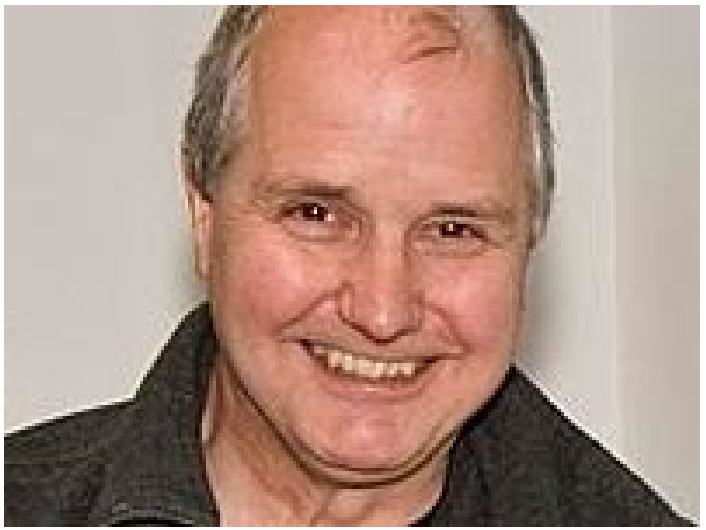
Idee/ der Held (Mesias) ← Ironie

Despite the dictates of modesty, I have to say that the idea was entirely mine.

Adrian Bower / Reprapmagazine Issue I



Idee/ wie Bower zu dieser Idee kam

1) I have been interested in the idea of artificial replicators since childhood. I can't remember where that came from.

2) Around the turn of the century, Bath University got an equipment grant, and I suggested that they spend it on two 3D printers. This was nothing to do with Item 1. - I just wanted access to them to make things.

3) As soon as the machines arrived I realised that here, at last, was a manufacturing technology that was powerful enough to replicate a significant fraction of itself.

4) I also realised that a self-replicating machine had to be a solid Darwinian success, independently of superficial and ephemeral froth like mere economics.

5) I decided that the way to do this was to copy an evolutionarily stable strategy from nature. The one I chose was the mutualist symbiosis between the flowers and the insects, as I have described elsewhere.

6) Almost as soon as I had the idea I realised that it was very powerful, and that the only way to prevent that power from falling into the wrong hands was to give it to every- one.

7) Literally minutes after I thought that I realised that you have to give any self-replicating device away anyway, otherwise you put yourself in an eternal battle trying to stop people doing with your idea the one thing it was intended to do.

8) Items 4. through 7. where what made me start RepRap as open-source from its very be-ginning.

Manifest

Wealth without money

People with resources can quite easily use them to acquire more.

(Communist Manifesto by Marx and Engels)

John von Neumann proposed a Universal Constructor - a machine that could copy itself.

There have been a number of such machines both realised in simulation and physically.

RepRap is thought to be the first usefull implementation, a machine that you can use to create things and that replicates itself other than Screws, Bushings, Lubricant, Electronics, Power Supply, Stepper Motors.

A compromise between immediately-achievable technology and the desirable aim.

The Machine will self-copy, but not self-assemble. (thought like a virus in nature)

The three most important aspects of such a self-copying rapid-prototyping machine are that:

1. The number of them in existence and the wealth they produce can grow exponentially,

2. The machine becomes subject to evolution by artificial selection, and

3. The machine creates wealth with a minimal need for industrial manufacturing.

Reprap Timeline

23 March 2005 / The RepRap blog is started.

RepRap

This is the blog for the RepRap project. See that link for details.

This blog has a threefold purpose:

1. To solicit and to acknowledge contributions to the RepRap project from other researchers,

2. To get project ideas into the public domain as soon as possible, to ensure that they are unpatentable, and

3. To act as a project diary.

As a consequence of Item 2, in particular, some items are a bit scrappy and provisional.

If you have something to contribute, please get in touch. But understand that all solutions offered must be open-source and free (as in not costing anything, as well as in freedom...).

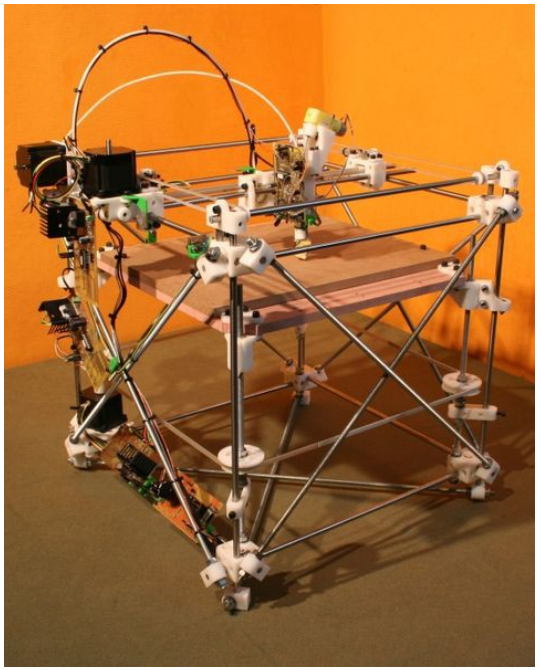
Reprap Timeline

13 September 2006

The RepRap 0.2 prototype successfully prints the first part of itself, which is subsequently used to replace an identical part originally created by a commercial 3D printer.

9 February 2008

RepRap 1.0 "Darwin" successfully makes at least one instance of over half its total rapid-prototyped parts.



14 April 2008

Possibly the first end-user item is made by a RepRap: a clamp to hold an iPod securely to the dashboard of a Ford Fiesta.

29 May 2008

Within a few minutes of being assembled, the first completed "child" machine makes the first part for a "grandchild" at the University of Bath, UK.

23 September 2008

It is reported that at least 100 copies have been produced in various countries. The exact number of RepRaps in circulation at that time is unknown.

30 November 2008

First documented "in the wild" replication occurs. Replication is completed by Wade Bortz, the first user outside of the developers' team to produce a complete set for another person.

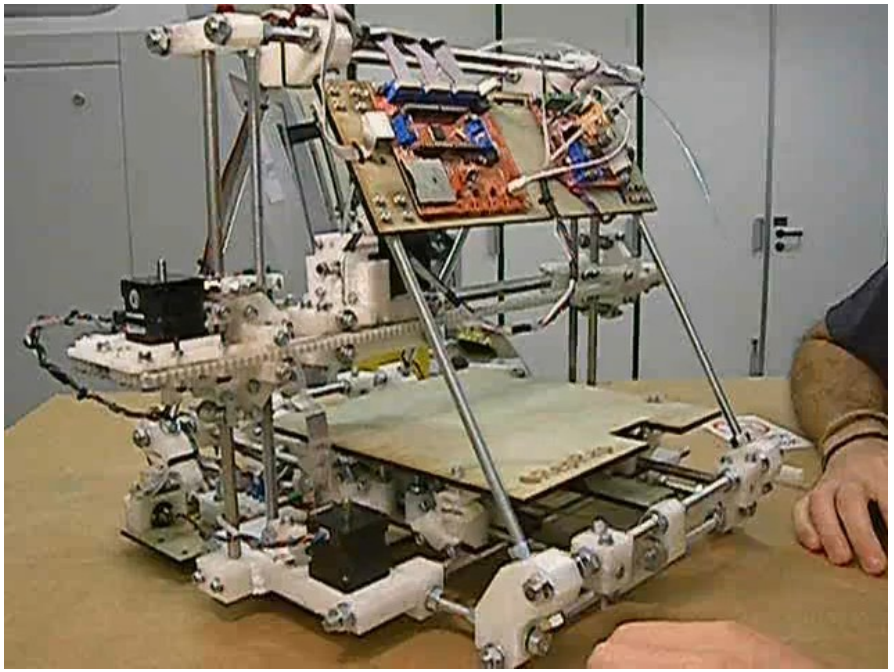
Reprap Timeline

2 October 2009

The second generation design, called "Mendel", prints its first part. The Mendel's shape resembles a triangular prism rather than a cube.

13 October 2009

RepRap 2.0 "Mendel" is completed.



