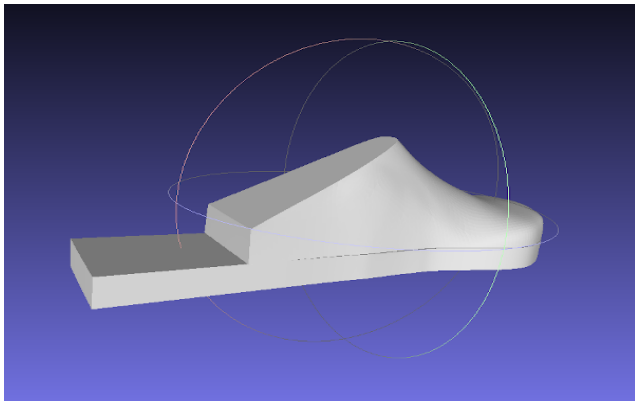
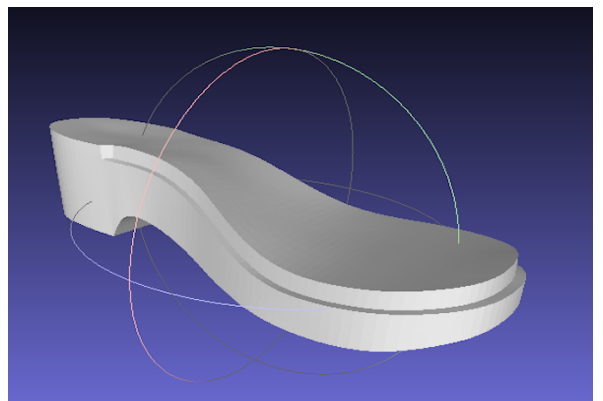


THE OPEN CLOG PROJECT

These pages aim to make freely available the 3D models and techniques to make open-backed, wooden soled clogs using digital tools. Most shoes contain various types of plastic. Clogs are cool, comfortable, and made from sustainable materials. These clogs are made using a CNC router to carve the wooden sole and the last which is used to form the leather for the uppers. The molded leather is then trimmed by hand and nailed to the sole with small upholstery nails.



3D model of the Last



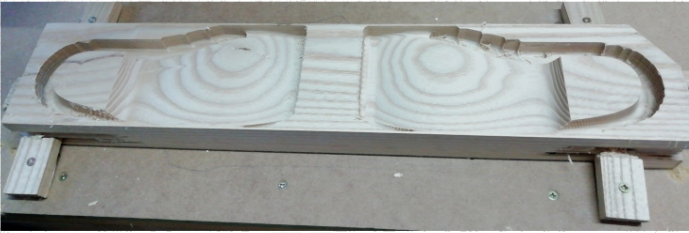
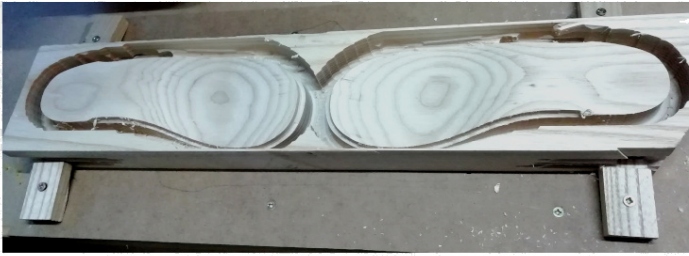
3D model of the Sole

All the 3D Models and CAD files you will need are contained in the zip file. You will find a model for the sole, a model for the last, a leather cutting template, and a former to help position the leather on the sole. They will have to be copied, and mirrored so you have a left and a right for each, except the former. The models are the correct size for a ladies size 4. For other sizes, you will have to change the size of the sole to suit. Scale the model proportionally to be 20mm longer than the total length of the foot (including the sticking out part of the heel). Scale the and the last and the upper fixing former by the same amount

I used Blender to model the last and the sole. And I used the BlenderCam addon to generate the toolpaths for the project. Follow the directions here to download the correct blender and addon. Be sure to set your units correctly. <https://github.com/vilemduha/blendercam>

The lasts are used to form the compound curves of the leather around the toes and the upper part of the foot, they are best cut from some hardwood, but quality softwood should be fine. I used a long reach 12mm ballnose cutter for both the rough and the fine cut. The lasts will also need a slightly longer piece of wood, cut, shaped, and screwed to the base to use as a sacrificial board to pin the leather too. This can be replaced when it gets too damaged.

The soles of the clogs are cut from a piece of hardwood like beech, alder, or ash. I set up a flip-cut fixture so I could cut the top and bottom of each clog, leaving a 1.5mm skin. I used an 8mm flat bit because I wanted to keep the definition for the leather recess, and I figured a fine cut with a resolution of .5mm will still leave a smooth surface. But you may have your own methods.



