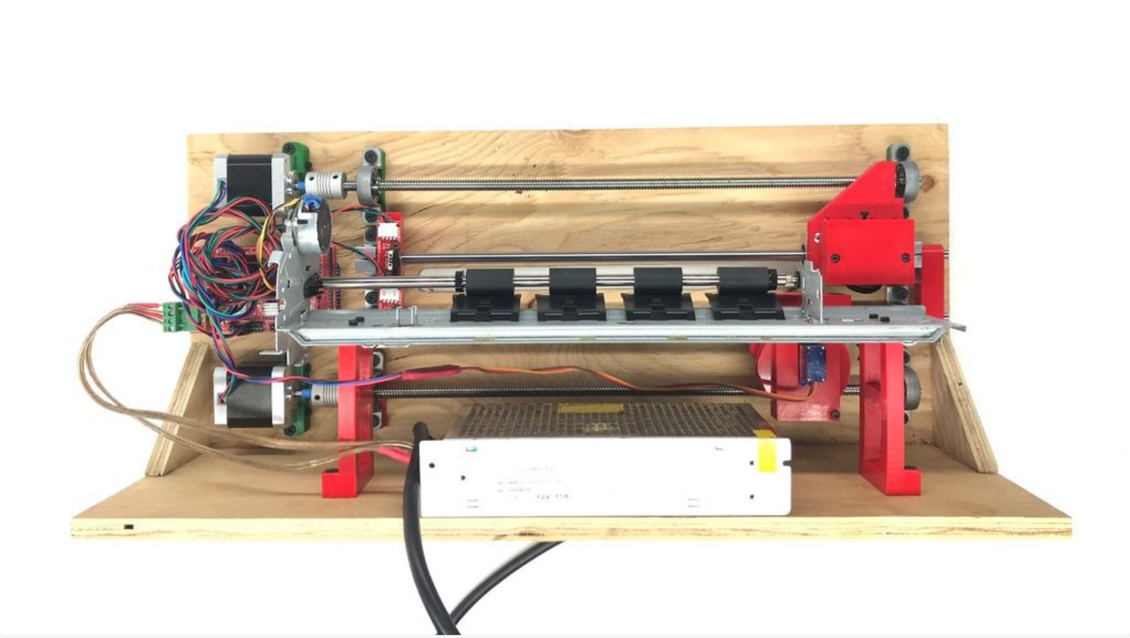
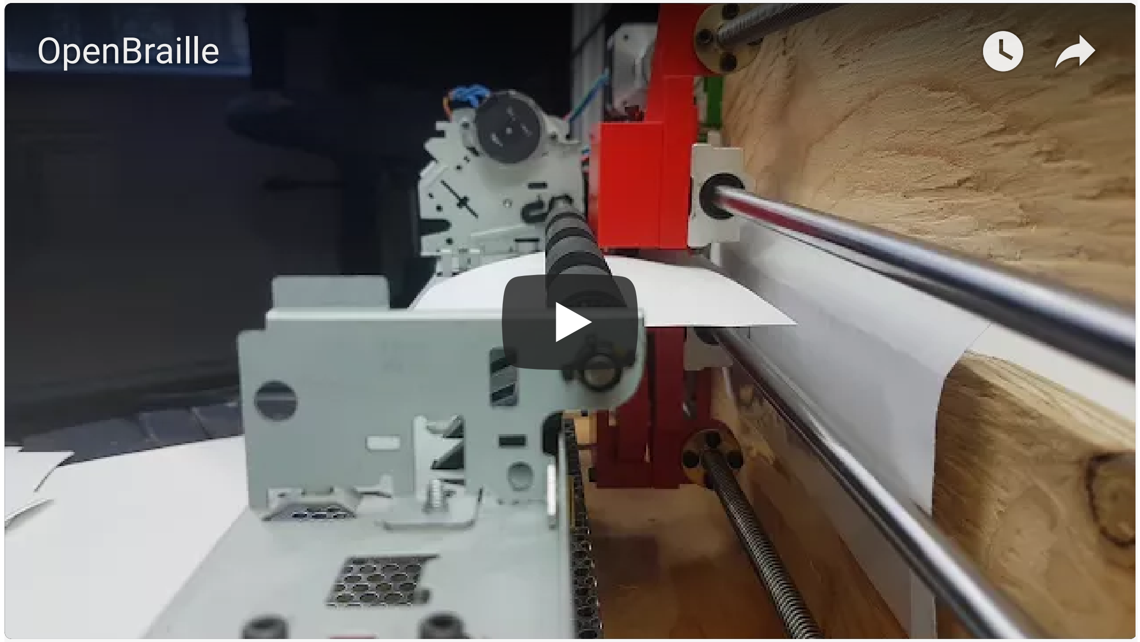
OPENBRAILLE, A DIY BRAILLE EMBOSSER

Technology > Assistive-technology | by ccampos7 Follow

Posted Dec. 28, 2017 |




OpenBraille

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I was quite surprised to find out how expensive assistive technology is. A mechanical braille embosser cost over a 1000$USD and an electric goes from 3000$ up to 5000$. I tough about making one for a friend but I couldn't find a DIY version, so I decided to make one myself. This isn’t, by any means, a finish product. By making the machine an open source project, I am hoping others will improve the design. In a near future, with the help of others makers, OpenBraille will reduce the cost of these printers and it will allow anyone with a visual imparity to read and write. So, if you know someone, if you are a maker, if you are curious or if you want to help out, please feel free to follow this tutorial and help me built a community around OpenBraille.

