BoardCAD CNC guide

Jonas Hörnstein, 21 September 2008

Introduction

The BoardCAD CNC guide is primarily written to guide the machine operator at Bluebottle surfboards, but also serves as an introduction for anyone who wants to use BoardCAD together with a CNC-machine. At Bluebottle surfboards we use BoardCAD to design the boards and to generate G-code, and Linux CNC to control the machine. Our machine is a home made three axis CNC machine where the blank rests on two fixed supports. While this is a typical setup for most shape machines, the naming of the machine axis and the placement of the supports differ between machines and you'll most likely need to change the configuration file in order to adapt BoardCAD to you specific machine. Please refer to Appendix A: Configuring the machine interface, for information on how to adapt BoardCAD CNC to different machines.

Place the blank in the machine

1. Place the blank to be cut with the deck facing up and mark the stringer 40 cm from the tail (50 cm for mini-mal blanks and 70 cm for longboard blanks).
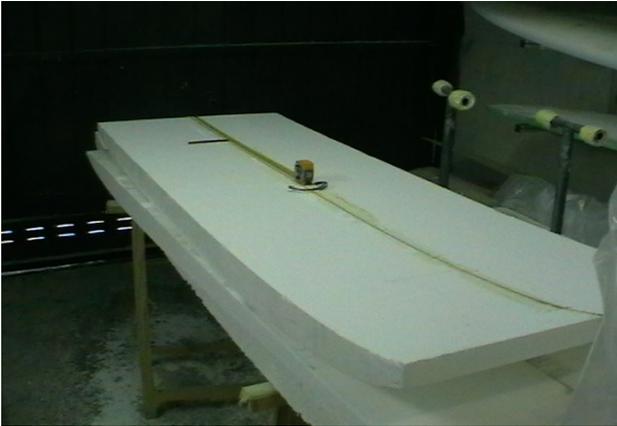
2. Place the blank in the machine with the bottom facing up. Make sure that the blank supports are in the upper position to allow the blank to move freely above the spikes.

3. Adjust the position of the blank so that the mark aligns with the spikes on the left support and the stringer is centered between the spikes on both supports.