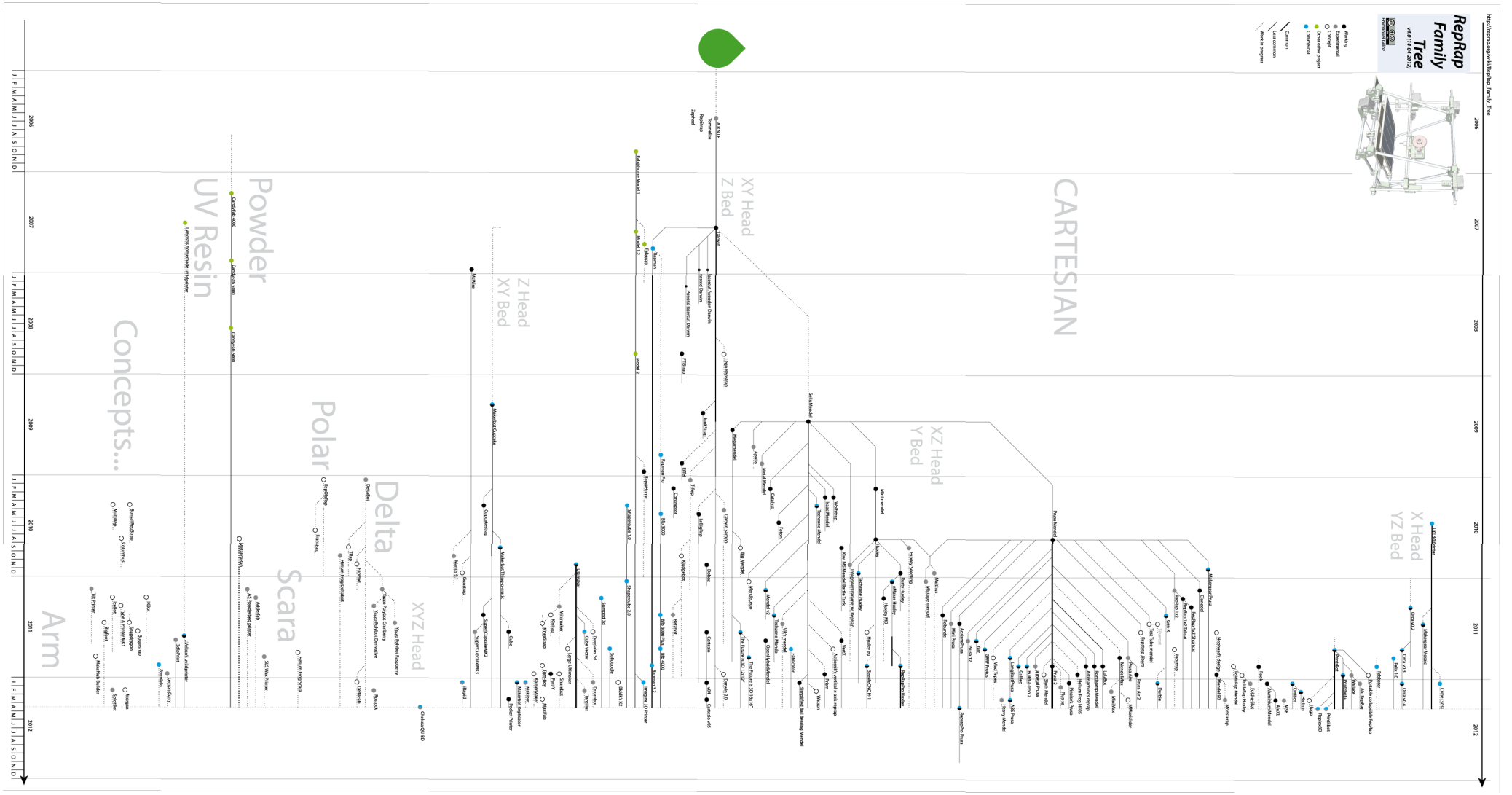
First half 2012

RepRap and RepStrap building and usage are widespread within the tech, gadget, and engineering communities. RepRaps or commercial derivatives have been featured in many mainstream media sources, and are on the permanent watch lists of such tech media as Wired and some influential engineering-professionals' news media.

Late summer/fall 2012

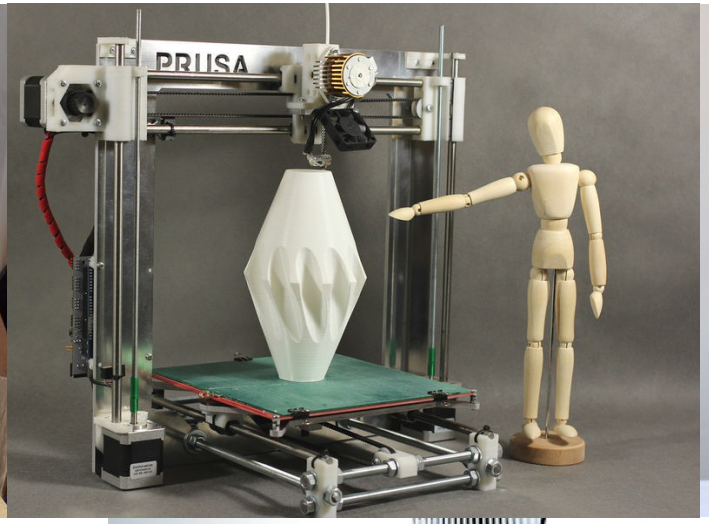
There has been much focus on smaller startup companies selling derivatives, kits, and assembled systems, and R & D results into new related processes for 3D Printing at orders-of-magnitude-lower prices than current industrial offers. In terms of RepRap research, the most notable result is perhaps the first successful Delta design, Rostock, which is maturing slowly and has an initial working solution for experimentation by self-sourcing builders of some experience. While the Rostock is still in an experimental stage with major revisions almost monthly, it is also near the state of the art, and a radically different design. Latest iterations use OpenBeams, wires (typically Dyneema or Spectra fishing lines) instead of belts, and so forth, which also represents some of the latest trends in RepRaps.

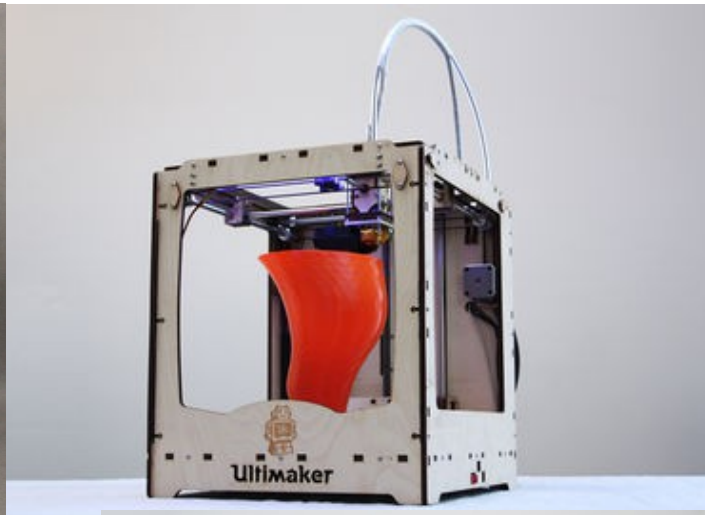
Stammbaum

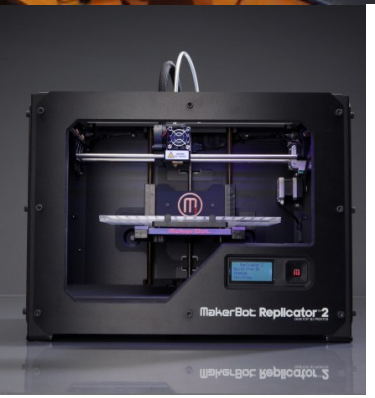


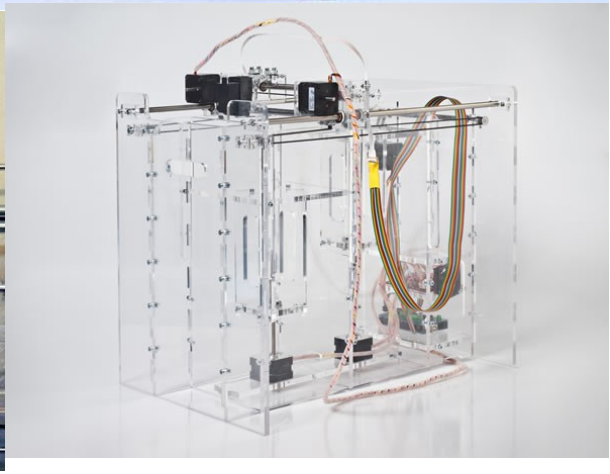
http://upload.wikimedia.org/wikipedia/commons/5/56/Reprap_Family_Tree.png