The encoder is pretty much the heart of the embosser. Most of the commercial machines emboss the dots by impacting the sheet. Because it's harder to build a precise machine out of 3D printed parts, I designed a different system. Instead of impacting and applying all the energy in a single hit, OpenBraille uses a physical encoder and a roller. This way, the embossing is gradually done and the parts can be easily printed.

Facebook page:

https://www.facebook.com/OpenBraille-Braille-print...

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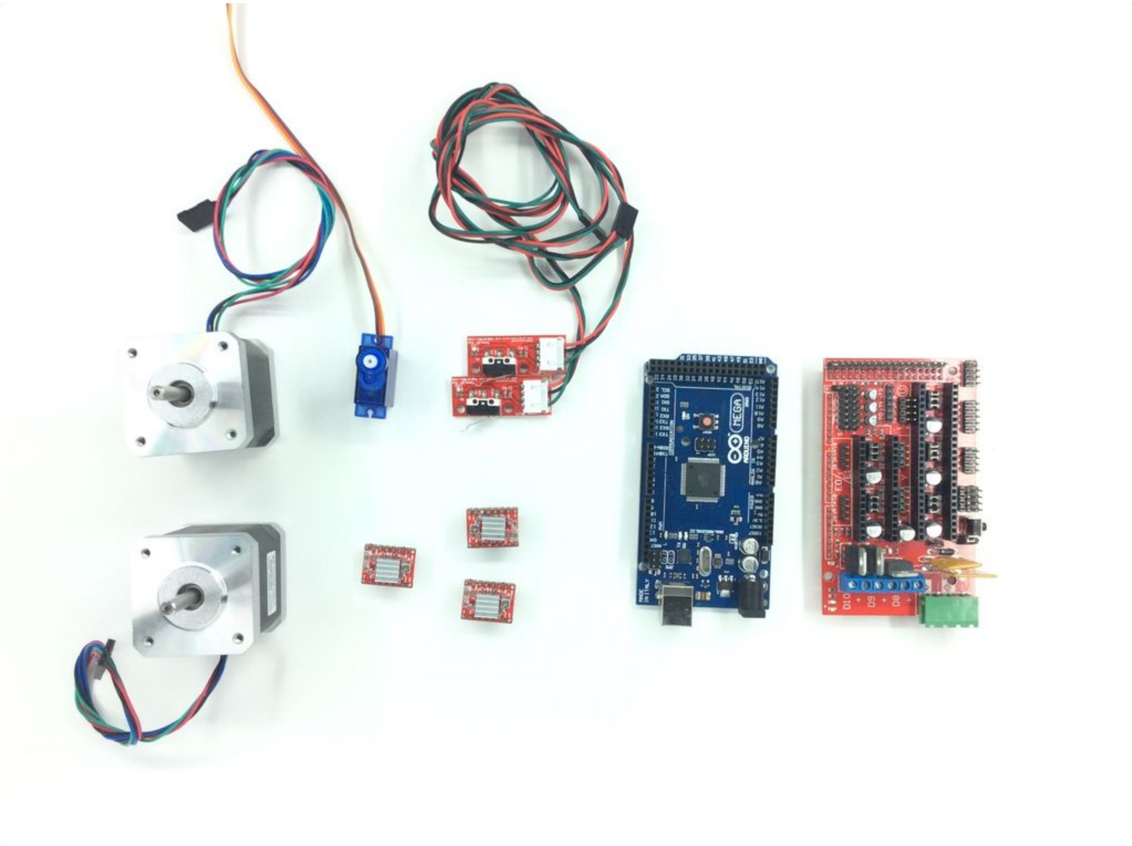
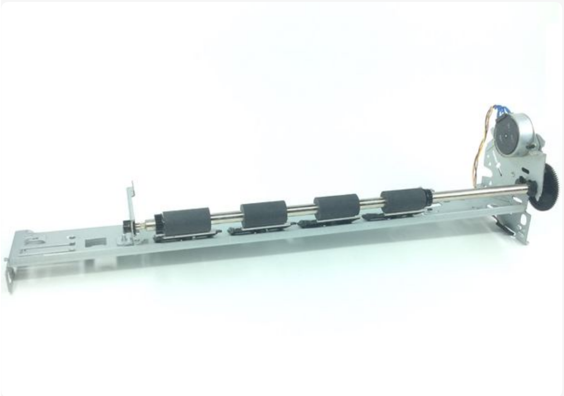
Step 1: Getting the Parts








OpenBraille uses widely available parts on the market. Most of the components are originally used for 3D printers. The brain of the embosser is an arduino mega with a RAMPS board. The following parts are needed for the build:

Arduino Mega

RAMPS board

Stepper Drivers

End Stops

Servo Motor

Steppers

Rods

Lead Screw Rods

Power supply

Coupler

Bearing

Screws

Printer carriage

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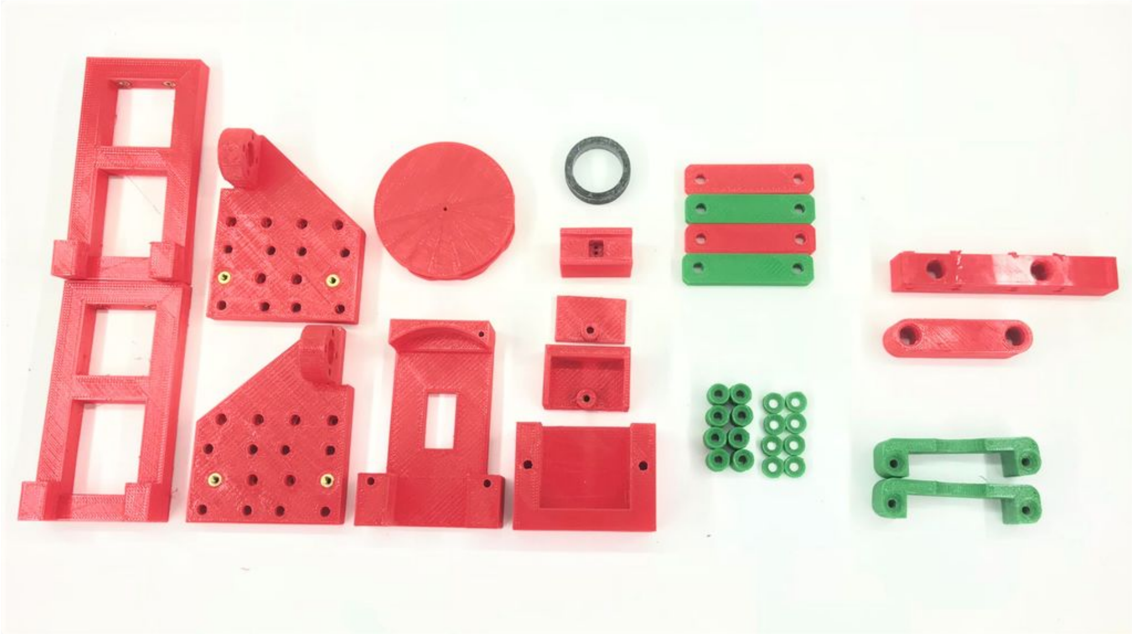
Step 2: Printing the Parts



All the remaining parts can be 3D printed. Follow the link and get the files:

https://www.thingiverse.com/thing:258673

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Step 3: Building the Frame

A little bit of wood working. It should really be an enclosed casing for security but on the mean time it’s only a frame. It’s basically a plywood board put together to support the parts. You can look at the plans for more detail. This is how I built it but feel free to suggest something better.

Plates.pdf Download

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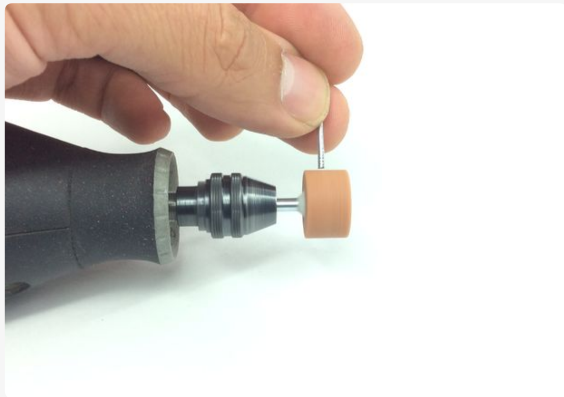
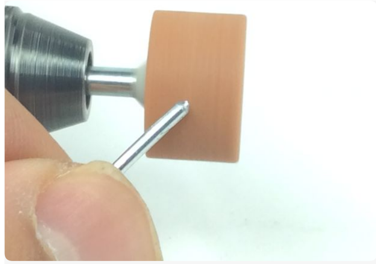
Step 4: Machining the Pins





Show All 8 Items

The pins are the only components that have to be machined. For each, you will need a nail and a hexagonal nut. As for the tools, you need a rotary machine (dremmel) a vice-grip and a punch.

First of all, the head of the nail has to be cut. The other end of the nail has to be grinded round, this is what will emboss the dots, so, make it pretty.

Then, we have to make a hole on the nut. Use a punch to guide the hole. Then, use the dremmel to finish the hole.

Finally, with a soldering station, add a drop of thin on the nut so to fix the pin on it.

