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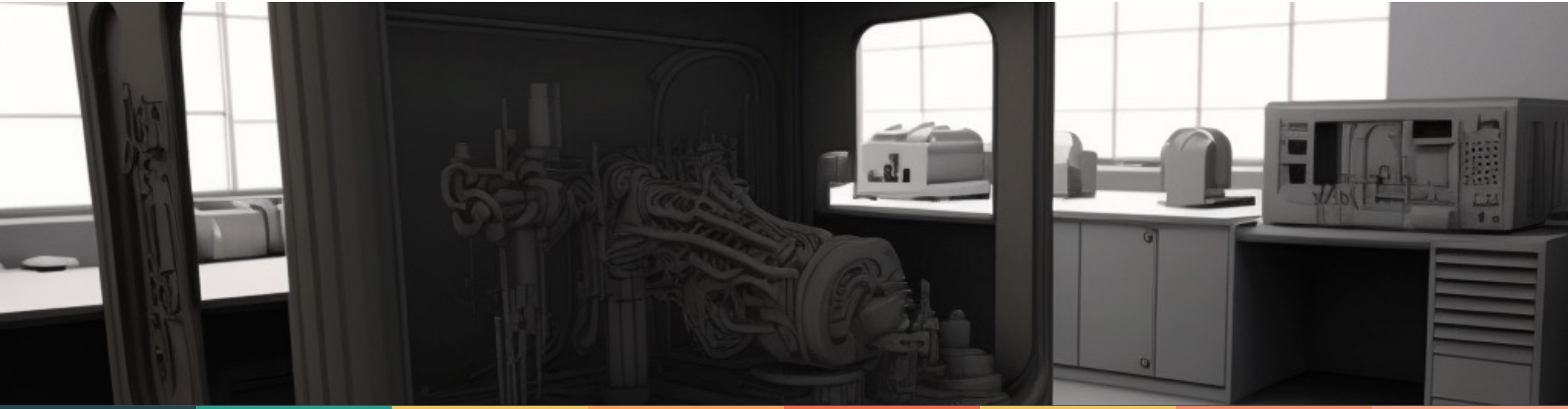
FORMAÇÃO

MAKER LAB – 3D Printing I

*How to make **'nearly'** everything*

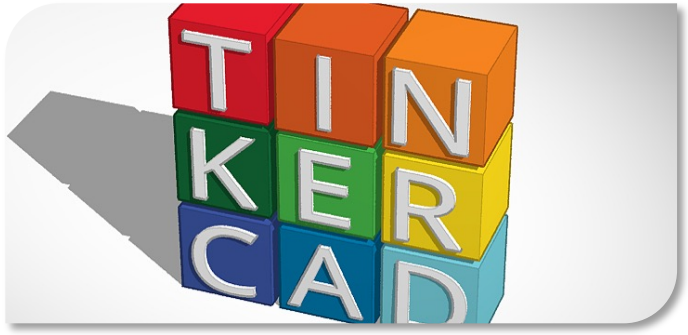
Tiago Carita 20 24



MAKER LAB I

THEORY

- Fabrication Technics
- 3d Printing



TOOLS

- Caliper
- Thinker Cad

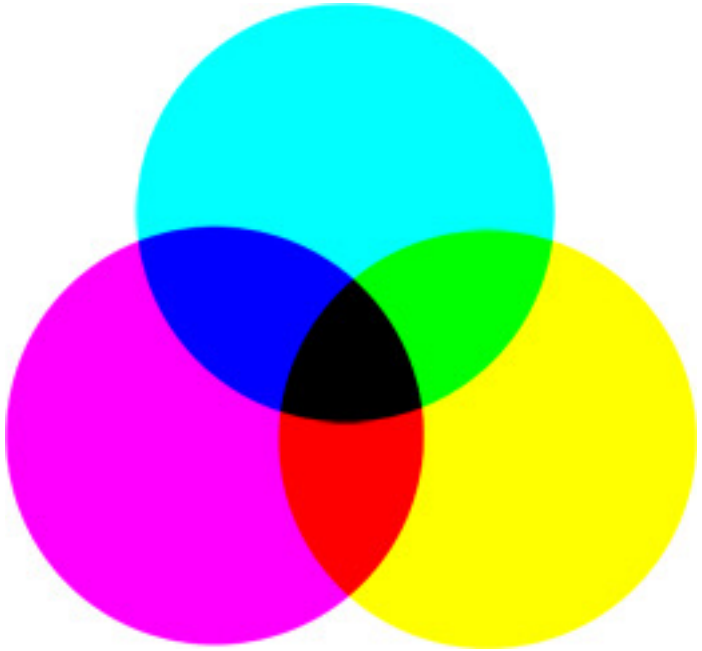
EXERCICES

- Guided Exercise

Building 'Stuff'

Some Production Methods

PRINT



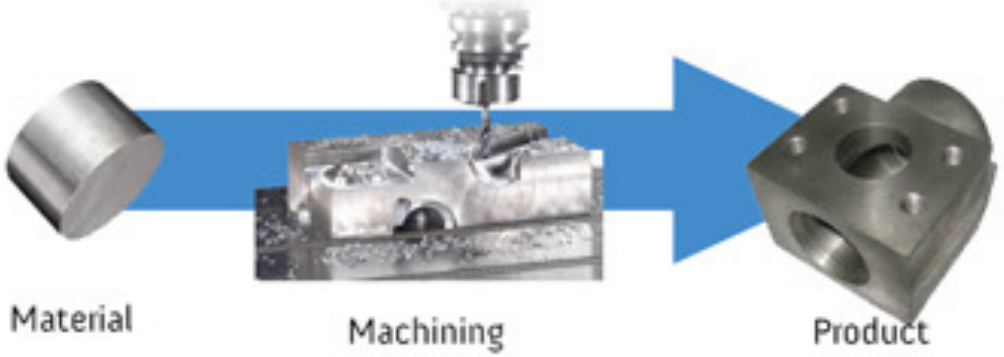
- The process of reproducing text and images, typically using colored ink on paper through a machine

Impression
One of the first printers

- Gutenberg Print Press (1440)
- It used copper letter moulds and was much faster and stronger than Asian Print Presses.