Wie sieht das nun aus



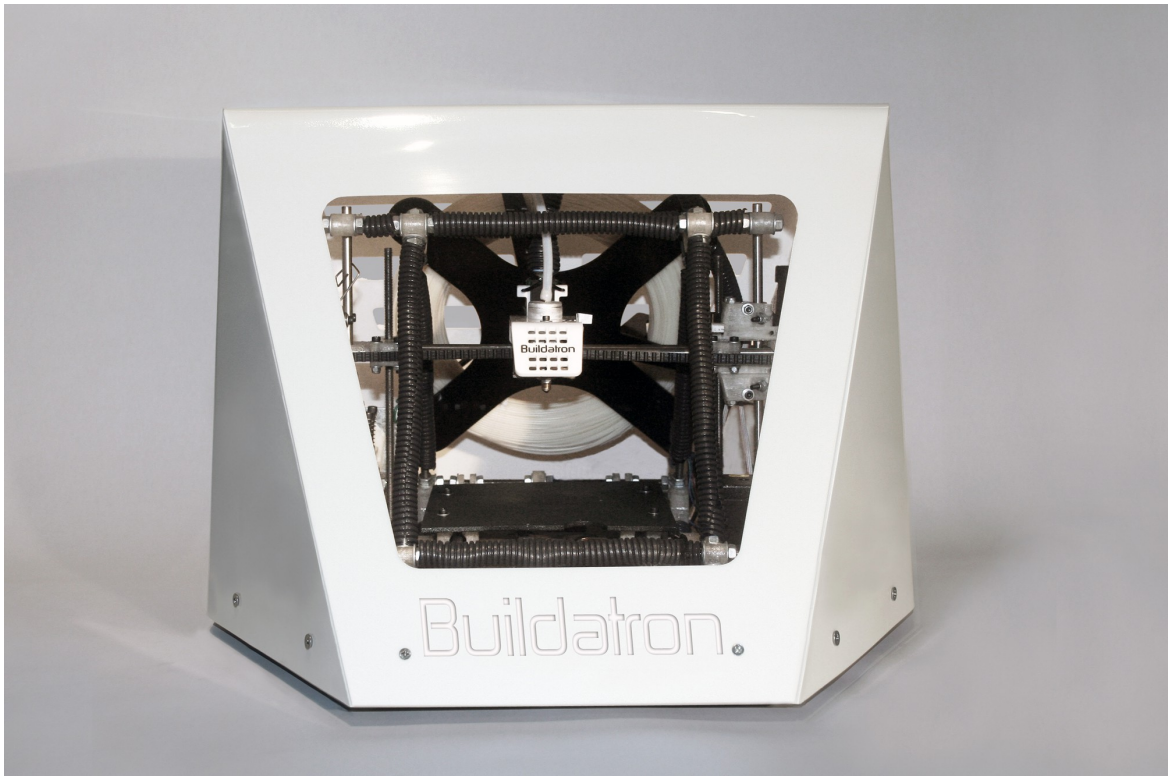






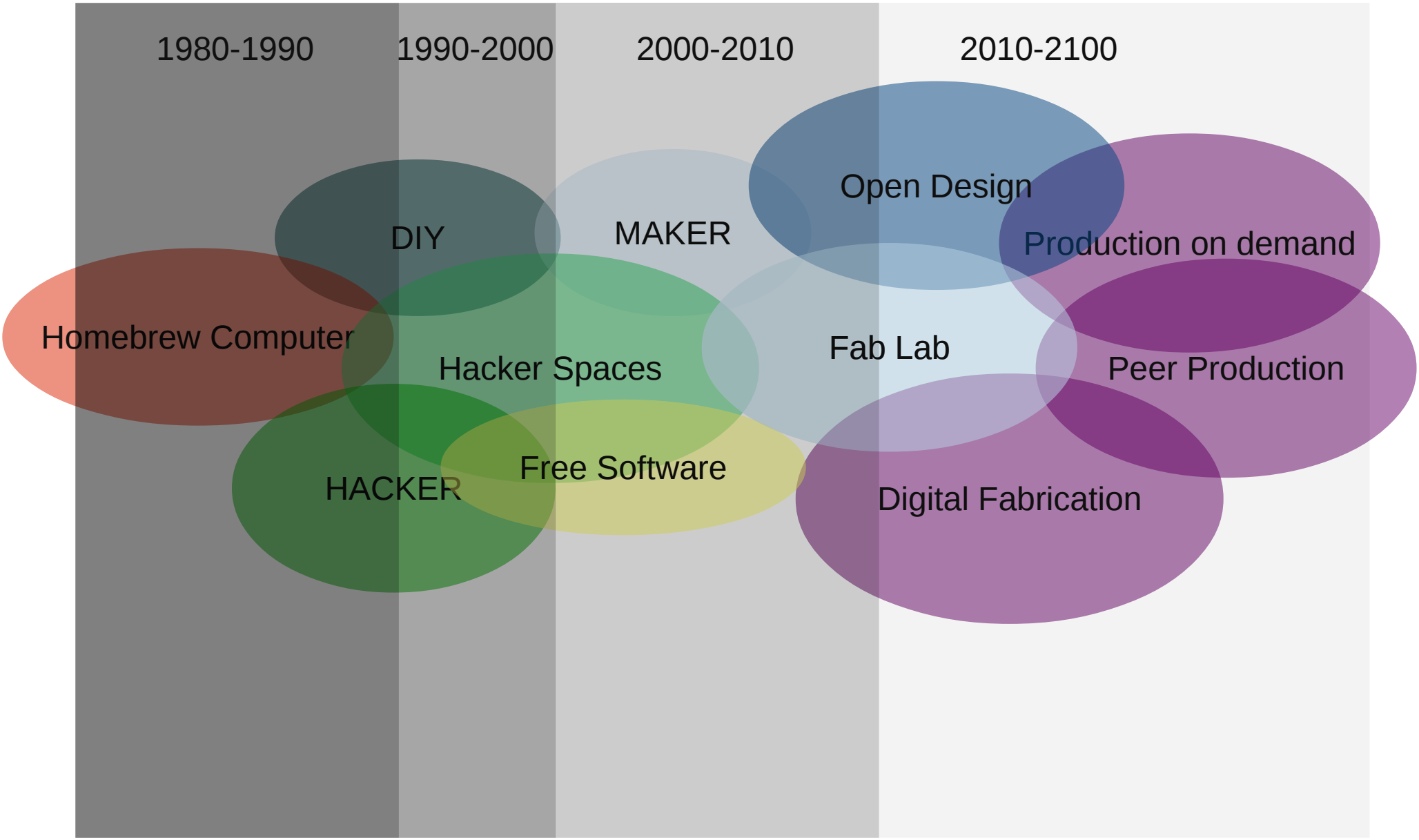
Gefahren/Falsche Versprechen

The company's press release stops just short of going "YOU get a car and YOU get a car and YOU get a car"…but then you click on the link.

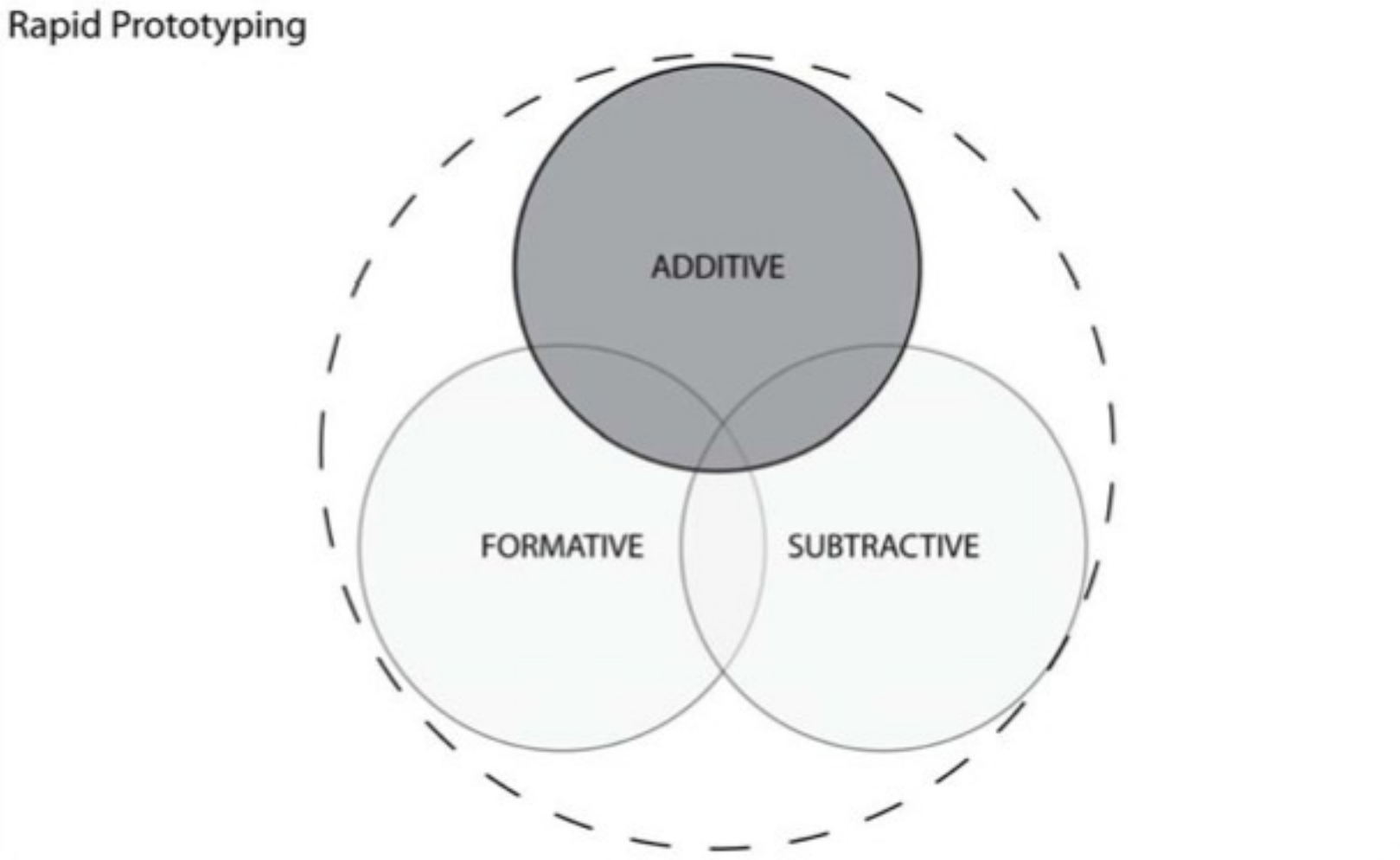


They put a box around a reprap. Then they put their name on the box.
Then they promised a revolution.