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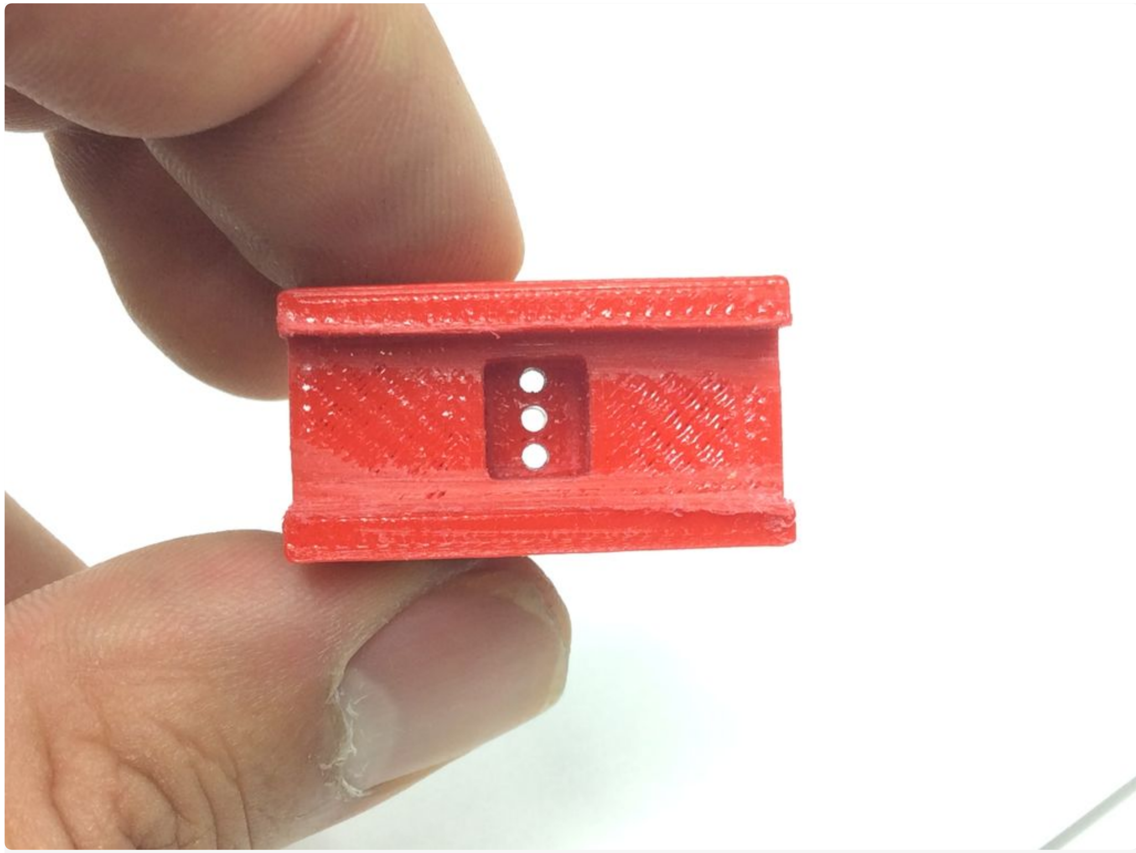
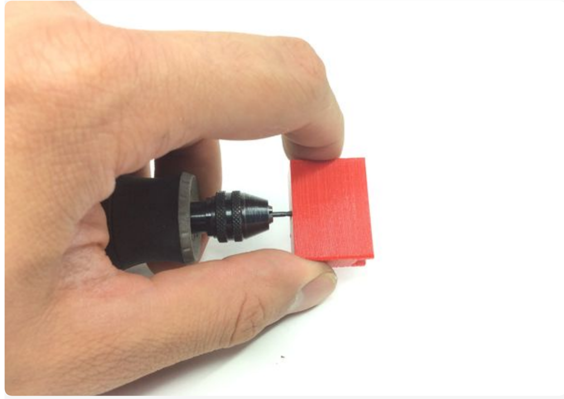
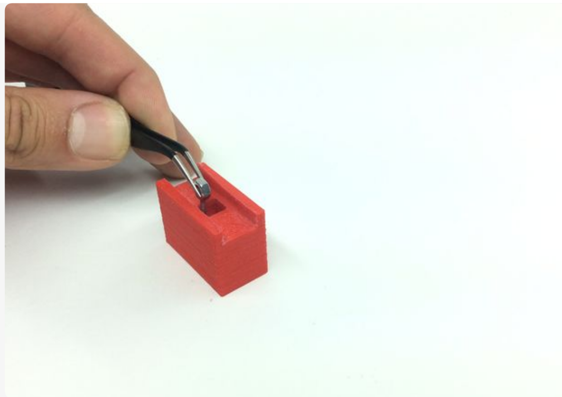
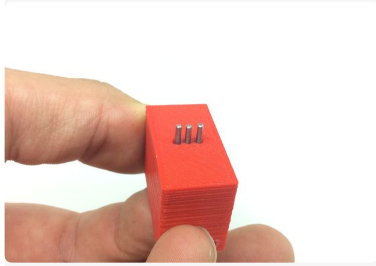
Step 5: Assembling the Encoder



Show All 12 Items

The 3d printed parts have to be cleaned for them to fit nicely. The holes for the pins are smaller. Therefore, by using a dremmel with a bit of the size of the pins the holes will be perfect.

The servo is attached to the wheel by press fitting it inside. Then, the wheel_base has to be sandwiched together with the servo and the wheel.

The pin holder goes on top of the wheel with the pins pointing toward the top.

Before finishing this part, the bearings have to be mounted to the bearing_support_inverse (as named on the files). The bearings are made for M4 screws.

Finally, the wheel base is mounted on the bearing support with two M3 screws. I had to drill a little extra hole on the corner of the wheel base for stability, and I used a third M3 screw.

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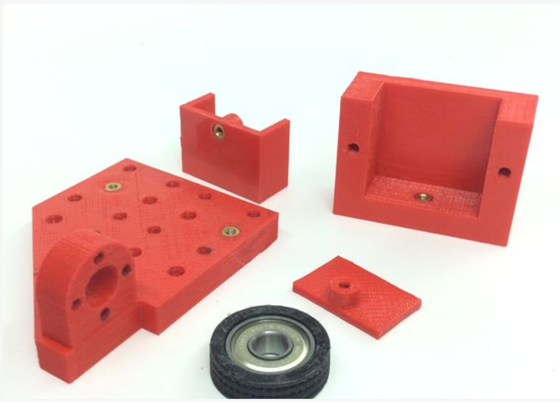
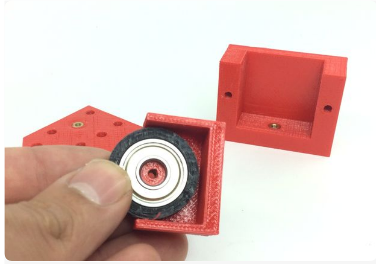
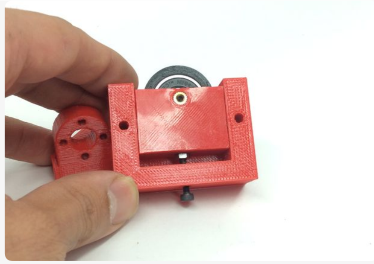
Step 6: Building the Roller







Show All 9 Items

The bearing goes inside the roller, I had to sand it a bit and then I pressed the bearing inside.

The roller goes in the shaft box and the cover is held in place with an M3 screw.

As the picture shows it, the shaft box goes in the roller support and a M3 screw allows the shaft box to be adjusted.

