

Class 02
Digital Bodies
Anastasia Pistofidou



Program outline

Human proportions

Made to measure - bespoke - mass production- mass customization

References of the representation of the human figure in art

The mannequin in haute couture

Mannequins

Prosthetics

Tools/Software/Hardware

Software

3D scanning: sense 3D, kinect-skanect, recap photo, milk scanner e.t.c.

Digital Fabrication Techniques: waffle, stacking, radial slices, triangulation, bending , kerf patterns

Laser cutting

3D printing

Cnc milling

Casting

Vacuum forming

Safety

Human proportions

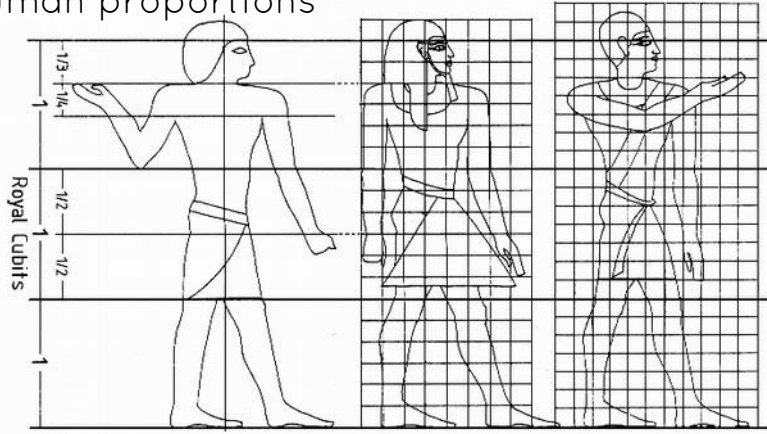
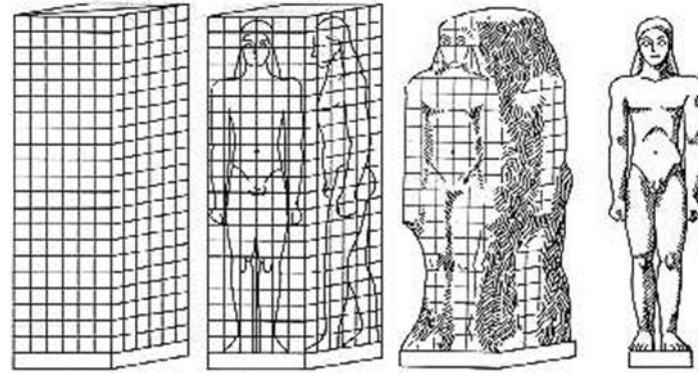
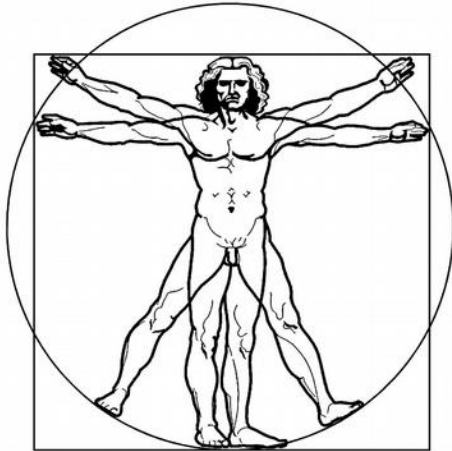


Fig. 1 The Development of the Egyptian Grid System

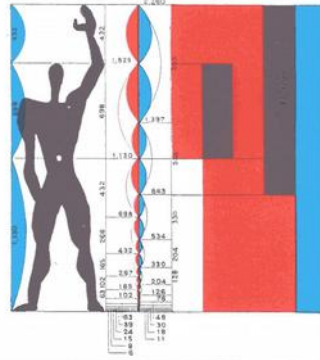
© John Legon



Greek Kouros, 700 B.C.



Leonardo da Vinci, Vitruvian man, 1487



Golden proportions in the human body proposed in Le Corbusier's Modulor II, 1943-55