4. Lower the supports until the spikes enter fully into the blank.

Creating cutting paths for the bottom

1. Start BoardCAD by clicking the icon on the desktop
2. Load the blank model by choosing File-open and select the blank-file. Answer NO to the question "Approximate Nurbs/3D from beziers"
3. Choose "set as blank" in the 3D menu
4. Load the board model by choosing File-open and select the board-file (answer NO again). If only the board appears and not the blank, right click in the rocker-view and choose "View blank"
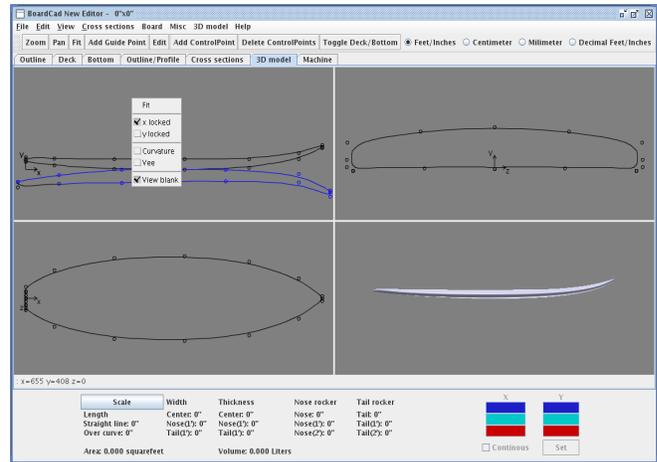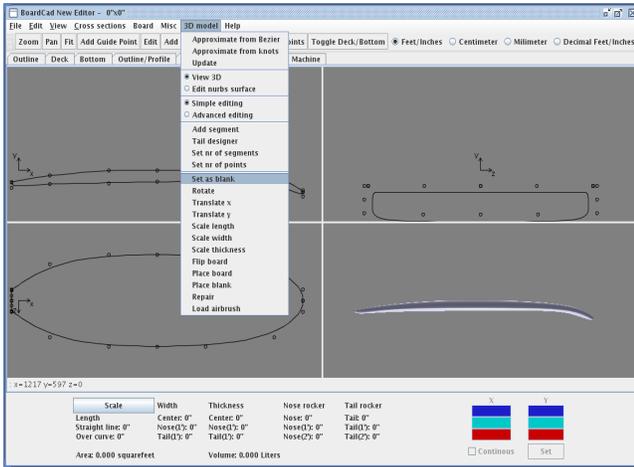
5. Place the board inside the blank by flipping, translating, and rotating the board using the 3D menu
6. Choose "place blank" in 3D menu
7. Save the cutting paths by choosing "export nurbs to G-code bottom" in the file menu. Name the file with the file extension .ngc
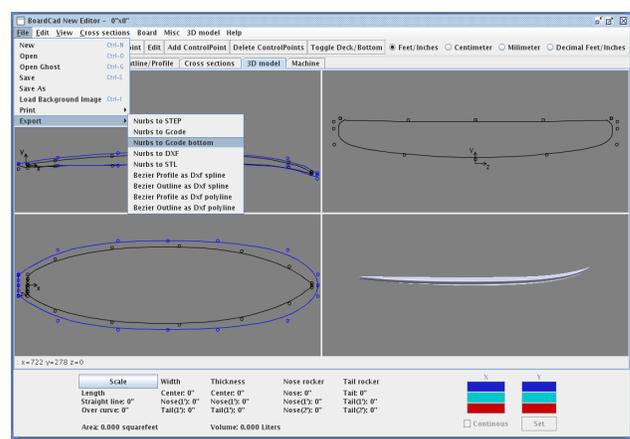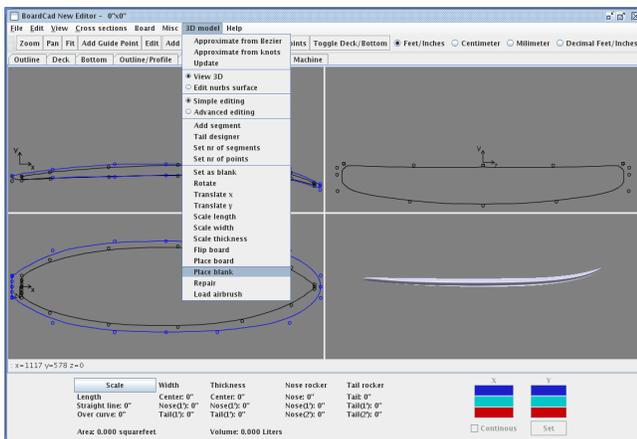
8. Save the correctly placed board model by choosing File - Save as. Name the file with the file extension .cad