The linear bearings have to be mounted in the bearing_support_regular (as named on the files) with M4 screws.

The roller can now be mounted in the bearing support with two M3 screws.

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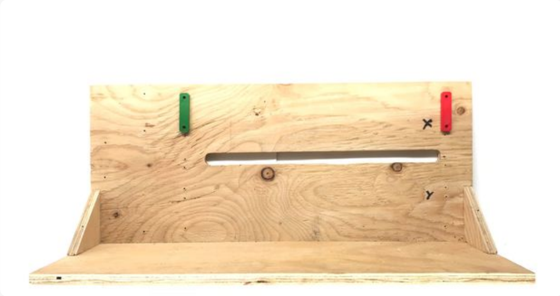
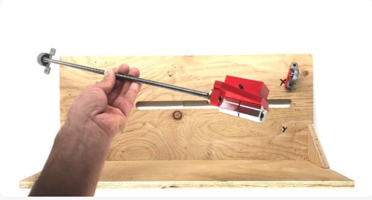
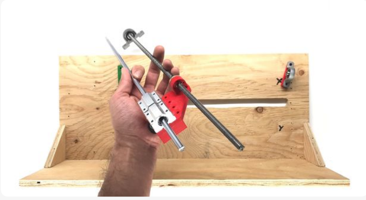
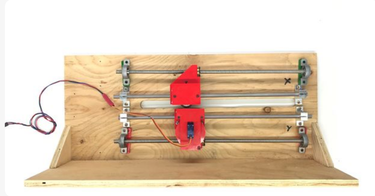
Step 7: Screwing the Rods



Show All 8 Items

There are 4 rods. Two linear rods for the bearings and two lead screws rods. All the rods have to be in the same plane. For that, there are four spacers that go underneath the lead screws brackets. Because I only had one size wood screws I made little round to correctly adjust the height of the screws. The Round_9mm go in the rod brackets and the Round_3mm go in the lead screw brackets, you can also use screws with the correct length and not use the rounds.

All the rods have to be parallel. For the linear rods to be parallel use the Calibration_spacer and the Endstop_holder. For the lead screws to be parallel to the linear rods use the roller assembly and the encoder assemble. Places the assemblies on the far right and screw the brackets into the board. Place the assemblies on the far left and screw the rest of the brackets. The lead screw should be free to turn.

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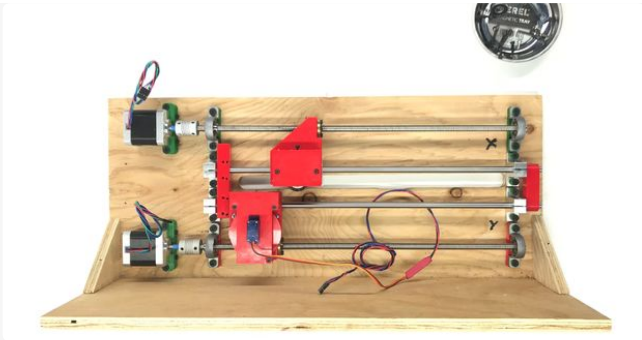
Step 8: Adding the Steppers


Wantai Stepper Motor
Model: 42BYGHM809



The steppers are mounted to the board with the NEMA_support. The support has two holes for M3 screws. Screw the support into the stepper and insert the coupler into the shaft. I got the wrong kind of coupler so I had to put shrink tube for them to fit nicely. Now, connect the steppers to the lead screw with the couplers. Make sure its straight and screw the support into the board.