Michaelangelo's David 1504

Made to measure - bespoke - mass production- mass customization

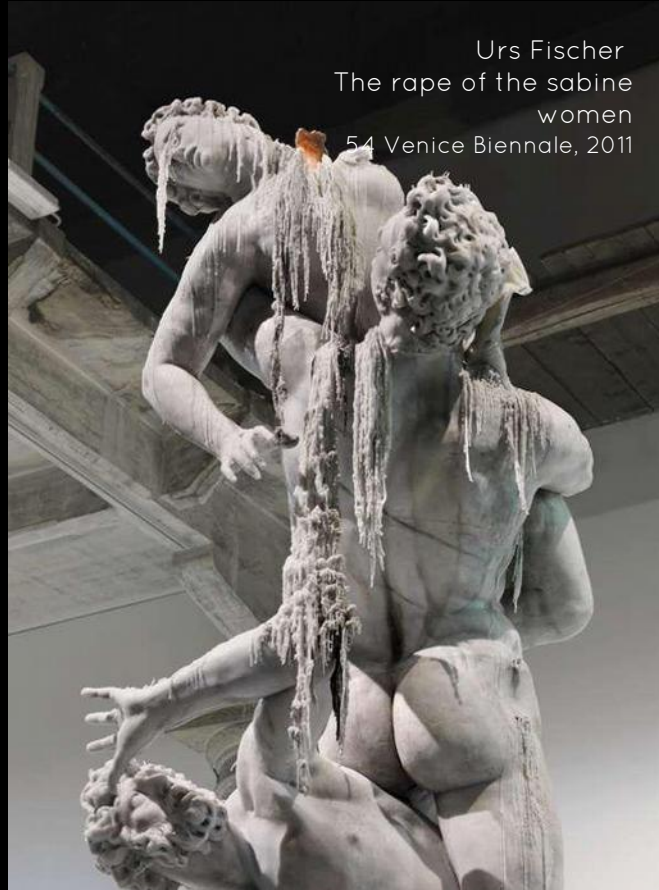


Suggested Reading

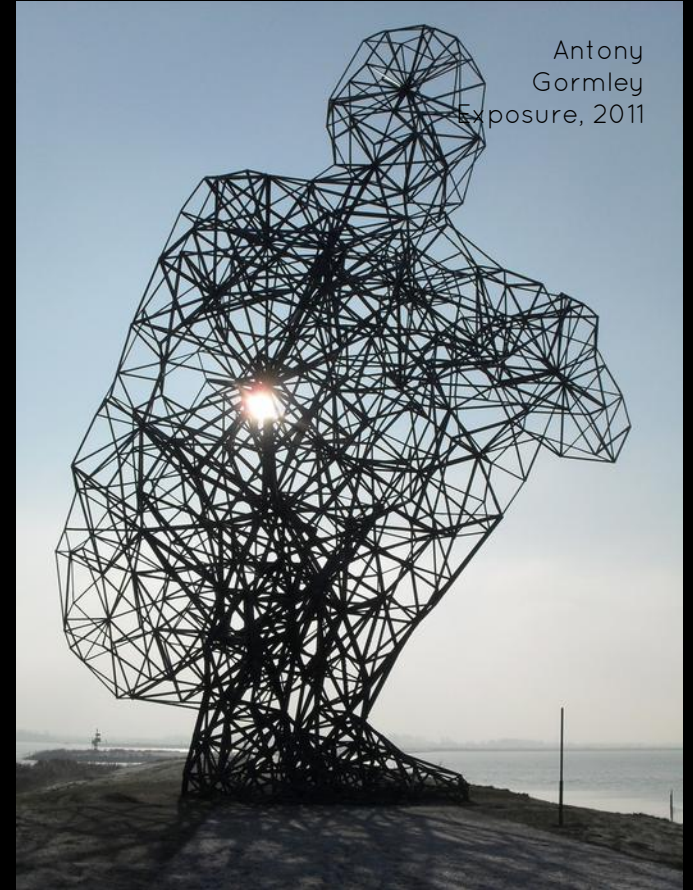


Old Media, Digitized, Make new forms

Martin Gayford, 2012
MIT technology review



Urs Fischer
The rape of the Sabine women
54 Venice Biennale, 2011

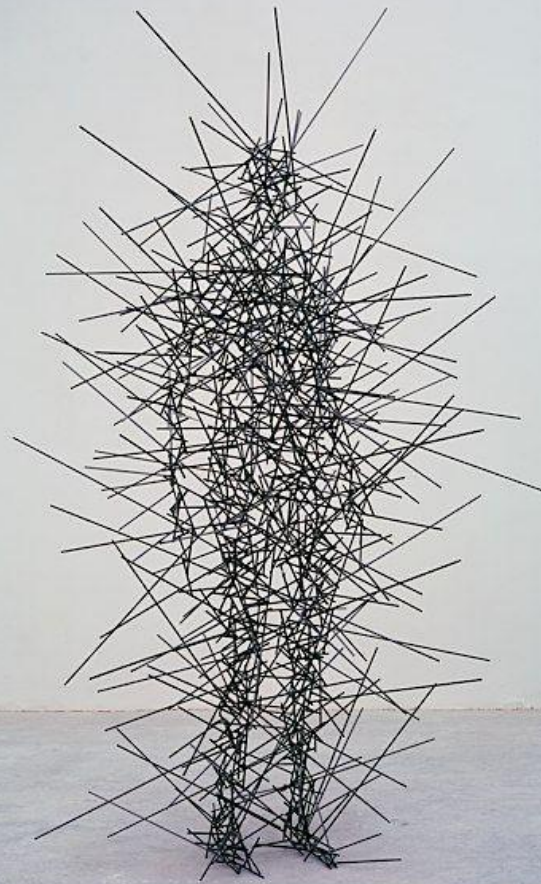


Antony Gormley
Exposure, 2011

Antony Gormley



Antony Gormley



Anders Krisar



Gerard Demetz
Gloomy sunday,
2007



Aron Demetz
Advanced Minorities
2012



Lucy McRae and Bart Hess
Body architect



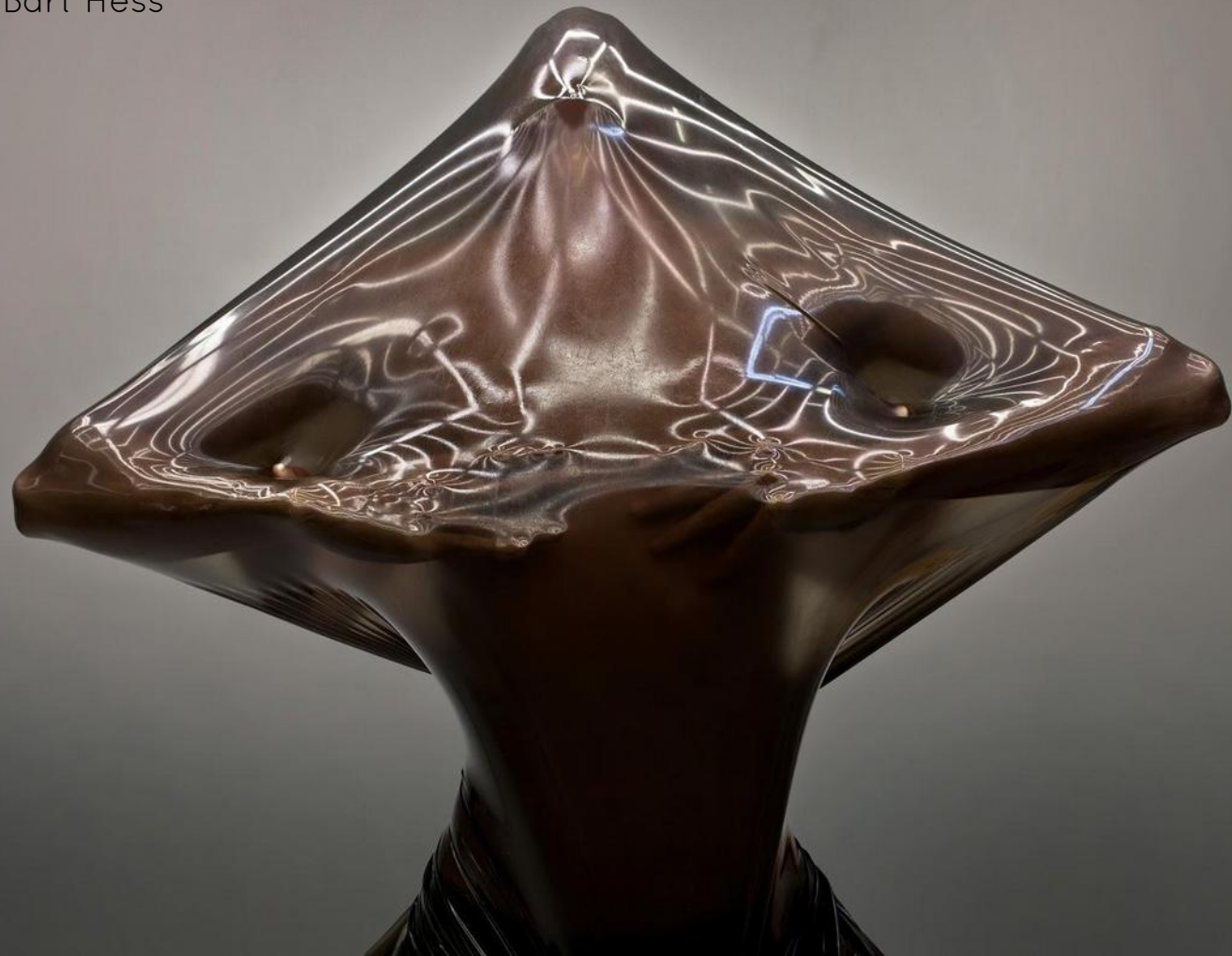
Lucy McRae
Body architect



Lucy McRae
Body architect



Bart Hess



Ralph Pucci
The art of the mannequin
MAD museum, 2015, NY



Ralph Pucci
The art of the mannequin
MAD museum, 2015, NY



Tokuji Yoshioka
For Issey Miyake
2016



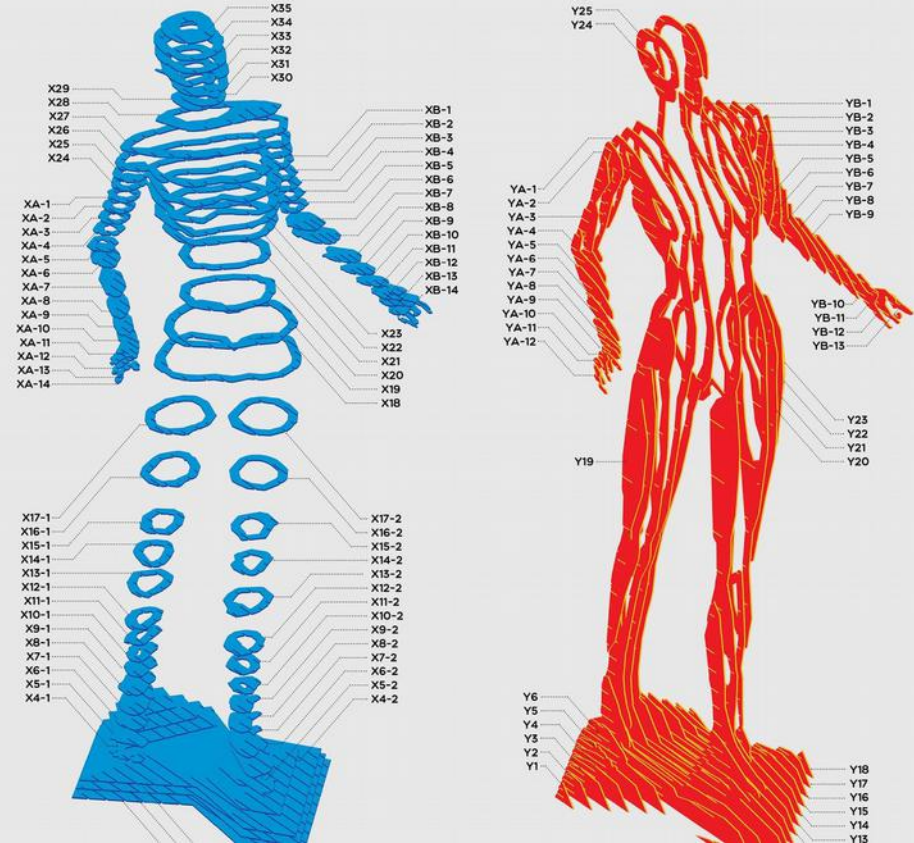
Rig Mannequin

FabTextiles, Fab10, 2014
Waffle structure, laser cut



Instructions

1. To build RIG, it is vital to understand the labeling system. Horizontal pieces are labeled X and vertical pieces are labeled Y. The -1 and -2 labels are reserved for the right and left leg respectively, and an A or B label is for the right or left arm.
2. A piece labeled -0 marks individual parts that are comprised of two or more sections that make up a total piece. Segmented pieces are divided in this manner to allow for easier assembly, piece by piece, onto RIG.
3. To begin, the pieces need to be assembled from the bottom up, starting with the base, following through to the legs, then the upper torso and eventually the head. The arm assemblies should be reserved for last.
4. An easy way to stabilize the long vertical Y pieces during construction is to attach one of the upper torso X pieces as a placeholder.
5. For the arms, the XA and YA pieces should be joined together and the XB and YB pieces should be joined together. Dress RIG before attaching the arms to the body. Refrain from gluing the arms to the body to allow for easy dismounting.
6. Lastly, be sure to refit each notch tightly before gluing. Any lost tolerances during the early stages of assembly will have compounding effects through the rest of the structure.



