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Media Factory

Digital_Fabrication_Studio.05

CNC milling – materials, finishes, process

Molding & Casting – materials, finishes, processes

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14.05.2012

Aalto Media Factory
Helsinki



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Today (01):

- * CNC Milling
- * CNC, but not only Milling
- * Examples
- * Design techniques



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Today (02):

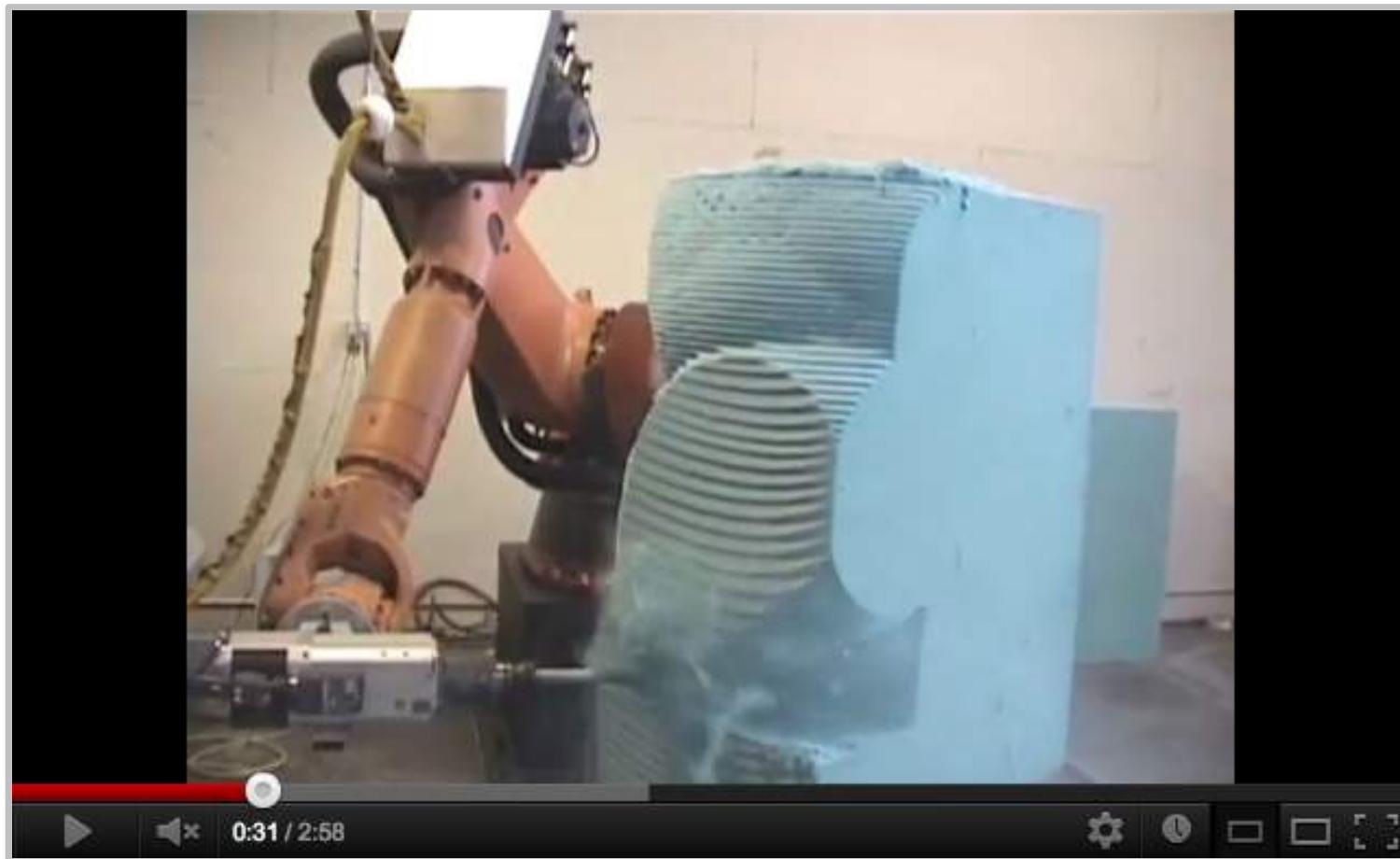
- * Mold
- * Designing a mold
- * Casting into a mold



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01. CNC Milling: computer controlled sculptures

CNC milling



Sculpting (subtracting) from a block of
(almost) any material.

Source: <http://youtu.be/j4akxGjTbOs>

CNC routing



Routing = different technology, different speed and resistance (more suitable for wood than metal).

CNC milling: 2D, 2.5D or 3D ?



2D or 2-axis (only X and Y), 2.5D or 2-axis (X,Y, and up/down position), 3D or 3-axis (X,Y,Z).

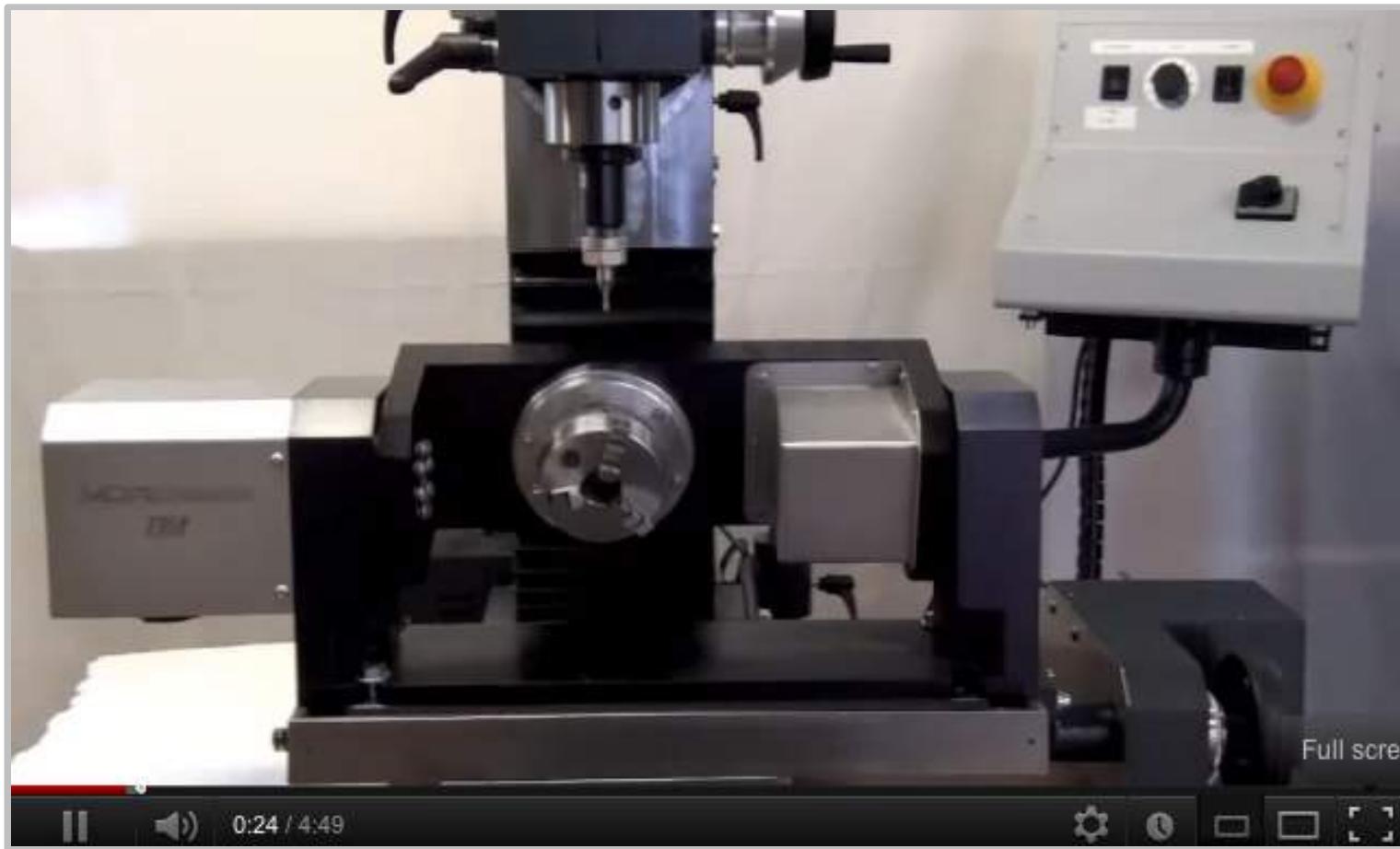
CNC milling: 4-axis



An example: Roland MDX-540 (but there's also
a desktop version, the MDX-40A).

Source: http://youtu.be/ZuXF_Y97j2M
<http://www.rolanddga.com/products/milling/mdx540/>

CNC milling: 5-axis



An example: TN5, a 5-Axis Milling Machine.

Source: <http://youtu.be/vark2IBMGr0> <http://www.mdaprecision.com/>
<http://www.fiveaxismachining.com/index.php/why-5-axis/> <http://www.shopbottools.com/mProducts/5axis.htm>

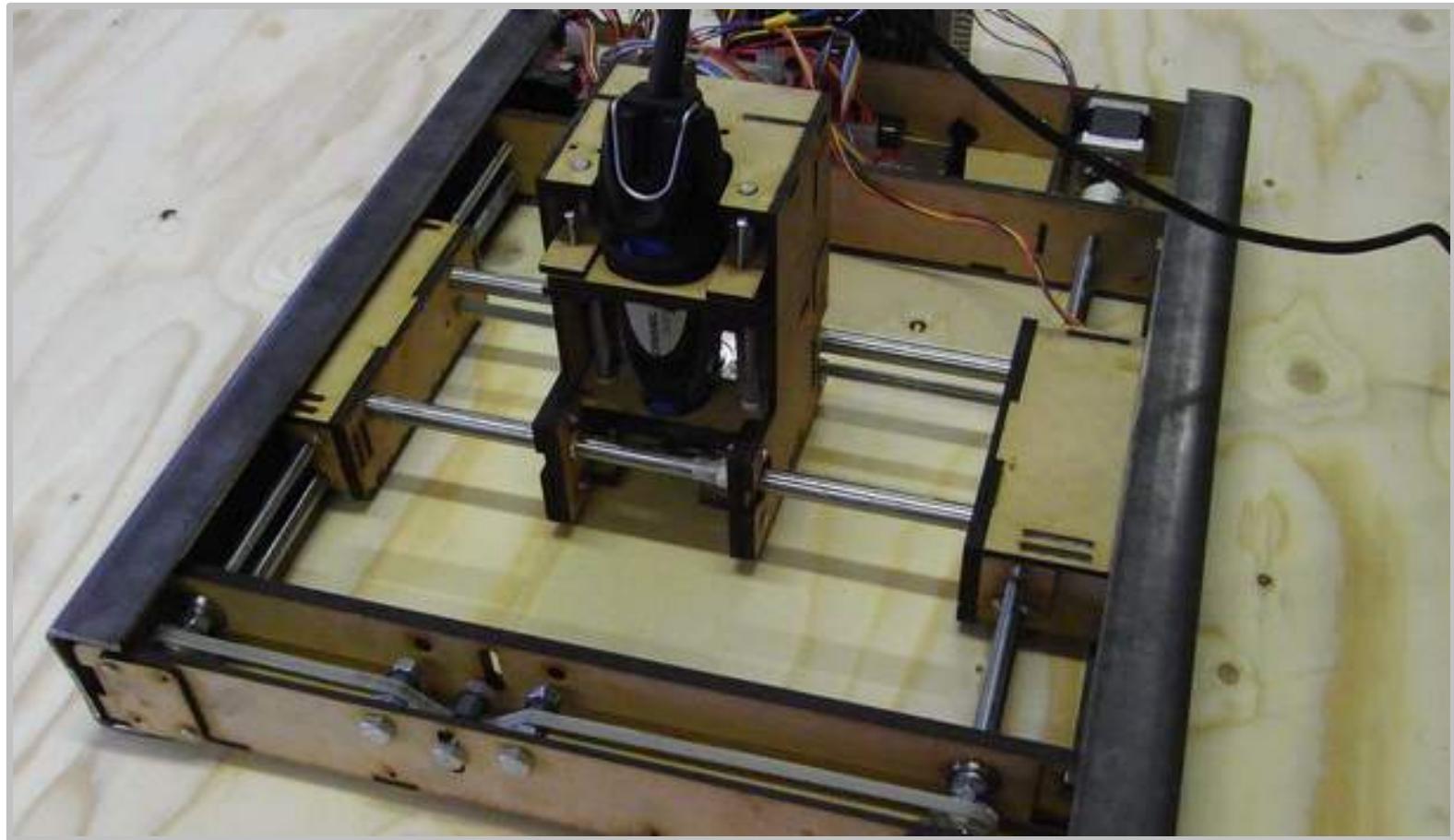
Roland iModela: small, low-cost CNC milling



The iModela is a low-cost, easy-to-use desktop device that mills wax, foam, balsa wood and plastic materials. Max operation area: 86 x 55 x 26 mm

Source: <http://icreate.rolanddg.com/iModela/Global/English/about/index.html/>

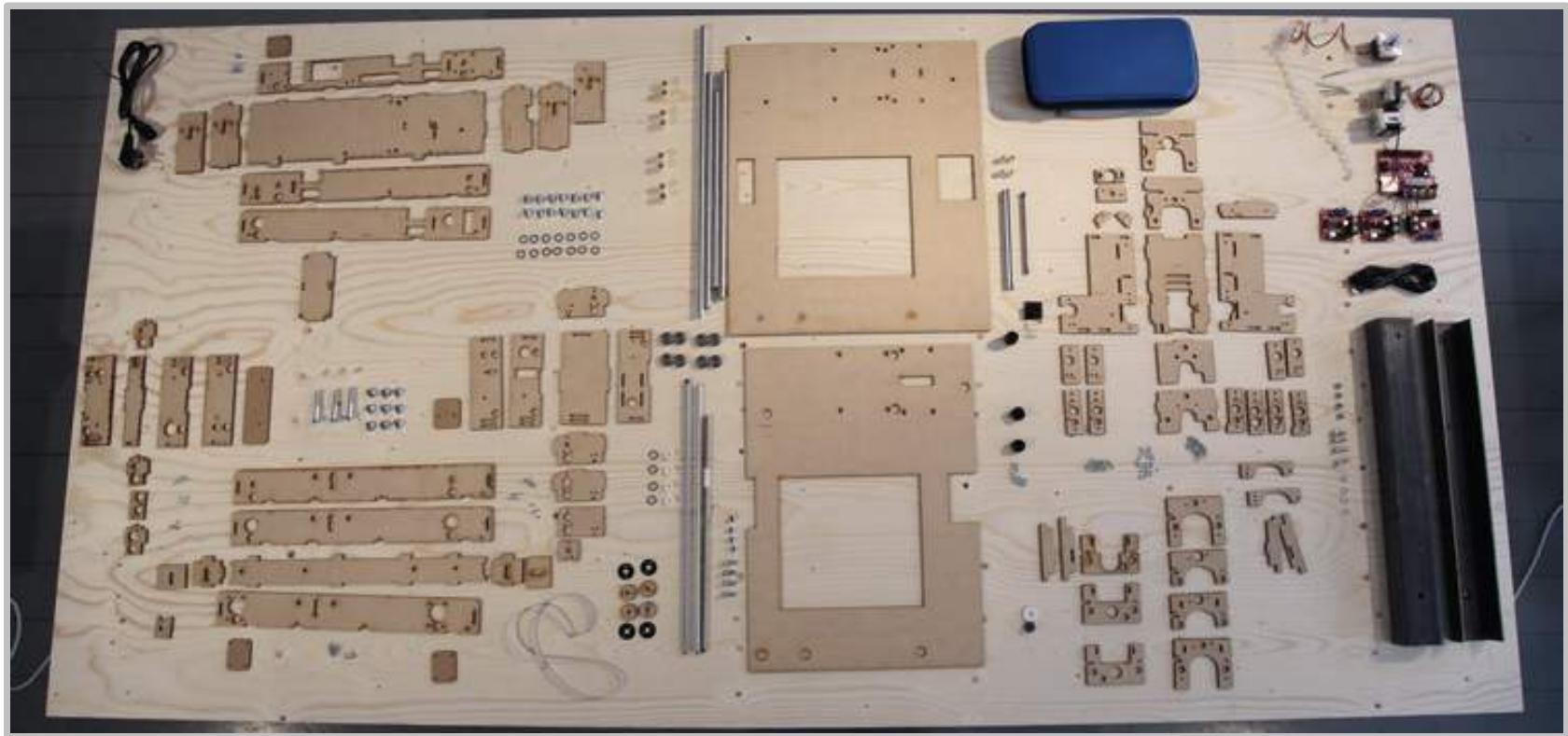
MiniCNC: Open Source CNC milling



A desktop-size, open-source milling machine in kitform, built from lasercut parts: a computer-controlled Dremel with a 20 by 20 cm work surface.