Addition and subtraction

● Conventional Manufacturing (subtractive) process



Material

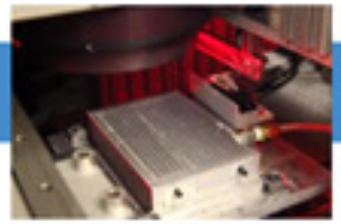
Machining

Product

Scrap/Waste

● Additive Manufacturing Process

Material



Layer Deposition

Product

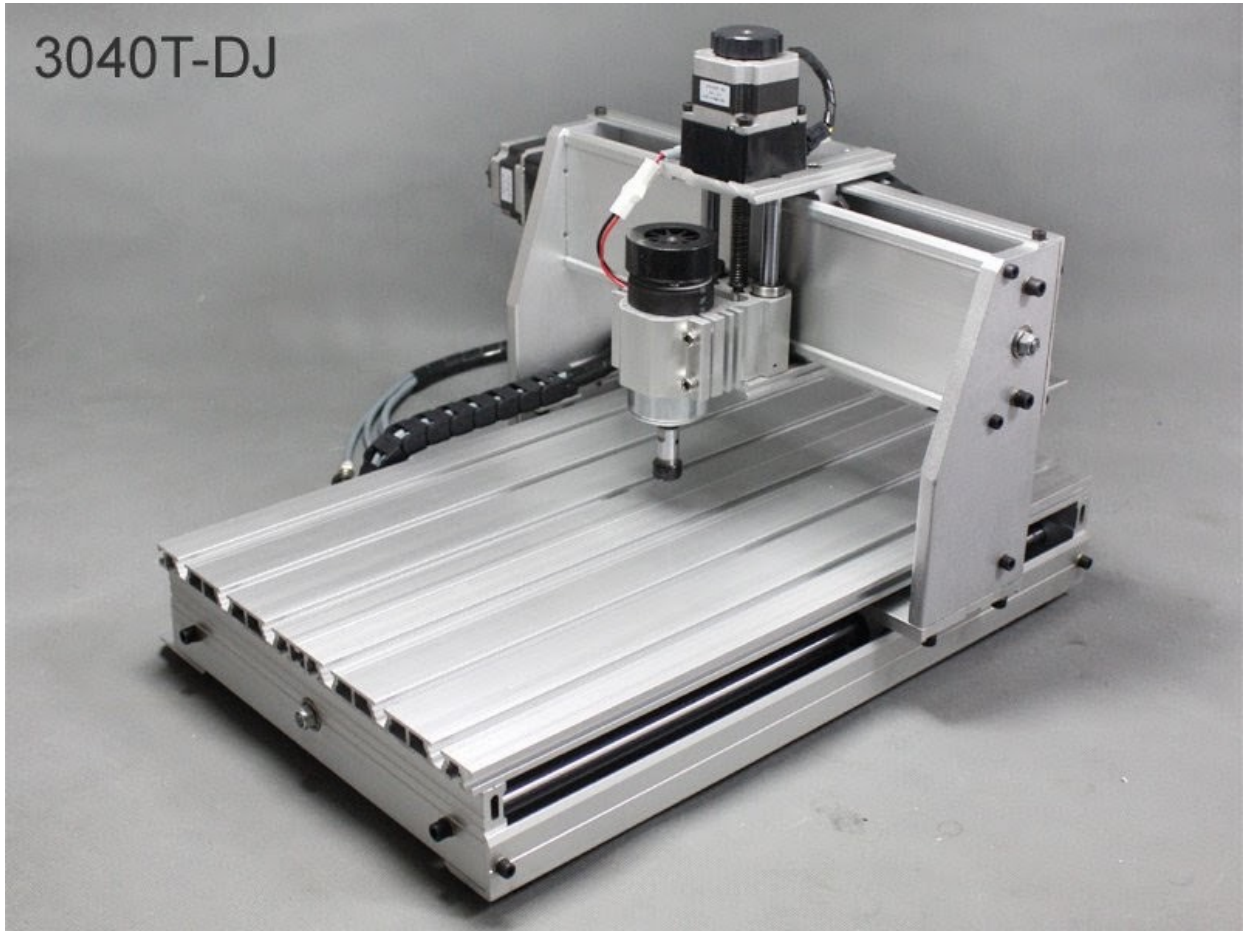
Scrap/Waste

Subtractive

- The object is divided into layers
- Excess is removed mechanically
- The solidity and integrity of the unremoved areas is superior to other production methods
- Generates a lot of waste
- Production Limitations
- Complicated to program
- Diverse and complex tools

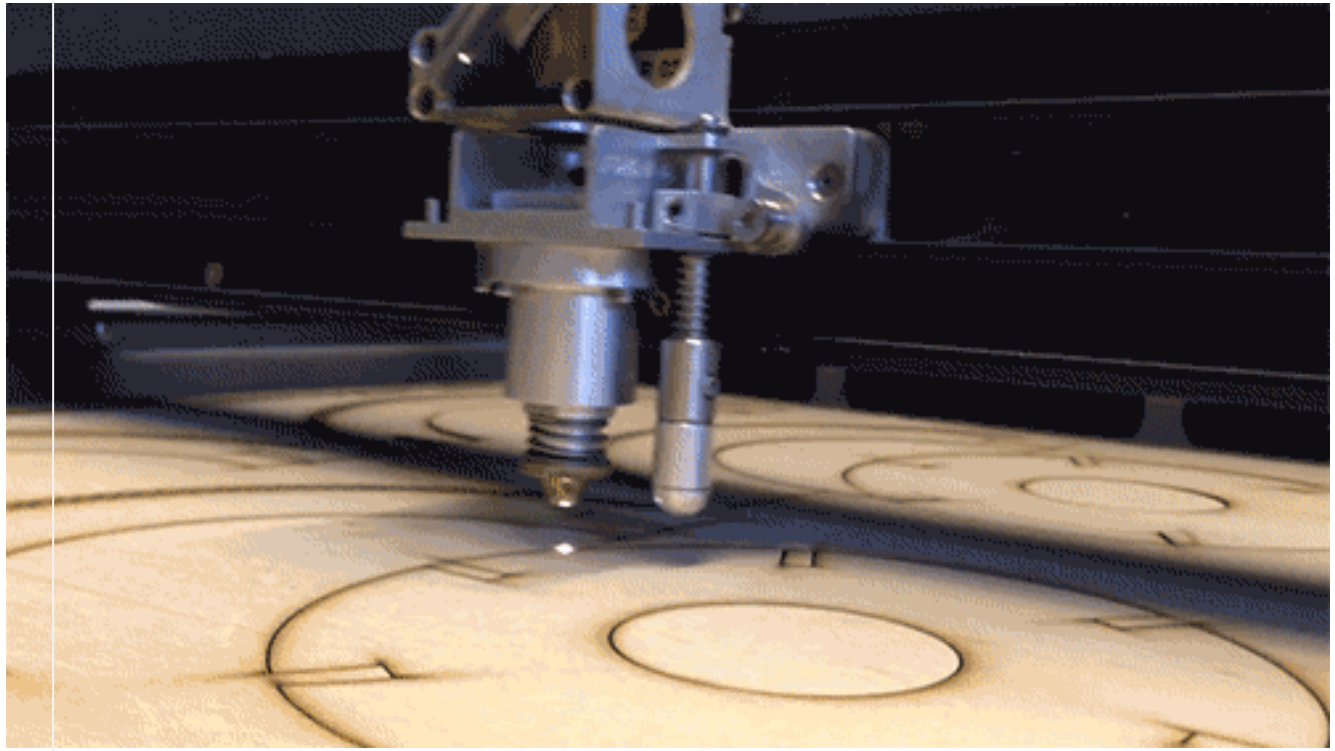
Considering costs...