Ada Mannequin
FabTextiles, Fab11, 2015
Stack slices, laser cut



Rena Mannequin
FabTextiles, Fab12, 2016
Wood & textile composite
vacuum formed on cnc milled
molds



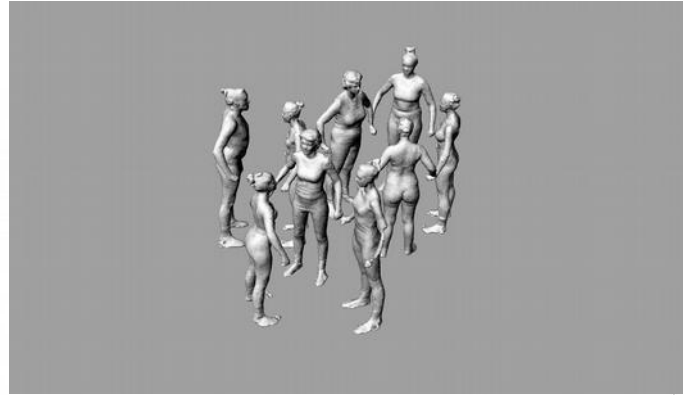


Mina Mannequin
FabTextiles, Fab13, 2017
cnc milled



Light Mannequin
FabTextiles, Feb14, 2018
3D printed

Mannequins
Textile lab Amsterdam
2017
Stack slices, laser cut



The Ultimate Flat Pack Mannequin

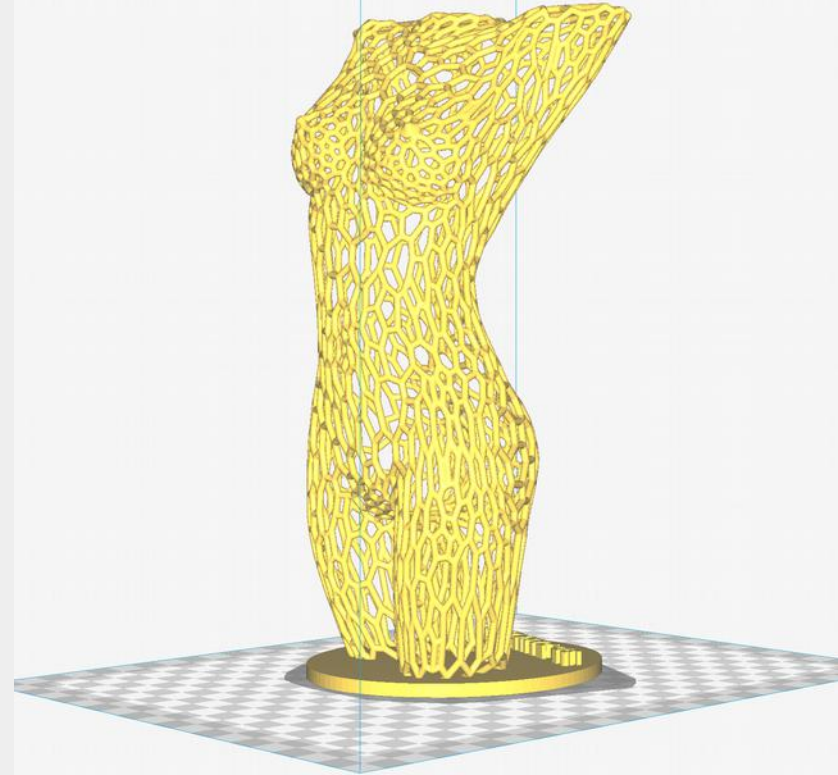


Man in color
Fab Textiles,
Fab10,2014
3d printed,
2meters



3d printed torso

Source: [thingiverse](http://thingiverse.com)



<http://euveka.com/en/welcome/>



Funcional Body Parts

Victoria Modesta



EXO- Prosthetic Leg

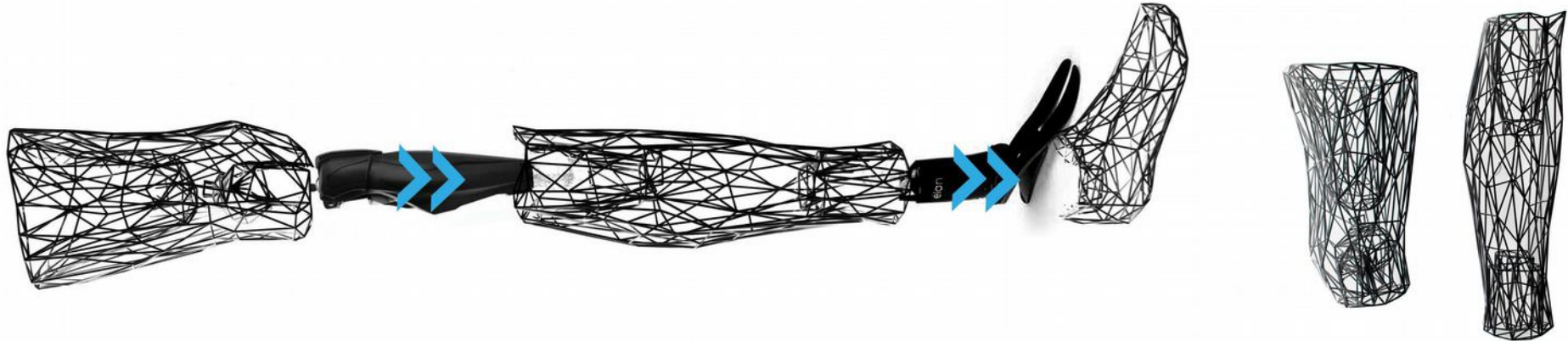
3

3D PRINTING

The finished model is sent to a 3D printing facility and printed out of Titanium, an extremely durable, lightweight, and biocompatible metal. Titanium dust particles are fused together in a process known as Laser Sintering. The resulting print is immediately ready for assembly.

ASSEMBLY

Using custom connectors 3D printed directly into the prosthesis, off-the-shelf prosthetic components are inserted into the prosthesis. Using a standard pyramid connector, they securely assemble together allowing a final option for fine-tuned adjustments.



altlimbpro

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Software

2D & 3D modeling for fashion	Price
Optitex	
Wildginger	
Marvelous designer	
Clo3D	
Valentina	Free
PatternMade4you	
Fashioncad	
Grafis	
Valentina	
Sodacad	
Patternmakerusa	

3D modeling Programs	Price
3D Slash	Free
3ds Max	2,141,70 /year
AutoCAD	1400 /year
Blender	Free
CATIA	7,180.00
Clara.io	Free
FreeCAD	Free
Fusion 360	499.80 /year
Inventor	2,060 /year
MakeHuman	Free
Maya	1,936 /year
Meshlab	Free
Meshmixer	Free
Moment of Inspiration	266
Mudbox	85 /year
Onshape	2.400 /year
OpenSCAD	Free
Photoshop CC	142 /year
Poser	\$129.99, Pro \$349.99
Rhino3D	1,695
SculptGL	Free
Sculptris	Free
SketchUp	Free, 657 Pro
Solidworks	9,950 ,
TinkerCAD	Free
ZBrush	720

weaving - knitting-Embroidery	
Open source embroidery	Free
embroidermodder	
fiberarts	
osloom	
artlink	
embird	
Brother embroidery	
All industrial machines	
Knit_pro	



Scanning

Applications of 3D scanning

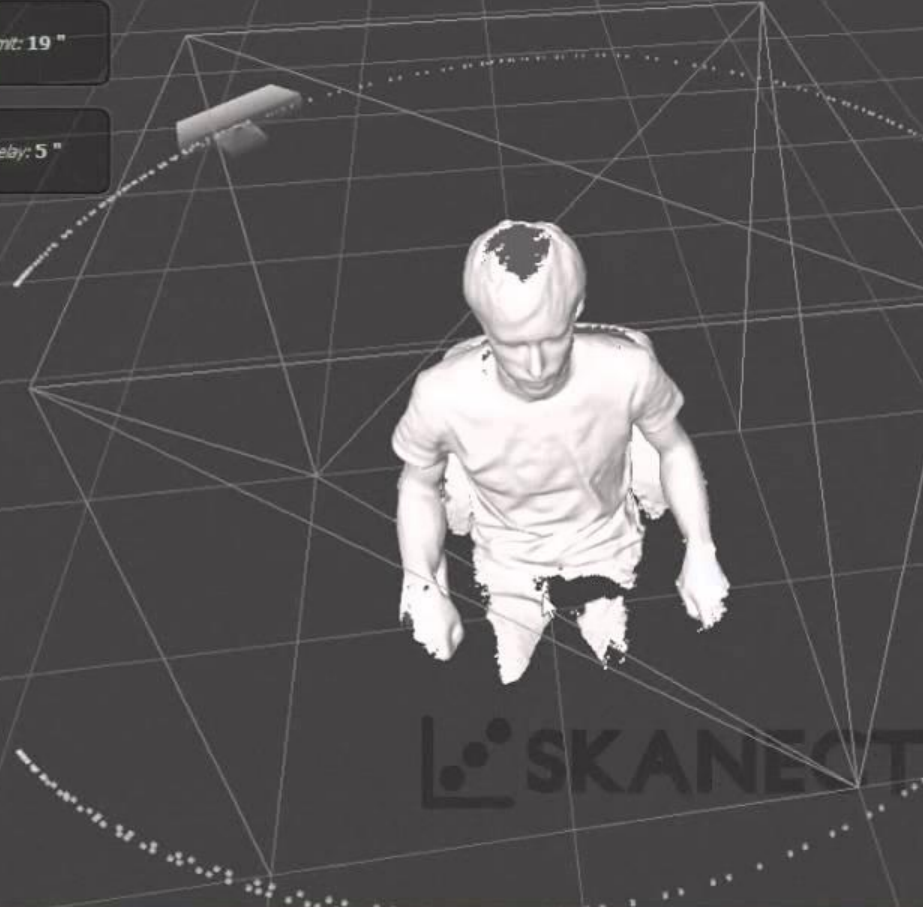
- Computer Vision
 - People and object tracking
 - 3D Scene reconstruction
- Interaction
 - Gesture-based user interfaces
 - Gaming/character animation
- Medical
 - Respiratory gating
 - Ambulatory motion analysis