Source: <http://www.repairablemachines.com/>

MiniCNC: Open Source CNC milling



A desktop-size, open-source milling machine in kitform, built from lasercut parts: a computer-controlled Dremel with a 20 by 20 cm work surface.

Source: <http://www.repairablemachines.com/>

DIYLILCNC: Open Source CNC

The screenshot shows the DIYLILCNC website homepage. At the top, the title "DIYLILCNC" is displayed in large, bold, black letters, with "vers. 1.0.2" below it. A navigation bar includes links for About, Blog, Buy, Contact, Downloads, Events, Forum, and Gallery, along with social media icons for Facebook and Twitter. To the right of the navigation bar is a 3D rendering of the CNC mill's wooden frame. Below the header, a section titled "Home" contains a brief description of the project: "The DIYLILCNC project is a free & open-source set of plans for an inexpensive, fully functional 3-axis CNC mill that can be built by an individual with basic shop skills and tool access." To the right of this text is a photograph of the assembled CNC mill on a workbench, with the caption "DIYLILCNC - A low-cost, open-source desktop CNC mill." Further down the page, a green banner reads "Kickstart v2.0!" above a smaller image of the mill labeled "DIYLILCNC 2.0". Below this, a paragraph explains the kickstart: "We're preparing to release version 2.0 of our free, open-source plans for a robotic cutting machine that you can build yourself."

DIYLILCNC

vers. 1.0.2

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The DIYLILCNC project is a free & open-source set of plans for an inexpensive, fully functional 3-axis CNC mill that can be built by an individual with basic shop skills and tool access.

CNC devices are used to fabricate physical objects with a high degree of precision. Some CNC devices, including the DIYLILCNC, feature a gantry-mounted cutting tool (like a router) that can move in two or more directions. The operation of the tool is controlled by a computer, which is tasked with translating a digital design into actual tool movement.

DIYLILCNC - A low-cost, open-source desktop CNC mill.

Google™ Custom Search [Search](#)

Kickstart v2.0!

DIYLILCNC 2.0 - Open-source plans for a low-cost CNC mill. by DIYLILCNC

We're preparing to release version 2.0 of our free, open-source plans for a robotic cutting machine that you can build yourself.

A free & open-source set of plans for an inexpensive, fully functional 3-axis CNC mill that can be built with basic shop skills and tool access.

Source: <http://diylilcnc.org/>

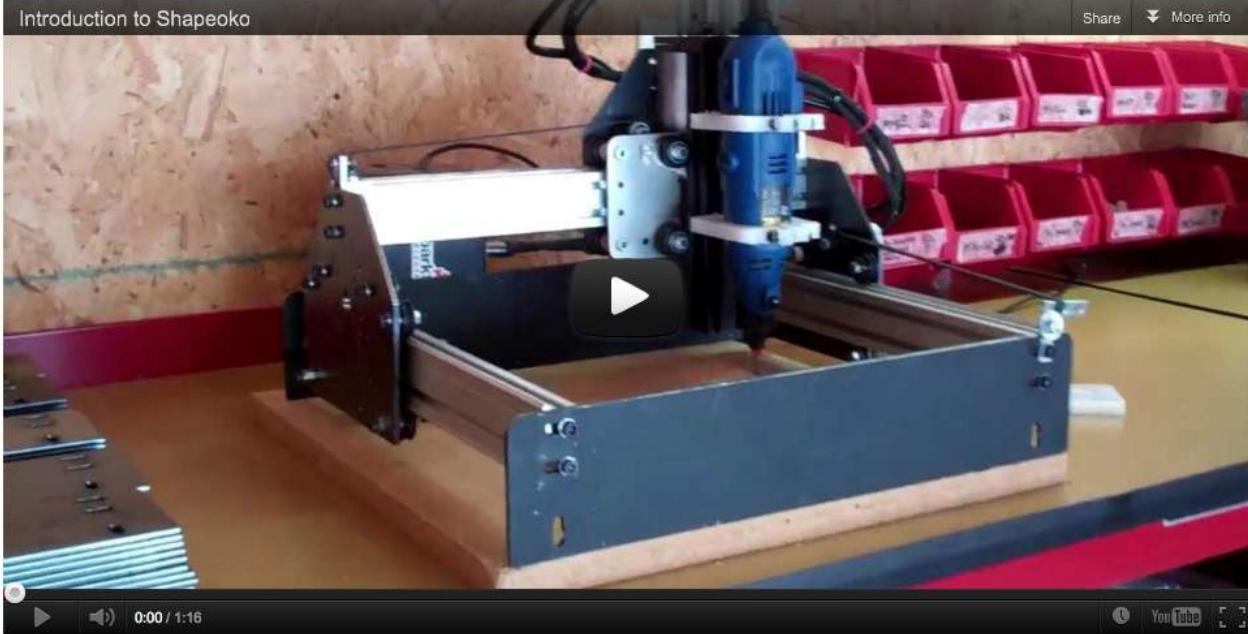
Shapeoko: Open Source CNC

shapeoko

Home Blog Purchase Downloads Wiki Forum About

Shapeoko is now available through [inventables.com!](#)

Introduction to Shapeoko



Share More info

0:00 / 1:16

YouTube

An open source CNC milling machine that was over 700% funded on Kickstarter and that it is now also available on Inventables.com.

Source: <http://www.shapeoko.com/>

3 Axis CNC router built from Lego



Arthur Sacek has created a 3D CNC router built entirely from Lego Mindstorm robotics components.

Source: <http://blog.ponoko.com/2011/08/21/3-axis-cnc-router-built-from-lego/>
<http://youtu.be/pX1c02XhMrg>

Hexapod Robot CNC Router



A walking CNC router built using B.F.Hexapod with an additional floating pen attachment, and a utility to convert DXF files into commands.

Source: <http://youtu.be/quN37YskoaM?t=1m18s>
<http://blog.ponoko.com/2008/11/11/articulated-cnc-robots-are-kind-a-scary/>

And in our lab: Roland Modela MDX-20 (3 axis)

Imagine.

Roland®

Applications Gallery About Accessories Support Store Find a Dealer en Español

Inkjet Printers + Printer/Cutters Vinyl Cutters + Print Trimmers Rotary Engravers + Impact Printers Benchtop Mills + 3D Scanners

COMBO 3D SCANNING & MILLING



MDX-15 & MDX-20 Portable Milling Machine and Scanner

Overview Features Specifications Accessories Brochure Technical Support

These small milling machines, capable of scanning and milling, are ideal for a variety of product design tasks, including reverse modeling, rapid prototyping, jewelry and model making, and small lot production.



Brochure

Free brochure available in print or download form.



Choosing The Right RP System. Free brochure available in print or download form.



3D Printing White Paper

Max operation area:
203.2 mm (X) x 152.4 mm (Y) x 60.5 mm (Z)

Source: <http://www.rolanddga.com/products/scanners/mdx15/>

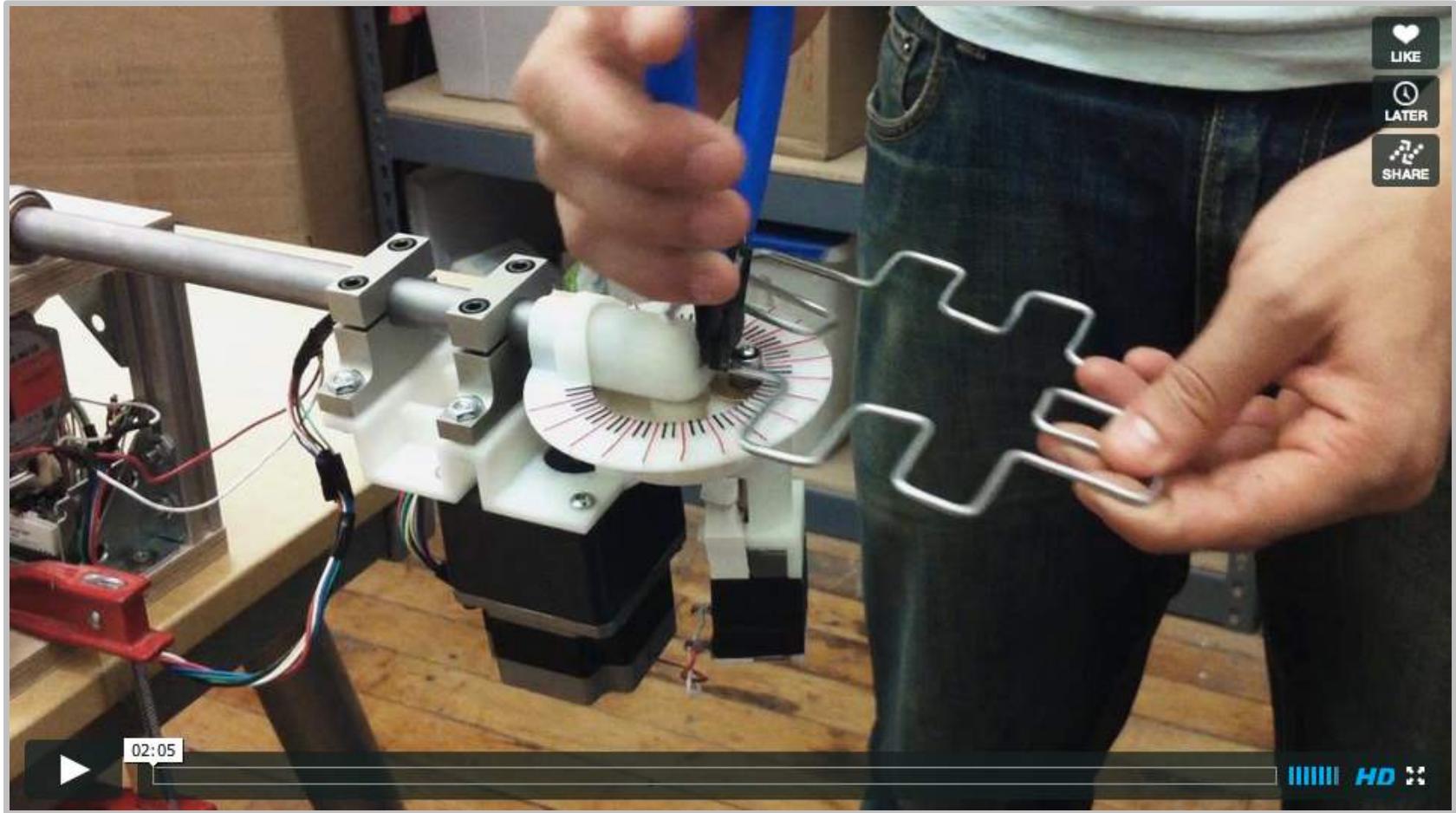


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02.

CNC, but not only Milling: other computer controlled tools

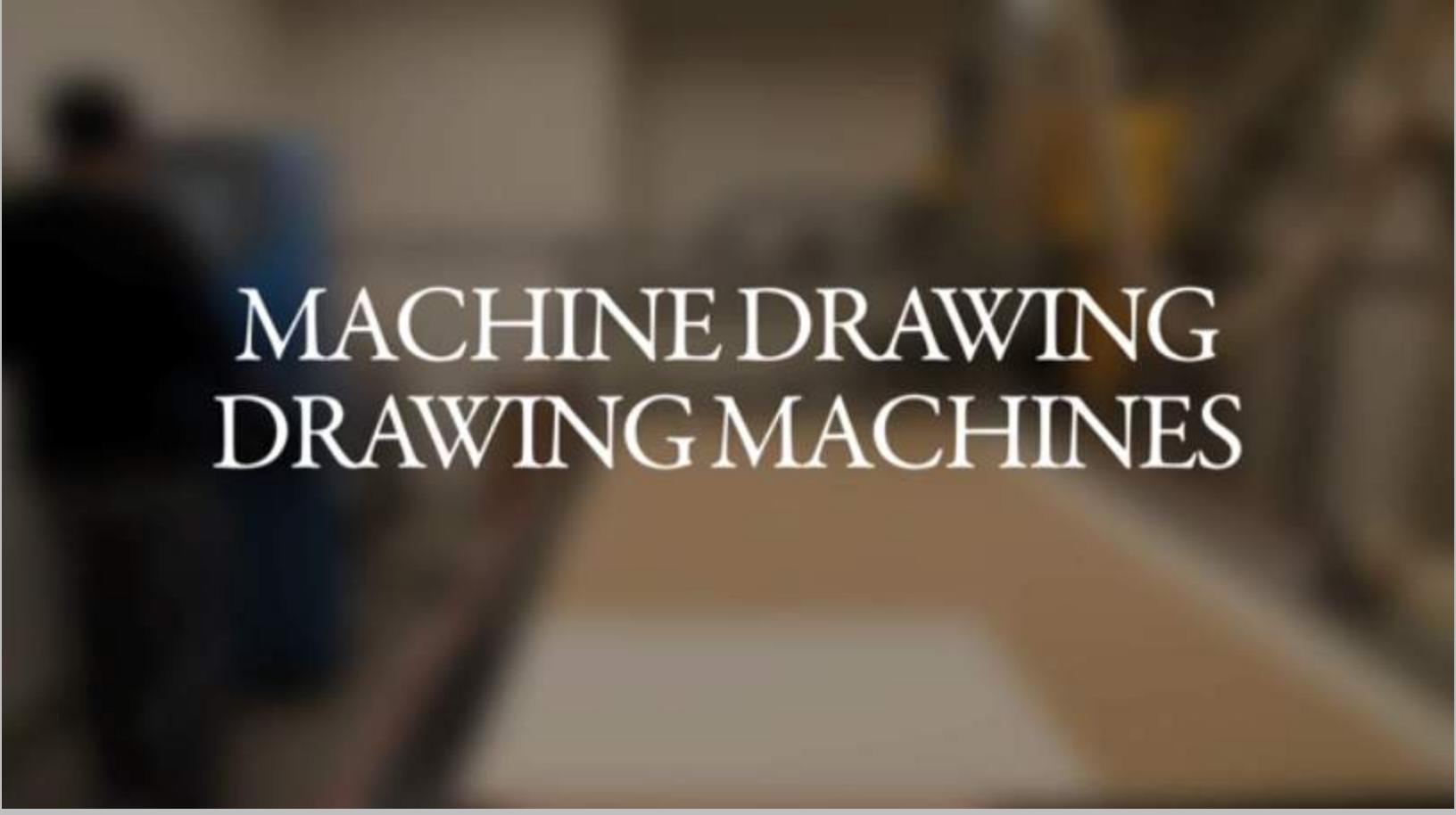
DIWire Bender



The DIWire Bender is a rapid prototype machine that bends metal wire to produce 2D or 3D shapes.