- Chinese CNC connected to a PC
- Capable of machining and cutting wood, plastics, and medium aluminium



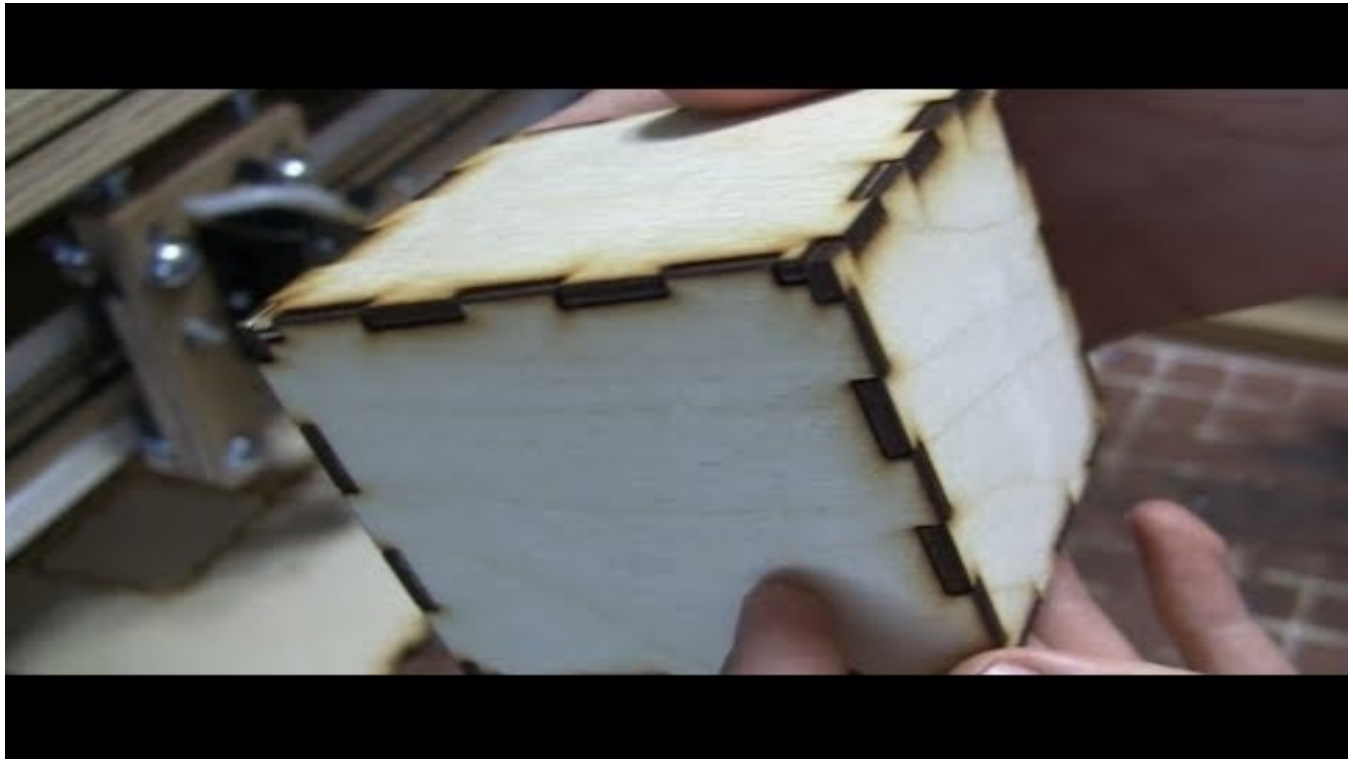
Cutting Materials
Laser, Plasma and H2O

- Simple Objects Created with Planes (Slotted Boxes)
- A slab of miscellaneous material is cut into pattern
- This pattern can be used and/or assembled with each other
- Cutting can be mechanical with CNC or jig-tick, by Plasma or laser
- Production Limitations
- 2D Drawings



Material Cutting - Example

- Drawing of a cube to be laser cut
- Example has one of the programs I use for CNC



Considering costs…

- Faulty white label c02 80W laser that I bought on ebay and fixed
- Capable of cutting wood, plastics up to 5mm, foams up to 50mm and marking materials including metals using various techniques

MAKER LAB – 3D Printing I

Material Folding Metals & Plastics

- Metal or plastic objects can be cut and bent with a variety of applications
- Folds can be used to use thin metals and create areas of mechanical setting and structural reinforcement
- The presses are measured by tonnage and use Dies and Punches to create the necessary shapes
- Production Limitations
- 2D/3D Drawings

