

3D Printing

Create anything

uFactory



What is 3D printing?

Additive Manufacturing

Building up a 3D object Layer by Layer

Advantages:

- Less waste
 - Mass customisation
 - Takes .stl .obj VRML
- 3D Mesh Formats

Disadvantages:

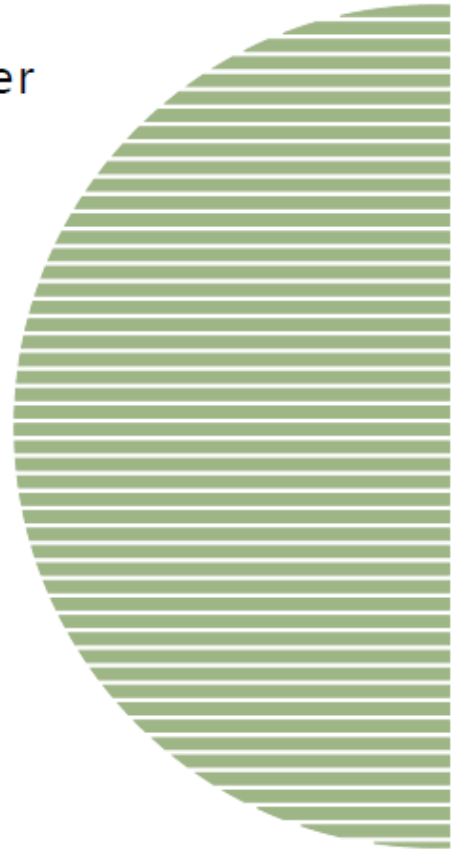
- Does not have economies of scale
- Objects can be fragile or weak
- Slow



The 3D Printing Process

3D Printers build up objects from thin slices, layer by layer

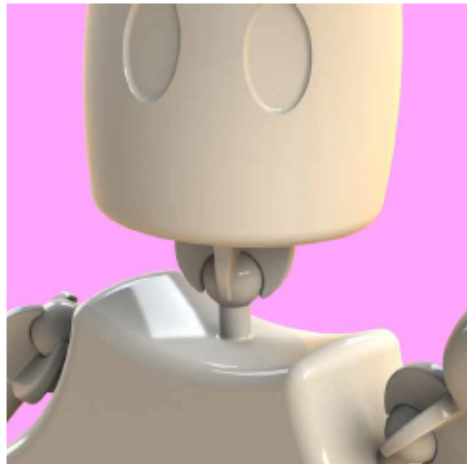
- 1** - The printer bonds the material of that layer together (using heat, glue or other means).
- 2** - The print bed moves down a fraction (as little as 1 micron in some processes).
- 3** - Depending on the process, a thin layer of fresh material is added to this new layer.
- 4** - The process repeats to create a 3D object.



The 3D Printing Process

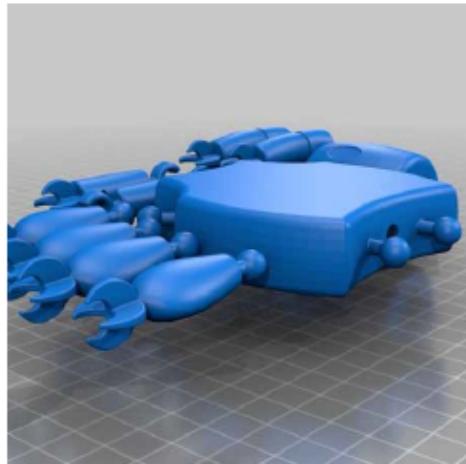
Design

CAD -
Computer Aided
Design



Convert

.stl format or VRML
for full colour prints



Print

On your own
machine or with a
service



Finish

Clean-up and post
processing



Then we get...



Mr Clicky

Process	SLS
	Selective Laser Sintering
Cost	\$85.49 + \$19.99 Shipping
	US\$105.48 Total
Service	Shapeways

3D Printing Technologies

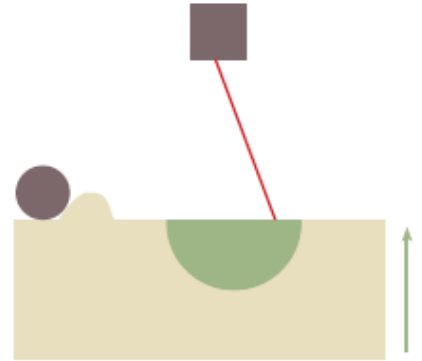
SLS - Selective Laser Sintering

Process - Melts nylon powder together using a laser to create strong detailed parts

Materials - Nylon, Alumide (aluminium and nylon mix)

Advantages - No support material required. Strong, large and highly detailed objects possible.