Source: <http://blog.pensanyc.com/tagged/DIWire>
<https://vimeo.com/41425580>

CNC milling drawing



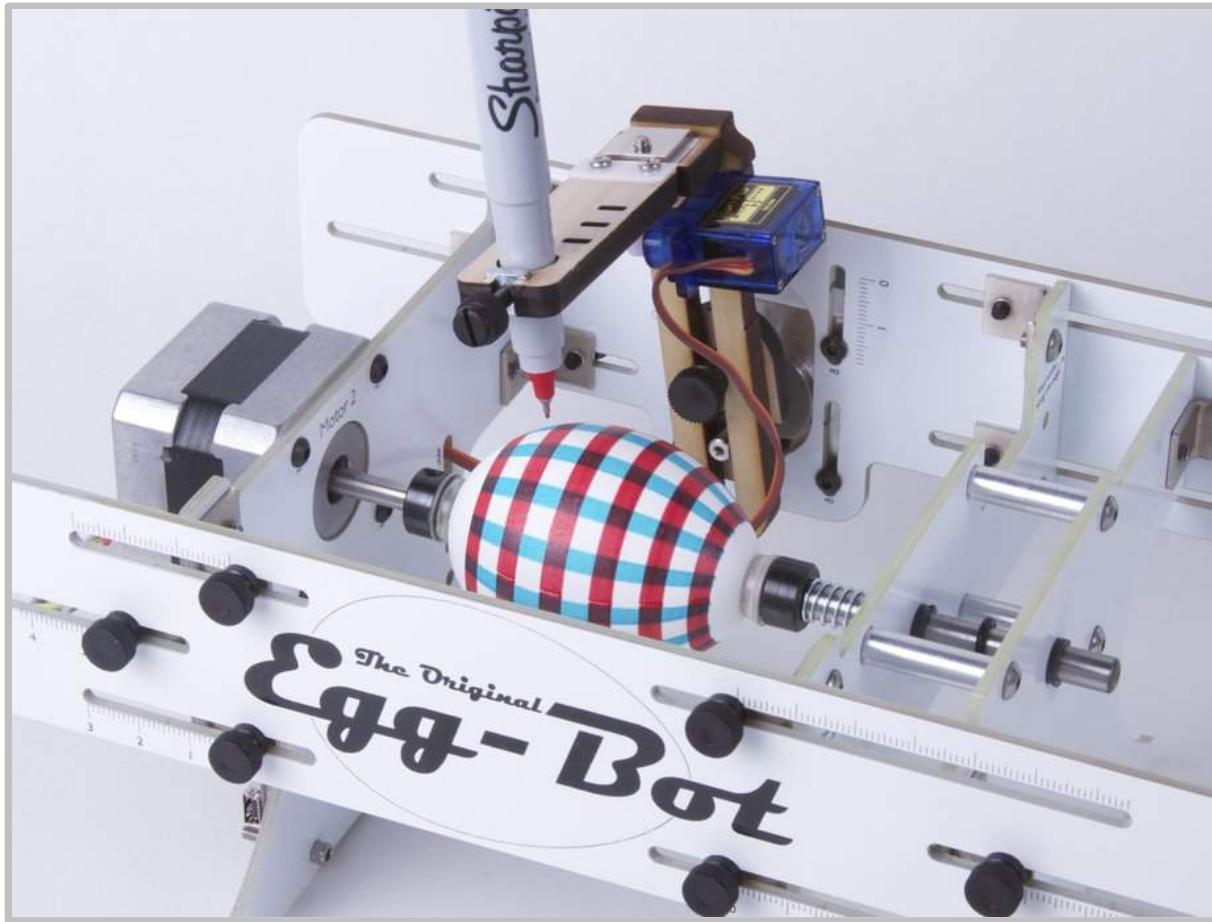
MACHINE DRAWING
DRAWING MACHINES

In which twelve drawings of historical drawing machines are drawn by a computer numerical controlled machine.

Source: <https://vimeo.com/39951217>

<http://www.designboom.com/weblog/cat/10/view/20427/cnc-historical-drawing-machine.html>

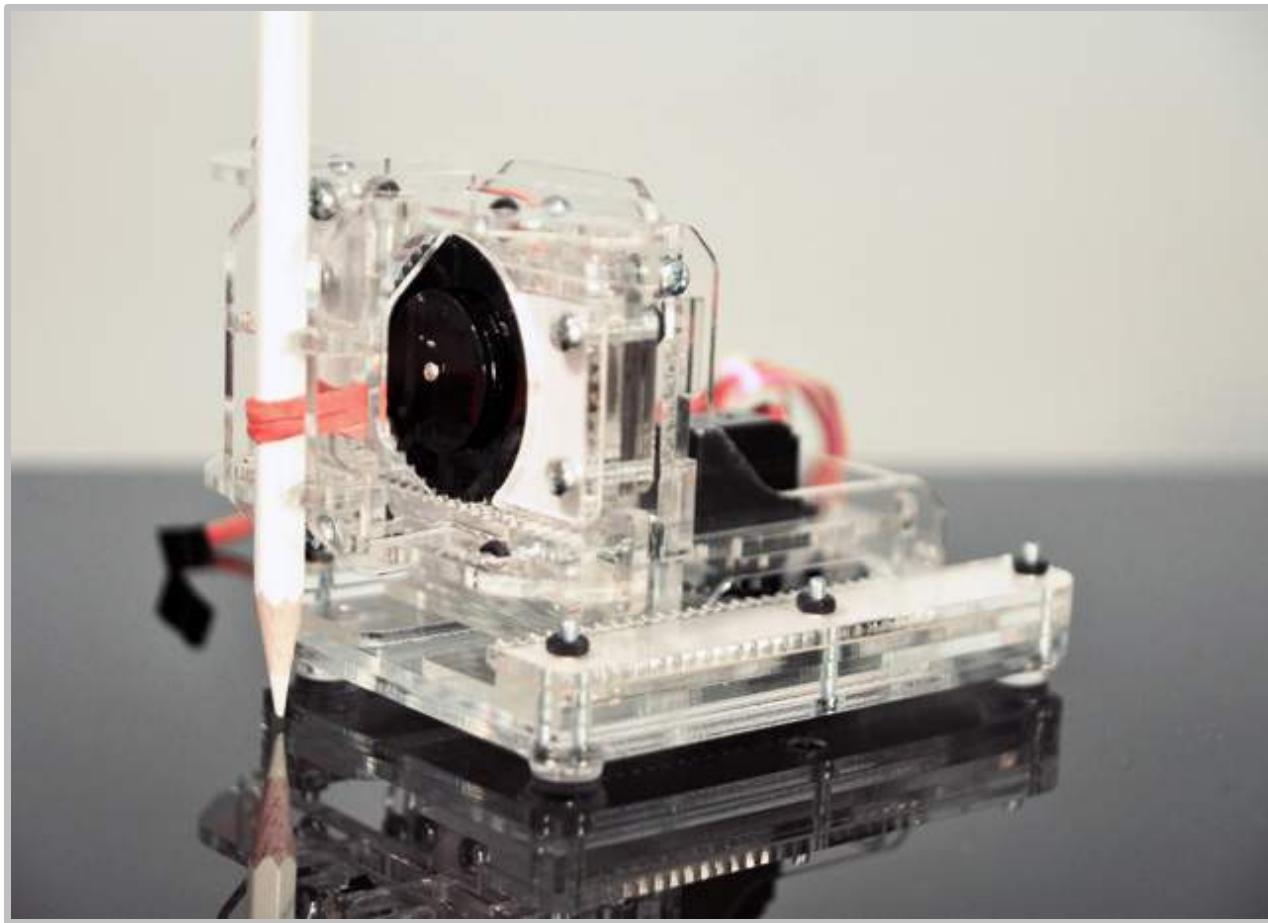
Egg-bot



“My experience, perception and digital information
(bits) shape this exact material and its values (atoms)”

Source: <http://evilmadscience.com/productsmenu/tinykitlist/171-egg-bot>
<http://egg-bot.com/>

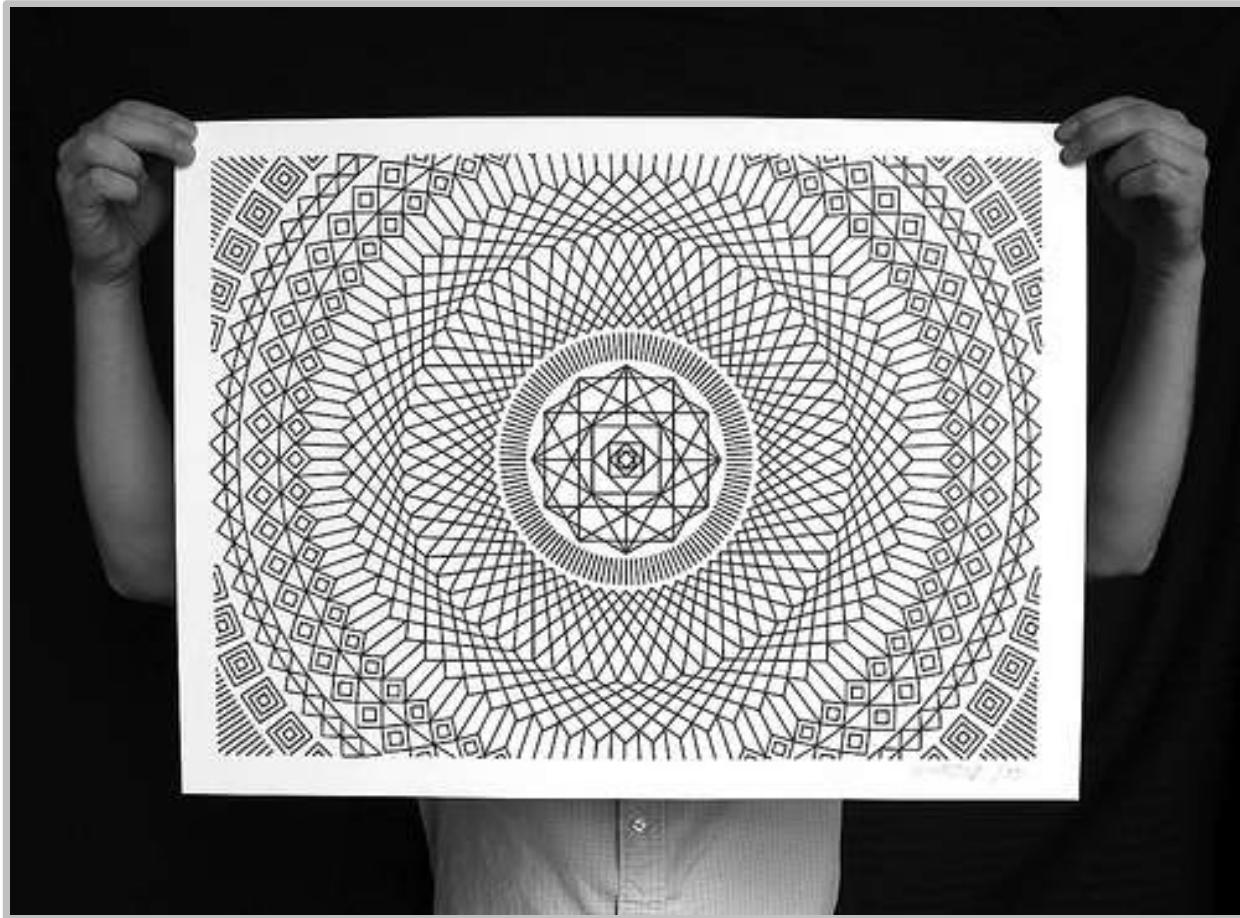
Piccolo



“My experience, perception and digital information
(bits) shape this exact material and its values (atoms)”

Source: <http://diatom.cc/piccolo>
<https://vimeo.com/36869769>

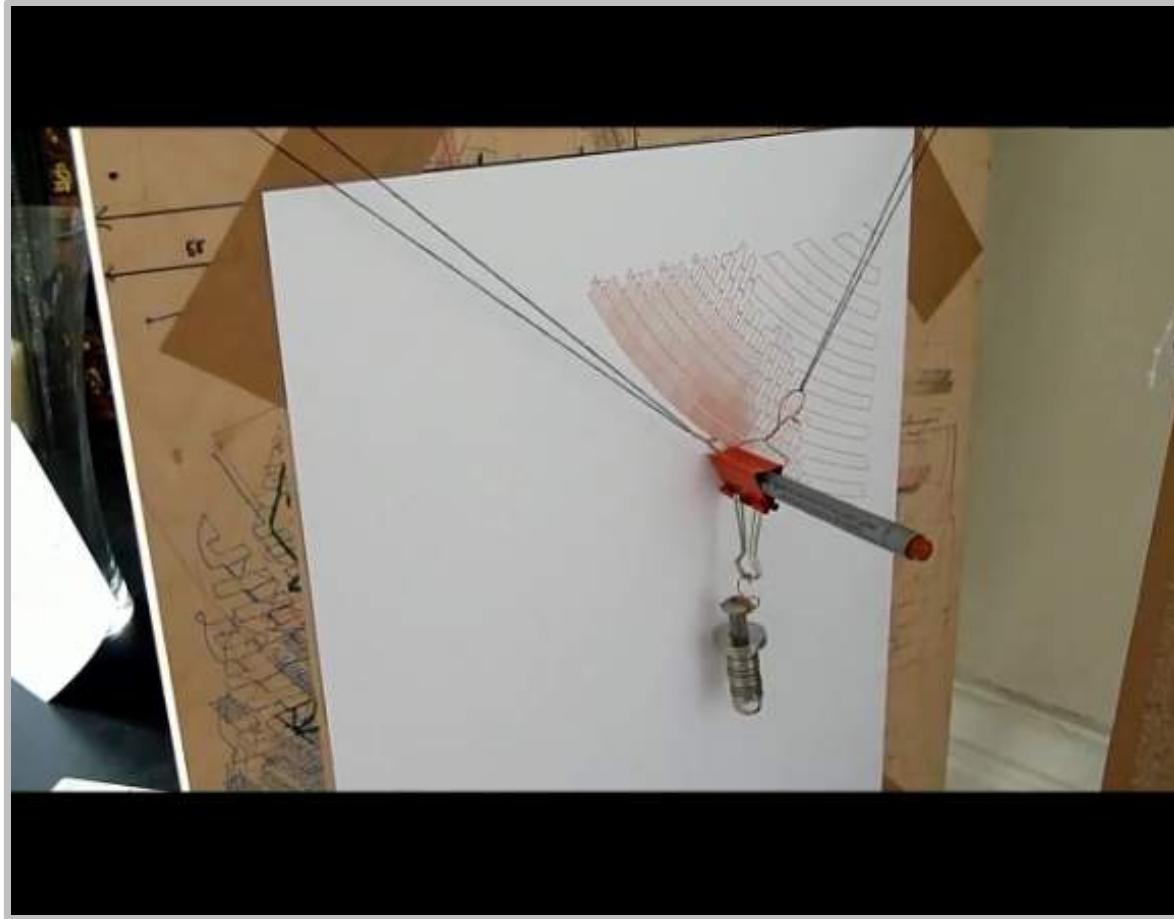
MWM graphics/aarn: CNC drawing series



3-axis CNC machine retrofitted with a special fixture - which holds a marker and mimics typical hand pressure during the act of drawing.