Bending Materials - Example

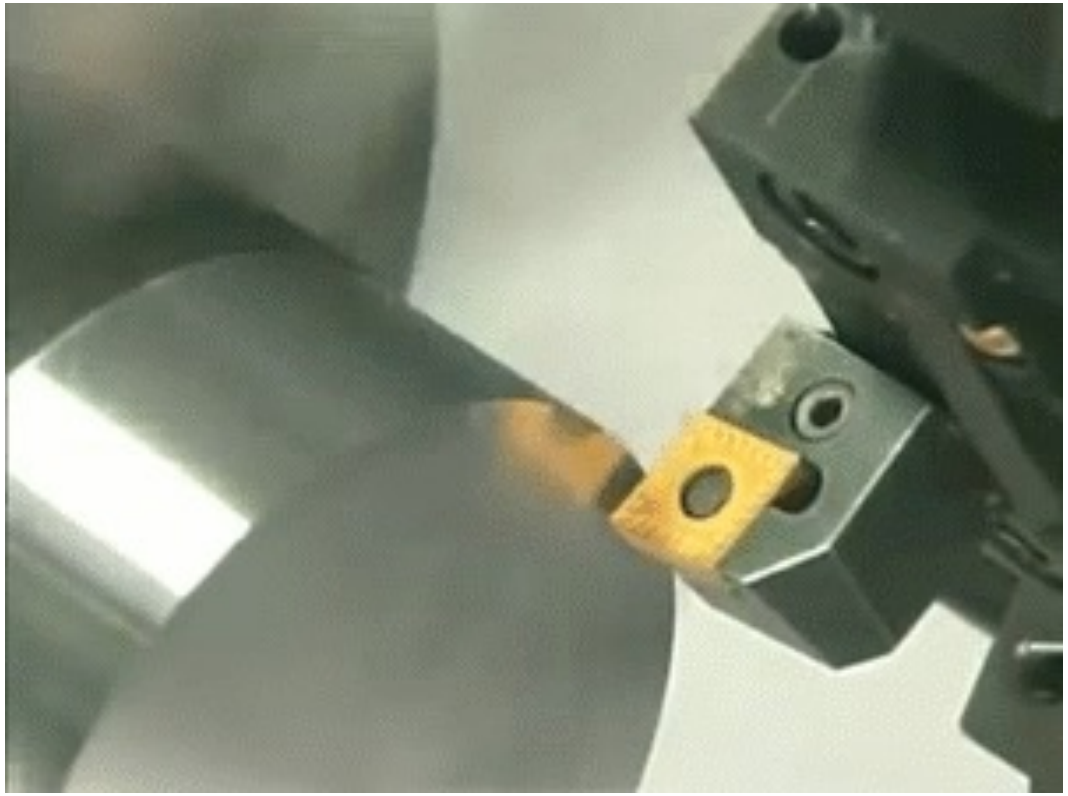
- 80 Ton Press

Since I could not afford it...

- Mini Dies clinging to a large Lathe
- Lots of sweat and strength
- A few tears and pieces for the trash

Tournament
Subtraction of rotating material

- Tubular or circular objects, shafts, inserts, etc...
- A block of material, preferably tubular, is inserted into a rotary engine and is sculpted via mechanical means



Lath - Example

- Creating a shaft

Since I could not afford it...

- I added an extra axis on the CNC, it allows you not only to do the rotary tournament but also to sculpt with one more axis of rotation
- My experiments were disastrous, and I ended up buying a lathe but manual other than by computer

Molds – Addictive

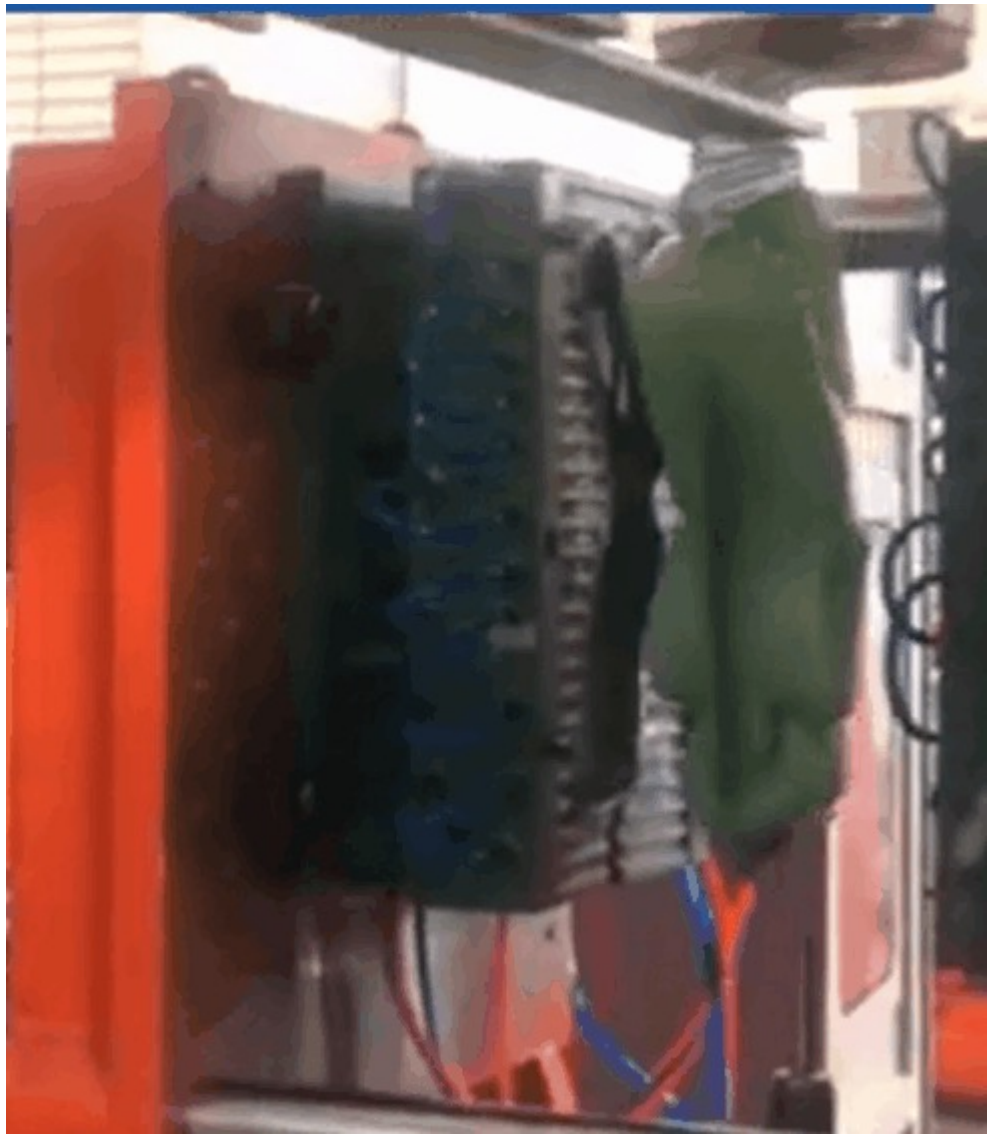
- Using any of the techniques described above (CNC or 3D Print) we manufacture one or more Negative parts of the one we want to produce
- These negatives can be filled with injected plastic, resins, or Styrofoam to produce the final piece
- In this way we can consistently make several pieces of the same

