

Modeling and Rendering in the Three-dimensional Effect in Rhino for Lady High Boots

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Abstract: Recently, the computer drawing technology has become hot topics in 3D design of footwear. Rhino is a kind of common and practical 3D design software with a very strong drawing and rendering graphics function, and it has been widely used to design commercial products. Through decomposition and modeling, the modeling and drawing methods in various parts of footwear by Rhino was researched, as well as the smooth technology and adjustments to its profile curve was studied by an example of lady high boots. Then based on a series rendering effects for footwear in color, light perception, grain characteristic and 3D graphics, the main technical essential and difficulties in design of overall Footwear styles was figured out.

Key words: 3D effect; footwear; Rhino; rendering and modeling

Introduction

In terms of footwear designing, the kind of high boots is famous for its elegant, free and smooth style. But it is the complicated and diversified style that increases the difficulty in CAD project. Therefore, the CAD that deals with 3D graphics and design of footwear becomes hot topics in the field of specialty design.

Rhino is a kind of universal CAD software for 3D design, which has powerful and effectual function of drawing or rendering. After large numbers of studies and application, we find that Rhino can be used perfectly in footwear designing. This article is to show the main technical essential and difficulties through an example of high boot.

Render effect of high boot:

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The render effect of high boot

1. Drawing steps for sole

Double click to open Rhino and click Large Objects - Millimeters in the pop-up dialog box, then a millimeter-sized large-scale stencil opens.

1.1 Creating outline for thickness of sole

Select Catcher at the bottom of the whole operation interface and type in “S” in Command Bar, and then press Enter. Click the button to restrict length, height and width of this boot. Now, we need to click to create a sole outline. Click to create a straight line which could divide the basal area in the middle. Then make up another straight line and click to create a curved surface (as Fig.1 shows) thanks to its stretching function.

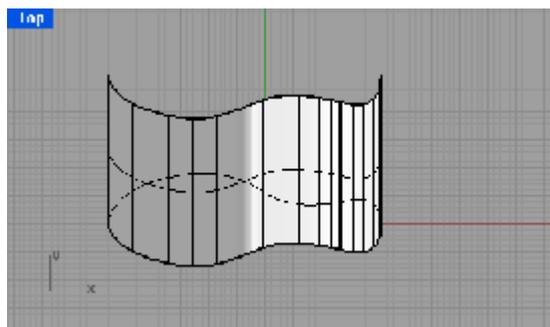


Fig.1 Sole Curve

Click to combine these sole lines and then click in order to move the joint-line onto the curved surface. The button is used to select both curved surface and sole line and divide them by right-hand button. Select the sole line and click to stretch down a distance for the thickness of sole.

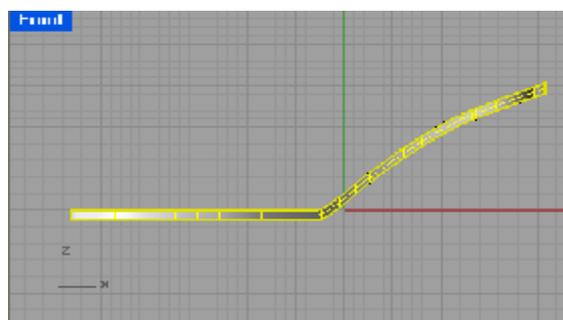


Fig.2 Sole Thickness Curve

We use  to copy supine surface of sole, and then move down it to the bottom of the stretching surface. Once again, click  to combine the three surfaces. Use  to select the edge of sole, then we can follow the notice in Command Bar to type in a number for chamfer angle (we use 0.25 for example).

1.2 Creating heel outline

This time, we select the sole line, then click  to copy and hide it in its place. Now, create a straight line again and use  to select the sole line. Right click the new line and cut off the sole line, then expunge the first and reserve the other. Click  which is hidden under , and reshow the hidden sole line.

Next, click  to complete the mirror image excursion. Now, we should create a connecting line at the joint curved line in case that the curved line cannot be combined perfectly after excursion. Transplant this connecting line to the bottom of heel, then click  to turn it to horizontal position. The outline curve of heel must consist of those divided sole sidelines. Then open  to edit.

