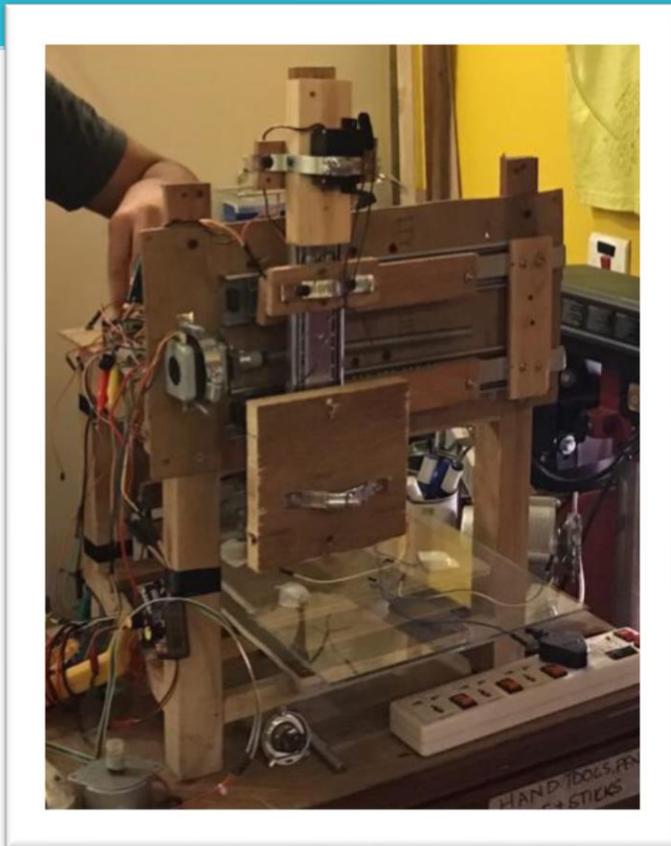


DIY CNC Machine

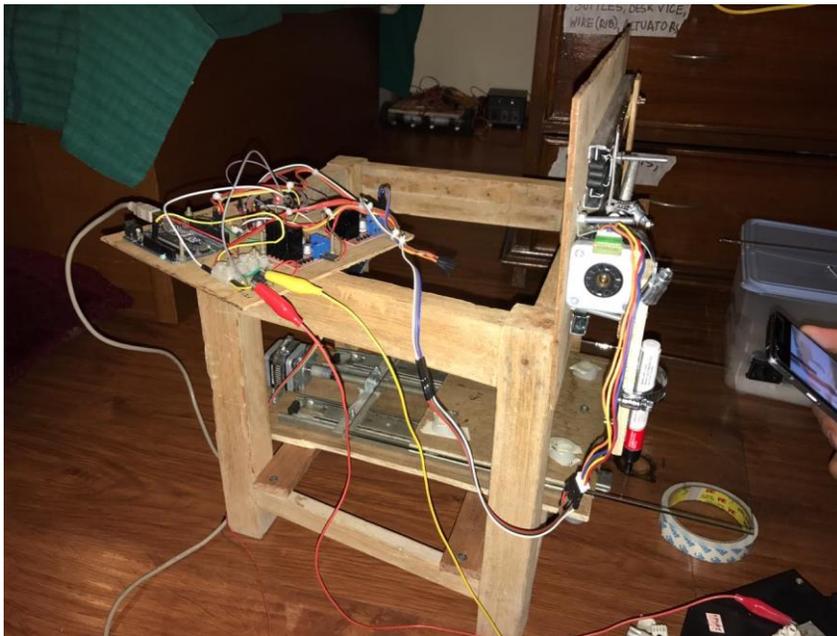


OBJECTIVE

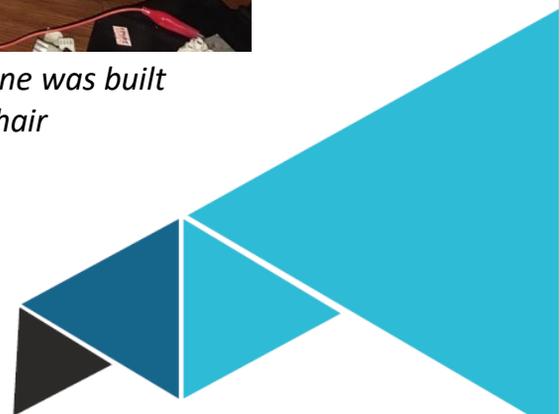
This project was built in August of 2015. At the time, the cheapest 3D printer cost around Rs. 60,000 (\$1000), making 3D printing technology out of reach for enthusiasts like myself. I decided that I wanted to build my own CNC machine. Little did I know that this project would span over 3 years and turn out to be one of my biggest projects.

To keep the costs minimal, all the wood, aluminum, rails, motors and ball screws were either purchased from a hardware store or recycled from e-waste. The only thing bought for this project was the Arduino Uno and motor controllers making the total cost of the project Rs. 1500 (\$25).