Source: <http://44rn.com/post/7774864814/numericallycontrolledseries>

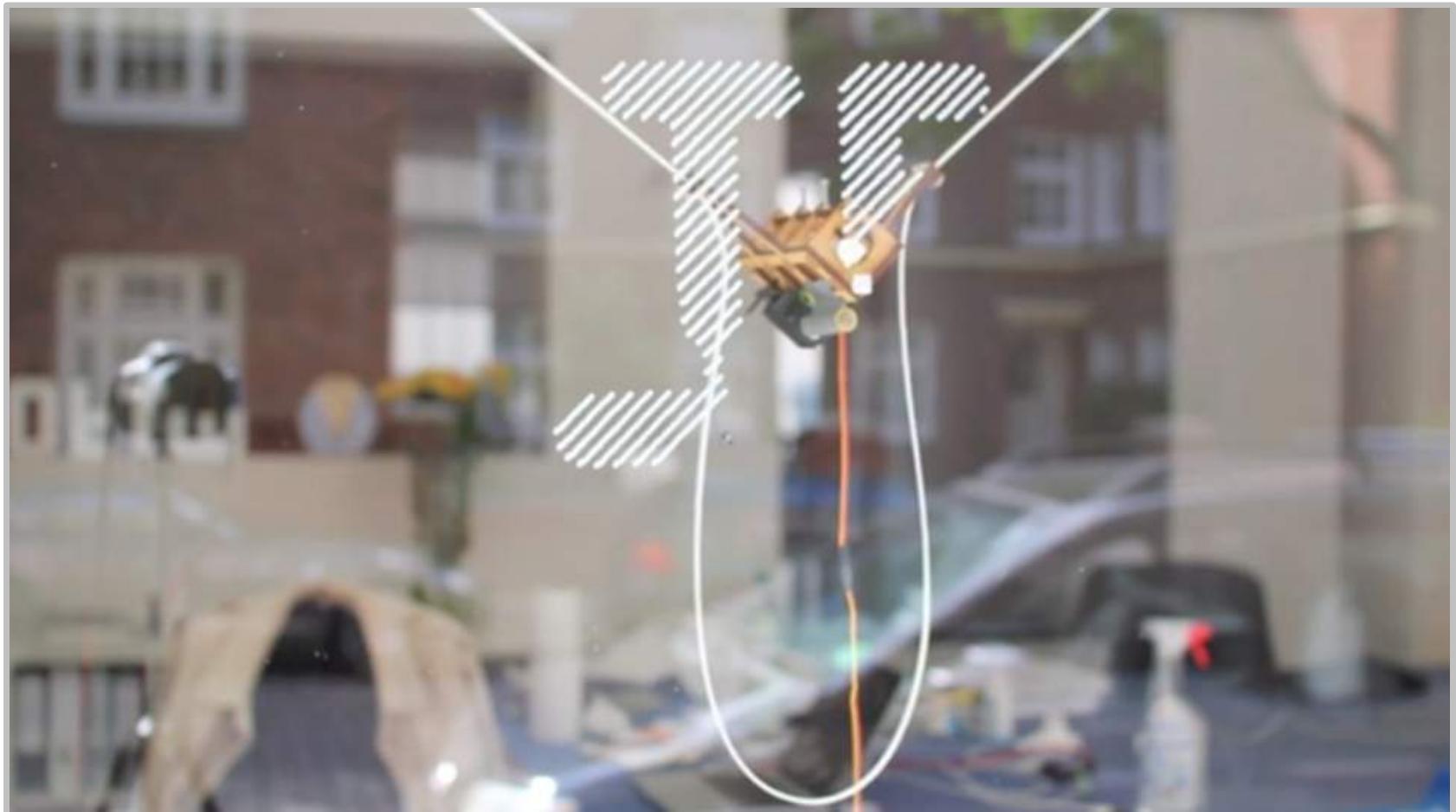
Polargraph Drawing Machine



Sandy Nobel's Polargraph uses a dual-polar coordinate system instead of the standard cartesian.

Source: <http://blog.makezine.com/2011/09/27/polargraph-drawing-machine/>
<https://vimeo.com/24647023> <http://www.instructables.com/id/Polargraph-Drawing-Machine/>

Der Kritzler Drawing Machine



2D scribbling machine, drawing directly on a window.

Source: <http://tinkerlog.com/2011/09/02/der-kritzler/>
<https://vimeo.com/28003302>

Robot Masterclass

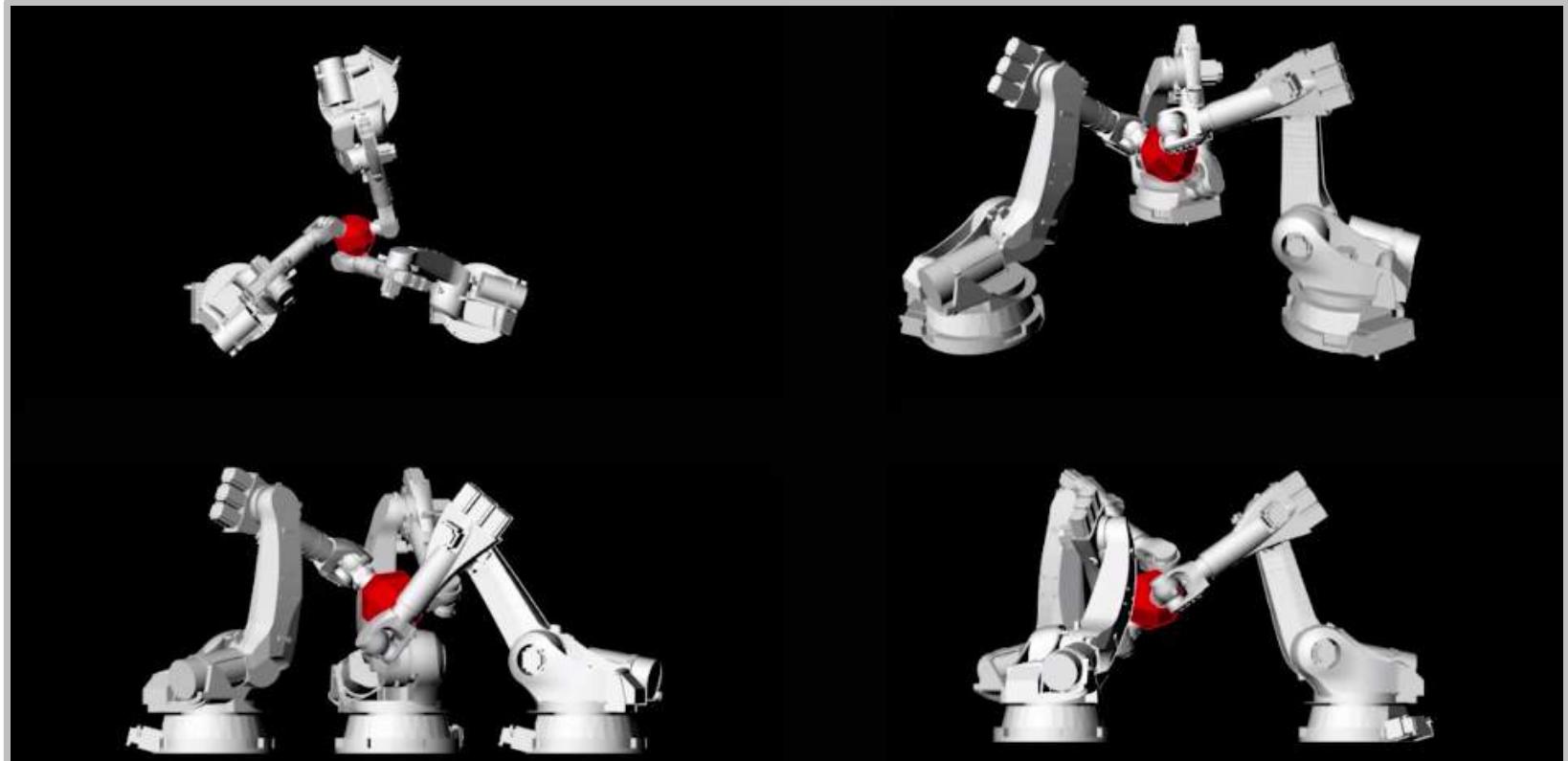


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LATER
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Using an Arduino board, the KUKA robot interfaced with the spraygun, allowing designs that consist of multiple strokes.

Source: <https://vimeo.com/30506602>
<http://www.robotsinarchitecture.org/>

And a plugin for Grasshopper



Multiple robot simulation

Simulate multiple robots by locking each kinematic component after setting it up

KUKA|prc enables you to program industrial robots directly out of the parametric modelling environment, including a full kinematic simulation of the robot.

Source: <http://www.robotsinarchitecture.org/kuka-prc>
<https://vimeo.com/37480161>

Positioning systems I - falling objects



A custom made machine that adds drops of water onto a special textured surface. Each drop forms into an almost perfect sphere through the surface tension.

Source: <https://vimeo.com/24491037>



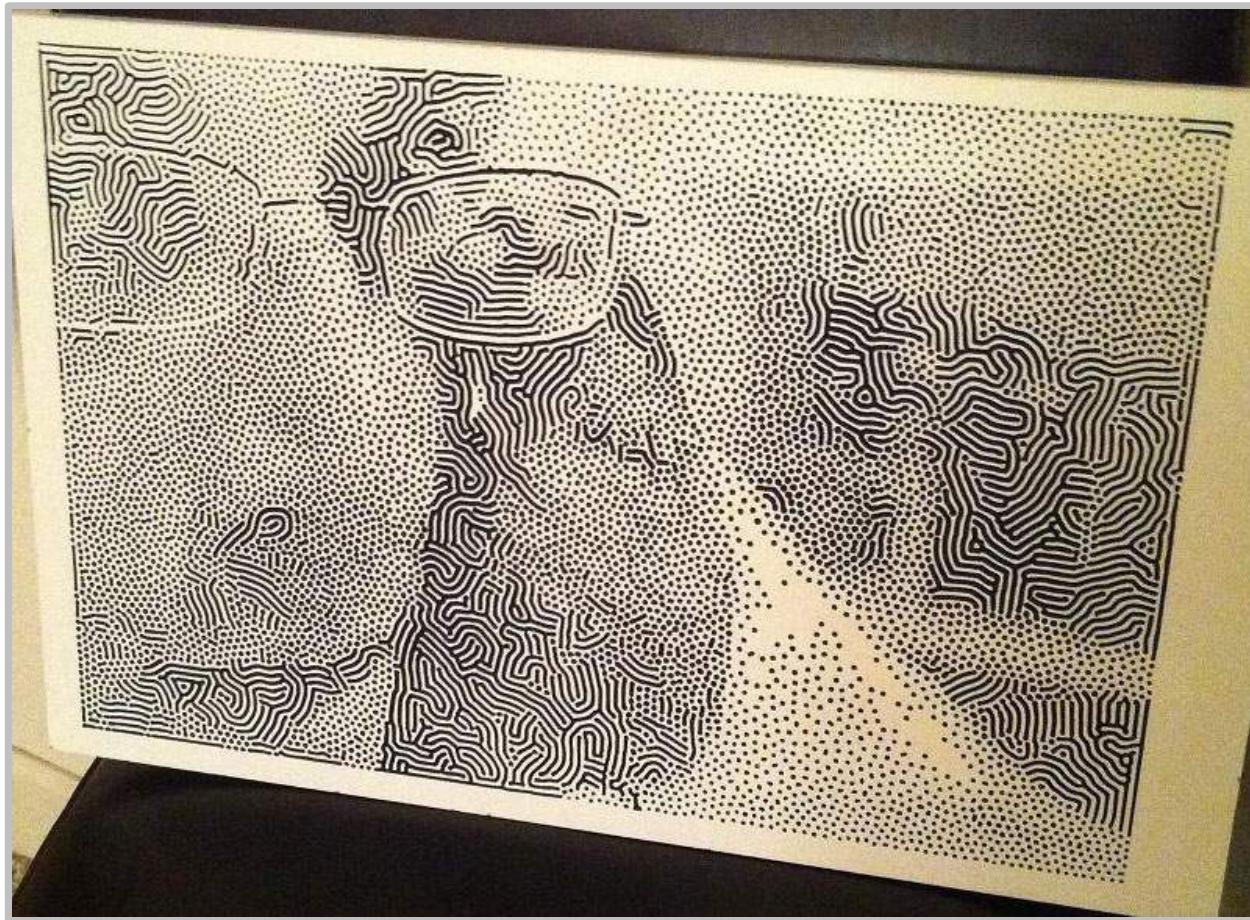
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03.

Examples:

what you can do with a CNC milling machine

Create halftones images with CNC Milling



Jason Dorie has created a couple of Windows applications that allow people to create halftones images for CNC routing from ordinary image files.

Source: http://jasondorie.com/page_cnc.html

Create halftones images with CNC Milling



Jason Dorie has created a couple of Windows applications that allow people to create halftones images for CNC routing from ordinary image files.

Source: <http://youtu.be/xoJDTPRqI6o>

Create halftones images with CNC Milling



A similar example, from Finland...

Source: <http://blog.ponoko.com/2011/08/07/halftone-pictures-drawn-by-cnc/>
<http://youtu.be/REu3MBDsNWo>

CNC Milled furniture: flat plack



PANELS.02&03 - Chair & table by Sebastien Wierinck.

Source: http://sebastienwierinck.com/html/SW_WORK_DF.html

CNC Milled bike: flat pack



Winning second prize from the L'Argus Design Competition for his Roll Bike Concept design, Nicolas Belly has taken the children's balance bike to another level.

Source: <http://blog.ponoko.com/2010/01/28/flat-pack-bike/>

CNC Milled and stitched furniture



Stitched collection by Tord Boontje

Source: <http://blog.ponoko.com/2011/08/06/tord-boontje-stitched-collection/>
<http://tordboontje.com/>

CNC Milled furniture



Gareth Neal has produced a few exceptional pieces that straddle the divide between art and design, furniture and sculpture.

Source: <http://blog.ponoko.com/2010/02/21/classic-cuts-and-cnc-craftsmanship/>

CNC Milled furniture



The design of the Laszlo Files are based on new possibilities afforded by the use of computer numerically controlled (CNC) technology.

Source: <http://blog.ponoko.com/2009/06/03/office-da-pump-serious-cnc-assisted-design/>

Textures: experiment with density and porosity



“Albeflex BL Special” is designed to be lightweight, self-supporting and capable of taking advantage of CNC driven digital fabrication techniques.

Source: <http://blog.ponoko.com/2009/12/13/experiments-in-porosity/>
<http://dudye.com/experimenting-with-porosity>

CNC Milled interior design



Working with natural materials, March Studio has formed a sculptural retail space for an artisan bakery in Melbourne, Australia.