Limit: 19"

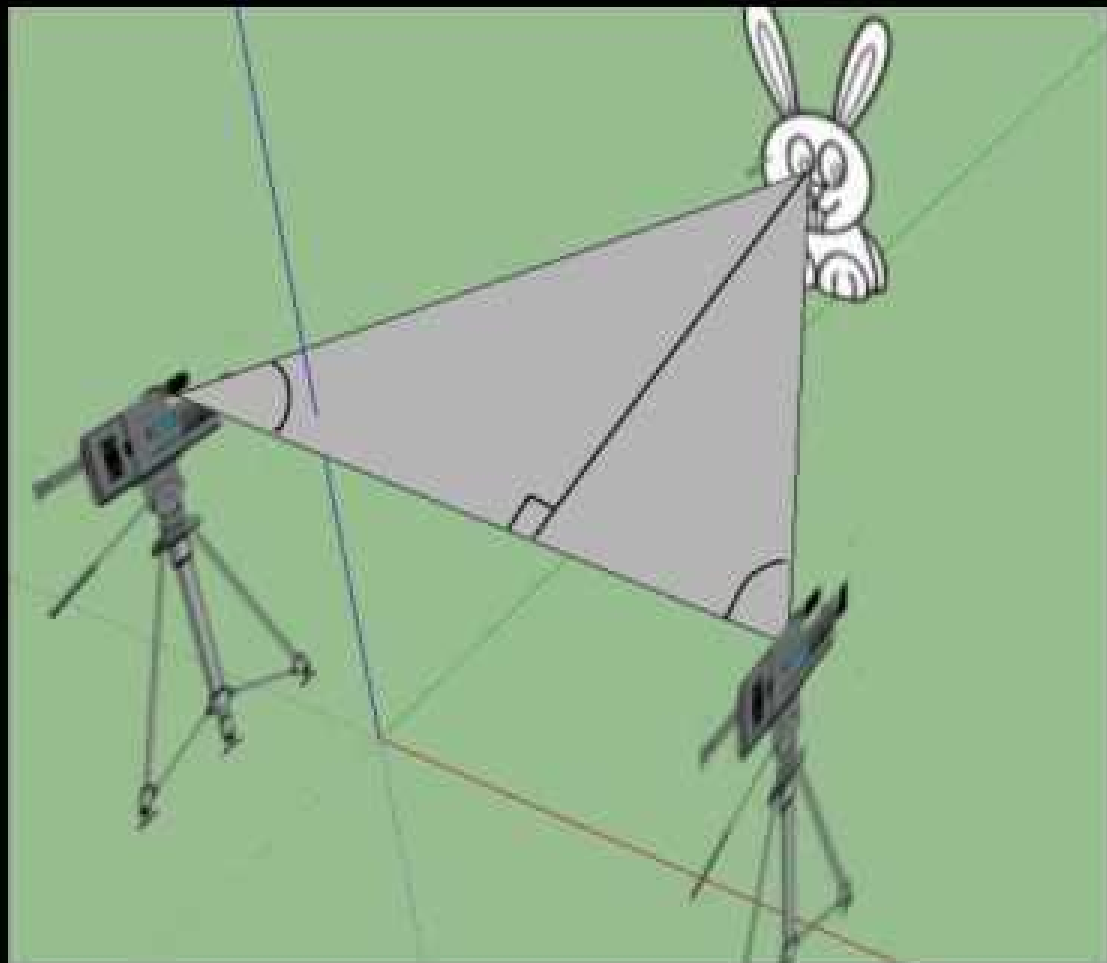


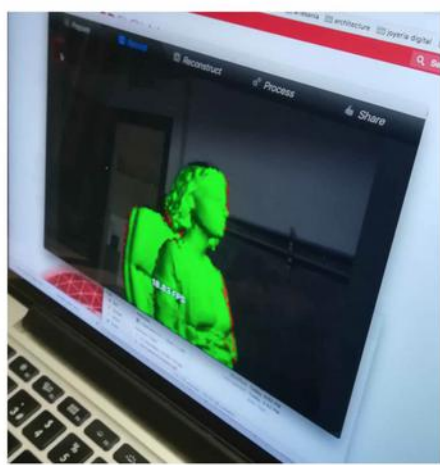
Delay: 5"



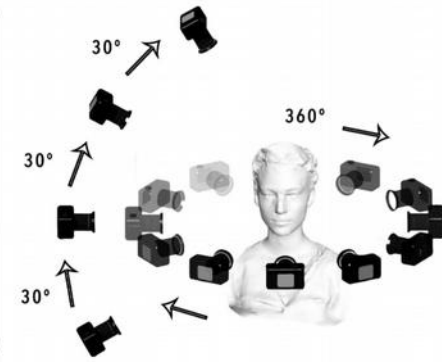
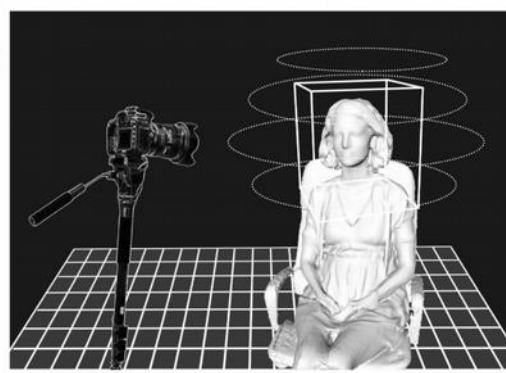
Vertices : 106747
 Faces : 201165
 Colors : Per vertex



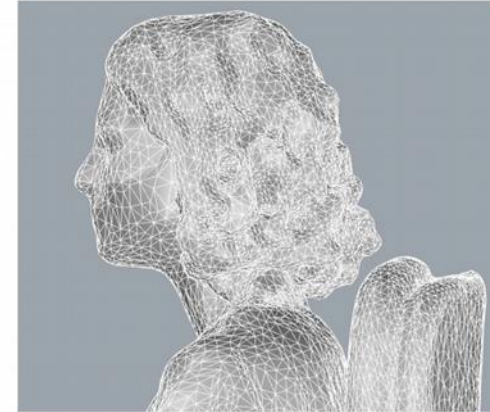
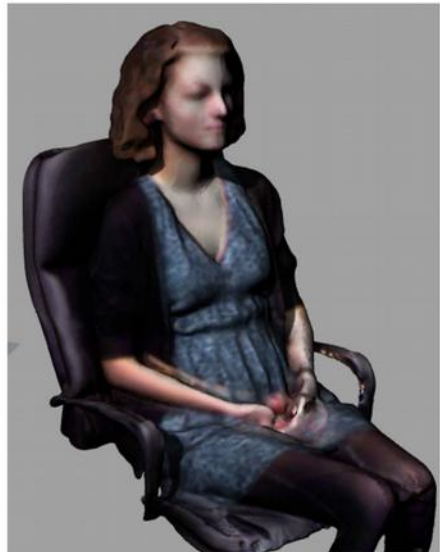




Computer screen during the 3d scanning session : Skanect 3D



How to take correct pictures for the 3d scan modelling



Rhino preview of the Skanect 3d mesh

3D SCANNING the body

http://wiki.textile-academy.org/fabricademy2017/students/clara.davis/digital_masks



Mode Project Scan Alignment Combine

Scan Mesh Editor New Open Delete Save All Export Import Lock Align Undo Align Repeat Align Combine Uncombine