To start double track scan by , we should select the upend sideline, the top-line and bottom-line of heel to perfect the heel. (As Fig.3 shows)

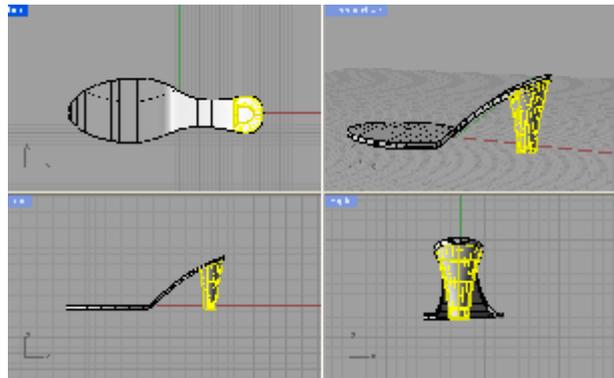


Fig.3 Heel

1.3 Combination of sole and heel

This time, click  to complete chamfer angle on the edge of heel, as Fig.4 shows. Because heel and sole surface are a unity, we should select sole surface and click  to combine them. As Fig.5 shows, this section is finished.

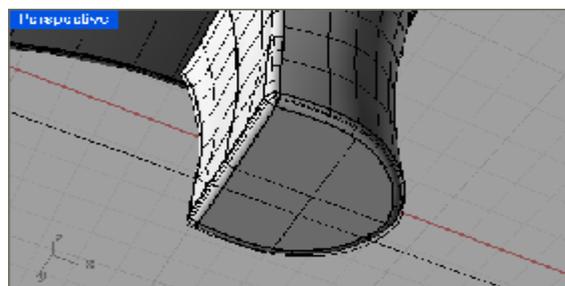


Fig.4 Chamfer Angle

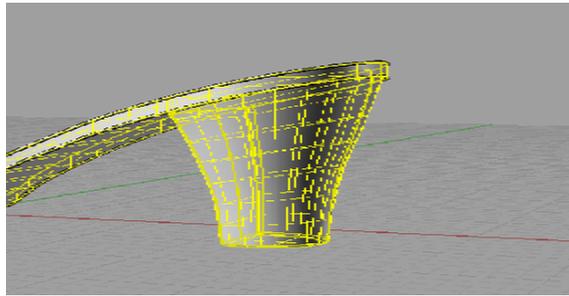


Fig.5 Combination of Sole and Heel

2. Drawing steps for vamp

2.1 Creating vamp outline

Click  to make a structure line for boot upper, maybe some little adjustment must be down according to its three views drawing. Then, the button  is used to adjust the structure line to showing an obvious outline for this boot. At this time, we could copy the sole lines in its place and select one of them to move up a little distance. Then we can click  to edit. (As Fig.6 shows)

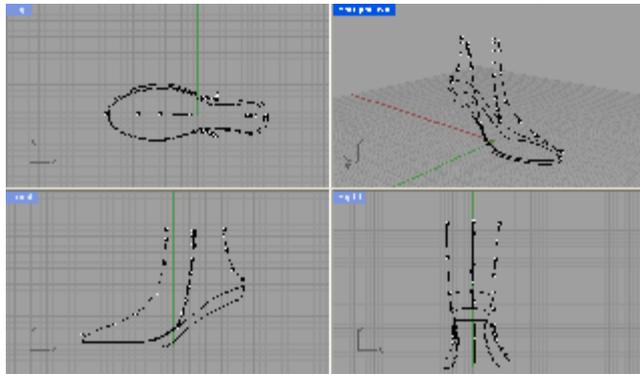


Fig.6 Vamp Outline

2.2 Combination of vamp and sole

Draw an ellipse on the top of these four sidelines. The back shows the width of bootleg, we should connect the end of these four sidelines to this ellipse by snap button, “end” and “near” patiently. (As Fig.7 shows) Now, please pay attention to adjust the boot style by change degree of curve when editing these four curves. Theoretically speaking, the degree of curve should be as gentle as possible.

The border-top is an ellipse which is used as the bottom of bootleg and the border-bottom comes from the replica of sole side with a little adjustment. Click  to cut these two yellow borders (when cutting side line, we need to copy and hide a back-up), that is to cut off the ellipse from the border-bottom. Then click  to select the yellow lines in order (make sure these lines are closed). This time we can follow the default parameters and click “OK”. As Fig.8 shows and other borders can be down like this.