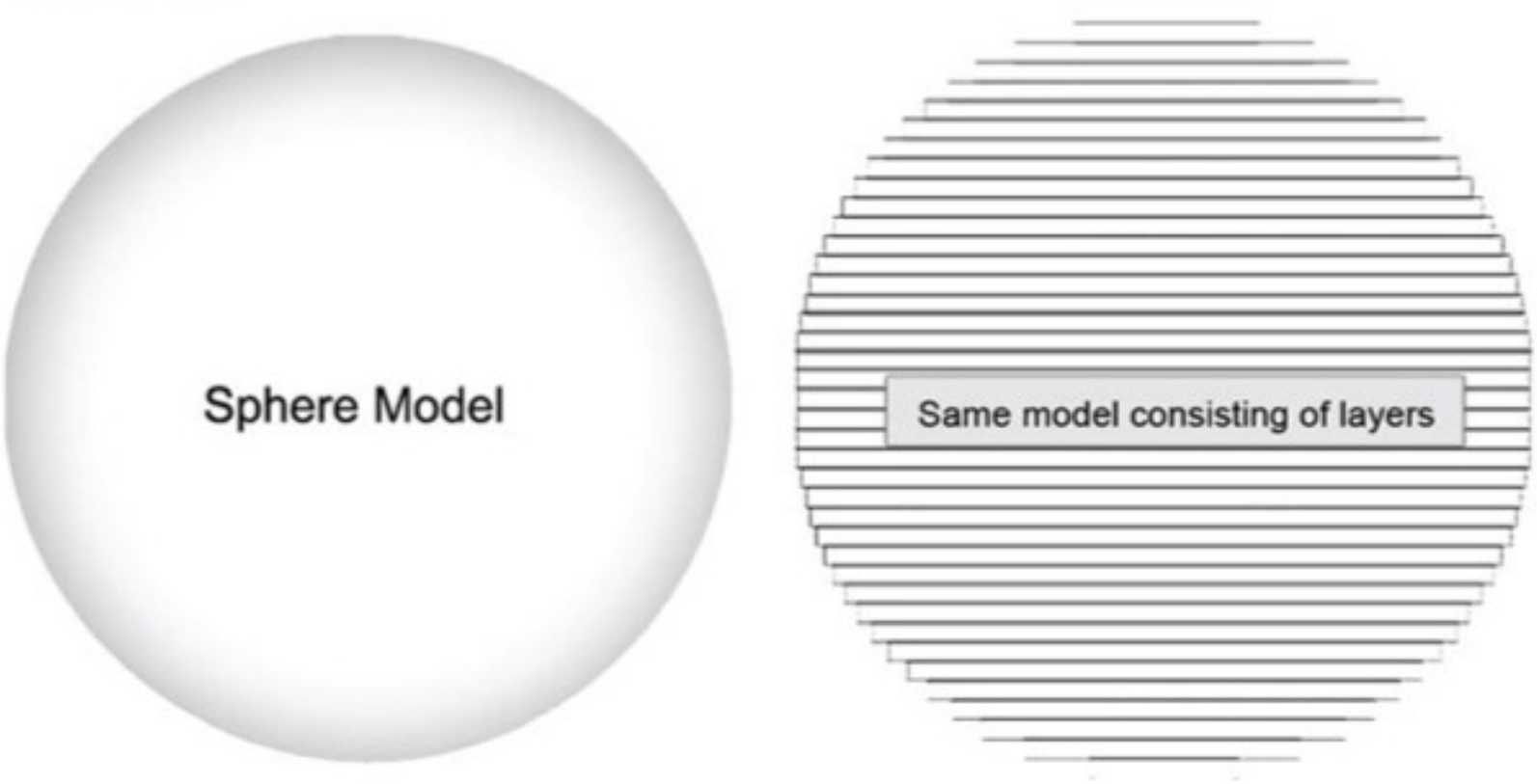
Die Wolke


1980-1990
1990-2000
2000-2010
2010-2100
Open Design
DIY
MAKER
Production on demand
Homebrew Computer
Hacker Spaces
Fab Lab
Peer Production
Free Software
HACKER
Digital Fabrication