Kscan3D

Vertices: 96.881 Faces: 131.908

Meshing

Generate Mesh
Alignment None
Density

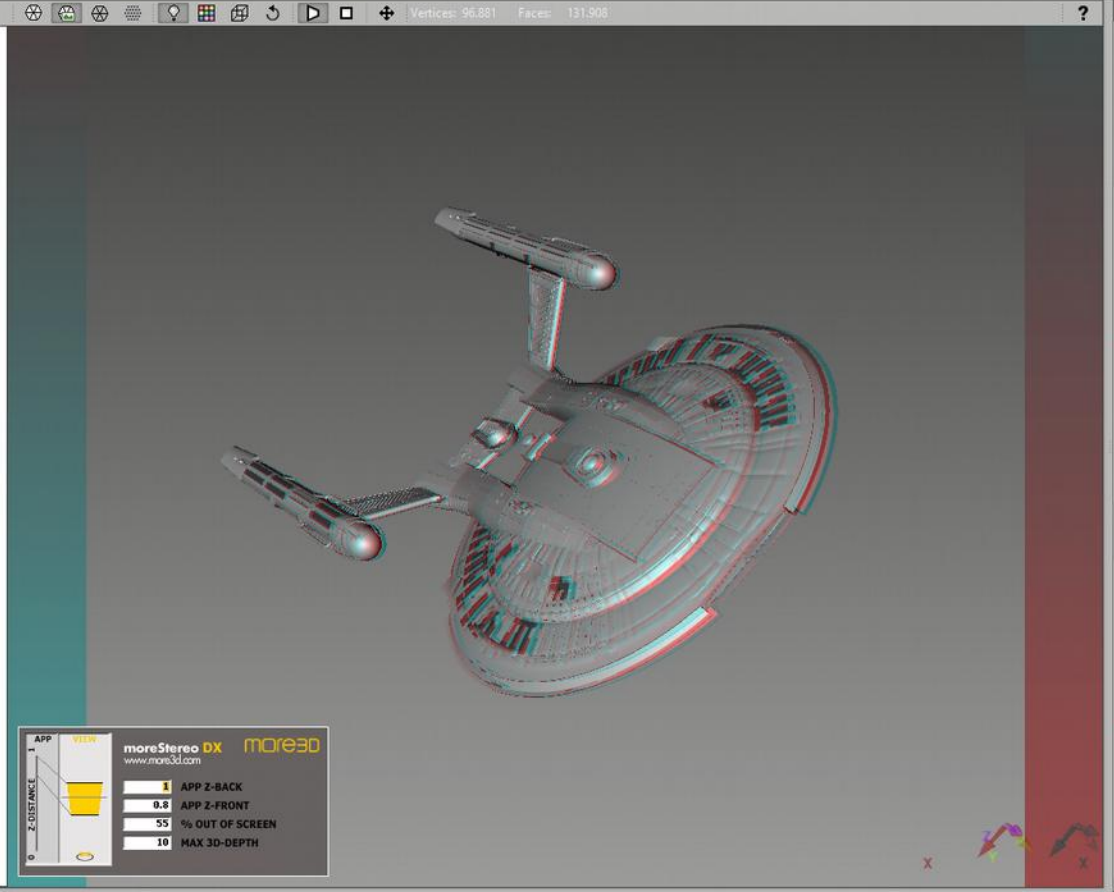
Scanning

Enable Batch Scanning

Number of scans 12
Delay between scans 3
Delay (in seconds) 0

SCAN

1 - Enterprise
2 - Enterprise
3 - Enterprise



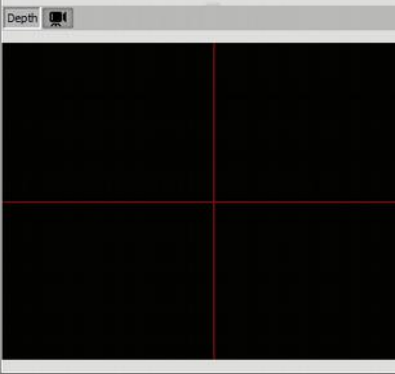
moreStereo DX more3D
www.more3D.com

1 APP Z-BACK
0.8 APP Z-FRONT
55 % OUT OF SCREEN
10 MAX 3D-DEPTH

Scanner 1

X Percent: [Slider]
Y Percent: [Slider]
Z Minimum: [Slider]
Z Range: [Slider]

Depth+RGB



Digitize Your World

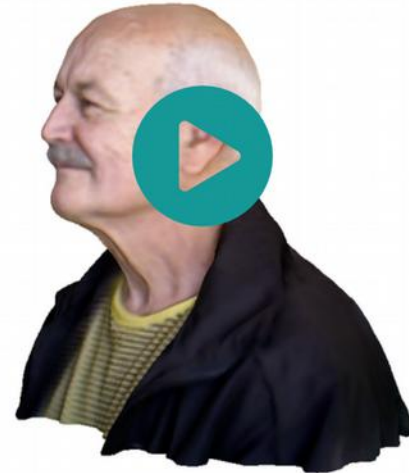
ReconstructMe is a powerful 3D real-time scanning system – plus it is simple to use and free.

 [Download 2.5.1034](#) for  64bit Vista/7/8/10

[Other downloads](#)

ReconstructMe's usage concept is similar to that of an ordinary video camera – simply move around the object to be modelled in 3D. Scanning with ReconstructMe scales from smaller objects such as human faces up to entire rooms and runs on commodity computer hardware. Read more about its [features](#).

Developers! Integrate ReconstructMe into your application using our [powerful SDK](#).



MilkScanner



Fluid Scanning
using milk, ink and other fun liquids

**how to use everyday objects and fluids
to digitize your stuff in 3D**

This project started out as the Milkscanner (as described on [instructables](#)).

The basic idea behind this process is that you can capture the silhouette of an object easily when it is surrounded by a high contrast fluid, such as milk or ink.

When lowering the object into the fluid, the silhouette changes gradually, as the fluid obstructs more and more of the objects shape. By capturing the silhouette of an object at different stages of submersion, one can generate slices, that, if properly stacked together, can be interpreted as 3D data.

what the computer sees:



what you see:

THANK YOU:
Jamie O'Shea
Dan Torop
Hannah Perner-Wilson
Geraldine Juarez
Taeyoon Choi
Zach and Theo for OpenFrameworks

and all the people brave enough to participate

THIS PROJECT IS SUPPORTED BY:
Eyebeam Center for Art and Technology
Staatsministerium für Wissenschaft und Kunst
Sachsen

DOWNLOAD:

Milkscanner for Windows

Milkscanner for Mac OSX

both downloads include sourcecode. To compile the source, you need [OpenFrameworks](#)

developed with [Moviesandbox](#).



milk



3D systems Sense Scanner



DESCRIBE TABLE CMMS

ing functionality with
ility

een using a MicroScribe to collect 3D data on fossil human bones for over 15 years. I've used it in
tions all over the world, and it has become an indispensable tool for analyzing the anatomy of our
ancestors.”

Laser Scanning





Create accurate 3D models with reality capture

Use ReCap™ reality capture software to convert reality into a 3D model or 2D drawing that's ready for further design.

[SUBSCRIBE](#)[PLAY VIDEO \(1:58 MIN.\)](#)[DOWNLOAD FREE TRIAL >](#)[Subscription benefits](#)

Includes support and more

[System requirements](#)