Starting the machine and cutting the bottom

1. Turn on the machine power
2. Start LinuxCNC by clicking the icon on the desktop
3. Turn off the software emergency stop by pressing F1
4. Turn on the software power by pressing F2
5. Click the Home-button to make sure the machine is at home position
6. Load the cutting file by using File-open.
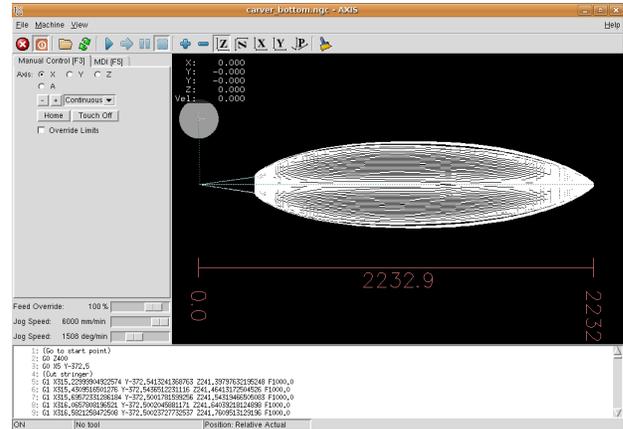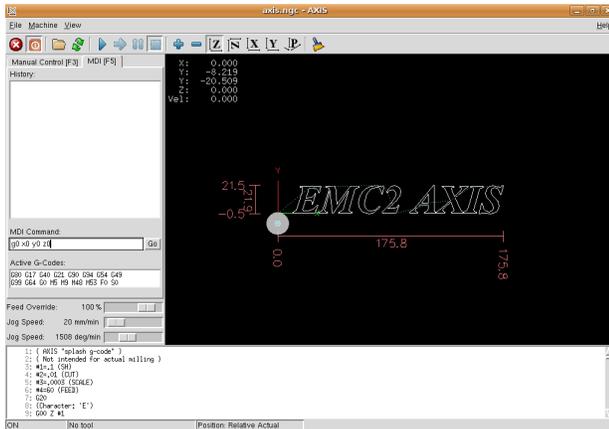
7. Turn on the power of the router
8. Press play to start cutting and control the speed of the machine by setting "Feed override" between 0 and 120%.

8. Take a coffee

Turning the blank

1. Release the blank from the spikes by setting supports to the upper position.
2. Clean off blank by cutting along outline

3. Place blank on machine supports with the deck facing up.
4. Center the router over the spikes of the left support by writing G0 Z400 followed by G0 X710.96 Y-372.5 in the MDI-command window of the Shapebot-program. (If the machine is turned off, follow step 1-5 in previous section)

5. Lower the router by manually controlling the Z-axis in the Shapebot-program until the router bit sits a few mm over the blank (use a Feed override of around 20% to avoid hitting the blank with full speed).
6. Move the blank until the marks from the spikes are centered under the router bit.
7. Make sure the stringer is centered between the spikes on both the left and the right support
8. Lower the supports until the spikes enter fully into the foam.

Note: If the board does not have a stringer we need to repeat step 4-6 for the right support instead of step 7. Just exchange the X-coordinate in step 4 to 1915.723 to center the router over the right support.

Creating cutting paths for the deck

1. Start BoardCAD and open the board model used for cutting the bottom (if not already open).
2. Choose "flip" in 3D menu to turn the board
3. Choose "place board" in 3D menu to place the board such that the bottom rests on the machine supports.
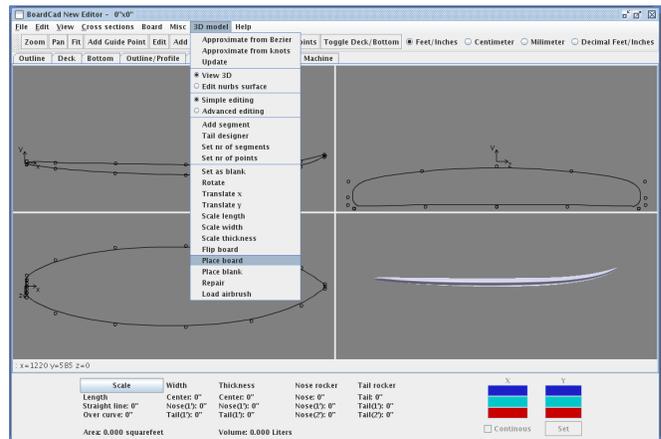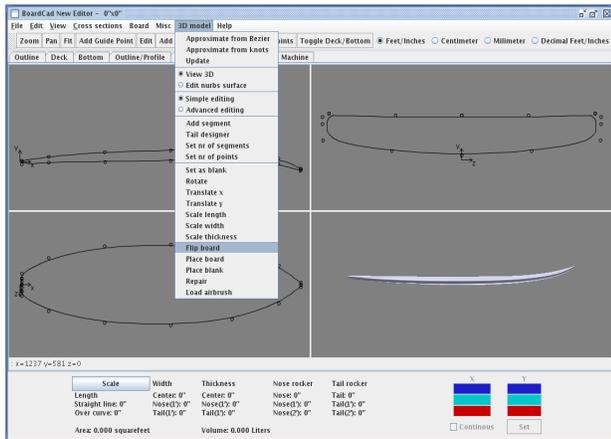
4. Choose "export nurbs to G-code" in the file menu and name the file using .ngc as a file extension.
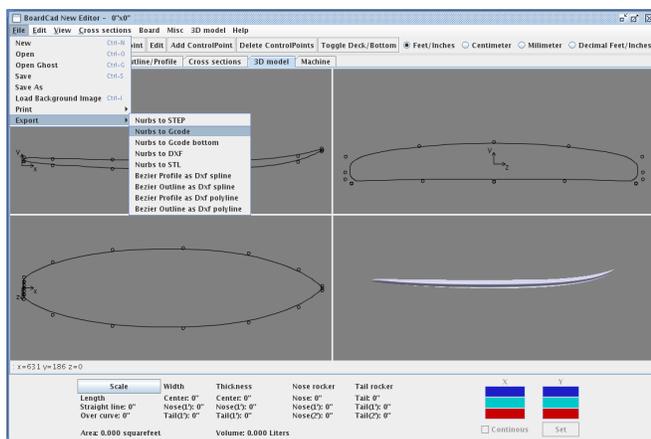
5. Save the board model using File - Save as. Name the file using the extension .cad.