Disadvantages - Very large and expensive. Unsintered powder can only be used a few times.



3D Printing Technologies

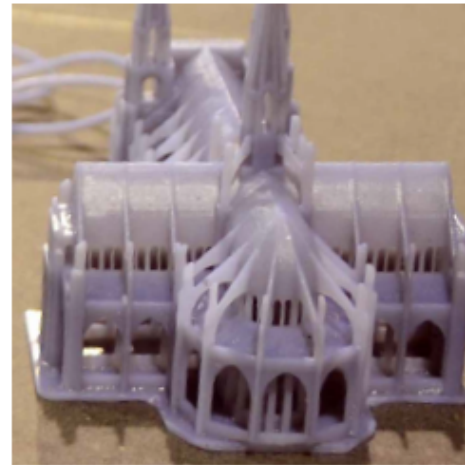
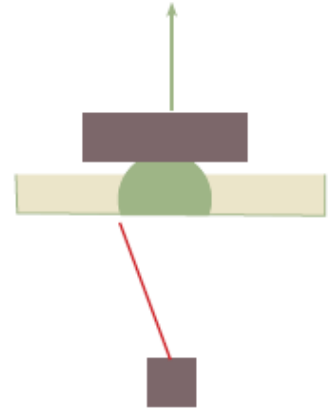
SLA - Stereolithography

Process - Builds objects using a UV sensitive liquid resin and a laser to selectively harden each layer.

Materials - Photo-reactive liquid resins, wax like resins for lost wax casting.

Advantages - Extremely high accuracy and detail.

Disadvantages - Expensive and slow. Objects are brittle and degrade when exposed to sunlight.



3D Printing Technologies

FDM - Fused Deposition Modelling

Process - Melts plastic filament out of a computer controlled hot end to build up an object.

Materials - Plastics (ABS, PLA, PET, Nylon).

Advantages - Strong Parts, low cost. Quiet and small.

Disadvantages - Low part quality and accuracy. Slow.



3D Printing Technologies

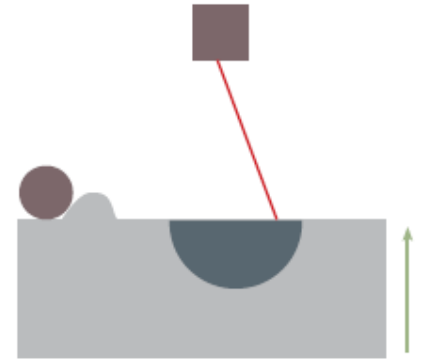
DMLS - Direct Metal Laser Sintering

Process - Metal printing using a high powered laser beam to directly melt metal powder together.

Materials - Titanium, aluminium and aerospace alloys.

Advantages - Create geometry in metal not previously possible with conventional machining.

Disadvantages - Expensive and power intensive. Still in its infancy but improving rapidly.



Entry Level 3D Printers

Company	PP3DP
Model	UP! Mini
Cost	\$1300
Build Volume	120 x 120 x 120mm
Min Layer Height	0.2mm
Technology	FDM Single Head
Materials	ABS and PLA plastic
Notes	Enclosed Chamber



Entry Level 3D Printers

Company	PP3DP
Model	UP! Plus 2
Cost	\$2200
Build Volume	140 x 140 x 135mm
Min Layer Height	0.15mm
Technology	FDM Single Head
Materials	ABS and PLA plastic
Notes	Has Auto Calibration



Entry Level 3D Printers

Company	Makerbot
Model	Replicator 2X
Cost	\$3985
Build Volume	250x 160 x 150mm
Min Layer Height	0.1mm
Technology	FDM Dual Head
Materials	ABS and PLA plastic
Notes	Advanced Settings



Entry Level 3D Printers

Company	Asiga
Model	Freeform Pico
Cost	\$10,000
Build Volume	30 x 40 x 76mm
Min Layer Height	0.001mm
Technology	SLA
Materials	Proprietary Resins
Notes	Wax-like and clear resins available



High End 3D Printers

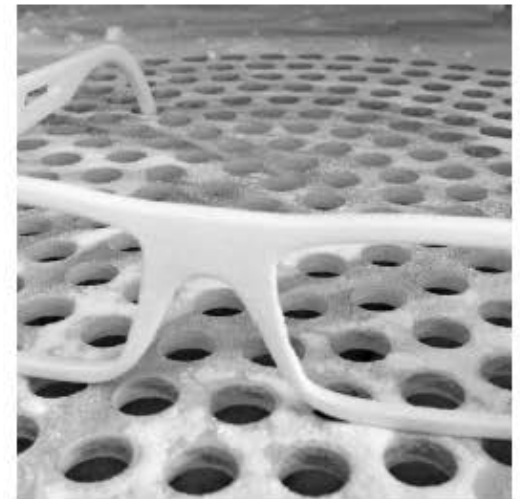
EOS P 396

The EOS P 396 is a mid range SLS printer designed for producing strong and accurate 3D Prints from nylon in an industrial production environment.