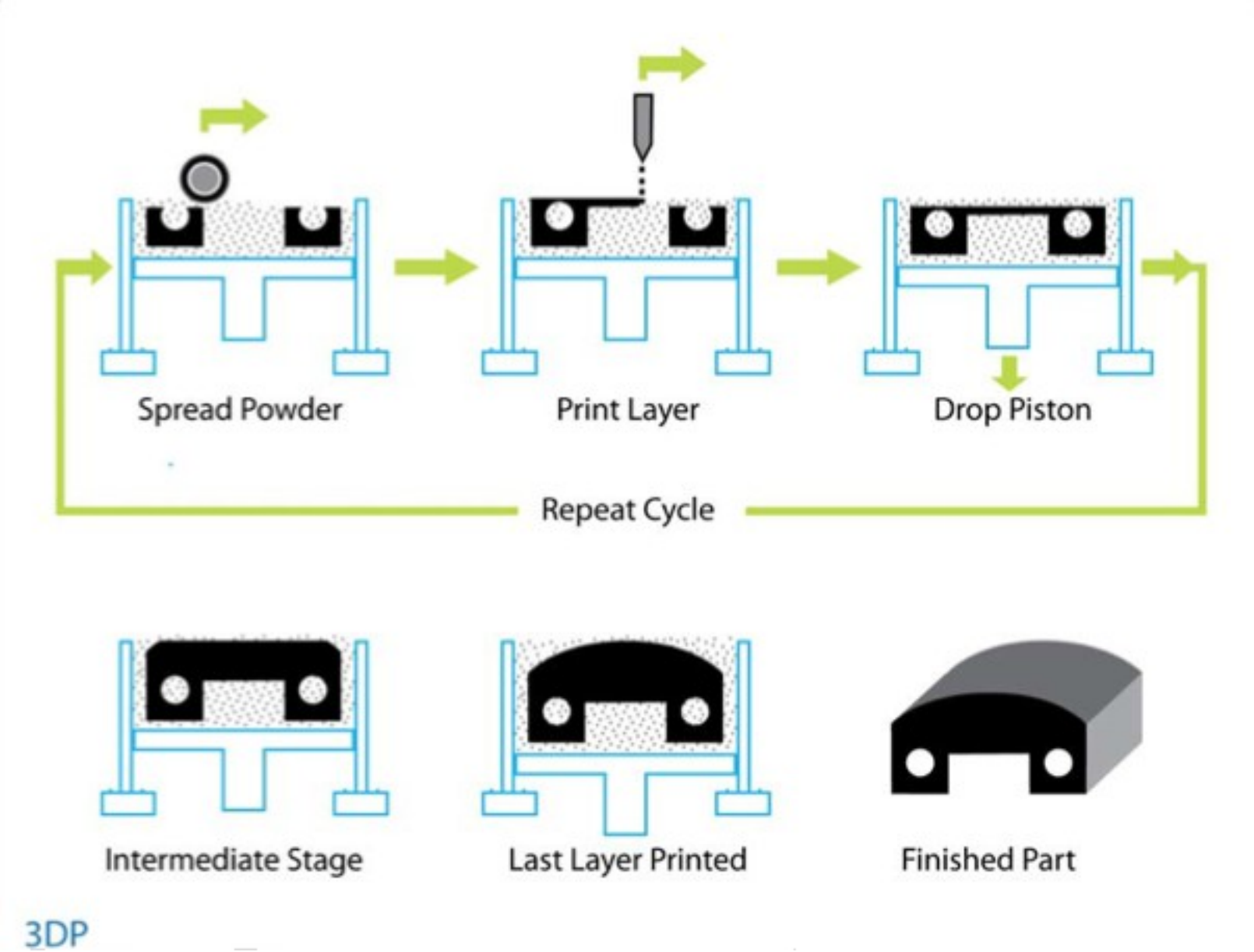
Rapid Prototyping



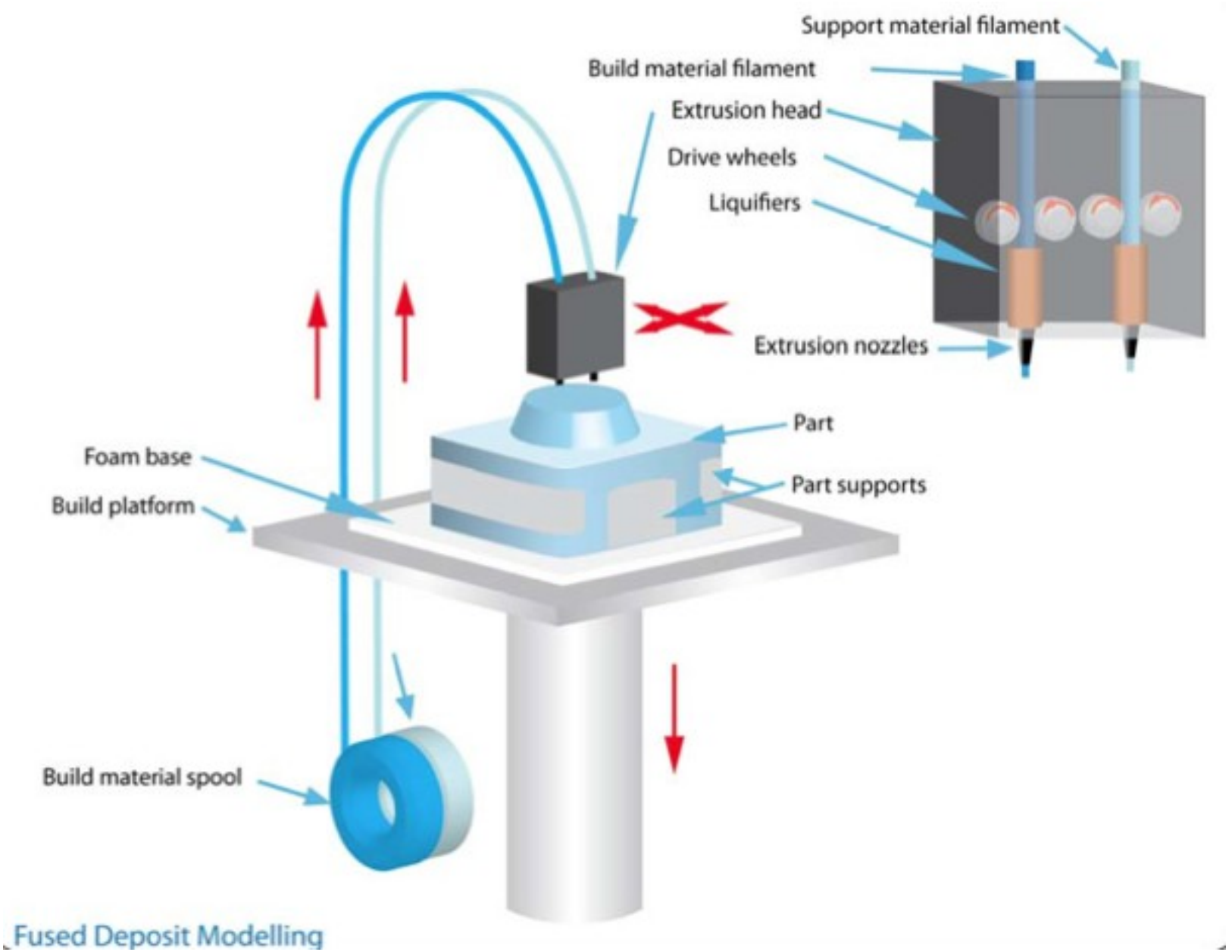
Layer Model



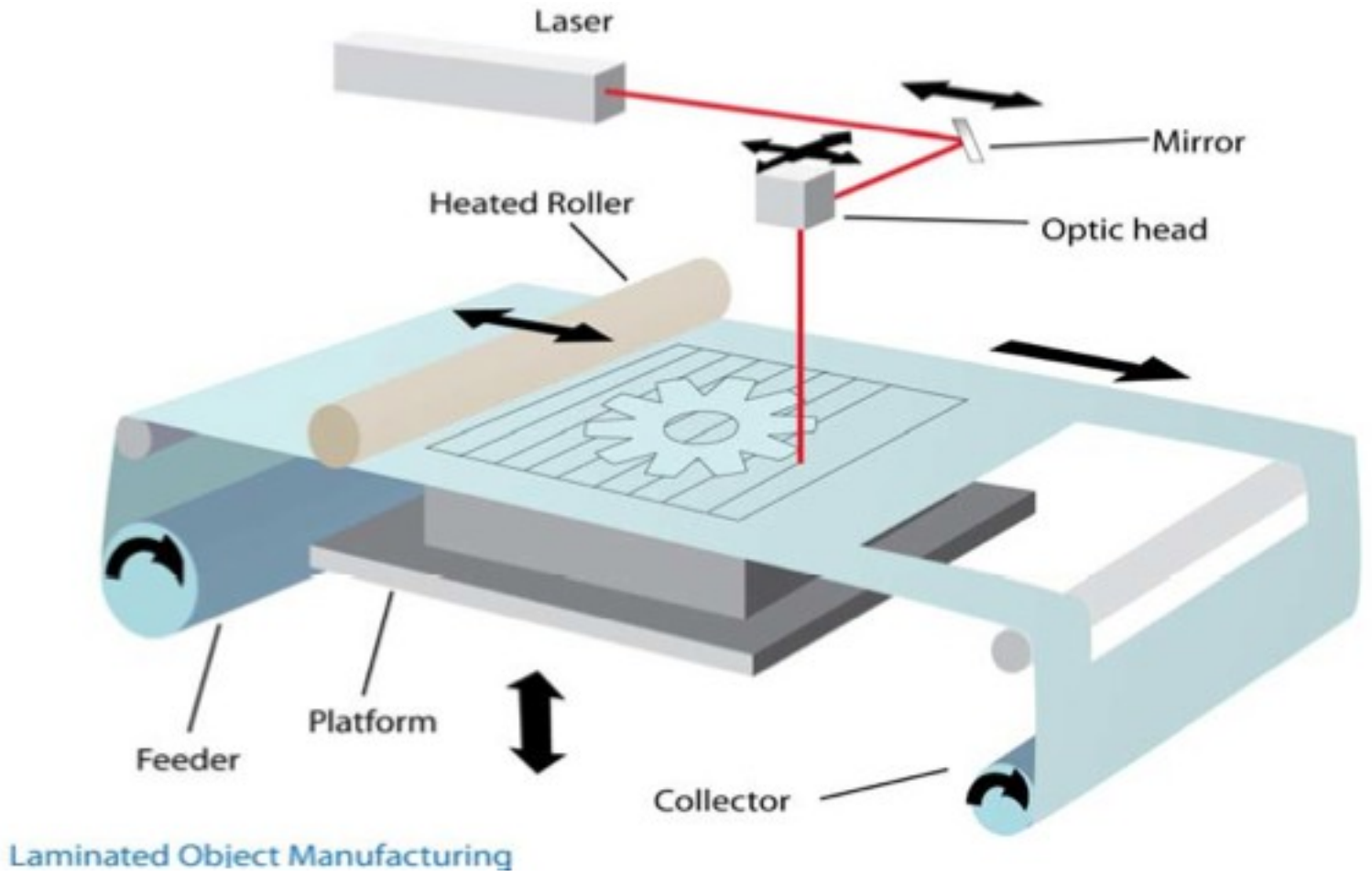
3DP


Spread Powder
Print Layer
Drop Piston
Repeat Cycle
Intermediate Stage
Last Layer Printed
Finished Part
3DP