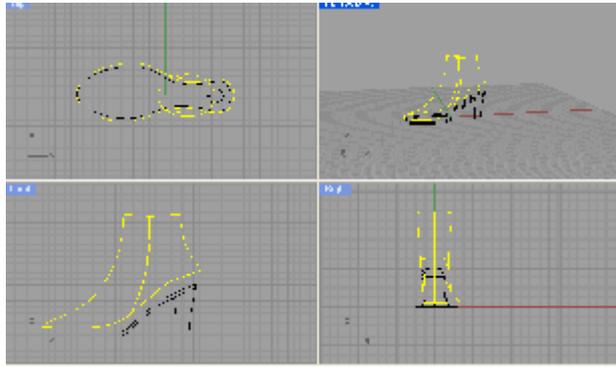


Fig.7 Vamp and Sole

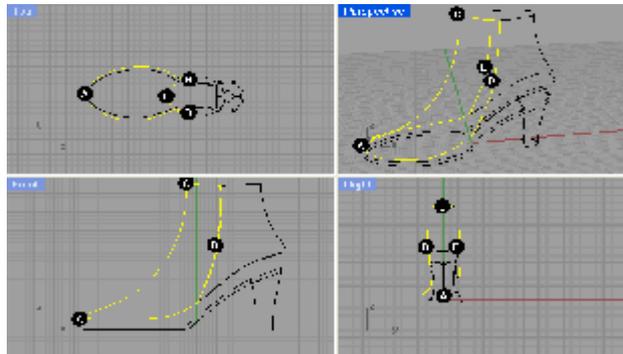


Fig.8 Combination of Vamp and Sole

2.3 Creating vamp curve

Click  to reshown the hidden borders which can play important roles in this step. Use  to create a curve between borders and sole side. Equally, we need a new curve at the behind. Thus, a section line is comprised of the border-bottom, the border-up of sole and these two new curves is finished. We use  to complete double track scan. At last, click  to combine them. (As Fig.9 shows)

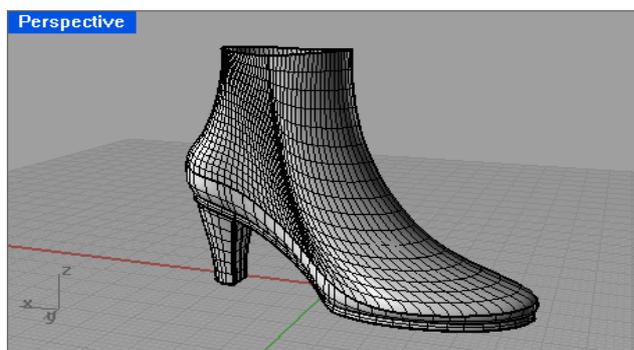


Fig.9 Vamp Curve

3. Drawing steps for bootleg

3.1 Combination of bootleg and vamp

Now, let's establish the curves in the part of bootleg, and we should set the height first. Then we draw an ellipse on the top and make sure the width of bootleg. When drawing, to start with the end of

those four sidelines of vamp and then open snap button with “End” and “Near” to create four sidelines of bootleg. Then to edit reference point is necessary, too. Easy to know that the degree of curve must be gentle and this step is similar with the steps of making upper and vamps too.

As we all know, the boot will be so awkward without any fold on bootleg. So we need this step to adjust these four sidelines. Open reference point button  and select the sidelines, then we can adjust and edit them as what we think to make them as natural as possible. When drawing, we need to separate bootleg into two parts. When cutting the top ellipse, we can use the same method as creating vamp. Click  to select these curves and follow the default parameters as well. Don't forget to click “OK”, and then use the same way to edit the other part of bootleg. Click  to combine these two parts and use this button once again to combine vamp and bootleg together. (As Fig.10 shows)

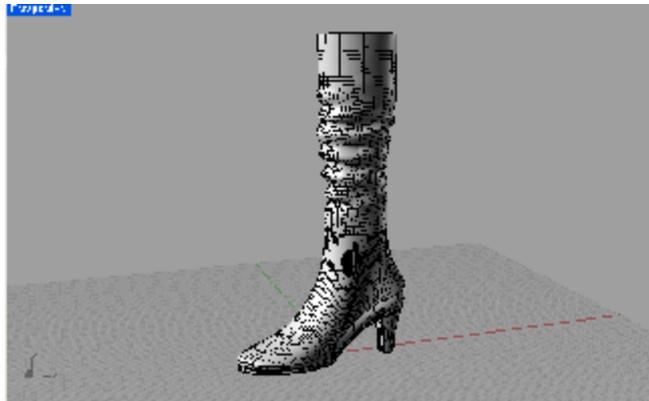


Fig.10 Combination of Vamp and Bootleg

Now, the part between vamp and bootleg has obvious concavo convex. So, we need to match these curves in order to reach the degree of G1 or G2 continuous.