Molds - Example

- Injection Molding Video

Blow Molds - Example

- Injection and pressing a air filled tube of soft plastic

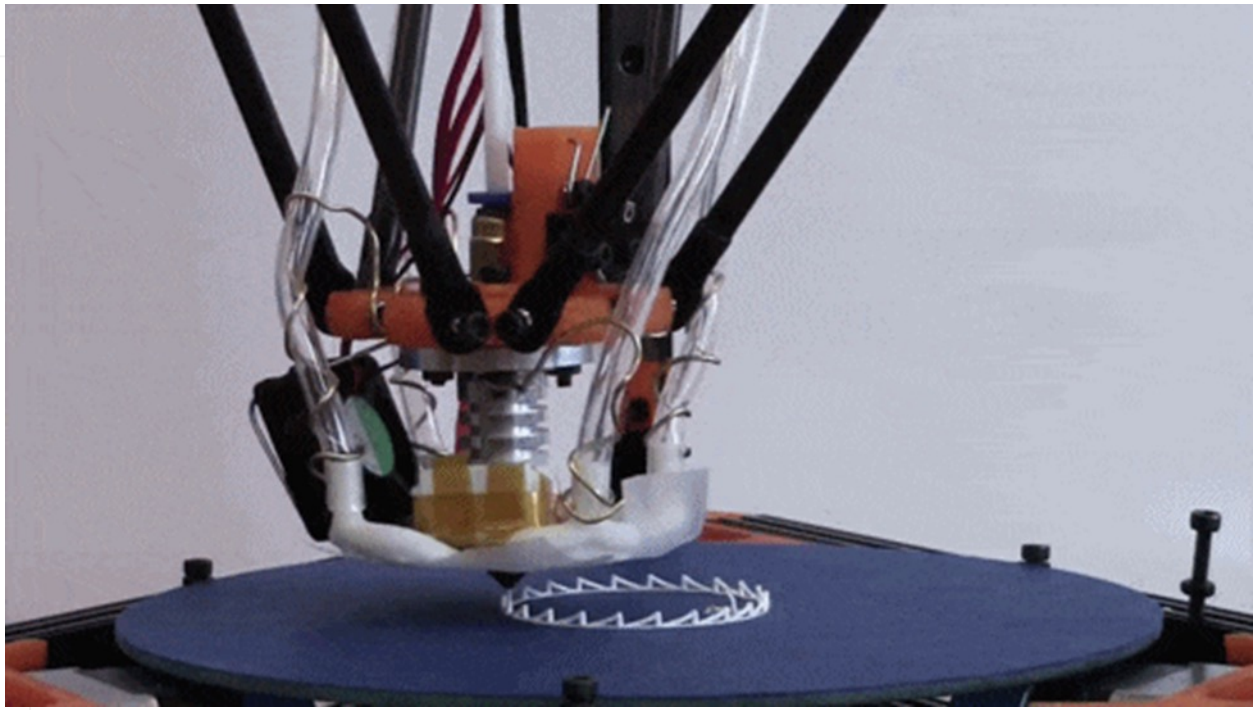


Since I could not afford it...

- Although I have a CNC, but it doesn't machine metal well and I don't have anything yet that allows injection, but I usually make less complex moulds
- Silicone moulds or 3D print where I use resin to make the parts, the durability of a silicone mould is 10 to 20 pieces, but the cost is low

3D Print – Addictive

- Three-dimensional objects are created by adding layers of materials that are fused together
- Mostly plastics, but there are dozens of materials that can be printed
- The process is less complex than CNCs, but still requires three-dimensional knowledge of the part



3D Print - Exemplo

- Plastic printing on top via FDM (Fused Deposit Modeling)
- Below is a metal print via SLM (Selective Layer Melting)