FDM / Fused Deposition Modelling

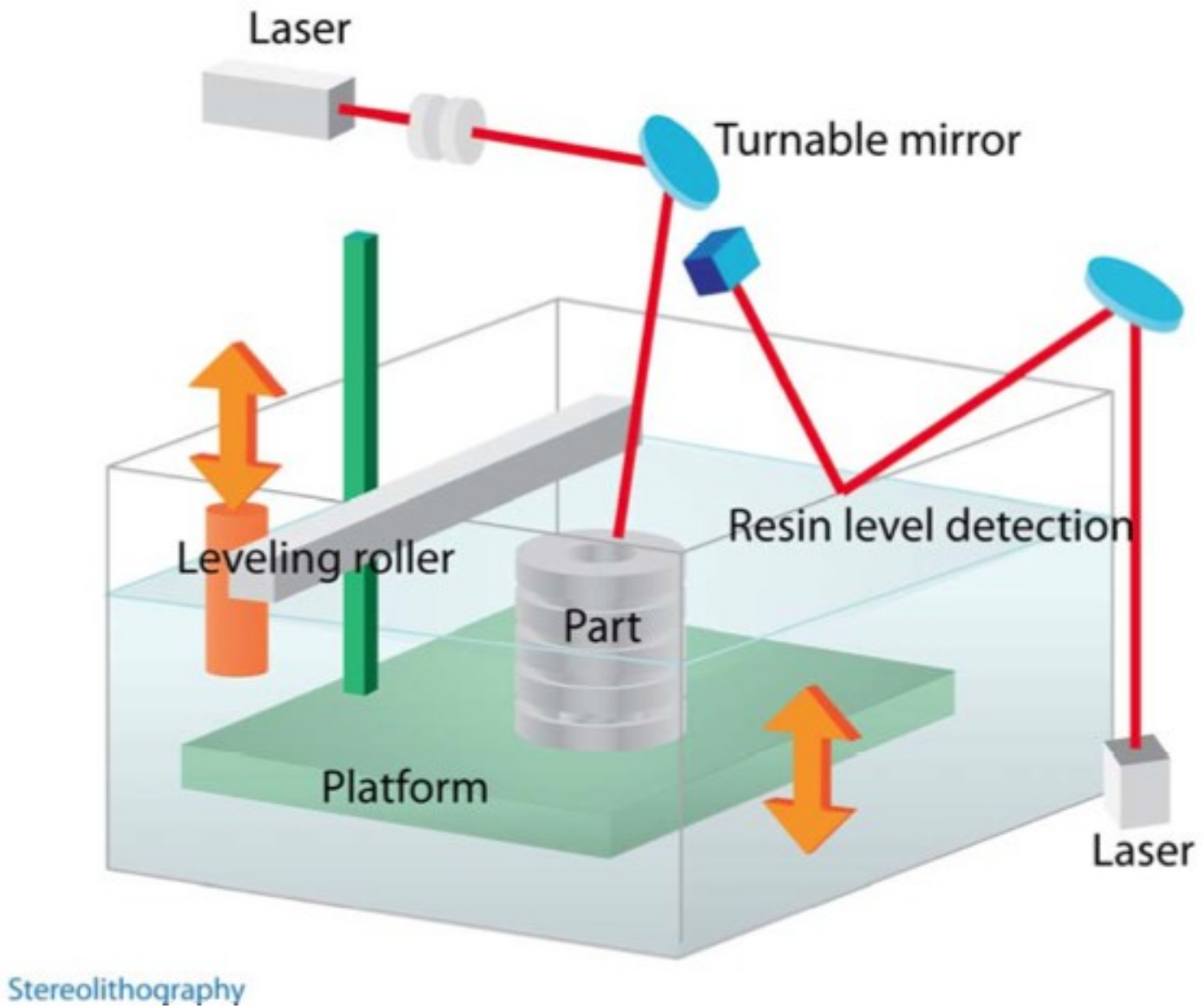


LOM / Laminated Object Manufacturing

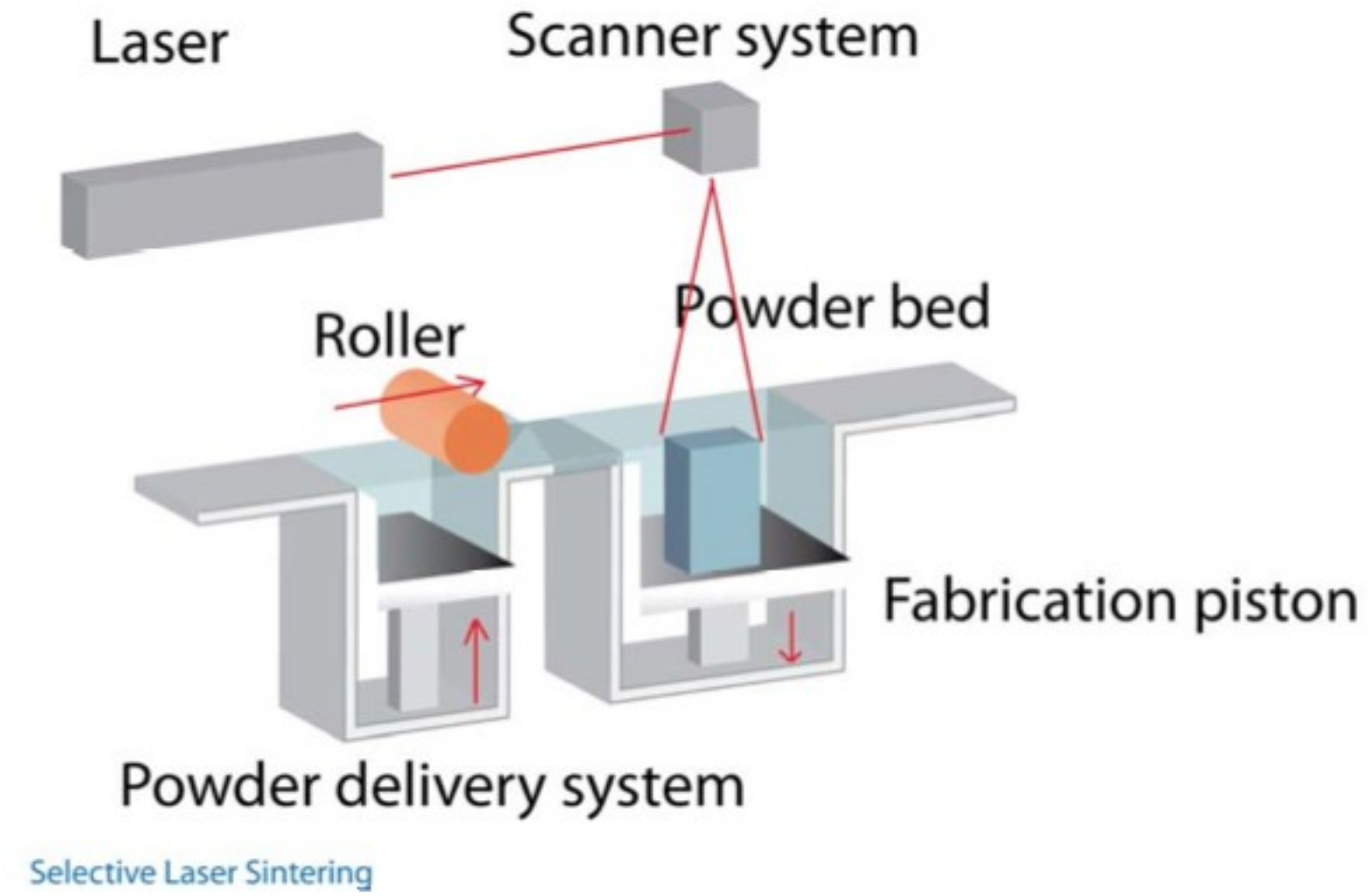


Laminated Object Manufacturing

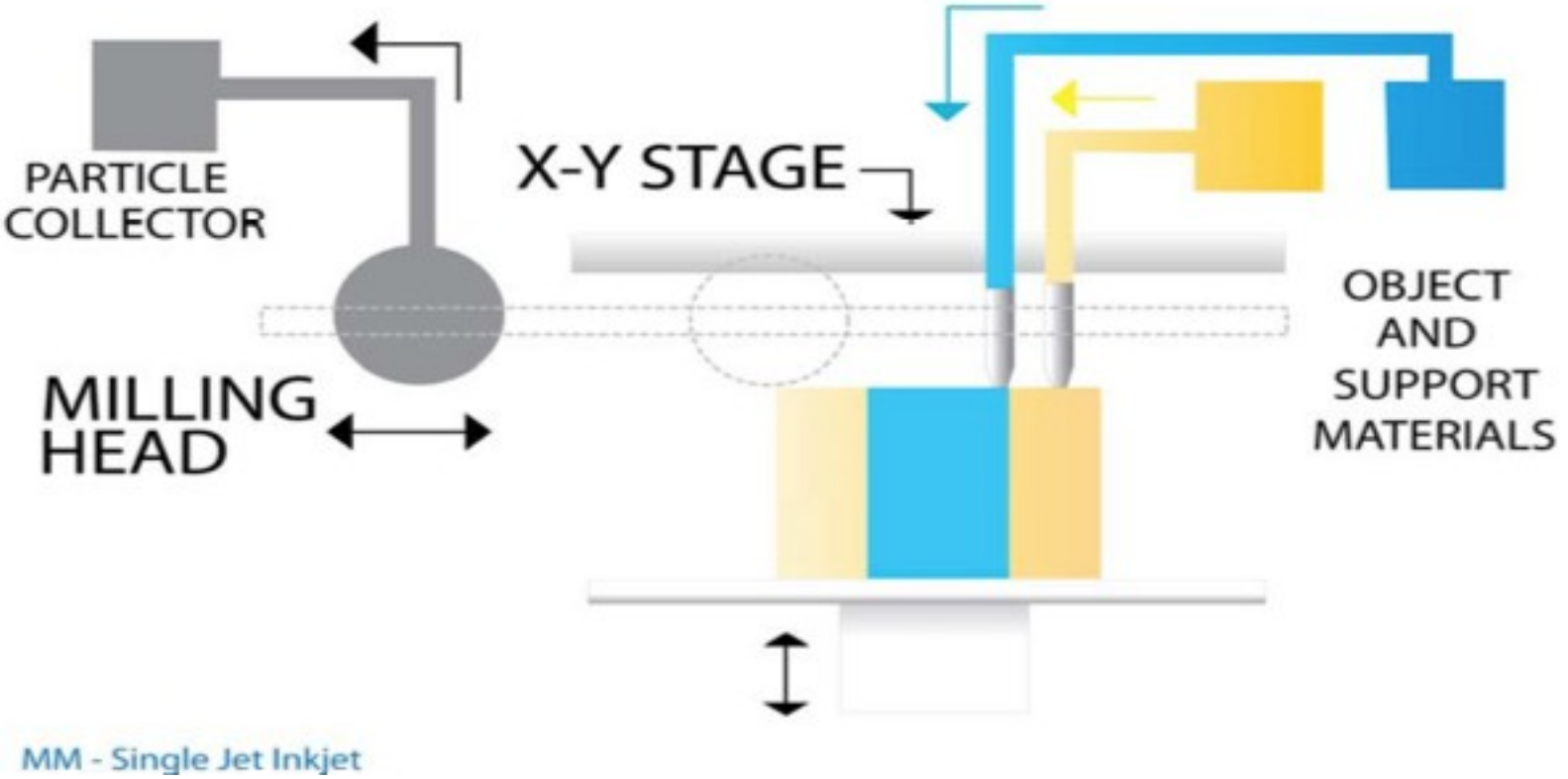
SLA – Stereolithography



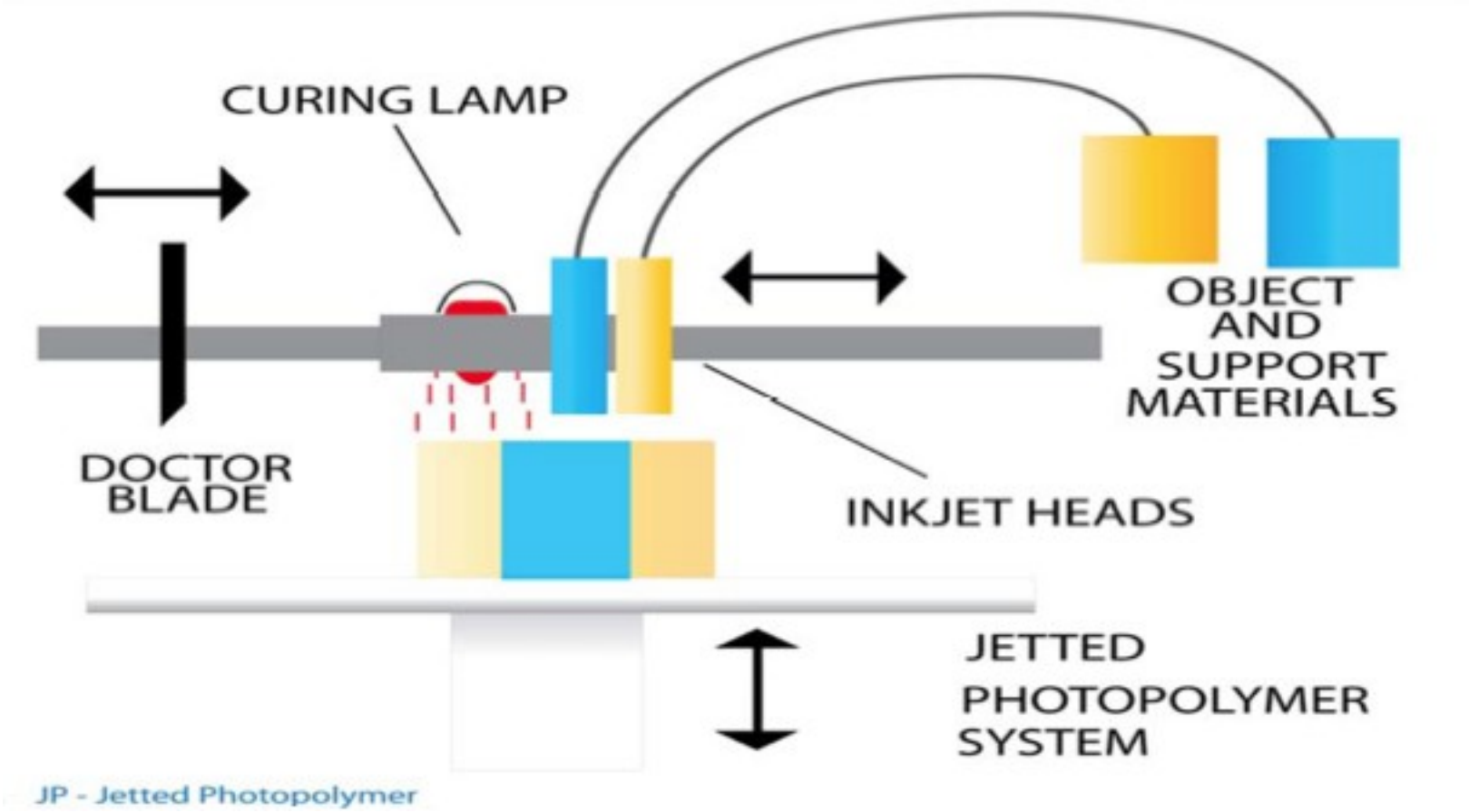
SLS – Selective Laser Sintering



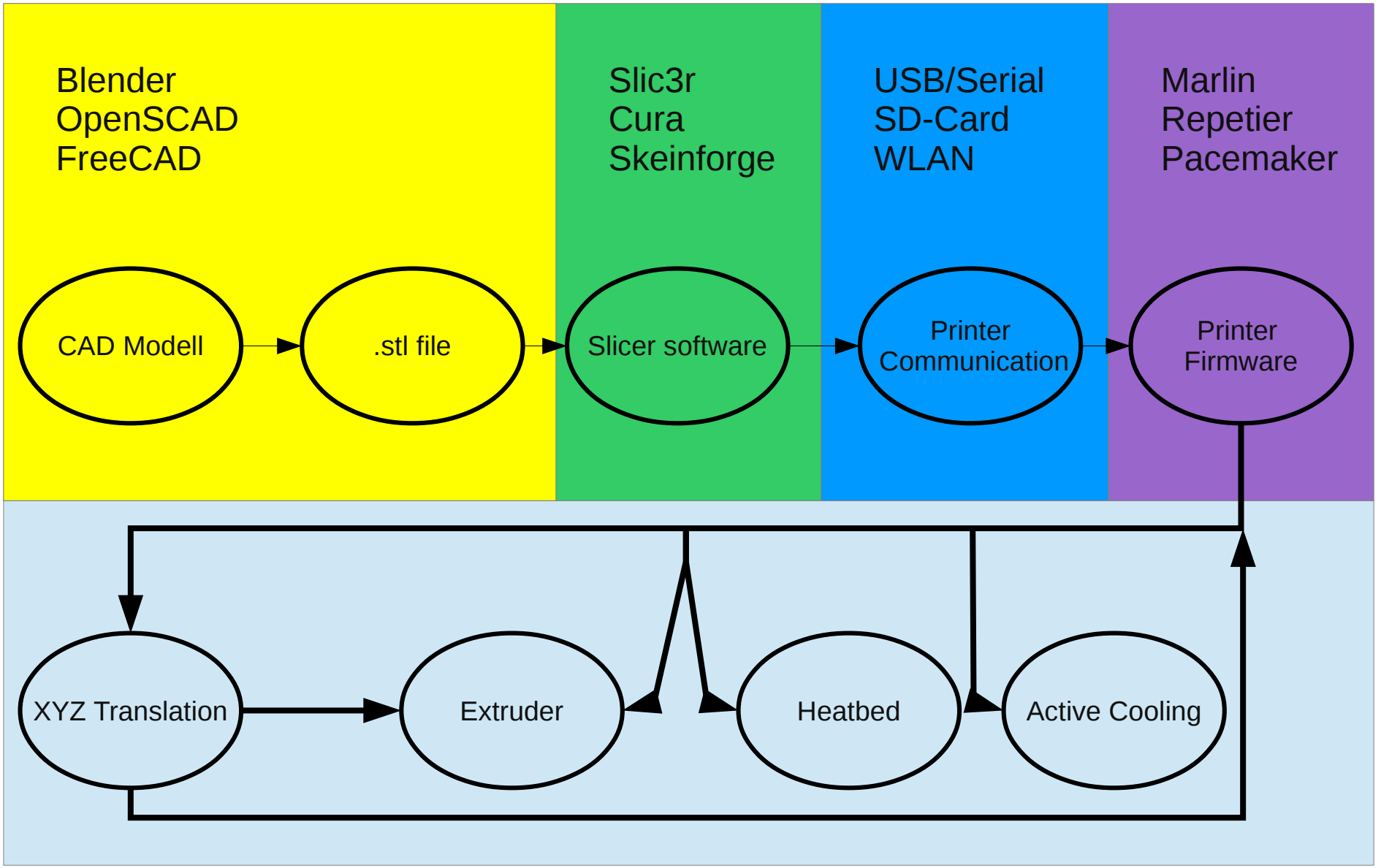
MM – Single Jet Inkjet



J-P – Jetted Photopolymer

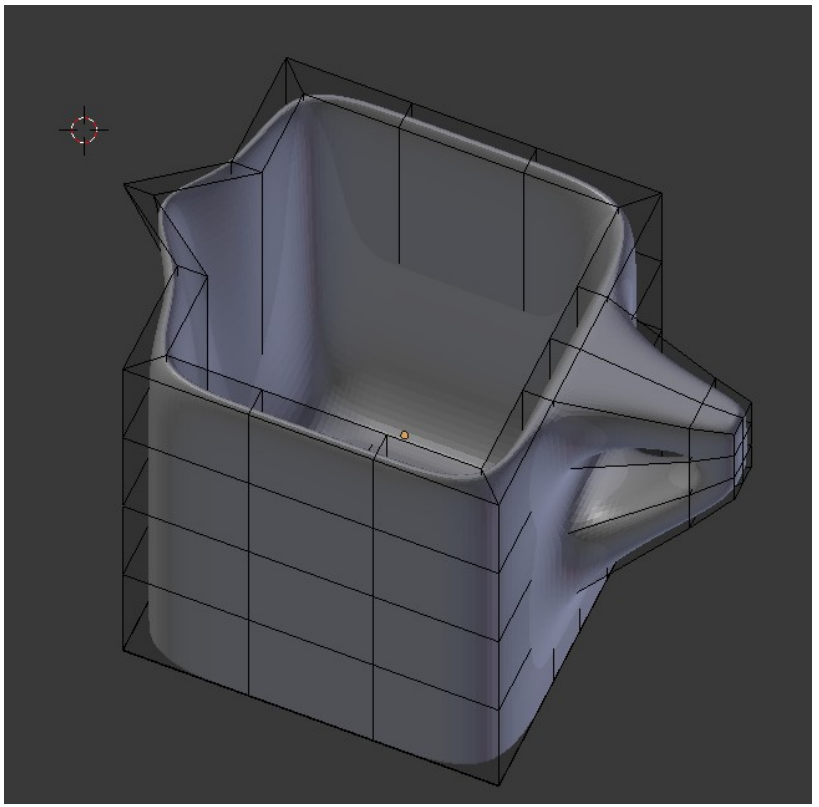


Let's tear FDM appart

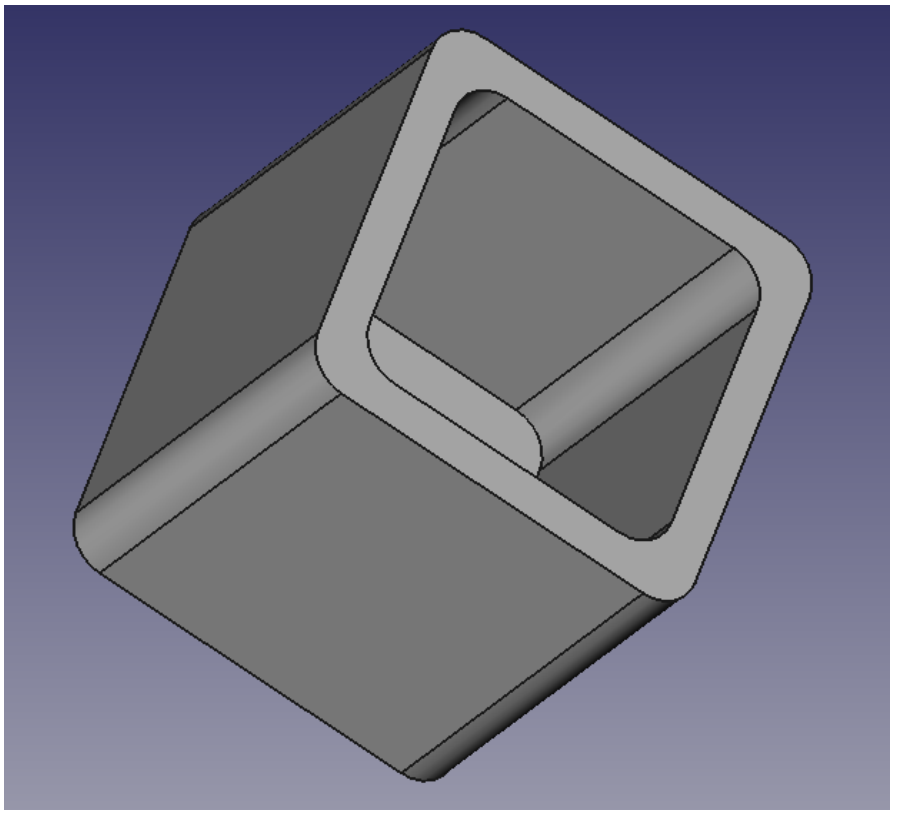


3D Mesh / CAD

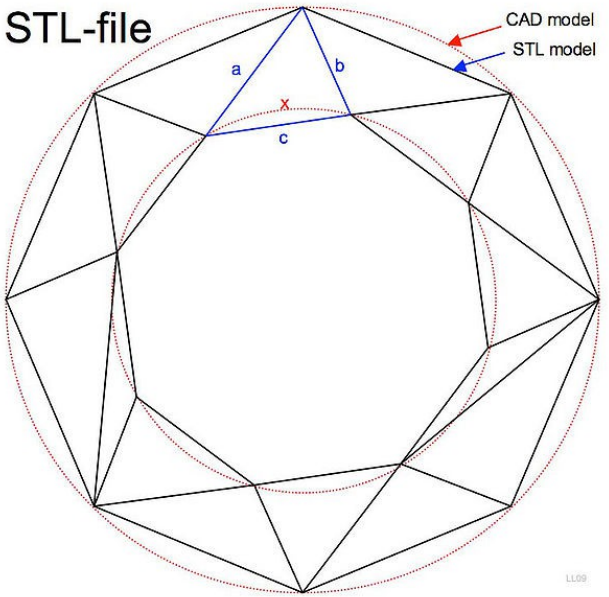
Blender / Mesh Modell



Freecad / CAD



STL / Stereolithografie Format



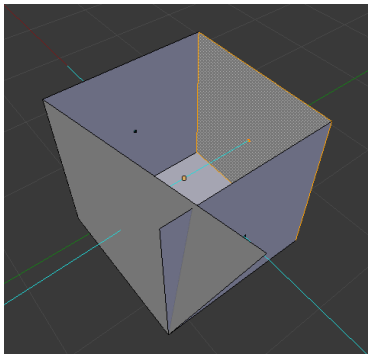
STL Dateien beschreibt eine geschlossene Oberflache in Form von Dreieken, wobei die Dreieckspunkte in einem Kartesischen Koordiantensystem mit positiven werten definiert werden. Einheiten sind willkürlich, jedoch wird In der Regel in milimeter pro Einheit umgerechnet.

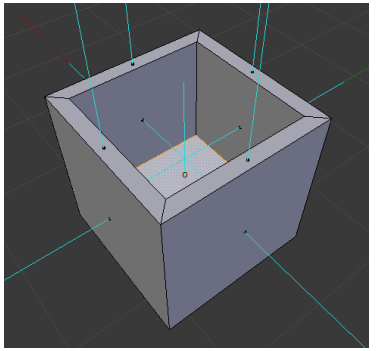
Datei Format:

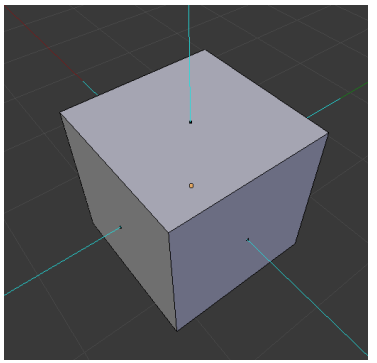
```
solid name              // Header

facet normal ni nj nk   // Normalenvektor
  outer loop