The project concluded when I made a 3 axis CNC machine. Due to the high cost of the extruder I left the project as a 3 axis CNC machine and began working on my own extruder.



To keep the cost low, the entire machine was built around the frame of an old chair



BUILD OVERVIEW

The structure of the printer is based on an old chair! The X and Y axis are controlled by an old stepper motor from a printer with a 10mm bolt and the leadscrew. To save money, instead of linear bearings and shafts is used drawer channels. Each axis is controlled by an EasyDriver from Adafruit connected to an Arduino. Due to the high current draw of the stepper motors, an old ATX Power Supply from a computer is used. For testing, a pen is used in place of an extruder.

HARDWARE

Unlike NEMA stepper motors, printer stepper motors have a low torque and so as many parts as possible are made of 3mm plywood. The 10mm shaft is used on construction and costs less than Rs. 60 per meter (\$1 per 3.2 feet). To reduce backlash, two nuts are used. The ATX power supply is modified to work without a motherboard and powers the Arduino and peripherals with 5v.

SOFTWARE

I wanted this to work not only as a 3D printer but also as a CNC machine in case I ever wanted to use it as a laser cutter. The CNC machine runs off G-Code. On the Arduino, we will install a G-Code interpreter called Grbl. A Grbl hex file is uploaded to the Arduino using XLoader. Next, the desired STL file can be used with the Grbl Controller program to move each axis in unison.



BILL OF MATERIALS

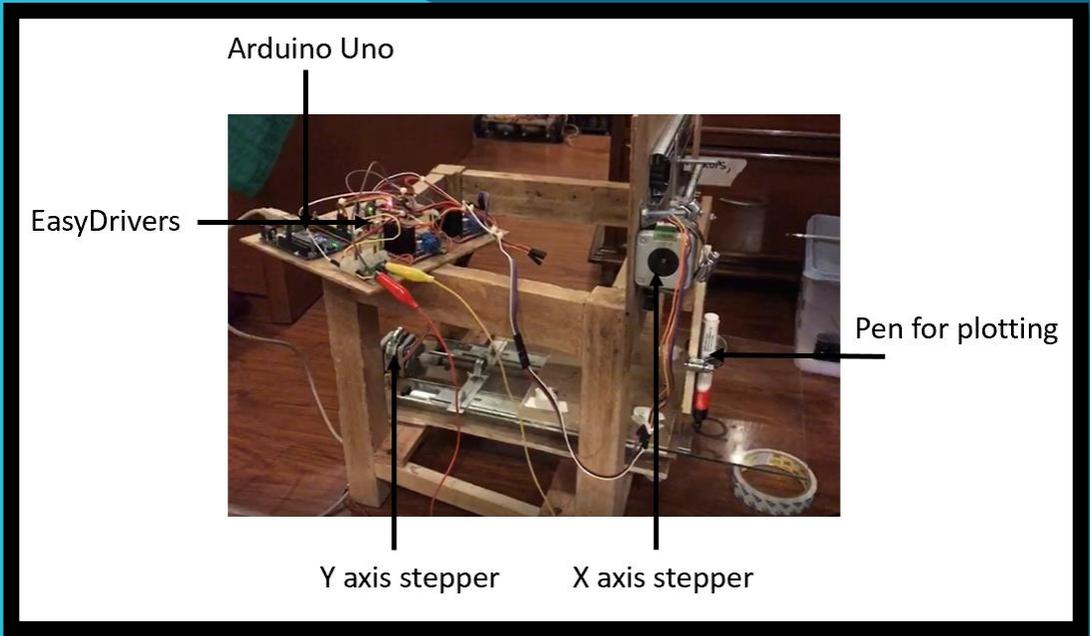
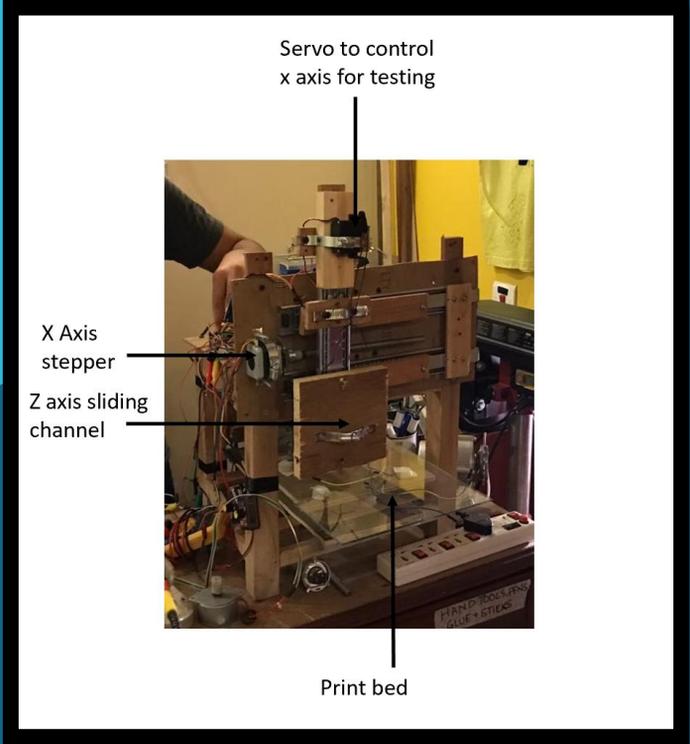
- 1x Arduino Uno
- 3x Adafruit EasyDriver
- 3x Stepper Motors
- 3x 10mm Shaft
- 6x 10mm nut
- 5x 12-inch drawer channel
- 6x Hose clamps to attach motors
- 1x ATX Power Supply
- 1x Extruder Setup (If you are using this as a 3D printer)
- 1x Glass bed
- Miscellaneous wood for frames
- 3mm plywood for each axis