Note: For thick blanks (typically EPS) you may need to cut the deck in several steps. Use "Translate y" in the 3D menu and write 20 to move the board 20 mm up. Export the g-code (step 4) and cut the deck (see next section) before moving the board back down by using "Translate y" and write -20. Export the g-code and cut the board a second time.

Cutting the deck

1. If the machine is turned off, follow step 1-5 in "Starting machine and cutting bottom".
2. Load the cutting file by using File-open.
3. Turn on the power of the router
4. Press play to start cutting and control the speed of the machine by setting "Feed override" between 0 and 120%.
5. Take another coffee

Appendix A: Configuring the machine interface:

The configuration of the machine interface is done in the file shapebot.txt. This file has to be placed in the same directory as BoardCAD.jar. Here we show an example of how shapebot.txt can look and below we explain the meaning of the different parameters.

Example file shapebot.txt:

```
0.25    % length step
0.0625  % cross step
4000.0  % speed (mm/min)
1000.0  % stringer speed (mm/min)
6.325   % tool radie (mm) 6.325
0.0     % sandwich thickness (mm)
0.0     % perimeter size (mm)
710.96 -427.239 202.065 (these are the machine coordinates for support 1)
1915.723 -427.239 202.065 (these are the machine coordinates for support 2)
1.0 0.0 0.0  (the x-axis of the machine corresponds to x-axis in BoardCAD)
0.0 0.0 -1.0  (the y-axis of the machine corresponds to - z-axis in BoardCAD)
0.0 1.0 0.0  (the z-axis of the machine corresponds to y-axis in BoardCAD)
410.96 -427.239 202.065 (these x,y,z-coordinates in the machine corresponds to 0,0,0 in BoardCAD)
```

The cutting path is created from the NURBS model in the 3D view and the first lines in the configuration file decides the step size when generating G-code. The cross step is probably the most interesting as it decides how many passes the machine will do. Default is 1/16. This means the machine makes 16 passes between each point in a cross section.

Next we set the machine speed. You can set a separate speed for the stringer cut. The stringer is cut in two steps, first the machine passes 1 cm above the final cut and then it cuts the last cm to avoid cutting too much wood at the same time.

Currently the G-code generator only works with flat router bits and the only parameter you can set is the tool radius

There are two parameters for sandwich boards that I will not be explained only describe if you need them.

Finally there are a lot of numbers that defines the coordinate system of the machine and the supports for the board. These allow BoardCAD to adapt to the position of your supports and the naming of your machine axis.