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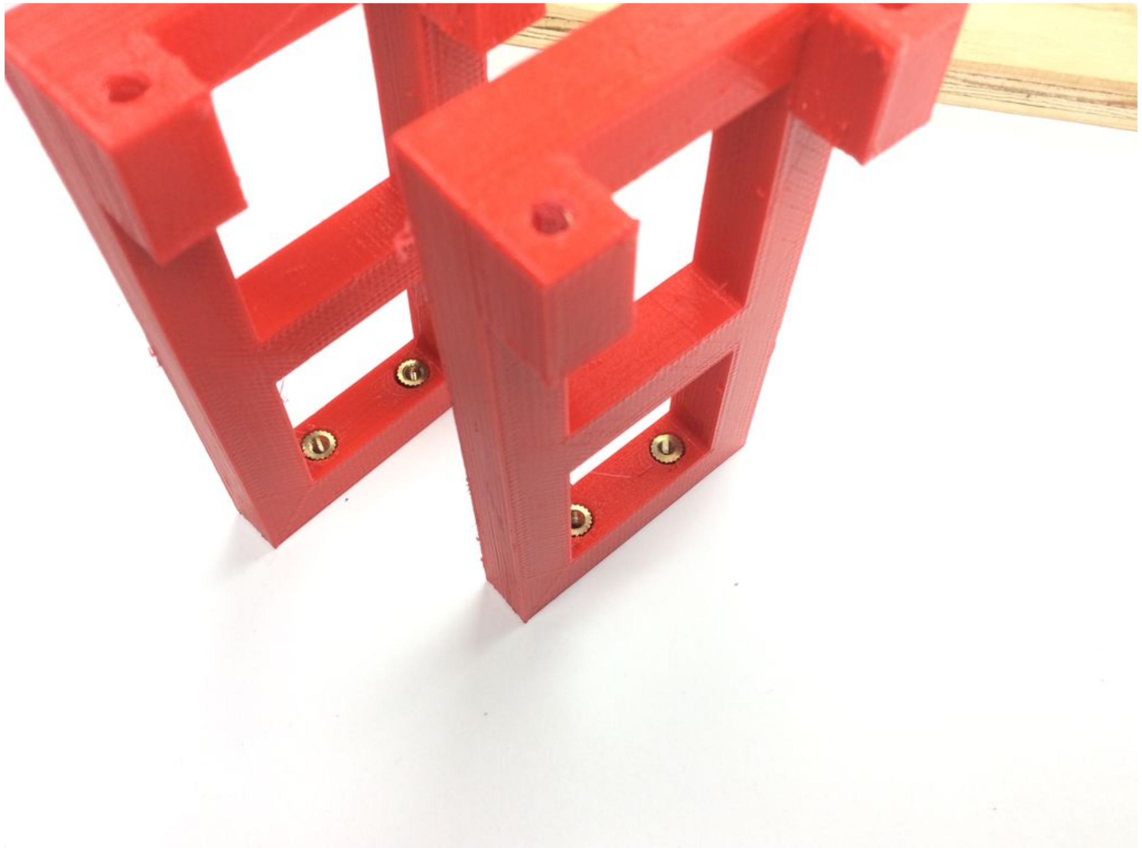
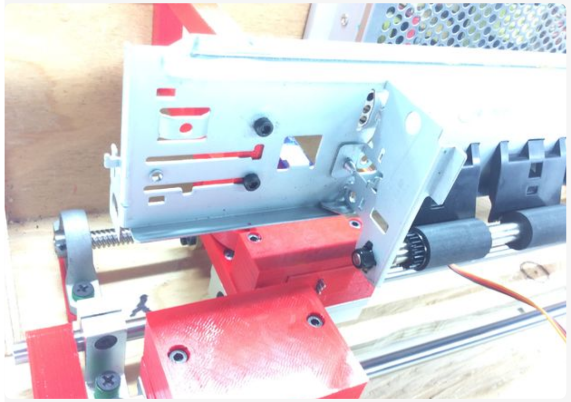
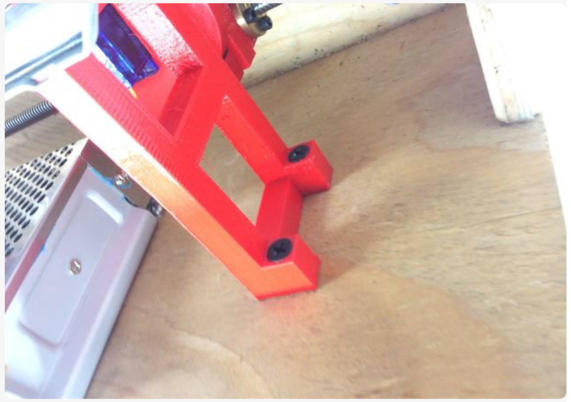
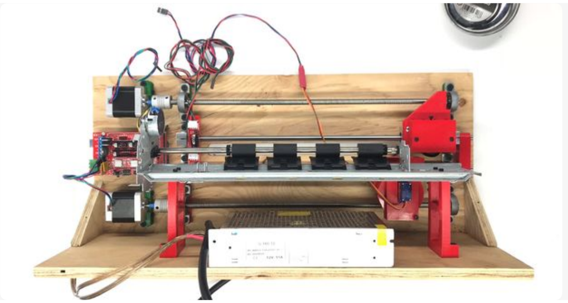
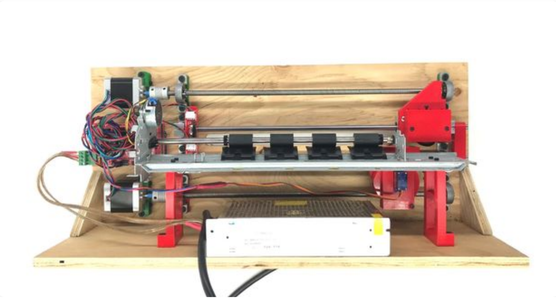
Step 9: Mounting the Z Axis and the Power Supply









For the Z axis I used a regular printer carriage. I found an old printer and I took it apart. The one I found didn't use steppers, it used dc motors with encoders... So I had to replace the motor with a stepper. Other than that, four holes have to be drilled in the carriage for the Z_supports. The Z_supports are mounted into the carriage with M3 screws, then, the Z axis is has to be screw into the wood.