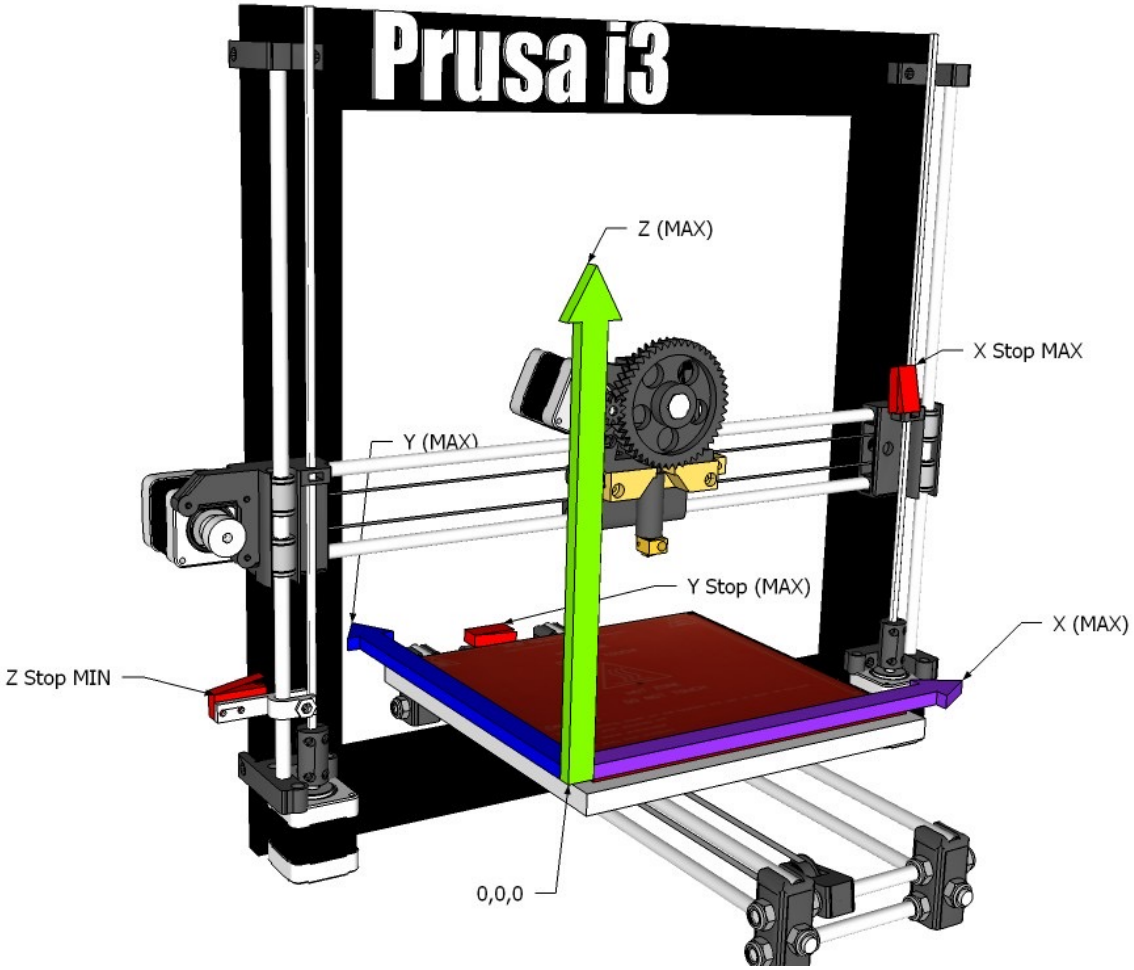
Types of 3D printers

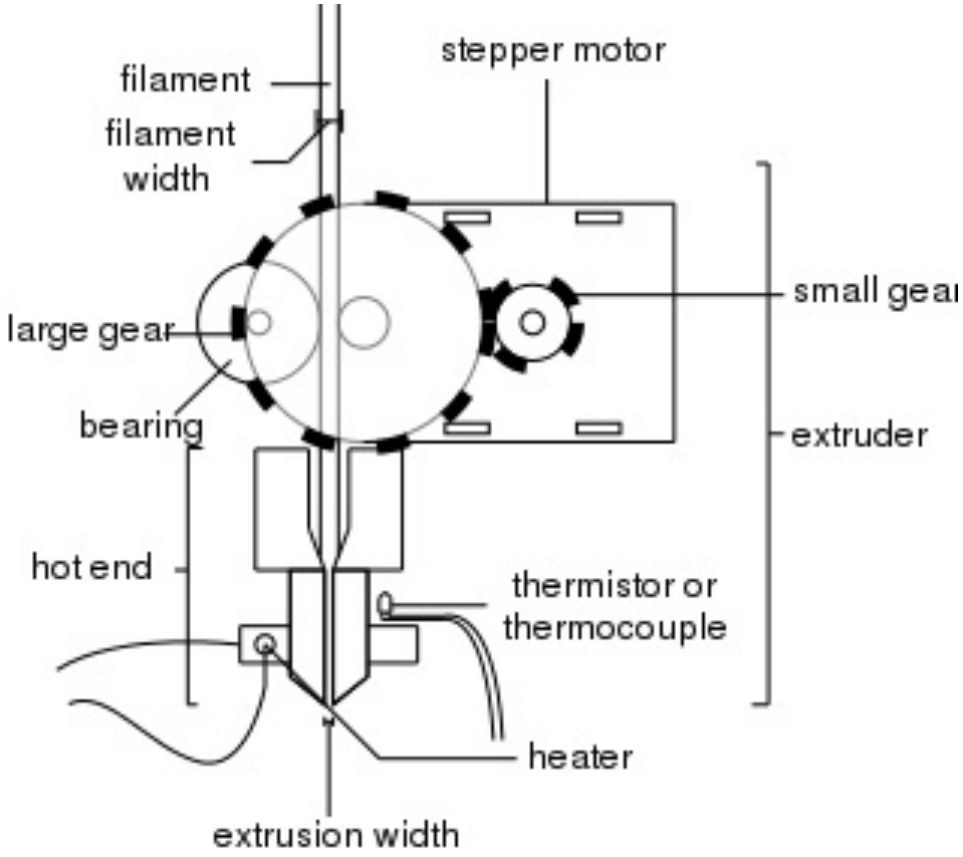
- Stereolithography (SLA) – Converts liquid plastic to solid
- Digital Light Processing (DLP) - Converts photosensitive resins from liquid to plastic
- Fused deposition modelling (FDM) - Converts plastic filament into objects using an extruder
- Selective Laser Sintering (SLS) – Converts layers of powdery material into solids with a laser that does selective fusion
- Selective laser melting (SLM) – similar to the one above but uses a much stronger laser fused to metal powders.
- Electronic Beam Melting (EBM) looks like both of those above but uses an electron beam to fuse the layers together
- Laminated object manufacturing (LOM), uses a roll of material that is glued/fused layer by layer and cut with laser, or mechanically.

Materials for FDM

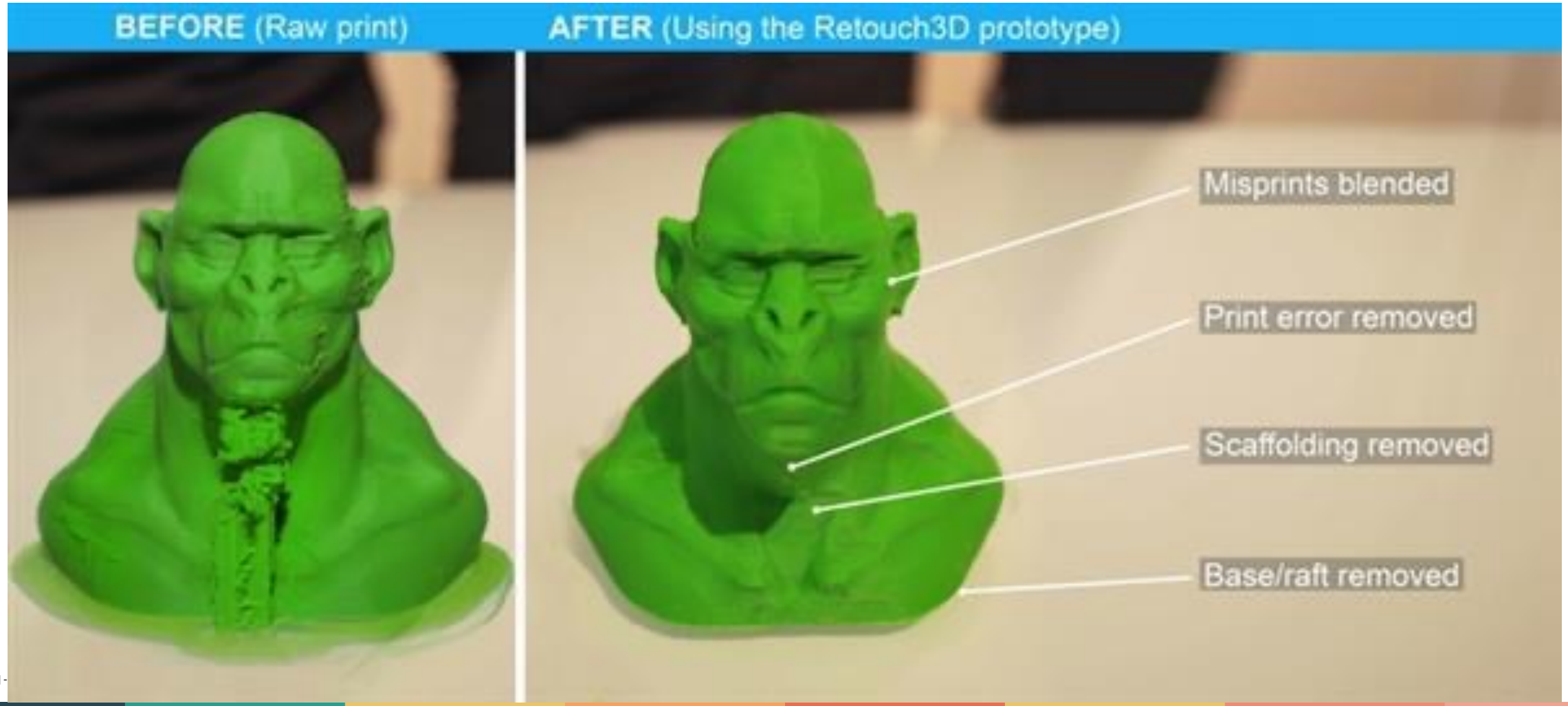
- ABS – resistant, injectable, slightly toxic
- PLA – Corn-based, recyclable and non-toxic plastic
- PVA – water soluble, used for supports
- Nylon – very hard, difficult to print
- PLA/PHA-based co-polyesters with performance, strength and printing improvements
- Ninjaflex - Elastic Thermoplastic,
- And so on.....