Source: <http://www.frameweb.com/news/d-chirico-bakery>

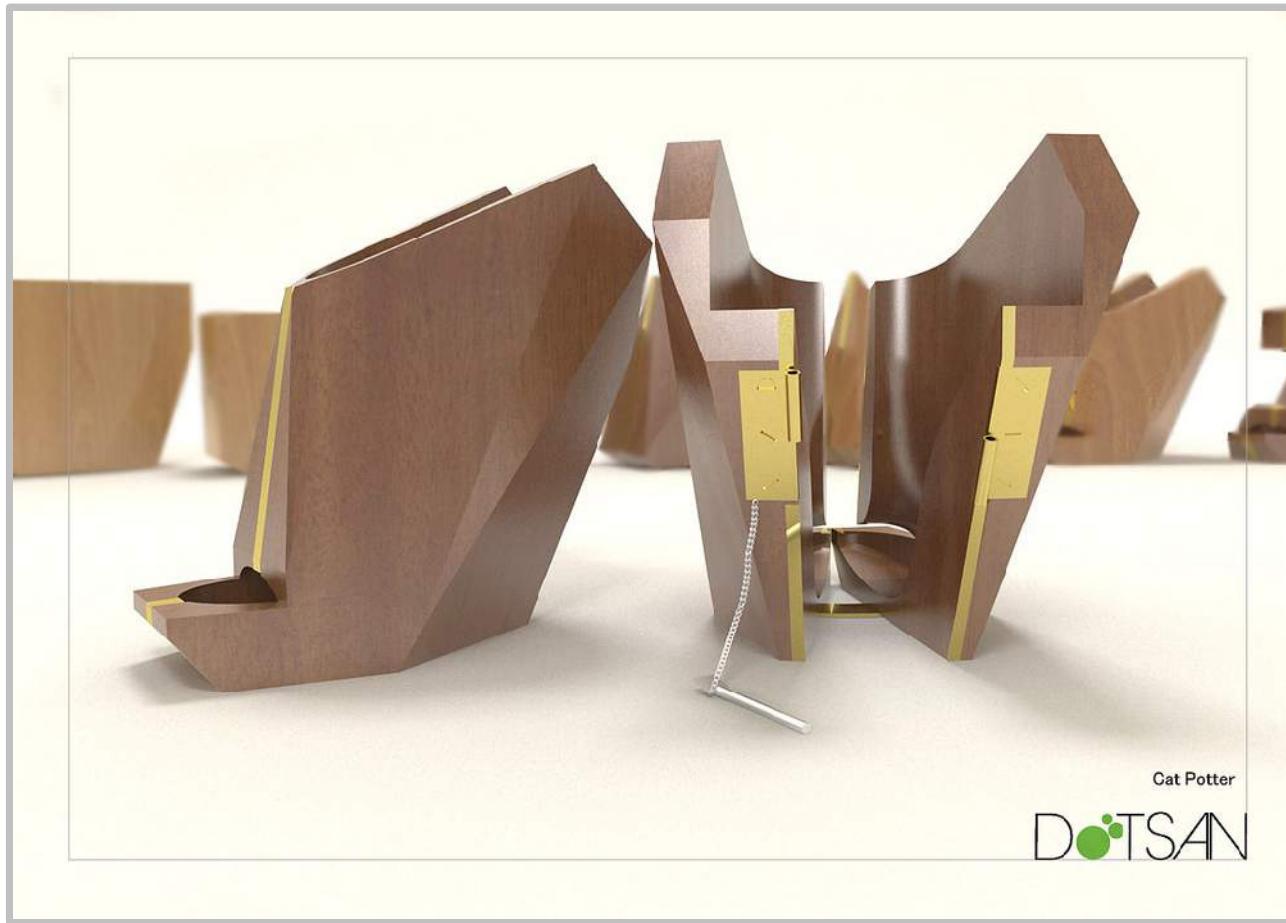
CNC Milled interior design



The piece is essentially a storage cabinet lifted 12" above the floor. The architect studied the form of water ripples from several photographs of the lake.

Source: <http://blog.ponoko.com/2009/05/25/lake-cabinet-further-cnc-wall-madness/>
<http://blog.ponoko.com/2012/03/12/cnc-milling-waves/>

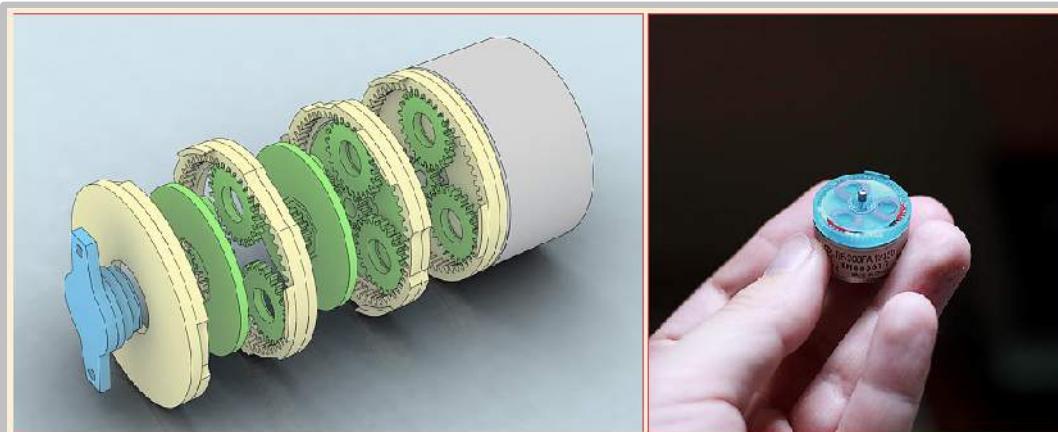
CNC Milled shoes



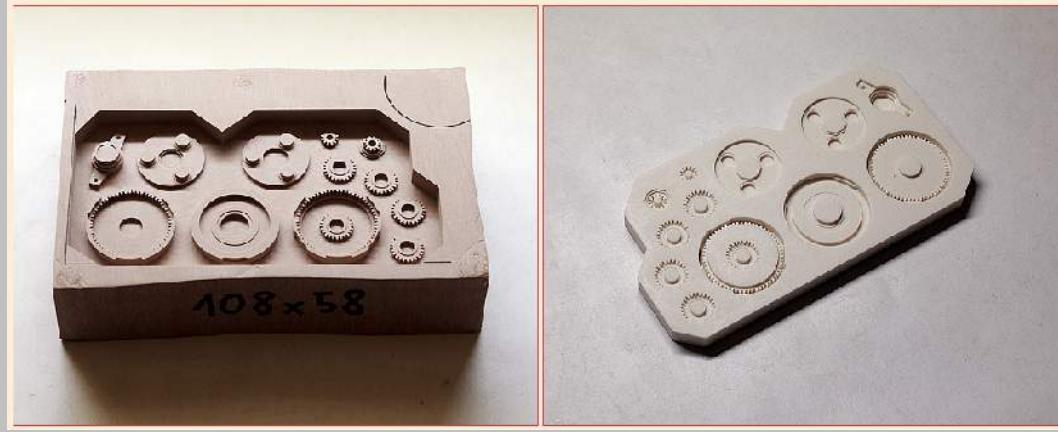
Experimental shoes by designer Cat Potter were shaped from solid blocks of wood with a 3-axis CNC milling machine.

Source: <http://www.flickr.com/photos/42746980@N02/6673839607/in/pool-375602@N23/lightbox/>
<http://blog.ponoko.com/2012/01/11/cnc-milled-wooden-shoes/>

CNC Milled molds for mechanical parts



Well, this time around, it worked out [pretty much flawlessly](#):



XXX

Source: <http://lcamtuf.coredump.cx/rstory/>

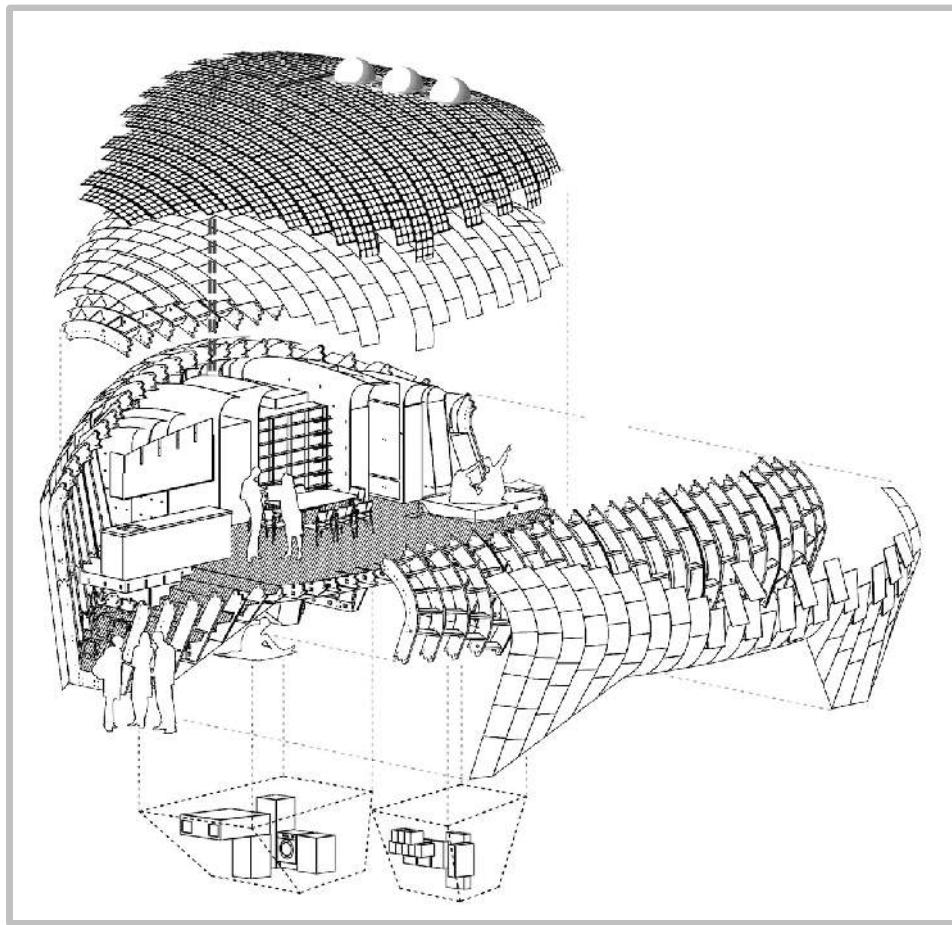
CNC milled products



Blocks of solid maple are milled in two separate halves and joined together with an accentuated “parting line”, articulating the profile of the shapes.

Source: <http://blog.ponoko.com/2009/05/07/cnc-vases-by-paul-loebach/>

FabLab House



The Fab Lab House is developed on a network of fablabs using CNC machines to design and produce houses than can be customizable.

Source: <http://www.fablabhouse.com/en/la-forma-sigue-la-energia/>



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04.

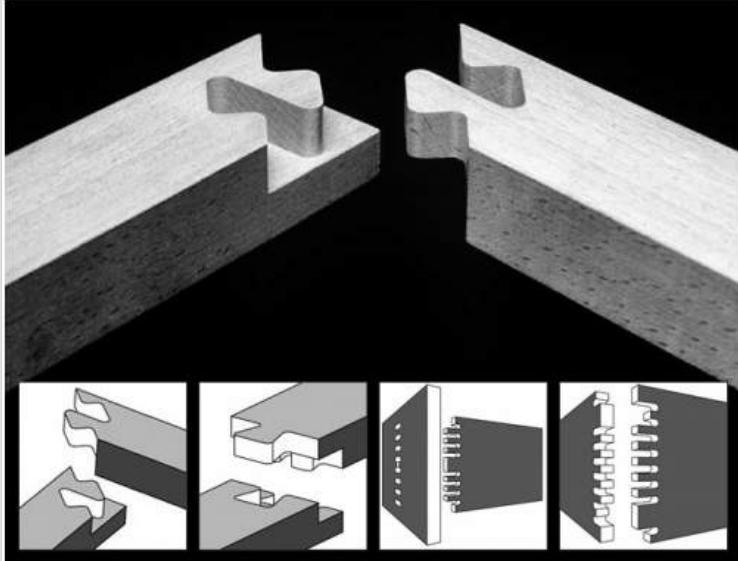
Design techniques: how to design for CNC milling machines

Digital wood joints ready to use

Flexible Stream
OPEN DESIGN SOURCE

Free Design What for Submit Help

50 DIGITAL WOOD JOINTS
Jochen Gros



Download this Design

Digital Wood Joints (4 examples)
 Instructions 4 Examples
[Download all Woodjoints](#)

Some rights reserved:
[CC BY-NC-SA 3.0](#)

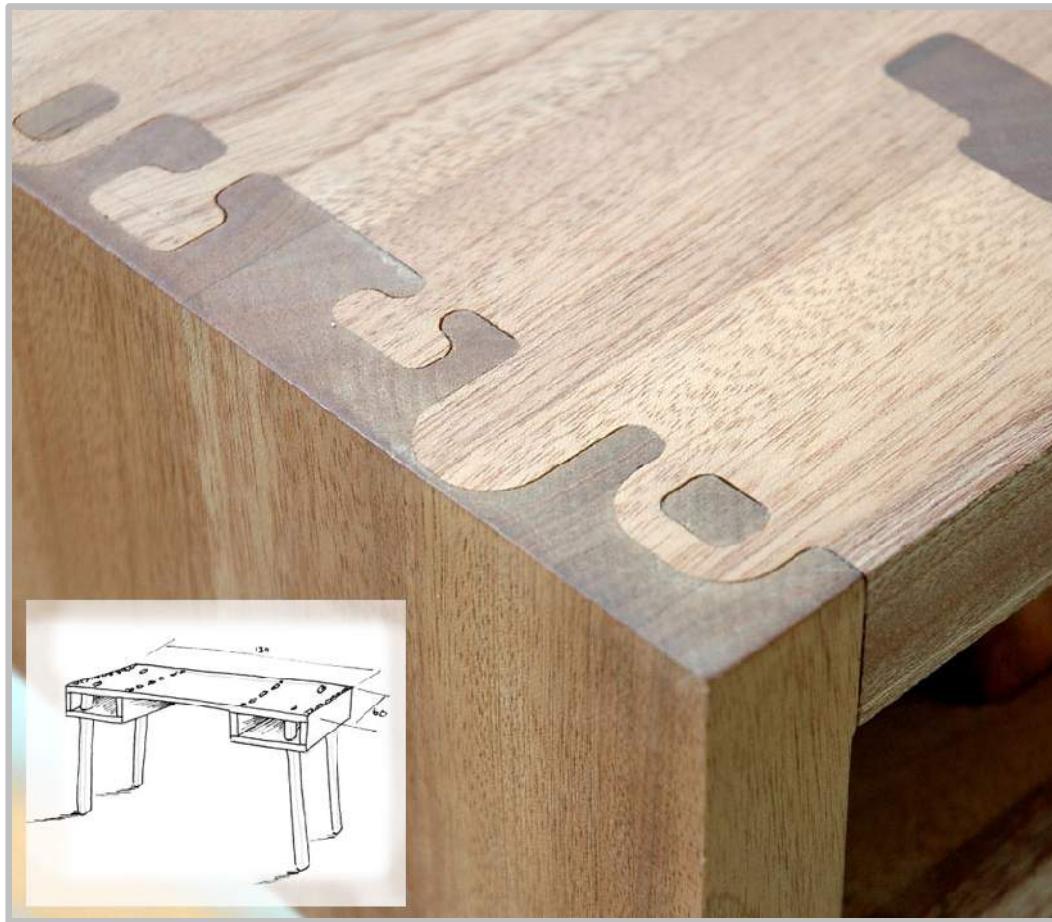
Parts
No parts available

Contact Designer
Jochen Gros
www.movicons.com

A library of 50 wood joints in digital format available for download and use in your project.

Source: <http://www.flexiblestream.org/Digital-Wood-Joints-001.php>

Wood joints: they don't have to be boring



Joints by Tineke Beunders and Nathan Wierink (ontwerpduo) takes advantage of the precision in digital fabrication for an entire mahogany desk.