1,060KG

POA ~ \$500,000



High End 3D Printers

EOS M 400

The EOS M 400 is a high end metal printer capable of producing metal parts directly from 3D data using Direct Metal Laser Sintering technology.



3,240KG

POA

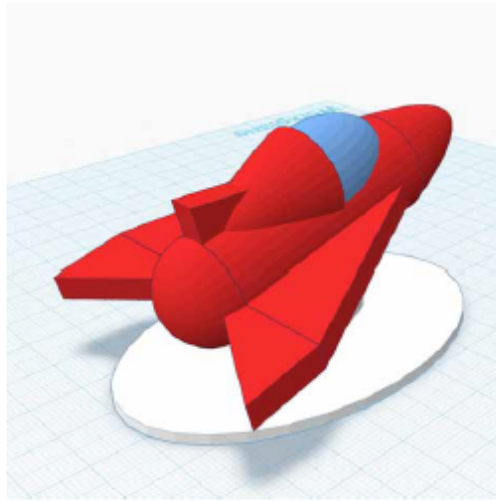


Computer Aided Design (CAD)

3D Design Software

Tinkercad

Tinkercad is web based, fast and easy to learn.



Beginner

Free

Advantages - Does not require a powerful PC and will work on Chromebooks. Can export .stl and designed with 3D Printing in mind.

Disadvantages - Needs a good internet connection. Can only create geometric objects and not organic forms. Requires WebGL and will not run on older internet browsers, use google Chrome for best results.

Computer Aided Design (CAD)

3D Design Software

Blender

Blender is powerful and open source, originally designed for use in 3D Animation



Intermediate

Free

Advantages - Can create amazingly detailed organic forms with incredible detail. Exports to many 3D mesh formats including .stl. Available for Windows, Mac OSX and Linux.

Disadvantages - Steep learning curve, even if experienced with other CAD software. Exported .stl files may need fixing up before 3D printing.

Computer Aided Design (CAD)

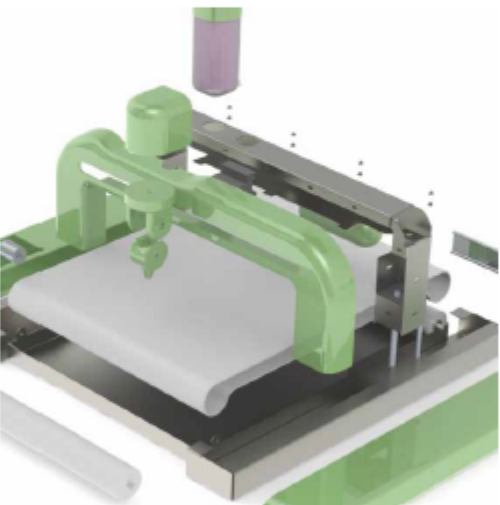
3D Design Software

Solidworks

Solidworks is the industry standard for 3D CAD design in engineering and design fields.

Advantages - Extremely powerful, offering the tools to design anything from simple parts to complex machine assemblies. Exports good .stl files for 3D Printing.

Disadvantages - Very high priced and steep learning curve. Poor handling of imported .stl files. Requires a very powerful PC and windows only.



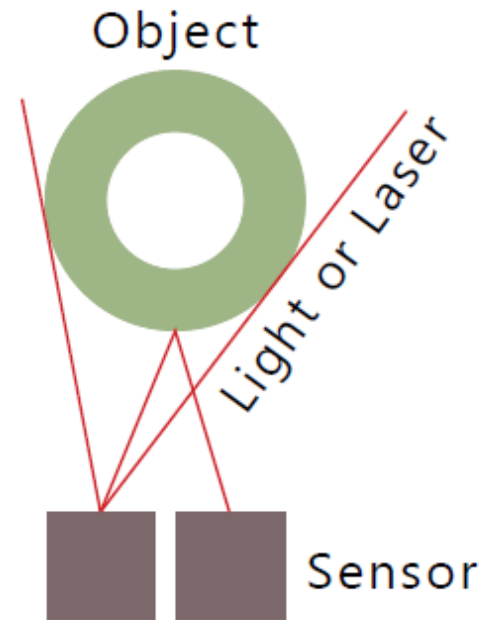
Advanced

Paid

3D Scanning

3D Scanning is still in its infancy but it is still possible to get involved with very little cost.