Anatomy of an FDM Printer



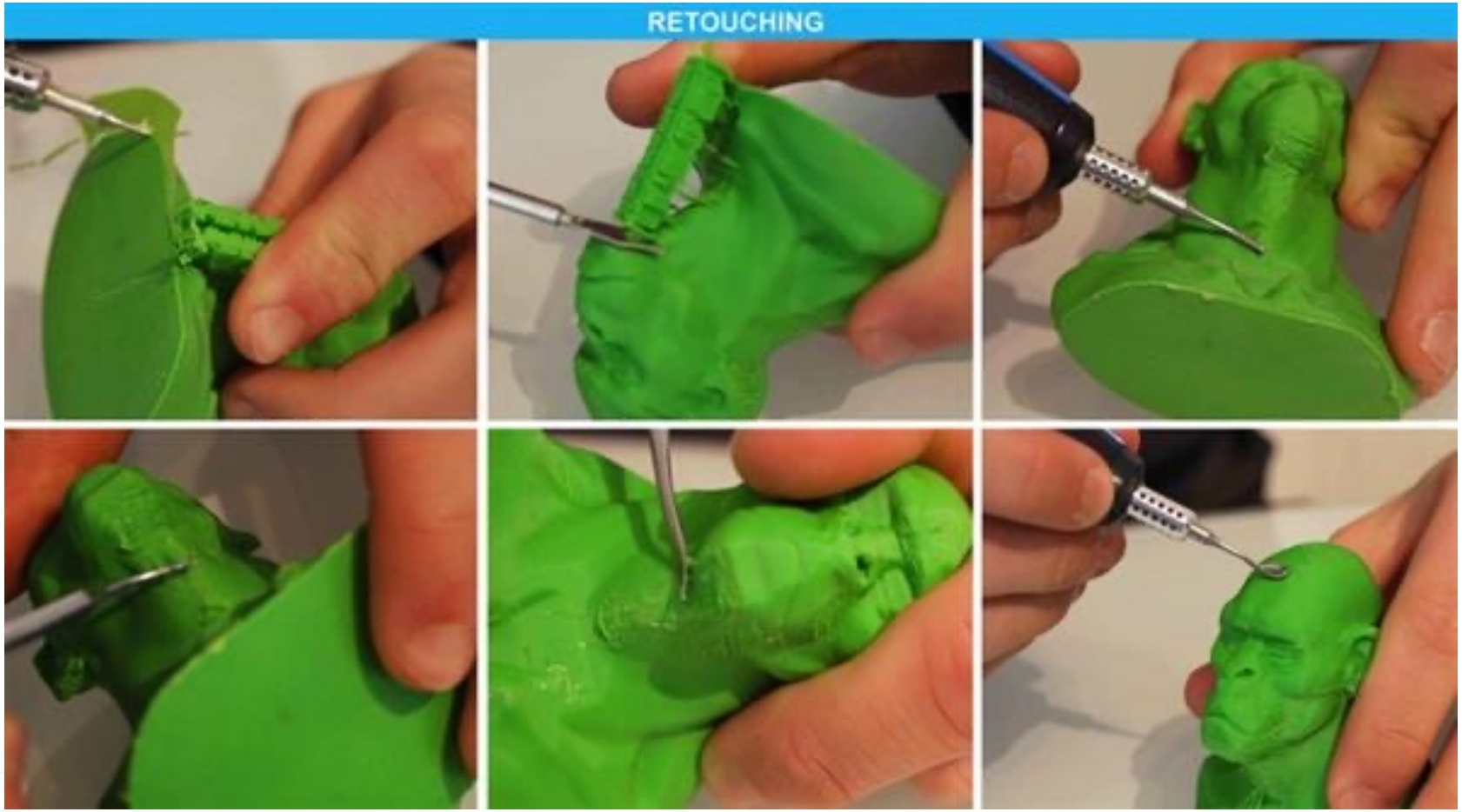


POST PRINTING
Finishes



POST PRINTING
Finishes

- Mechanical corrections
- Chemical straightening
- Subtraction straightening
- Straightening by addition
- Paintings
- Lacquers
- Fillers



A REAL REVOLUTION! (Reaallyy?)

- Imagine that whenever you need an object, you can print it right in your living room or home office.
- We can access Tangible Objects through digital services.
- It may seem like a revolution, but the first FDMs have been around since 1980, but only now have they expanded because technology has allowed it

É FÁCIL?

- NOT!
- Although there are dozens of printers for the public, the process itself is complex and not as easy to automate as ink printers are
- Users need to have a certain ability to act on problems
- You have to be Makers or Thinkerers or the experience will be lost

Is it sustainable?