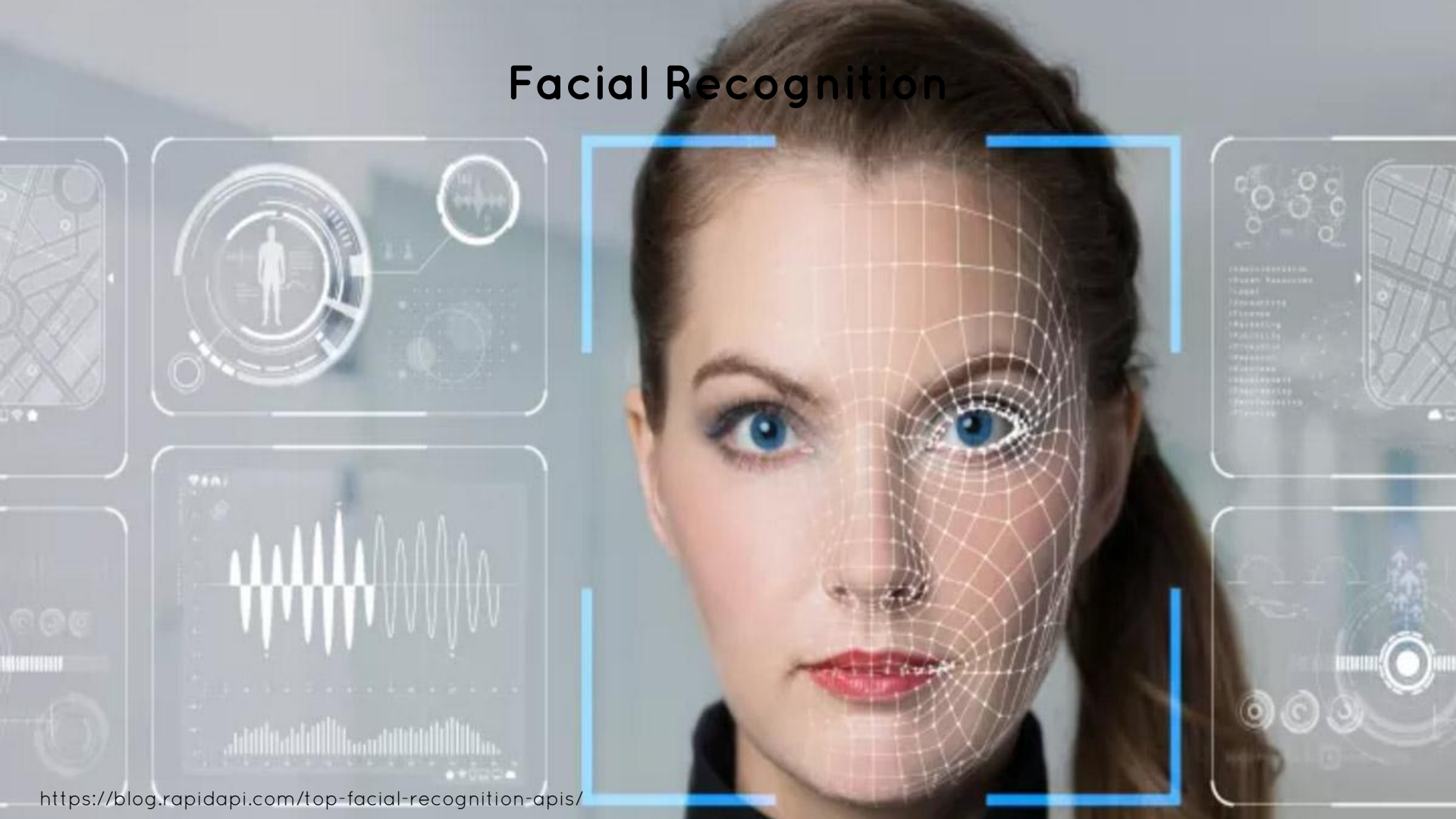
Available for: 

[Compare products](#)

ReCap vs. ReCap Pro

[ReCap Pro features](#)[View all features](#)

Facial Recognition





YOUR NEW SIZE COMPANION

Access tons of fashion brands after registering on bodi.me.

A neat top window will appear telling you which size to pick.

Now you can shop worldwide in all confidence.

Female Body Visualizer

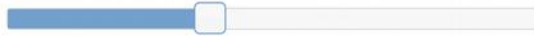
(switch to male)



Height: inches PREDICTED (?)



Weight: pounds PREDICTED (?)



Chest: inches PREDICTED (?)



Waist: inches PREDICTED (?)



Hips: inches PREDICTED (?)



Inseam: inches PREDICTED (?)



Exercise: hours/week PREDICTED (?)



 **Updates Available**
 Your computer will restart to complete these updates.

[Details](#)
[Restart](#)

Files Modelling **Geometries** Materials Pose/Animate Rendering Settings Utilities Help











Clothes Eyes Hair Teeth Genitals Topologies Eyebrows Eyelashes Tongue

Options

Hide faces under clothes

Tag filter



-  shoes01_hres
-  shoes01_lres
-  shoes02
-  short01
-  **suit01_hres**
-  suit01_lres
-  tshirt02
-  tshirt_long
-  tshirt_short
-  worksuit

Make Human



Model

Import...

Manufacturing Settings

Custom (279.40mm...)

Object Size

Units: mm

Height: 500.000

Width: 592.521

Length: 226.445

Original Size Uniform Scale

Construction Technique

Stacked Slices

Dowels: Automatic

Diameter: 6.350

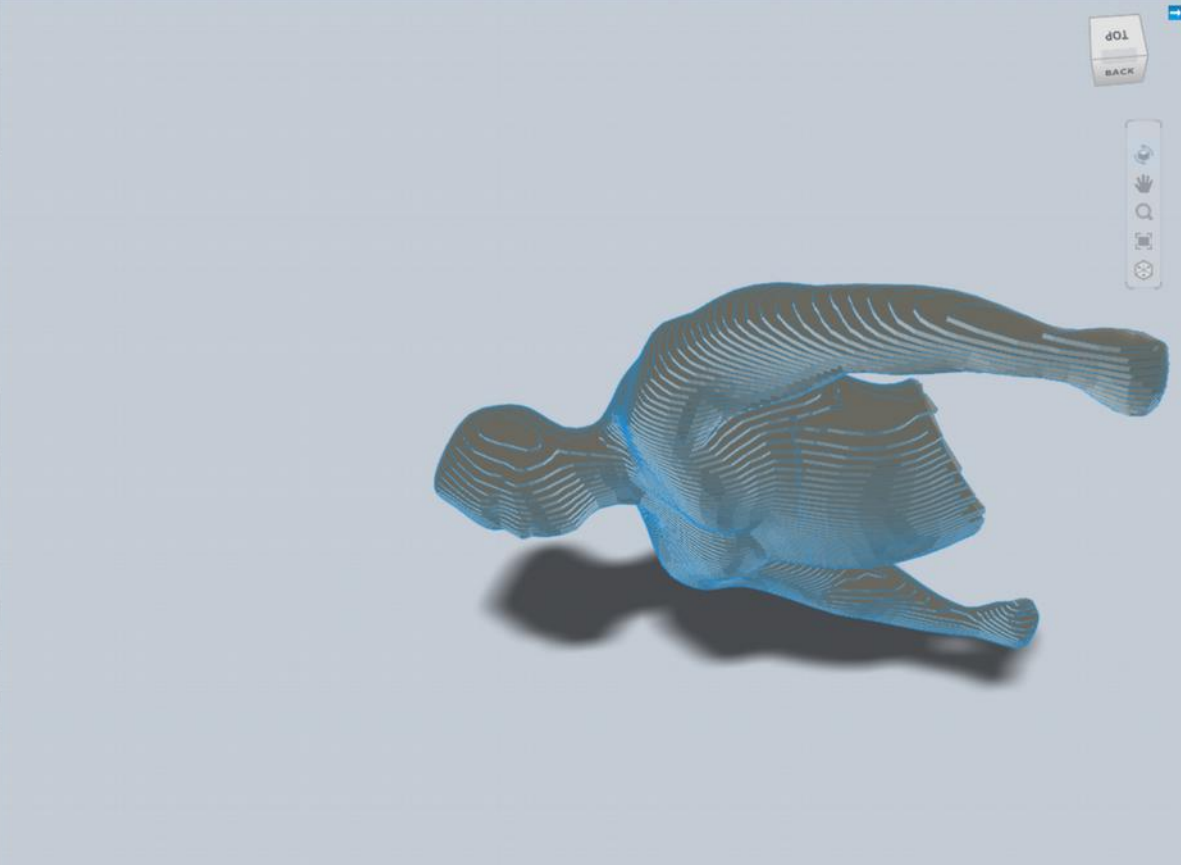
Shape: Round

Slice Direction

Modify Form

Assembly Steps

Get Plans



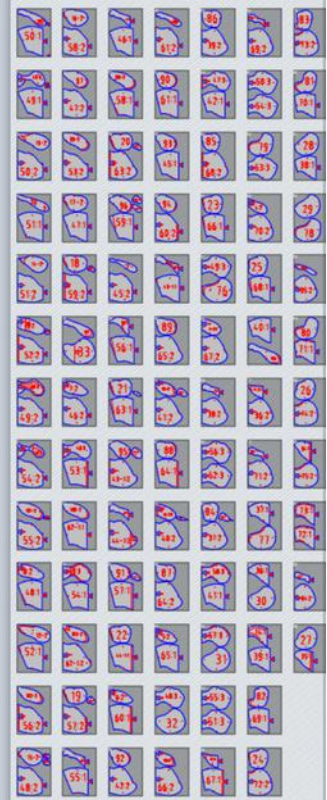
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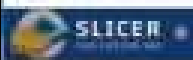
BACK

Navigation icons: Home, Hand, Zoom, Refresh

Cut Layout Model Issues

Sheets: 89 Parts: 197





Home

Modeling Tools

Layers

Settings

- File [Ctrl+S]
- View [Ctrl+V]
- Help [Ctrl+H]
- Close [Ctrl+W]

Application Settings

Layers

Settings

- File [Ctrl+S]
- View [Ctrl+V]
- Help [Ctrl+H]
- Close [Ctrl+W]