Source: <http://blog.ponoko.com/2009/05/31/ontwerpduo%20%94fun-studio/>

CNC Simulator

The screenshot shows the homepage of the CNC Simulator website. At the top, there is a large logo with the text "CNC SIMULATOR" and a binary code string below it. The main content area features a banner with the text "It is here! Download today!" and "Your virtual workshop... CncSimulator Pro!". Below the banner, there is a message about becoming a beta tester for the new software. To the left, there is a sidebar with a "Main Menu" containing links like Home, About the CncSimulator, Petrol station, FAQ, Forum, Download, Sign Up, Order, CncSimulator Blog, Online Help, Getting Started Tutorial, Privacy Policy, and License agreement. Another sidebar titled "Who are you?" lists options such as A CNC programmer at a company, A hobby CNC programmer, A CNC student, A CNC teacher, A CNC retailer, and Other. On the right side, there is a "Login" form with fields for Username and Password, a "Remember Me" checkbox, and a "Login" button. Below the login form, there are links for forgot password and forgot username. Further down, there is a statistics section showing "670095" total visitors, daily counts (Today: 876, Yesterday: 1918), monthly counts (This month: 35608, Last month: 71131), and online stats (19 guests, 5 members, 4 bots). At the bottom, there are links for News!, Latest version, and Future versions.

The idea of the new CncSimulator Pro is to provide the machining industry with a contemporary competent Fanuc inspired CNC ISO simulator.

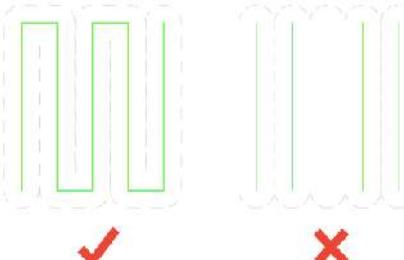
Source: <http://www.cnccsimulator.com/>

Some suggestions for CNC Routing

Pocketing lines should be joined where possible.

A continuous line (red, green, magenta) is better than a series of disconnected shorter lines. Every time the machine starts a new path it has to move to the start of the line, plunge into the material and then move along the line. Repeating this process over and over is not ideal. The edge of your pocket will not be as clean as it will be if you use a continuous line.

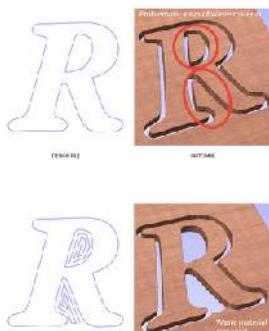
Also you can't guarantee which order the router will cut a lot of short disconnected lines. It is possible that it will leave a middle line until last leaving a thin, unstable piece of material that has the potential to break off and damage your job.



Find out more about pocketing and how to remove areas of material.

Small areas of waste need extra cut lines to remove them.

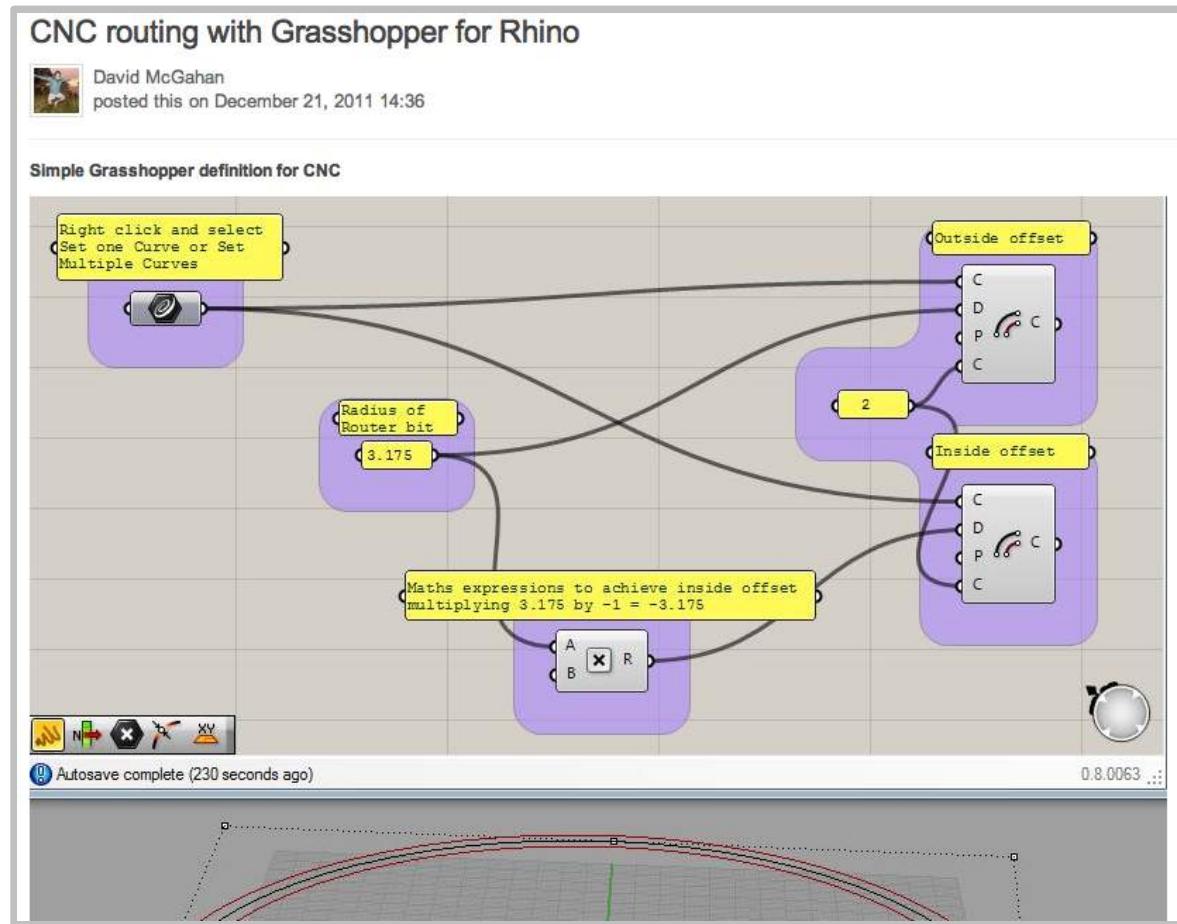
As the router cuts out your design there can be small areas of waste can be left in the middle which are not beefy enough to support themselves. These usually break off leaving a rough edge and cause the router to jam, damaging it and your work. If you have a narrow/small strip of waste, it's best to add extra lines so the area is left clear. These extra cutting paths should be open paths so the router knows to cut them before the cutting lines for your design.



You cannot avoid the size of the tool this time, so your design has to be drafted according to that.

Source: <http://support.ponoko.com/entries/20735156-things-you-must-know-for-cnc-routing>

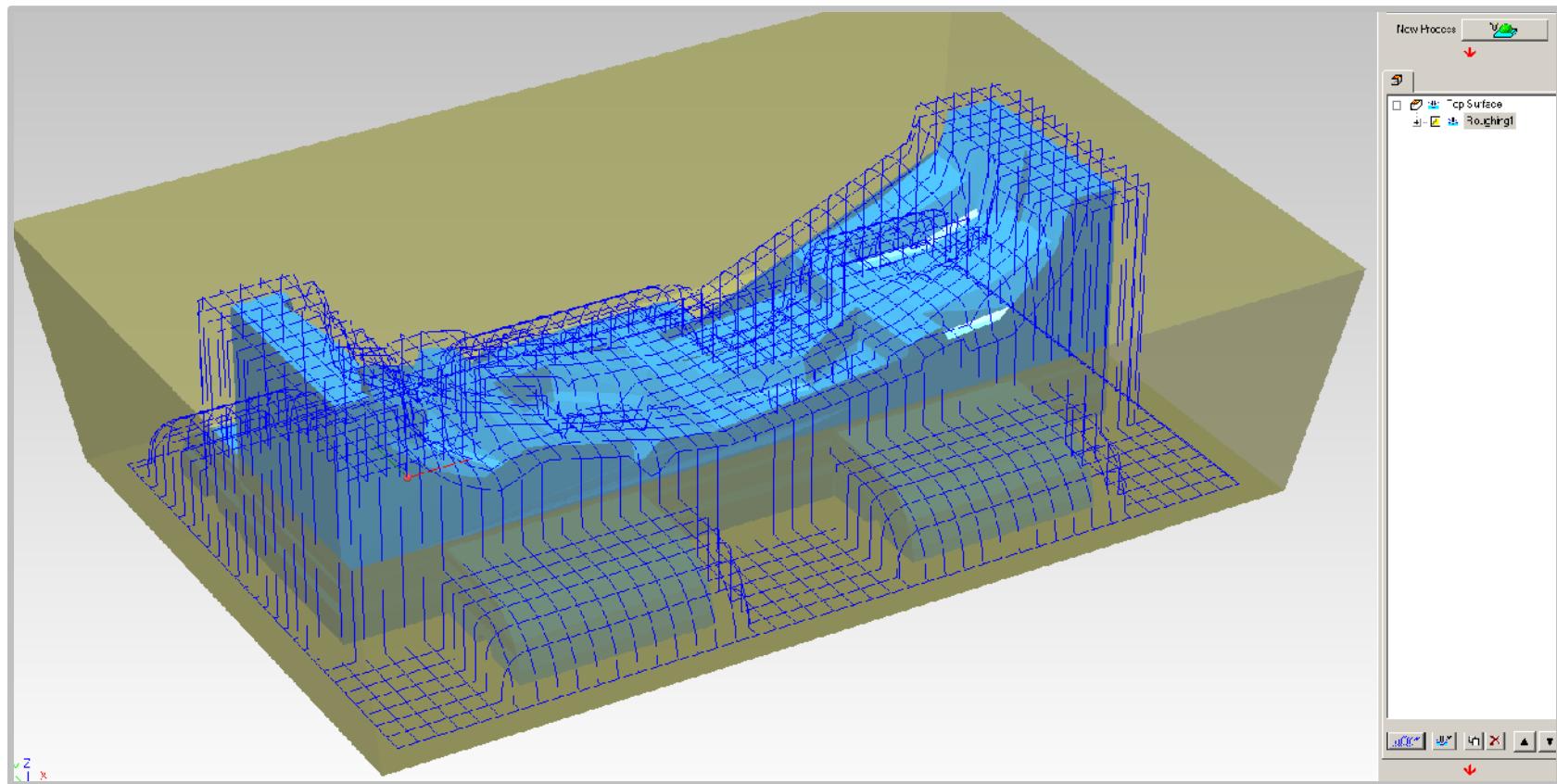
CNC routing with Grasshopper for Rhino



The Grasshopper plugin for Rhino is also useful for much simpler tasks such as offsetting lines as you might do manually for CNC routing.

Source: <http://support.ponoko.com/entries/20786136-cnc-routing-with-grasshopper-for-rhino>

Roland Modela Player 4



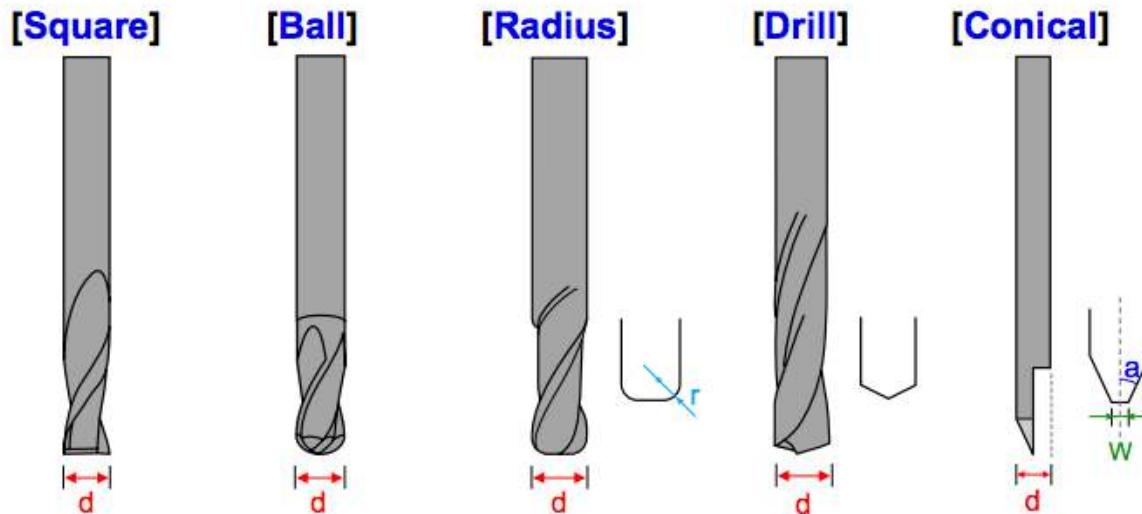
MODEL A Player is a CAM software that allows importing of 3D files for milling it. Virtual MODEL A provides a quick preview of the entire milling operation.

Source: http://academy.cba.mit.edu/content/tutorials/General_Machine_Tutorials/Milling/ModelaPlayer4_tutorial_v2.html
http://www.intellecta.net/mdx-15_20.html http://www.rolanddg.com/product/3d/3d/mdx-20_15/application.html

Roland Modela Player 4: adding milling bits

It is possible to register new tools. Roland original tools are originally registered.

Tool Type, Tool Material, Flute Diameter(**d**), Corner Radius(**r**), Blade Width(**w**) and Blade Angle(**a**) are necessary to be set to register a new tool.



MODELAPLAYER is a CAM software that allows importing of 3D files for milling it.
Virtual MODELAPLAYER provides a quick preview of the entire milling operation.

Source: <http://www.elecprint.ch/downloads/modelaplayer4e.pdf>

Many different milling bits ...



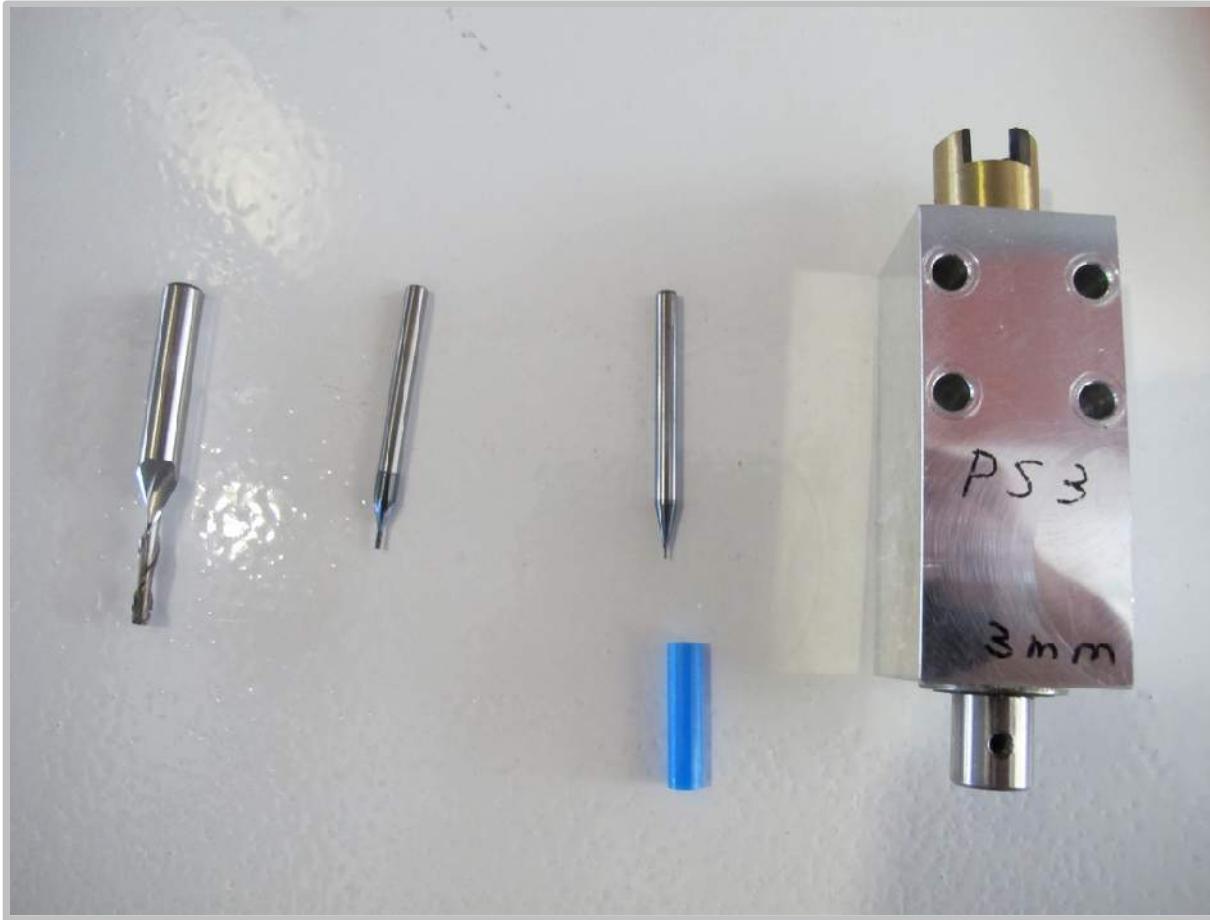
You may encounter also bigger and very different milling bits...