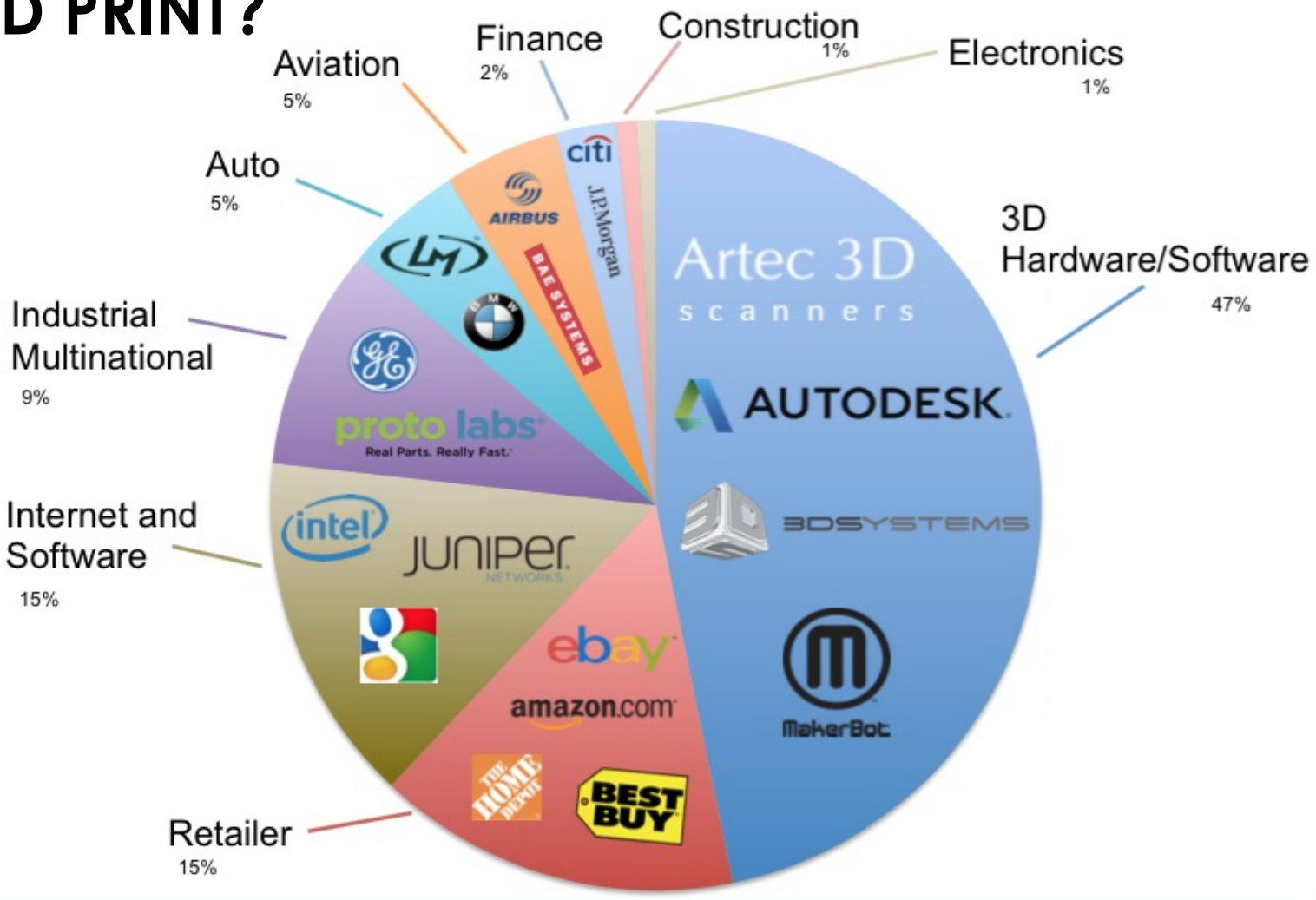
- It depends on the printed material, but there are many PLAs that are chemical-free and are even 'food safe'
- When we produce a 3D printed part, the leftovers are minimal compared to other forms of production
- The energy expended is less per cm3
- And we can print spare parts for small accidents

FUTURE?

- The intellectual property of what is printed is debatable, especially if the design is not ours or was taken from the Net
- Some products do not allow us to repair or modify them, losing the warranty automatically
- Almost anything can be printed, so a gun is something that darkens the future of 3D printing

APPLICATIONS OF 3D PRINT?

- Rapid Prototyping
- Modelling
- Custom Parts
- Design
- Research
- Architecture
- Restoration
- Entertainment



WHAT DOES THE PROCESS LOOK LIKE?

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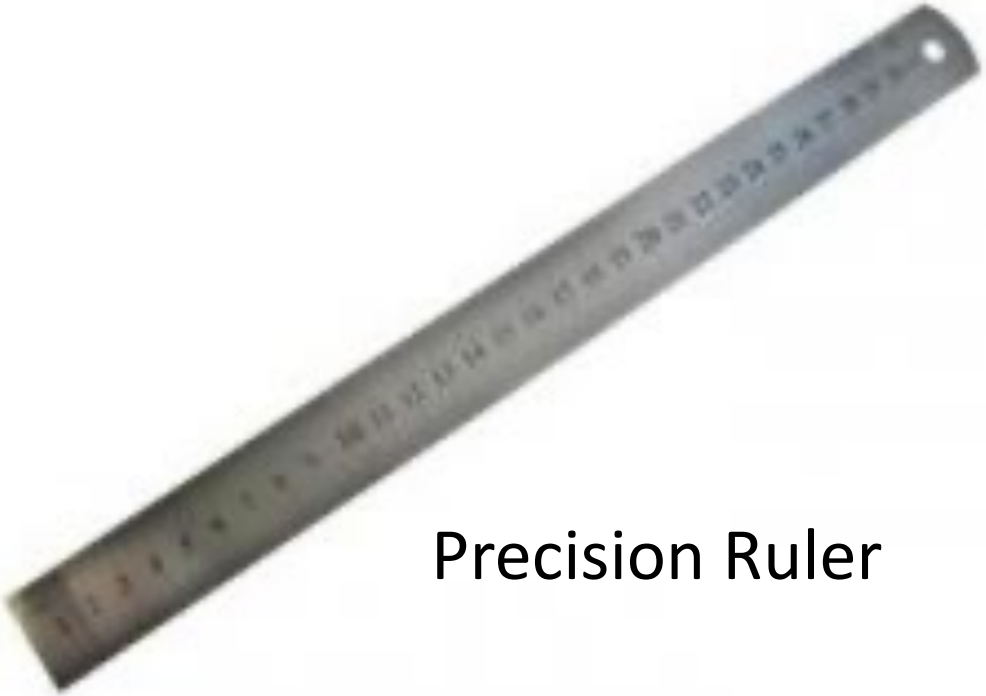
LET'S GET DIRTY
Essential Tools - Hardware

Caliper



Precision Ruler

LETS GET DIRTY

Essential Tools - Software

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Challenge I


Cults 3D
Pencil Holder · 3D printer ...


3D4Create
Pen Holder 3D Print: 15 Best ...


All3DP
3D Printed Pen Holder: 25 Best Models ...


Treatstock
3D Printed custom ...


Thangs
Honeycomb Pencil Hold...


Honey and Ivy
Chloe Pen Holder & Tray - 3D Print...


Maker Club
Maker Club: 3D Printed Porcupine ...


Printables.com
Pencil Holder 3D Printing by ...


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TOOTH BRUSH HOLDER ...

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All3DP
3D Printed Pen Holder: 25 Best Mo...


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DNA Pen Holder Stl...


Pinterest
3D Print Name Desk Offi...


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Pen Holder - 3D mo...


Reddit
Rocinante Drive Co...


MyMinifactory
3D Printable OLBA 3D Pr...


Treatstock
3D Printed custom Stormtroope...