3.2 Adjustment for bootleg and vamp curve

Click  which is hided under , then following the notice showed in Command Bar. We need to select knot line to remove. When Command Bar shows Select knotline to remove. Press Enter when done (Direction: V | Toggle: S), select curves at direction of “U” or “V” to remove. If some curved surface is found to make an unexpected change according to three views drawing, then we can't remove. After this, we need to match the connection of curves.

Click  to do ISO cut. First to select a curve, and then when yellow ISO line shows on the curve, we can type in “U” or “V” to set direction. End with a right click. The same method can be used on vamp and both sides of bootleg.

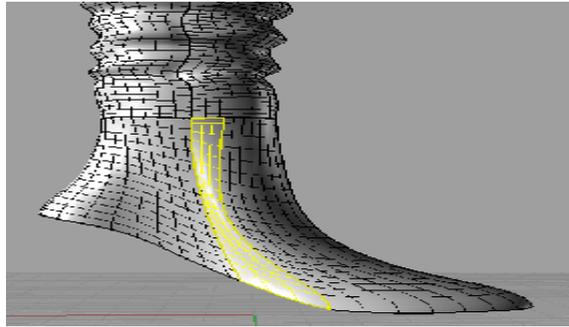


Fig.11 ISO Curve

Open  which is hidid under  and select the sheared edge of vamp, then press Enter. Now, it is the time to produce the consistency of the inborn blend surface and those two curved surfaces through adjusting slider button. It's easy to find that this new blend surface couldn't coordinate perfectly with those two curved surfaces beside. So, we need to adjust the ISO line on blend surface. Click  or  hidid under  and select this blend surface, then type in "U" or "V" in Command Bar in order to add or remove ISO line in direction of U or V. Now, these three surfaces perfectly combined. The same method will be used to deal with bootleg.

4. Drawing steps for decorative accessories

4.1 Cummerbund

Click  under , then select ellipse on the top to extend a suitable curve. Now, select these two ellipses, click  and stretched them an appropriate distance vertically. Click  to establish three curves that just as Fig.12 show. In terms of the position, we'd better put these three curves near to bootleg, because cummerbund is connected with bootleg. As we all know, the part of cummerbund which is nearer to vamp should be wider than others. So, we should set up an angle of inclination for this cummerbund. To create two curves with snap button between those two curves at the same time, then click  to create a curved surface. Because the cummerbund has width, click  under  to put a mirror image parallel displacement onto the new curved surface. That is another new curved surface. (As Fig.12 shows)

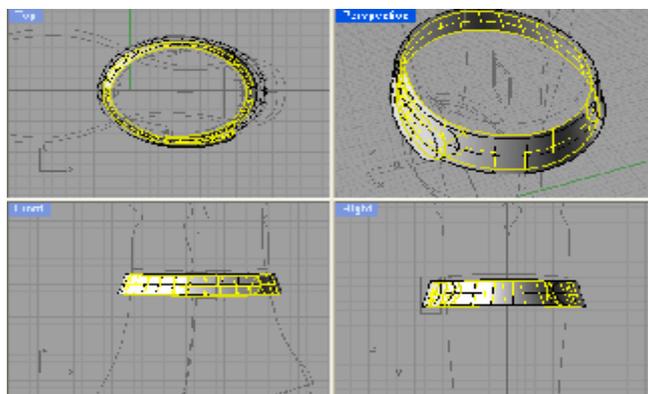


Fig.12 Cummerbund

4.2 Metal button

This time, click  to establish two curves between these two curved surfaces. Then, click  to create a joint face with a section which is tracked by the sidelines of these two curved surfaces. Next, click  to combine these three faces together. In the same way to establish a similar curve at the bottom of these two curved surfaces. Then to create a joint face followed double track scan. At last, we just need to connect these four faces.