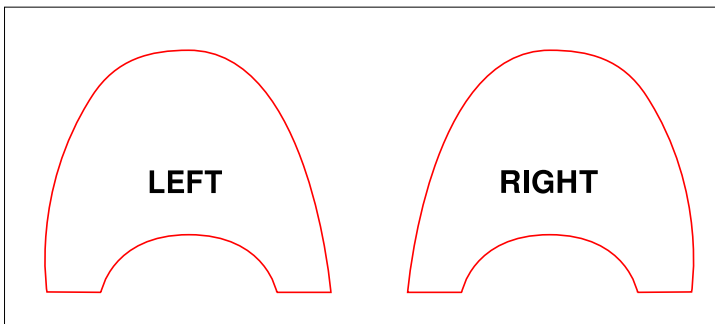
These images show the soles of the clogs as they were cut on the router table. First the tops are cut, then the block is flipped and the bottom is cut, leaving a millimeter and a half holding the the parts in position.



Here one of the lasts has just been cut.



The clog soles after they have been cleaned up.



Use the svg drawing in the zip file to make a template to roughly cut out the leather. This template seems to work for sizes from 4 to 7. For other sizes you will need to scale appropriately.

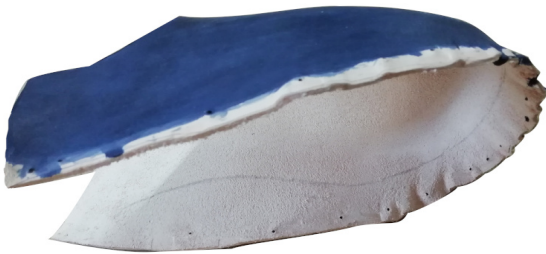


To make the uppers, I use Veg Tan Leather 2 - 2.5mm thick (I have tried other types of leather, but they just didn't work). You will need to cut out two pieces, a left, and a right, using the templates.

Next, clamp the last in a vice, soak the leather in a large pan of warm water, and get a hammer, some 25mm pins, and a pair of pliers ready. After 10 minutes take the leather and pin the tip of the toe to the last, making sure there is an even amount of leather down both sides. Stretch the leather and pin the two ends. Return to the toe end and stretch and pin the leather as evenly as you can down both sides, keeping the pins as close to the edge of the leather as possible. A pair of pliers can be used to pull the leather nice and tight. It may be necessary to remove some pins, tighten the leather and pin it again. Leave them both to dry in a warm place overnight. .



In the zip file you will find an .svg drawing of the 'upper fixing former'. You will only need one of these because the large cross piece can be rotated and used for both left and right. This is the right size for a ladies size 4. For any other sizes, the drawing will have to be scaled by the same amount as you scaled the soles. It is used to position the leather on the wooden sole so there is enough room for the foot to enter. The upper fixing former is laser-cut, or cut out by hand and placed on the wooden sole. The leather can then be removed from the last by extracting the pins and placed over the fixing former.



I have found that the best way to mark the leather is to rub graphite from a pencil onto the edge of the leather recess. Place the fixing former and the leather onto the sole. Make sure the leather is pushed onto the former and tight around the edges of the sole and rub around the edge to transfer the graphite onto the inside of the leather. you can just see the line on the image above



Use a very sharp craft knife and begin cutting the leather at the toe end. Cut a small section at a time and keep checking that the transferred line is correct. Once you have cut all the way to the back and you are happy it fits well you are ready to start nailing the leather to the sole.

Sand off the graphite from the edge and then make a series of pencil marks around the edge of the sole 15mm apart so that you can place the nails evenly. Clamp the very back of the sole in a vice, and position the leather so that it fits in the recess all the way around. Starting at the very top, use a bradawl to make a small hole in the leather opposite the pencil mark, place the upholstery nail in position, and hammer it home. Continue around the sides in the same way until you get to the end of the recess, where the leather will have to be trimmed.

Draw a nice curved line across the top of the leather upper and cut it as cleanly as you can with a sharp craft knife.



The next thing to do is glue on some rubber to protect the bottom of your clogs from wearing away too quickly. You can buy these from a cobbler's shop, or use some inner tubing from a lorry tire. Either way they will have to be trimmed and then glued on using good quality contact adhesive.



And you're done. Slip them on and practice a few clog dance steps. If you need some inspiration check out; <https://www.youtube.com/watch?v=YeMrOimkzxE>



If you enjoyed this tutorial and have made some clogs please let me know. And if you have any comments, suggestions, or 3D models for new sizes it would be great to add them to the files. Contact me at aaron@cncraft.co.uk