    vertex v1x v1y v1z  // Punkt A
    vertex v2x v2y v2z  // Punkt B
    vertex v3x v3y v3z  // Punkt C
  endloop
endfacet

endsolid name           // Footer
```

Fehlerquellen:

- Die Datei muss wasserdicht sein
- Kanten dürfen nicht überlappen
- Die Normalen müssen korrekt sein





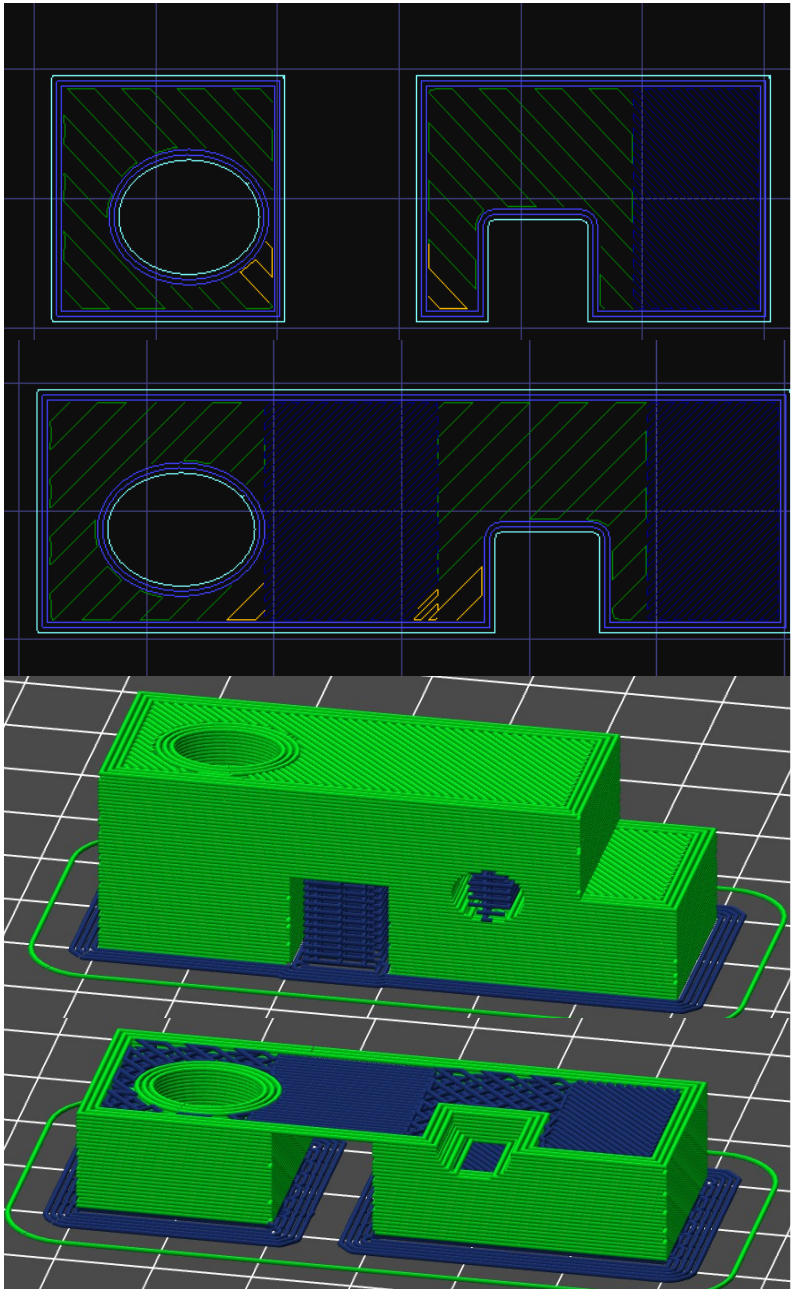


Sliceing

Workflow:
- Modell wird in Horizontale Layer zerlegt
- Perimeter / Infill werden generiert
- Raft / Brim / Skirt werden generiert
- Unterstützungsmaterial wird generiert

Settings:
- Nozzle / Filament Diameter
- Extruder / Heatbed Temperatur
- Skin Thickness / Perimeter
- Layer Höhe
- Menge des Infill's
- Geschwindigkeiten / Beschleunigung
- Support (on / off)
- Active Cooling

Problem:
- Slicer sind dumm !
- Settings variieren von Drucker zu Drucker
- Filament hat stark variirende Eigenschaften



GCODE

```
G21                         ; set units to millimeters
M107                        ; Fan off
M190 S65                    ; wait for bed temperature to be reached
M104 S210 T0                ; set temperature
G28                         ; home all axes
M109 S210 T0                ; wait for temperature to be reached