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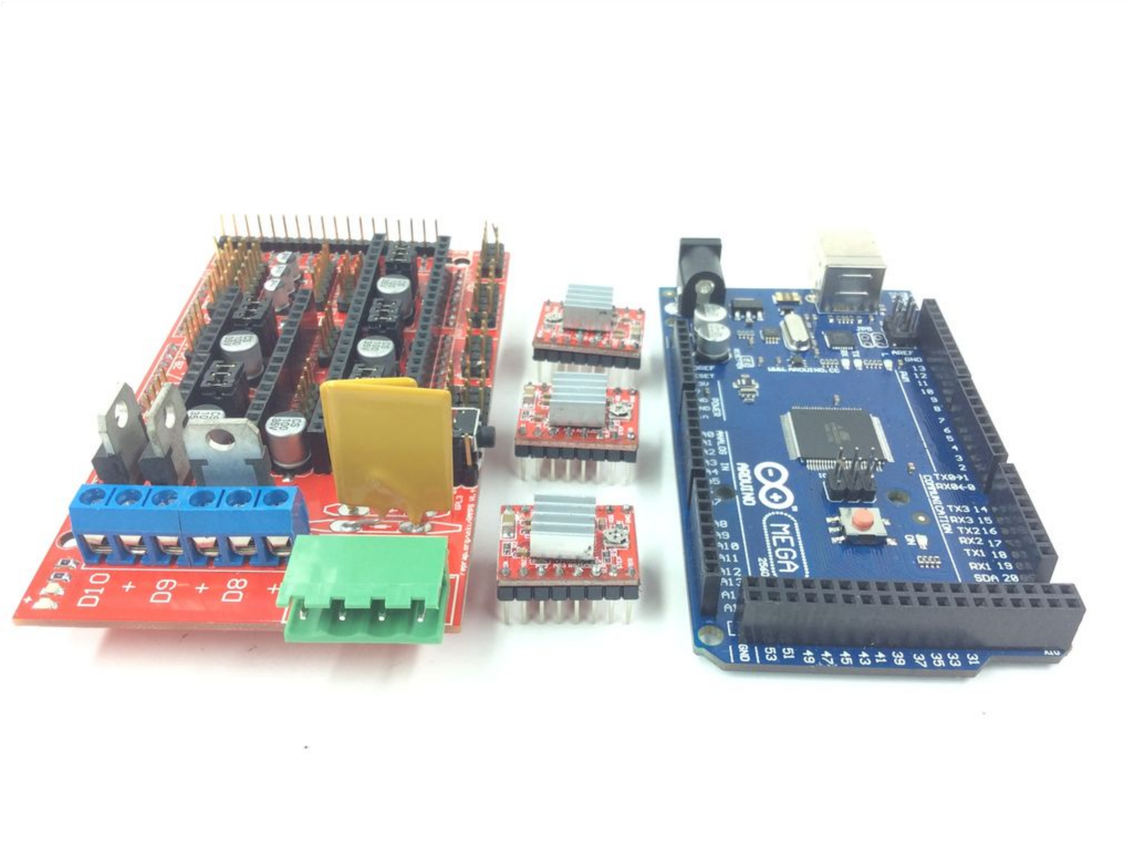
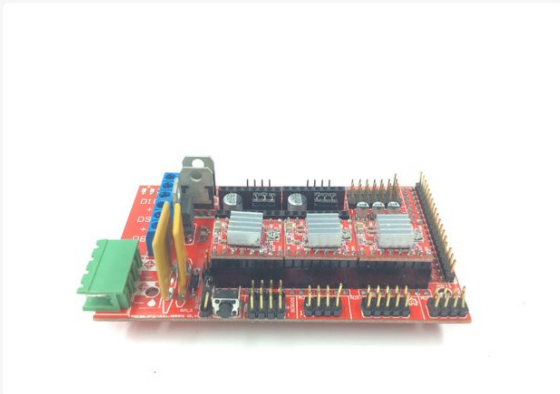
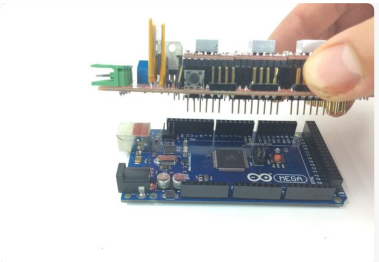
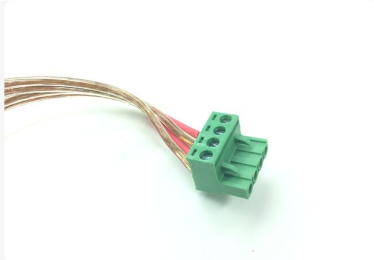
Step 10: Connecting the Electronics


D10 + D9 + D8 +
MEGA







Show All 7 Items

Let’s assemble the brains of the printer. I use the exact same electronics intended for a 3D printer. First, we need to place the stepper drivers in the ramps board (big red board in the pictures). There is place for 5 drivers, we will only use the first 3, as labeled in the board insert the drivers for the X, Y and Z(only one). The drivers (small red in the pictures) have to be inserted the right way, so look at the pictures before inserting the pins in the headers. Now the ramps board can be added to the arduino (blue board in the pictures).

The power supply is way bigger than what is needed (It’s what I had). A 12 V with 6 Amps should be more than enough.

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Step 11: Getting the Software

Follow the link:

https://github.com/carloscamposalcocer/OpenBraille

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Step 12: Credits

OpenBraille itself is a production of LaCasaLab, a home made laboratory made by me and my roommateChristelle.

I would like to thank Sensorica and Eco2Fest, both organizations helped me find a programmer.

And a special thanks to David Pache who programmed the user interface!