Our milling bits



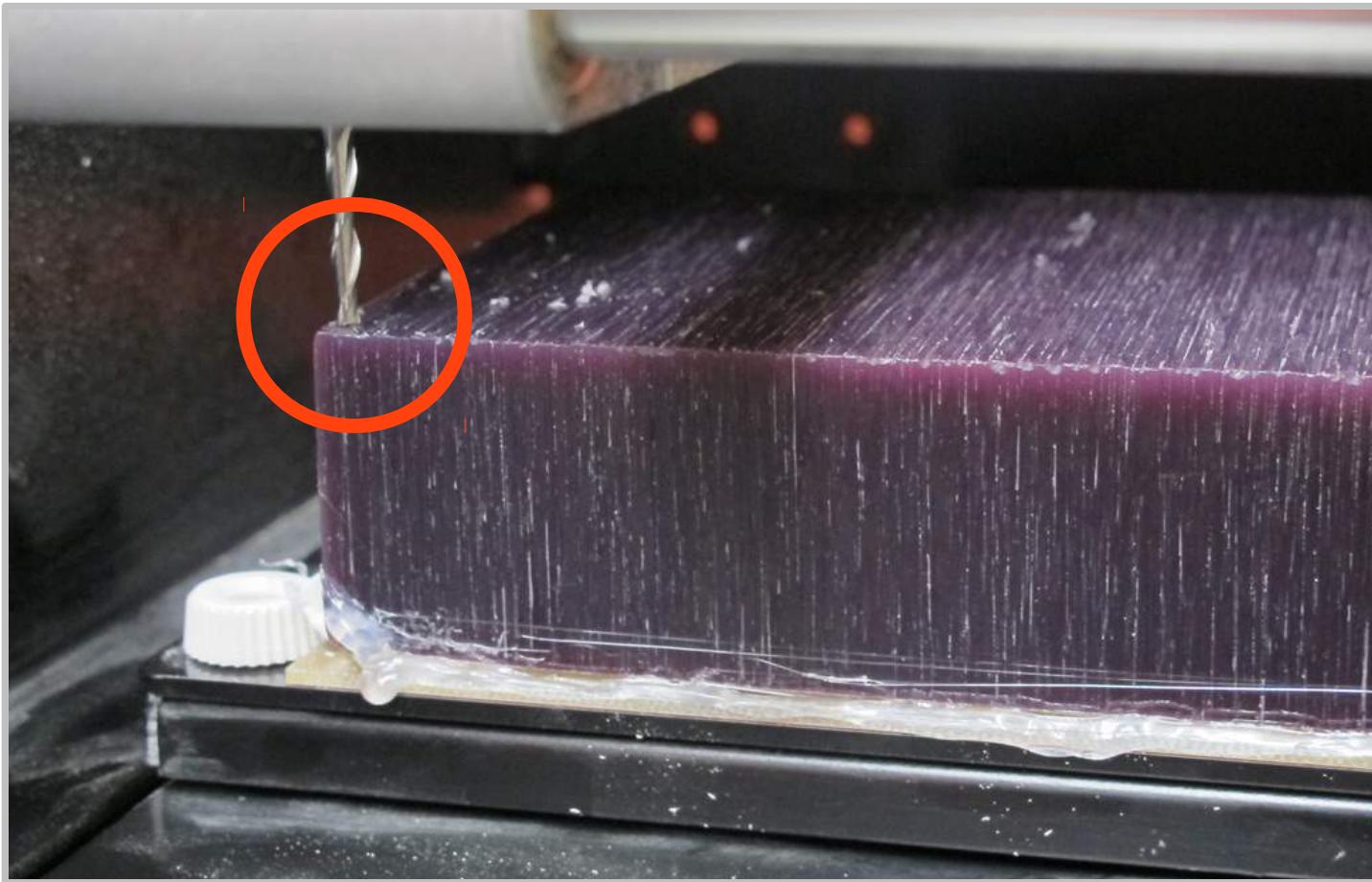
Diameters = 3 mm, 1/32 inch (0.79375 mm), 1/64 inch (0.396875 mm).

Our milling bits



Diameters = 3 mm, 1/32 inch (0.79375 mm), 1/64 inch (0.396875 mm).

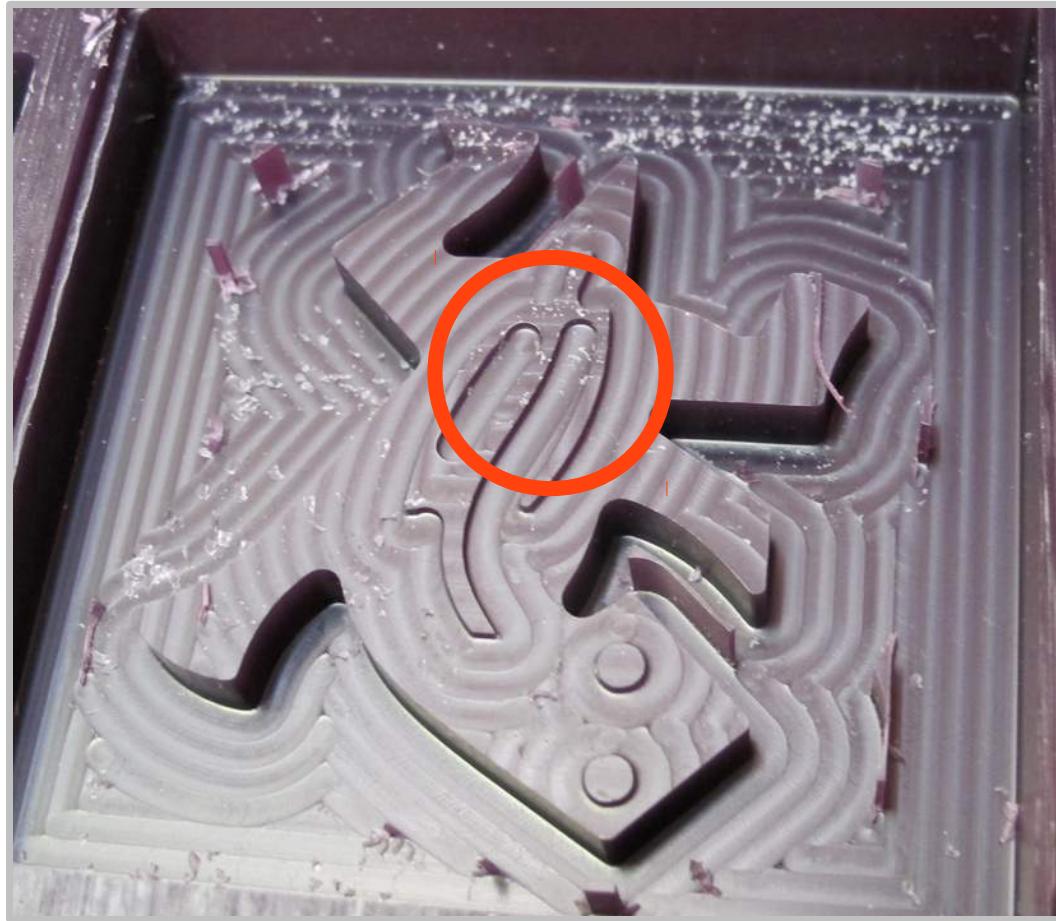
Always, set the Zero: X, Y, Z



And write down the X and Y coordinates! Furthermore, don't mill around it, so you can preserve it for future passes.

Source: <http://www.flickr.com/photos/aaltofablab/6924563776/in/photostream>

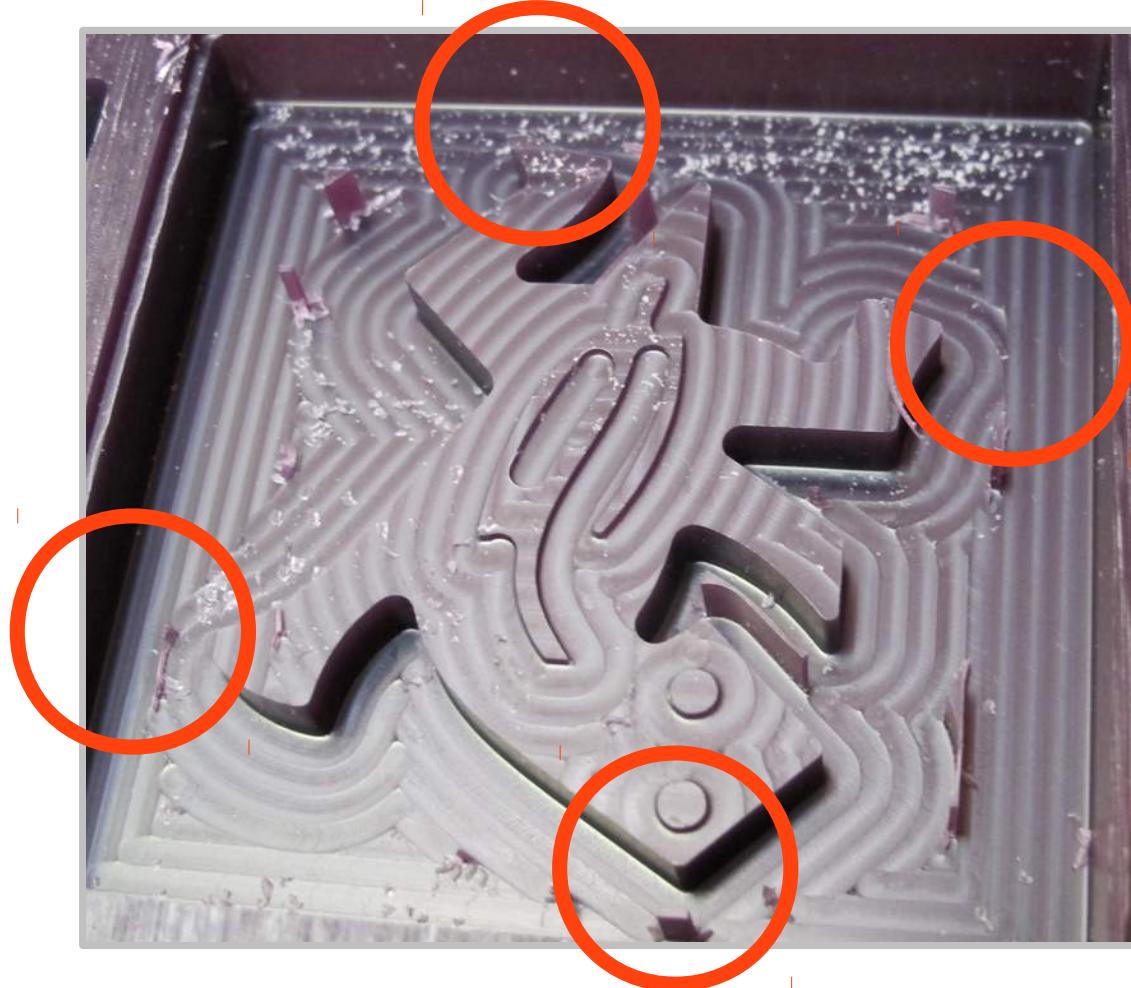
When designing, think about the milling bit



Leave enough space for the milling bit to pass, or it will erase part of your details. Rough finish should leave a 1.4 mm offset.

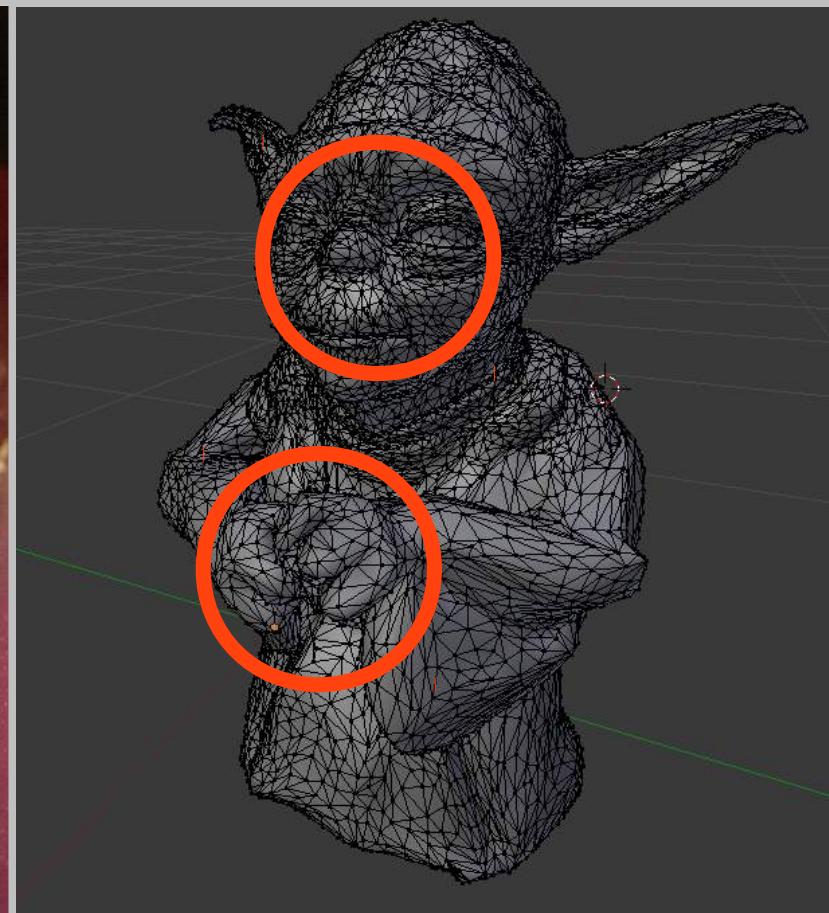
Source: <http://www.flickr.com/photos/aaltofablab/7070645517/in/photostream>

When designing, think about the milling bit



Leave enough space **also** around your object!