G90                         ; use absolute coordinates
M83                         ; use relative distances for extrusion
T0                        ; use Extruder 0
G1 Z0.400 F10200.000 ; move z achis to 0.4 mm with 102000 mm/min
G1 F1800.000 E-0.60000          ; retract extruder -0.6 mm
G1 X66.270 Y84.420 F10200.000     ; move to x 66.27mm y 84.42mm
G1 F1800.000 E0.60000                     ; extrude 0.6 mm filament
G1 X67.430 Y83.800 F720.000 E0.15461
G1 X68.690 Y83.420 E0.15470
G1 X70.000 Y83.290 E0.15475
G1 X130.000 Y83.290 E7.05306
G1 X131.310 Y83.420 E0.15475
G1 X132.570 Y83.800 E0.15470
```

Kommunikation zum Drucker

Usb / Serial Verbindung:
- Probleme mit Verzögerungen da Packetorientiert
- Natives Usb Protokoll muss implemetiert werden !!

SD-Card:
- Super keine Verzögerung Datei wird direkt vom Filesystem gelesen.
- Datei sollte von Computer direkt auf die SD Karte geladen werden

Wlan:
- Ist noch sehr neu
- Unterliegt dem selben Problemen wie Usb / Seriell verbindung

Firmware

Firmware Varianten:
- Marlin
- Repetier
- Sailfish
- Makerbot Gen3/4

Platform:
- 16 Bit AVR
- Arm (noch relative neu)

Programmierung:
- C/C++

Lizenz:
- ausschließlich GPL 3