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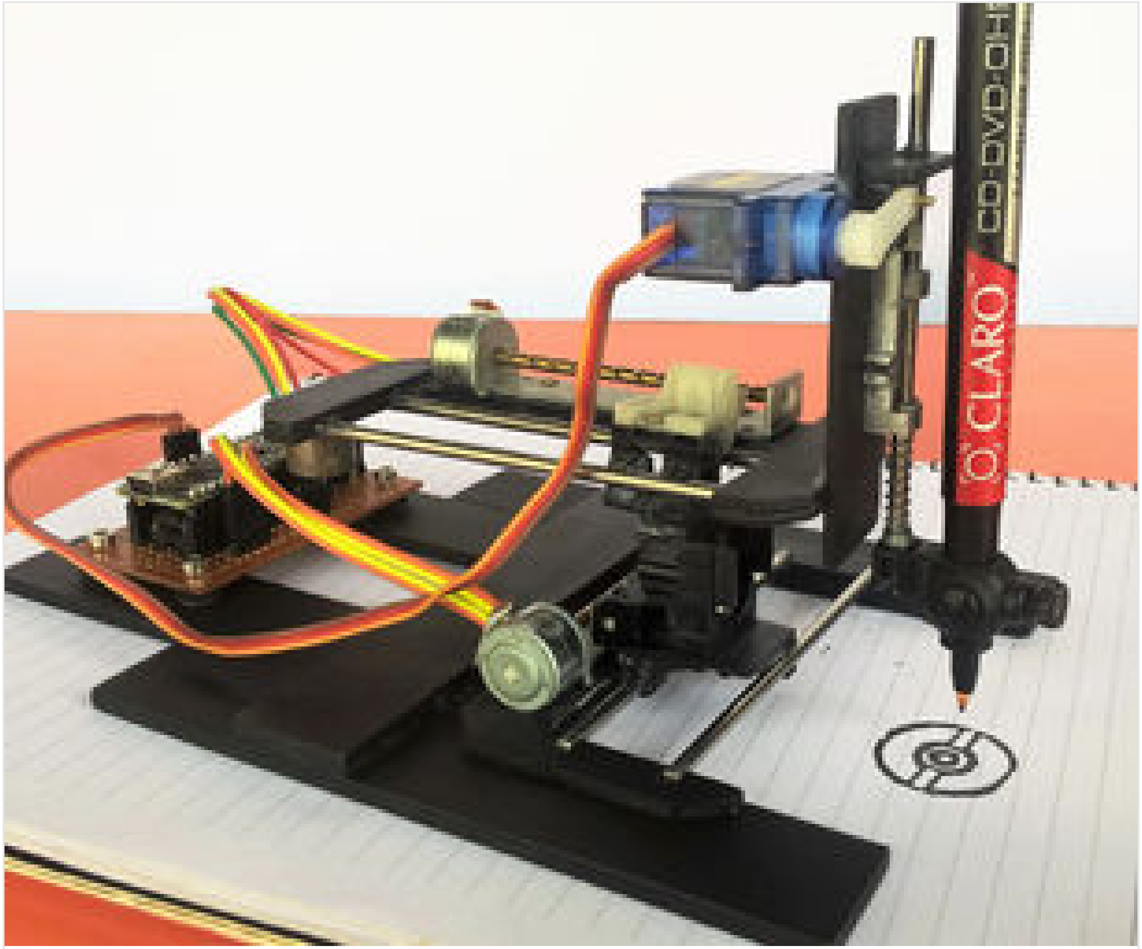

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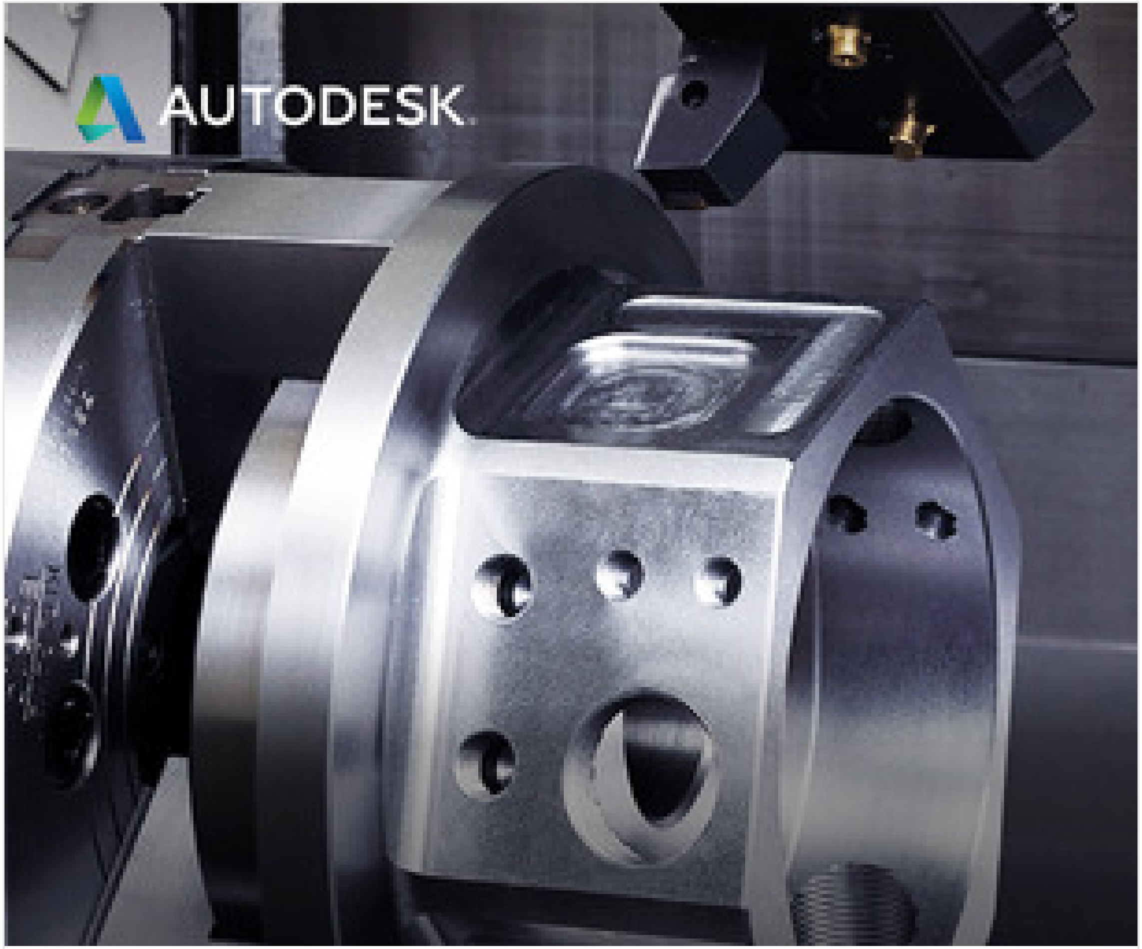

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