with the slider at 75 and 99.

Move the slider slowly from 0 to 99 to observe the action of the lever. The lever should rotate open then close two times.



The final animation step is to move the pivot point. The lever should pivot on a point in the upper body just in front of, and below the shoulders.



In the Right viewport this point should be -10,235.

Select the lever group.

From the Bongo menu select Utilities > Move Pivot Point.

With your cursor in the right viewport, type -10,235 when prompted for the new point.

When you scrub the timeline slider the lever should pivot on the new point in a manner more like a nutcracker.

Save your Nutcracker file!