Home

Modeling Tools

Layers

Settings

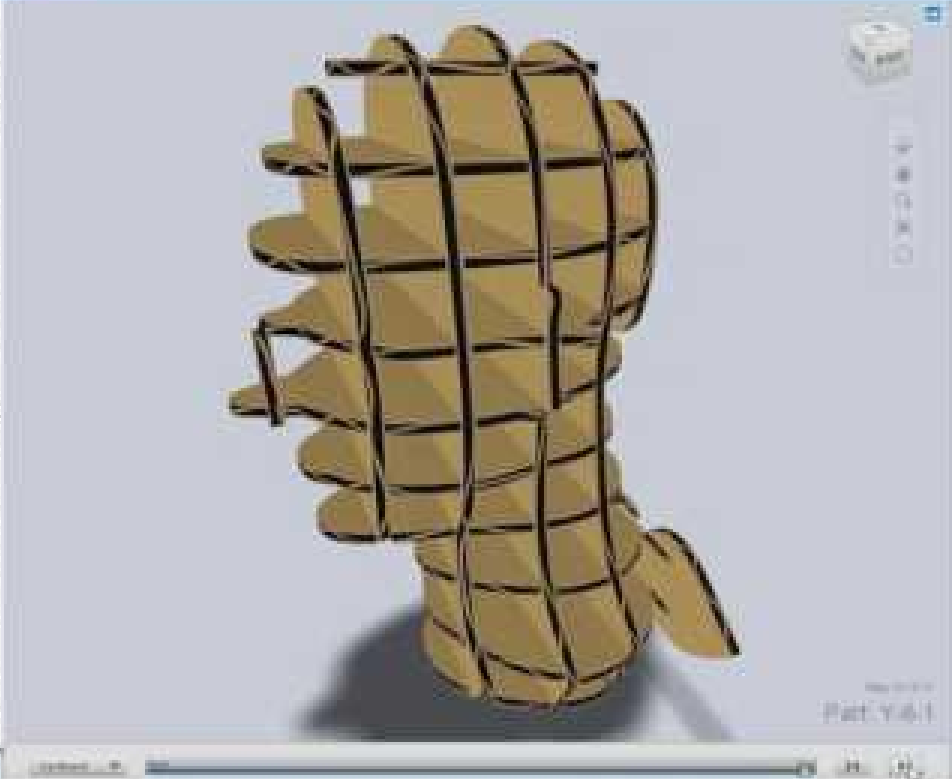
- File [Ctrl+S]
- View [Ctrl+V]
- Help [Ctrl+H]
- Close [Ctrl+W]

Application Settings

Layers

Settings

- File [Ctrl+S]
- View [Ctrl+V]
- Help [Ctrl+H]
- Close [Ctrl+W]



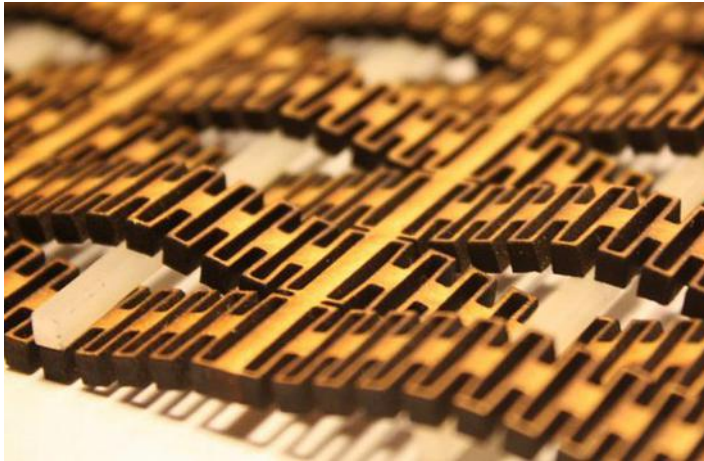
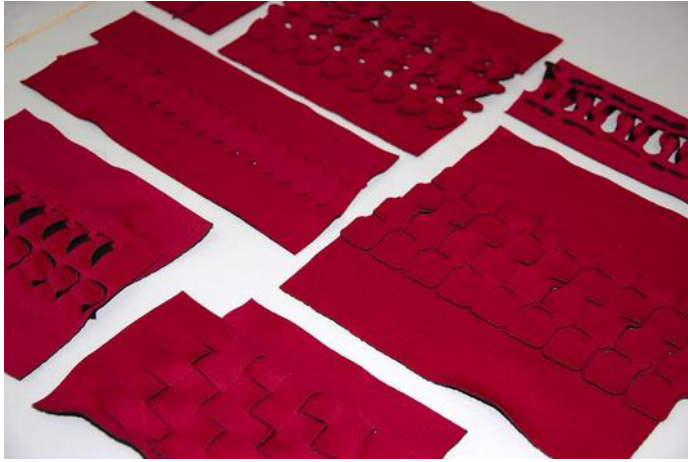
Rendering Methods

Rendering Methods

Rendering Methods

Part Y 61

Laser Cutting



Vector and Raster Fill Engraving Samples

Sample Raster Fill Values	Sample Vector Line Engraving Values
FR: 000 000 000	
FR: 010 010 010	
FR: 020 020 020	
FR: 030 030 030	
FR: 040 040 040	
FR: 050 050 050	
FR: 060 060 060	
FR: 070 070 070	
FR: 080 080 080	
FR: 090 090 090	
FR: 100 100 100	
FR: 110 110 110	
FR: 120 120 120	
FR: 130 130 130	
FR: 140 140 140	
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FR: 245 245 245	
FR: 250 250 250	
FR: 255 255 255	

Line: 255 000 000 Line: 000 255 000 Line: 255 000 255 Line: 000 000 000

Tips and Tricks:

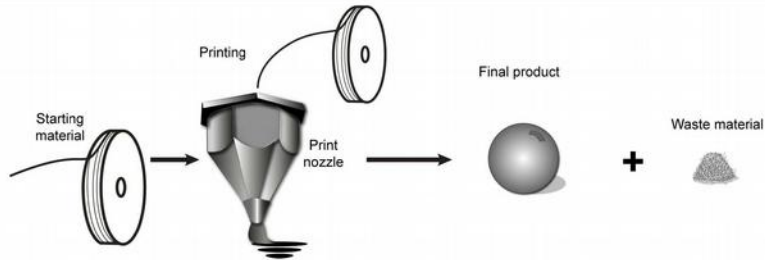
- Objects with different raster fill values will override raster fill values of objects under them.
- Vector line values will always be cut even when obscured.
- To prevent this, "cut" the higher object out of the lower object.

Computer-Controlled Cutting FabAcademy



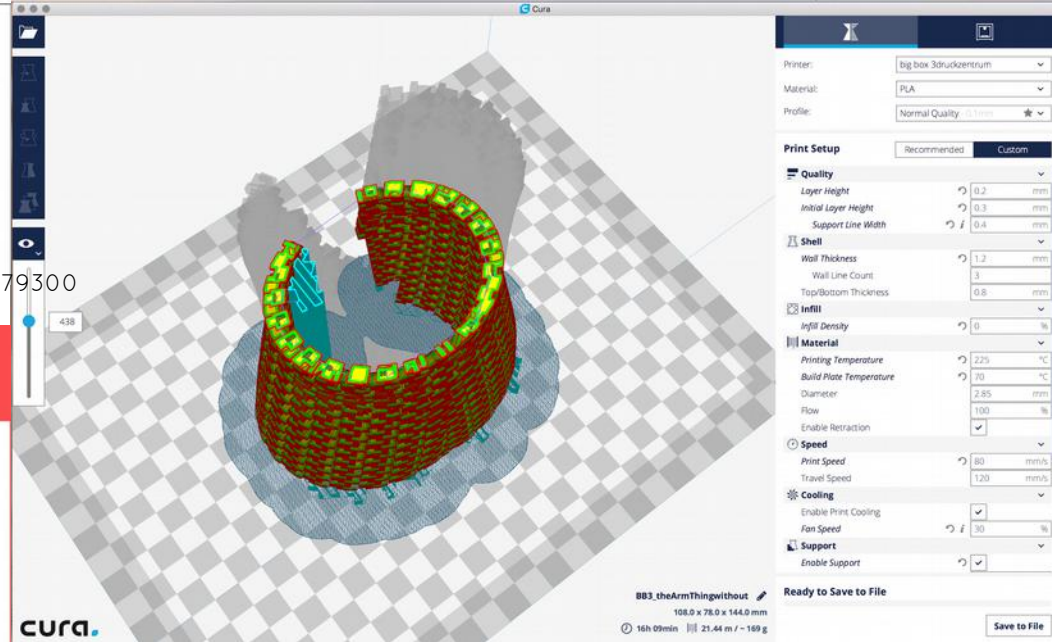
3D printing - additive manufacturing

Additive manufacturing



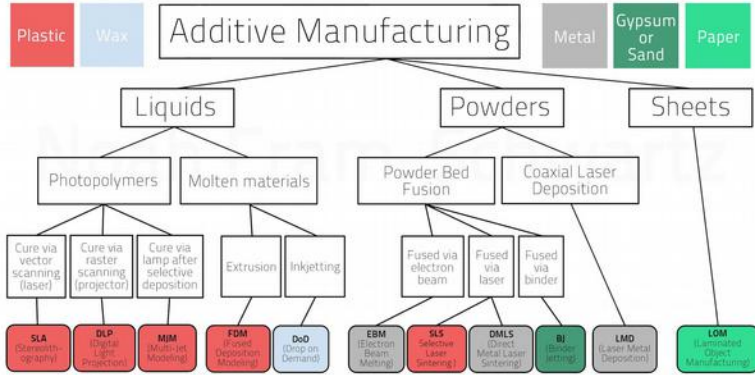
source: www.gao.gov , <https://www.flickr.com/photos/usgao/22327379300>