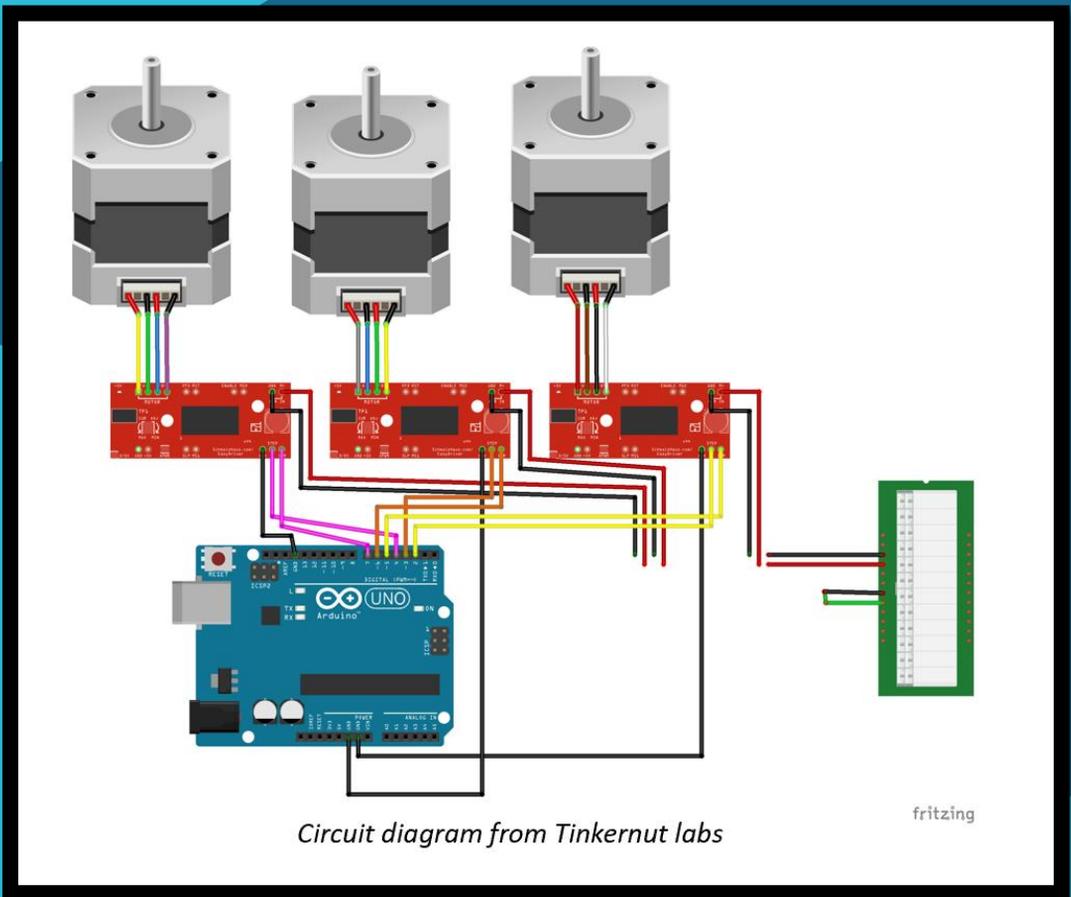
This may seem insignificant but this was my first print ever. A simple circle took me hours and hours of work to print!



ROBOT OVERVIEW



CIRCUIT DIAGRAM



Circuit diagram from Tinkernut labs

fritzing

RESOURCE LINKS

Xloader - <http://www.russemotto.com/xloader/?from=@>

Grbl hex file - <https://github.com/grbl/grbl>

Grbl Controller -

https://www.tinkernut.com/demos/383_cnc/grblcontroller.zip

Inspiration for this project from Tinkernut labs -

<https://www.tinkernut.com/portfolio/hack-old-cd-roms-into-a-cnc-machine/>