After selecting width of the cummerbund, click  hided under , then the numerical value will show up in Command Bar. We just need to select the value we want to create a square with chamfer angle, and then click  to zoom. We could take a part of the curve when making buckle as a track to scan these two frames. That is to keep the degree of curve in buckle and this metal button the same. Click  to establish a line between these two curves, and then click  to create a joint face (As Fig.13 shows). In the same way we can edit the other parts of metal button. So far the metal button will be completed.

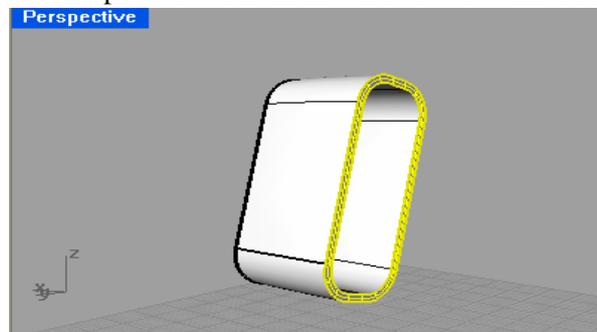


Fig.13 Metal Button

4.3 Buckle

Click  and then click  to draw a part which looks like Fig.14 shows in the front view. Now, click  to establish two curved surfaces by elongating those two curves, and then click  under  to select the co boundary of these two new curves. Next, to adjust the slider button which is followed by “OK”, we have another curved surface. To connect these two curved surfaces, we have to click  to establish a new curved surface as bottom, and then click  to combine these four surfaces. Now, click  to add a top, we could see a part as Fig.14 shows.

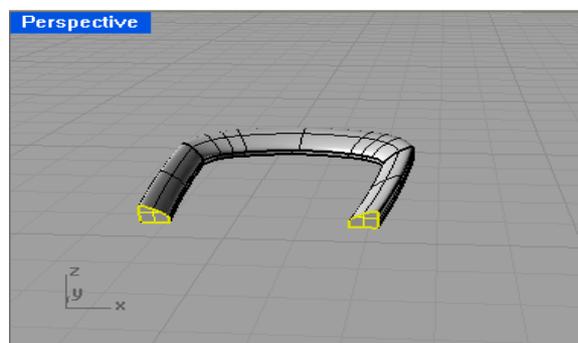


Fig.14 Buckle

If we feel the edge of buckle is not smooth enough, now, we can click  to make a chamfer angle on its bottom. Then click  to draw a circle on the top and stretch the circle. Now, click  to cut off the parts you don't want and make chamfer angle again.

To click  can help us establish a circle, and then click  to select this circle and clip which is to project them on buckle. Click  and select buckle and projection line to carve the surface. Now, click  under  to adjust the curved surface until suitable. Then click  under  to create a joint face with adjustment at slide button. At last, click  again to combine these three faces. So far, the groove part of buckle is finished.

Next is the step for making metal needle, we start from the geometric locus to cross section curve of metal needle. Click  to create a curve, and then we should establish a circular curve at one end of this curve. Now, click  to single track scan and add a top by clicking . The button  can help to complete chamfer angle and  is to adjust the position of buckle to one side of boot. We know that there is a whole between buckle and needle. So, click  under  and select needle and buckle at the same time, then right click to complete the whole part. (As Fig.15 shows)

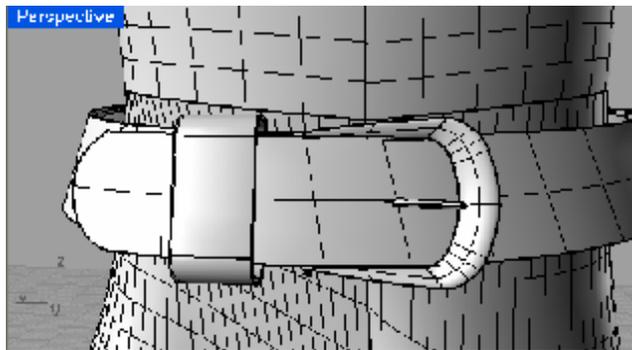


Fig.15 Cumberbund and Buckle

5. Conclusion

All the analysis showed that Rhino can be used perfectly in footwear designing, especially in the drawing 3D graphics and rendering.