3D Model -> slicer -> gcode



TYPES OF ADDITIVE MANUFACTURING

CREATED BY NOAH FRAM-SCHWARTZ



Slicer

- cura
- simplify3D
- slicer3D
- repetier
- Kisslicer
- MatterControl

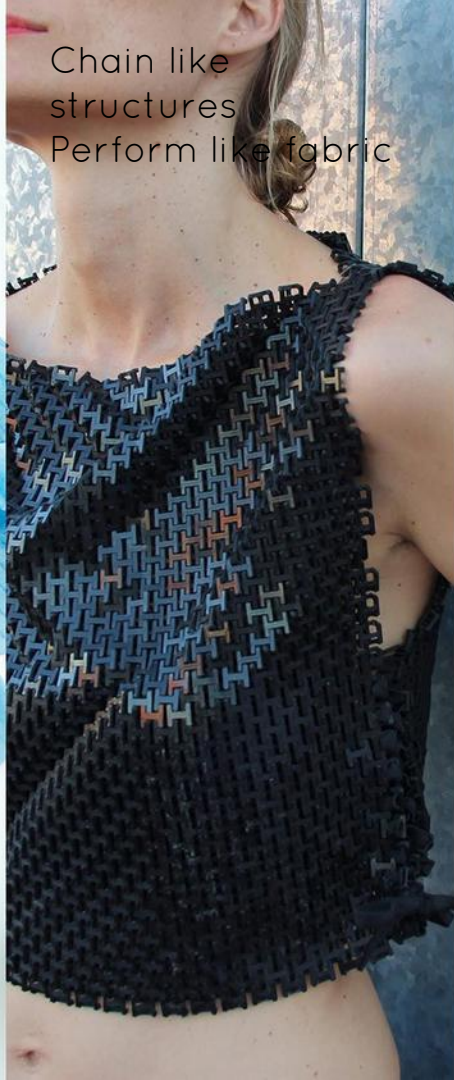
[3d printing presentation on Prezi](#)



PLA 3d print



Chain like
structures
Perform like fabric



Mesostructures-
flexures
Auxetic structures



3DPrint on fabrics



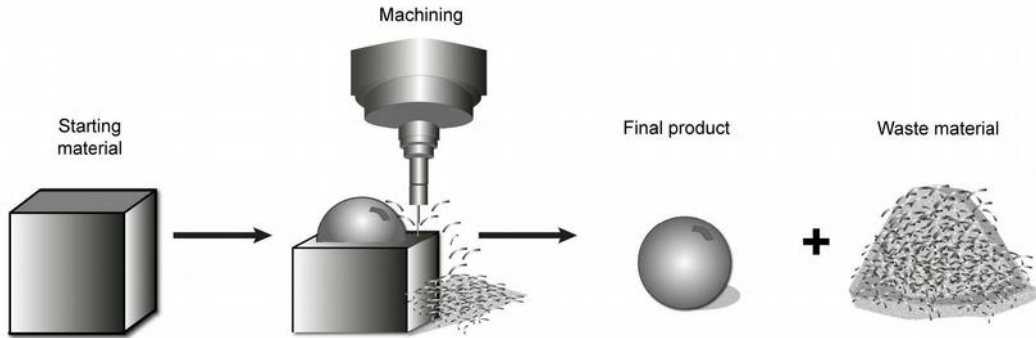
Nervous System



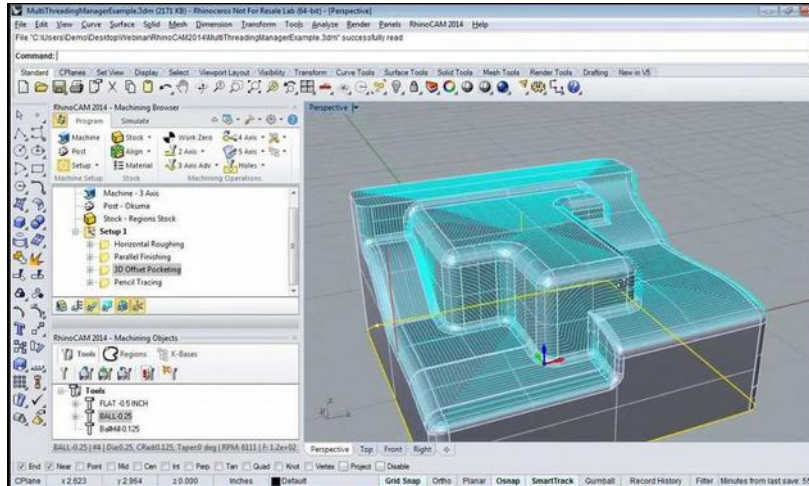
CNC milling - subtractive manufacturing

Subtractive manufacturing

3D Model -> CAM -> gcode



source: www.gao.gov , <https://www.flickr.com/photos/usgao/22327379300>

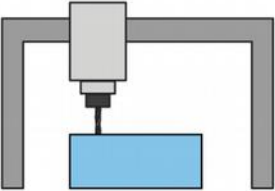


Eva
Wohlgemuth
Datobody, 1997

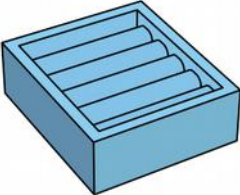
CNC MACHINE



CNC milling - casting



CNC



MOULD

MOULDS



ONE PART



TWO PART



THREE PART

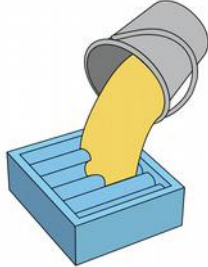


FOUR PART

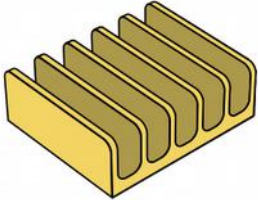
Casting



COMPOSITE



OBJECT



MOULDING



CAST



PRESS

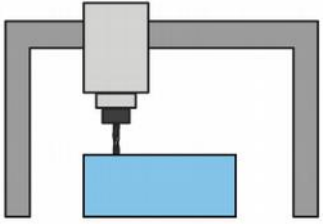


INJECTION

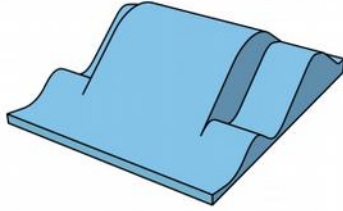


ROTATION

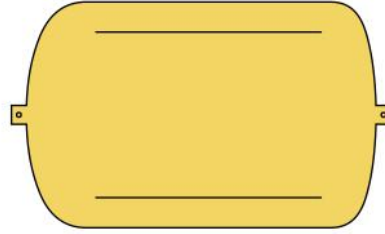
Vacuum forming



CNC



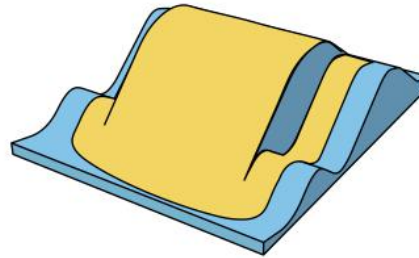
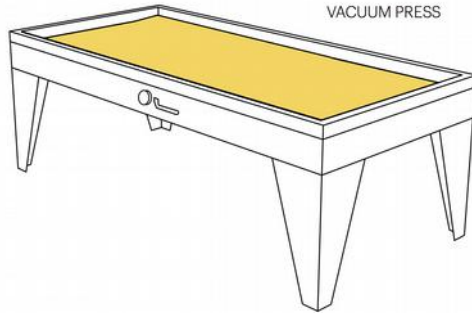
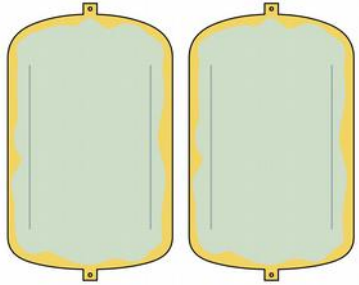
MOULD



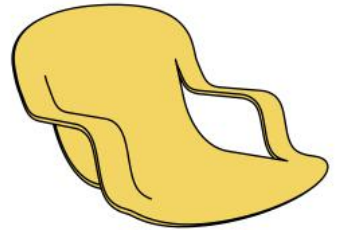
PATTERN



COMPOSITE



PRESS



OBJECT

Fab Lab Rules

- Opening hours
- Booking System
- Training and file review
- Materials and Storage area
- Consumables
- Recycle Policy
- Tools
- Security
- Food/Drinks
- Machine Damage
- Cleaning/Maintenance