- 3D Scanners can only scan what they can see, so will not pick up internal geometry.
- All 3D scanning systems require post processing, the repairing and preparation of a 3D mesh to make it useable for printing or in further 3D design.
- 3D scanning is not fast, even the fastest and most expensive systems need lengthy post processing.



3D Scanning - Low End

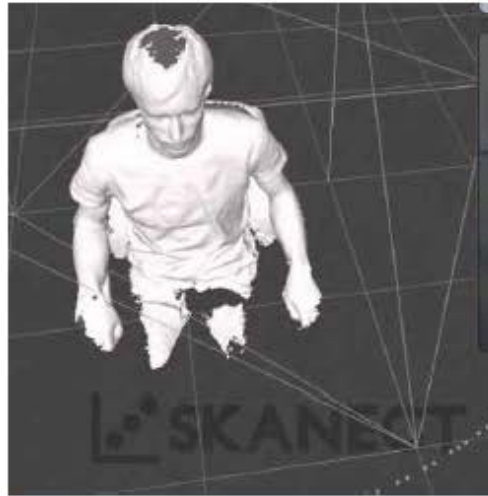
Xbox Kinect



Hardware

\$100

Skaneet



Software

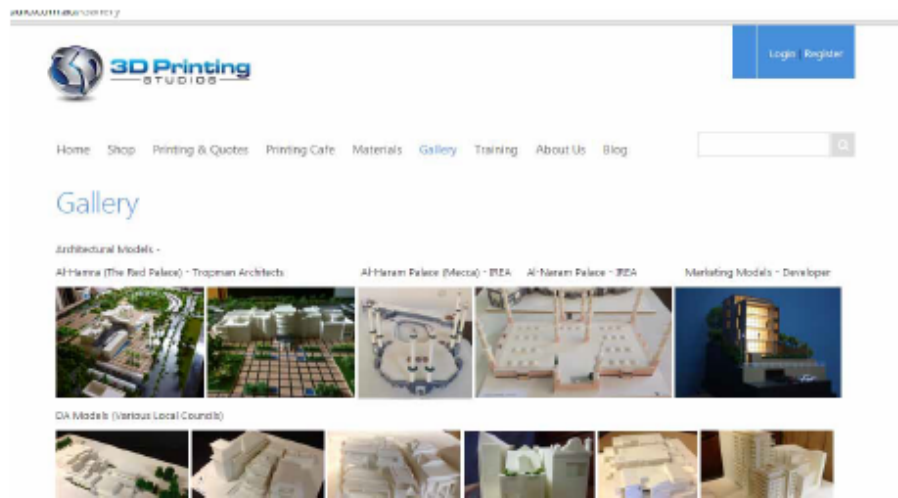
99 Euro

Print



3D Printing Services

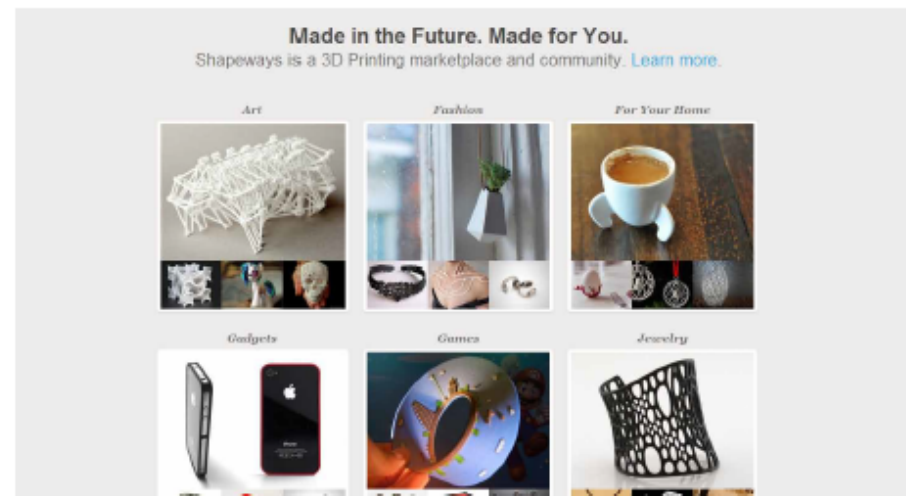
3D Printing Studio



Sydney CBD

<http://www.3dprintingstudio.com.au/>

Shapeways



New York

<http://www.shapeways.com/>