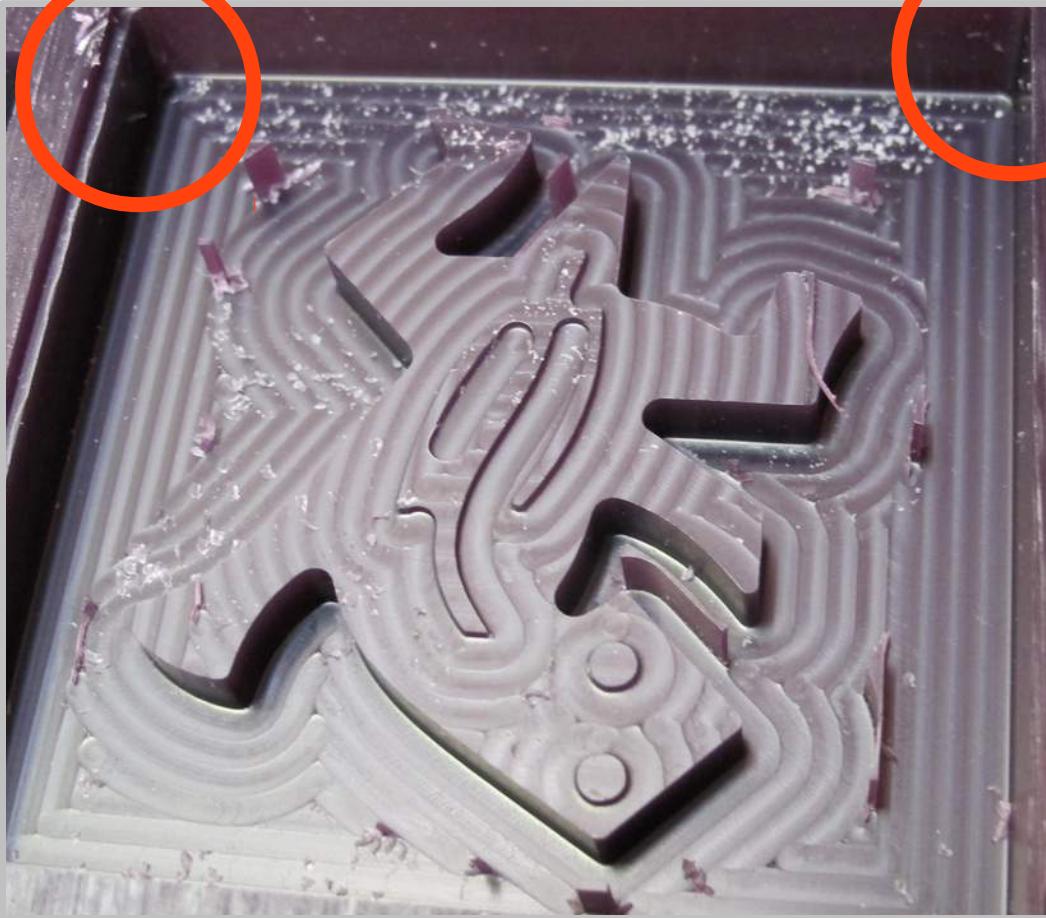
When designing, think about the milling bit



Your tiniest detail will be the size of your smallest milling bit, not the resolution of your mesh, think about it!

Source: http://www.flickr.com/photos/massimo_menichinelli/6765894657/in/photostream

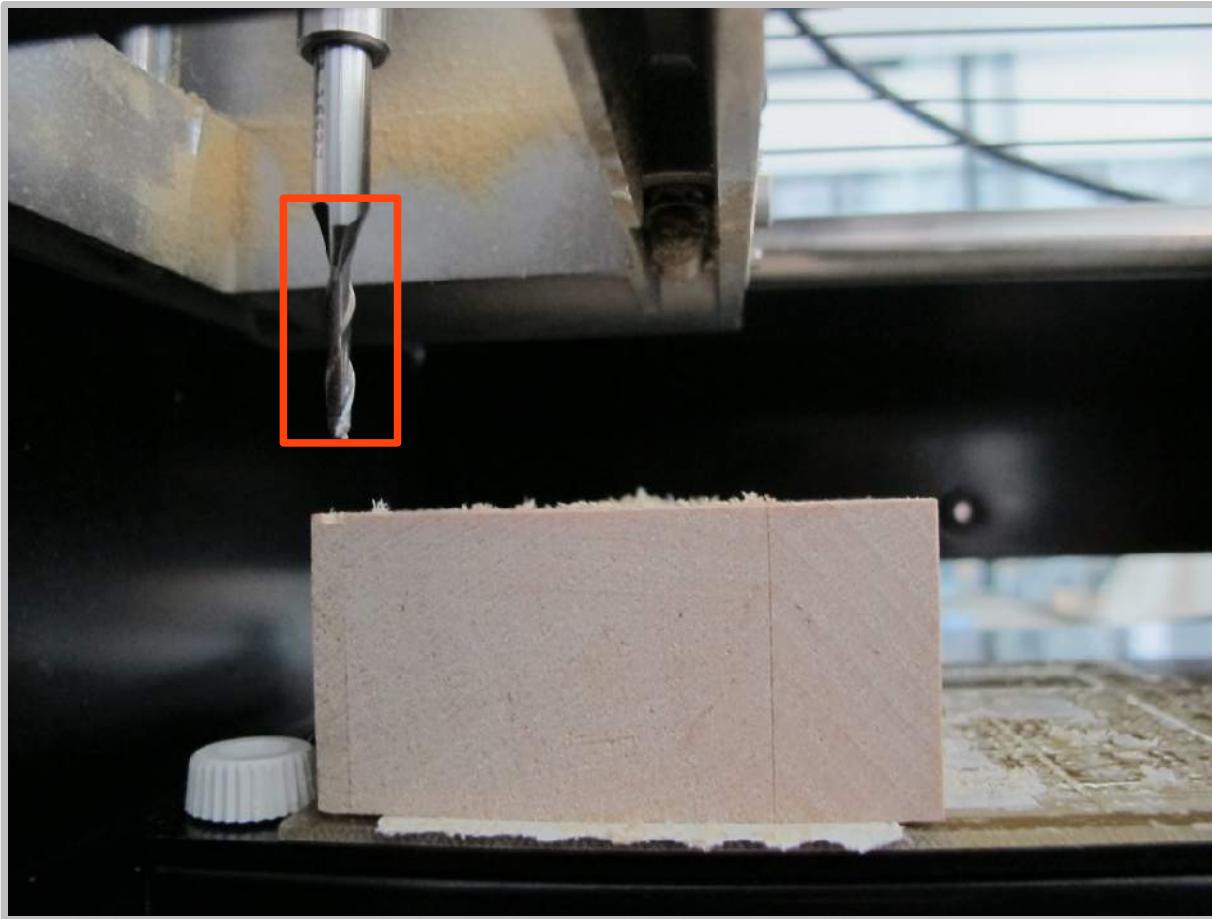
Rounded milling bits: rounded corners



The milling bit is rounded and rotates, so your corners will be rounded, and the radius is the same of your biggest milling bit.

Source: <http://www.flickr.com/photos/aaltofablab/7070645517/in/photostream>

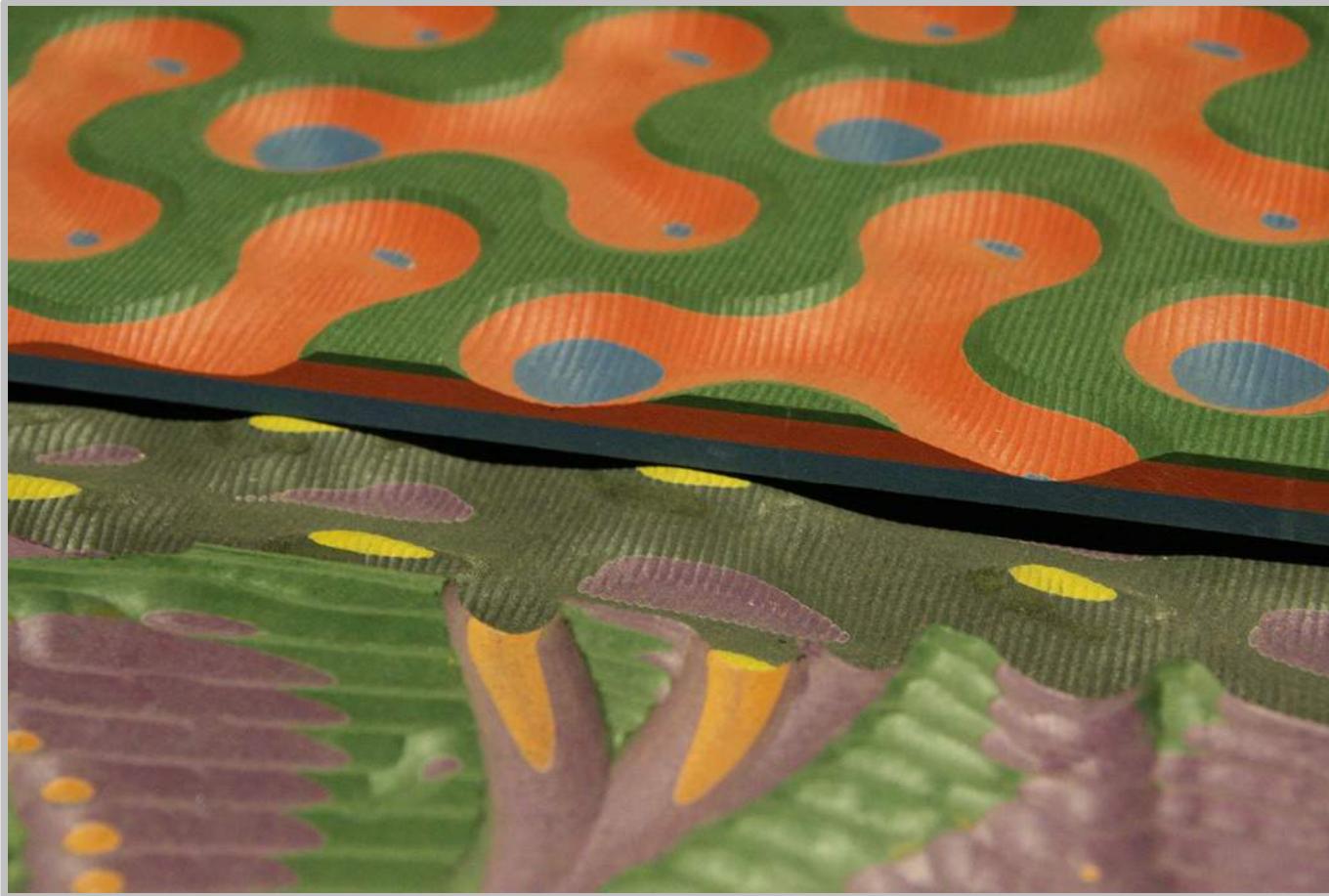
The milling bits also determines the depth



Even if your modelling block is higher than the milling bit, it is the last one that determines how deep you can mill.

Source: <http://www.flickr.com/photos/aaltofablab/7194259202/in/photostream>

Depth: the layers of the material



If your material has many different layers, you can play with its structure to achieve different effects.

Source: http://www.flickr.com/photos/massimo_menichinelli/6680470207/in/photostream

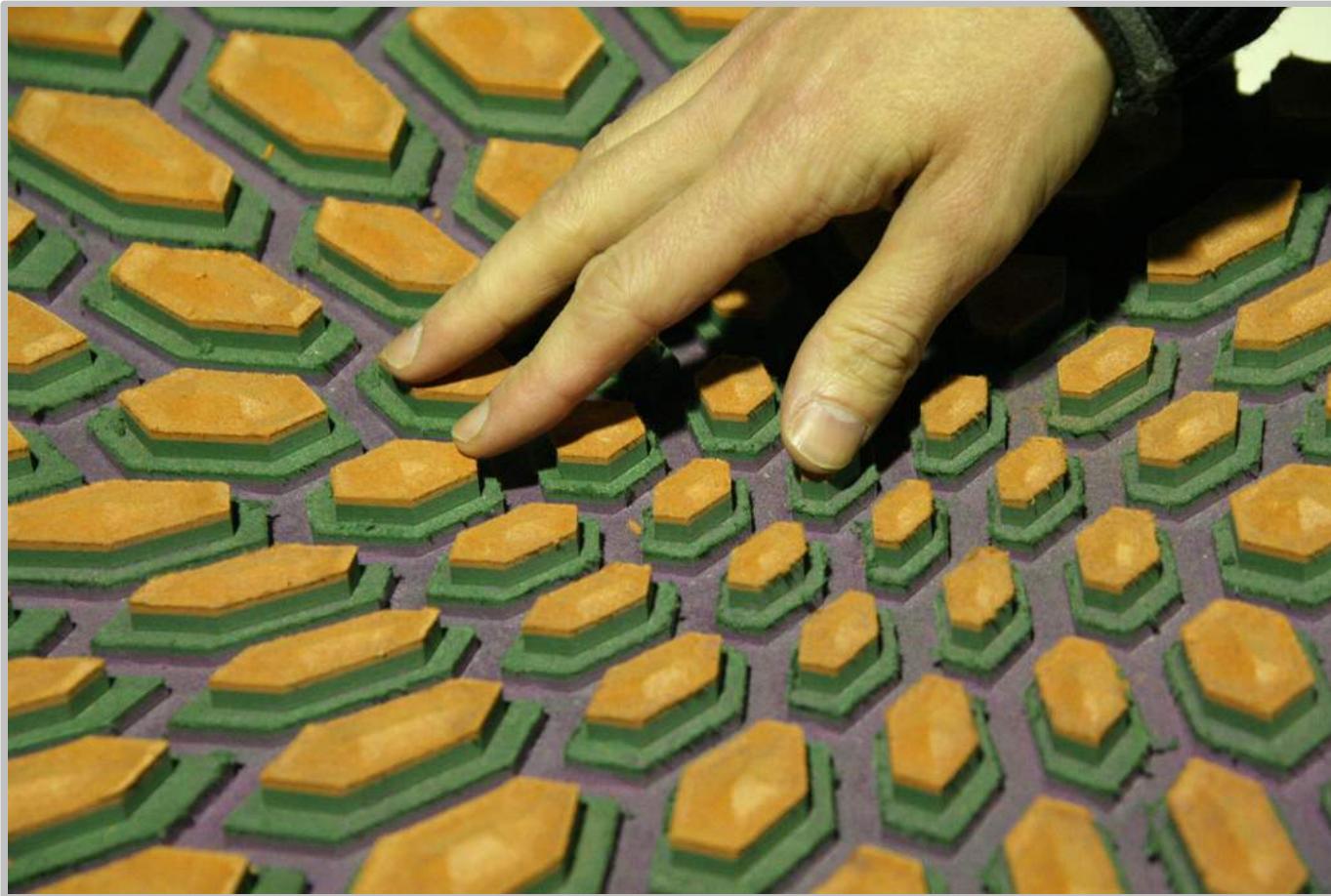
Depth: the layers of the material



If your material has many different layers, you can play with its structure to achieve different effects.

Source: http://www.flickr.com/photos/massimo_menichinelli/6680488643/in/photostream/

Depth: the layers of the material



If your material has many different layers, you can play with its structure to achieve different effects.

Source: http://www.flickr.com/photos/massimo_menichinelli/6680483663/in/photostream

Layers: Ripples, by Toyo Ito



Ripples, winner of the 2004 Compasso d'Oro, is made of a laminated composite of five different solid woods.

Source: http://www.horm.it/eng/prodotti_di_design/toyo-ito/collezione-toyo-ito-foto.php?id=99
http://www.bonluxat.com/a/Toyo_Ito_Ripples_Bench.html

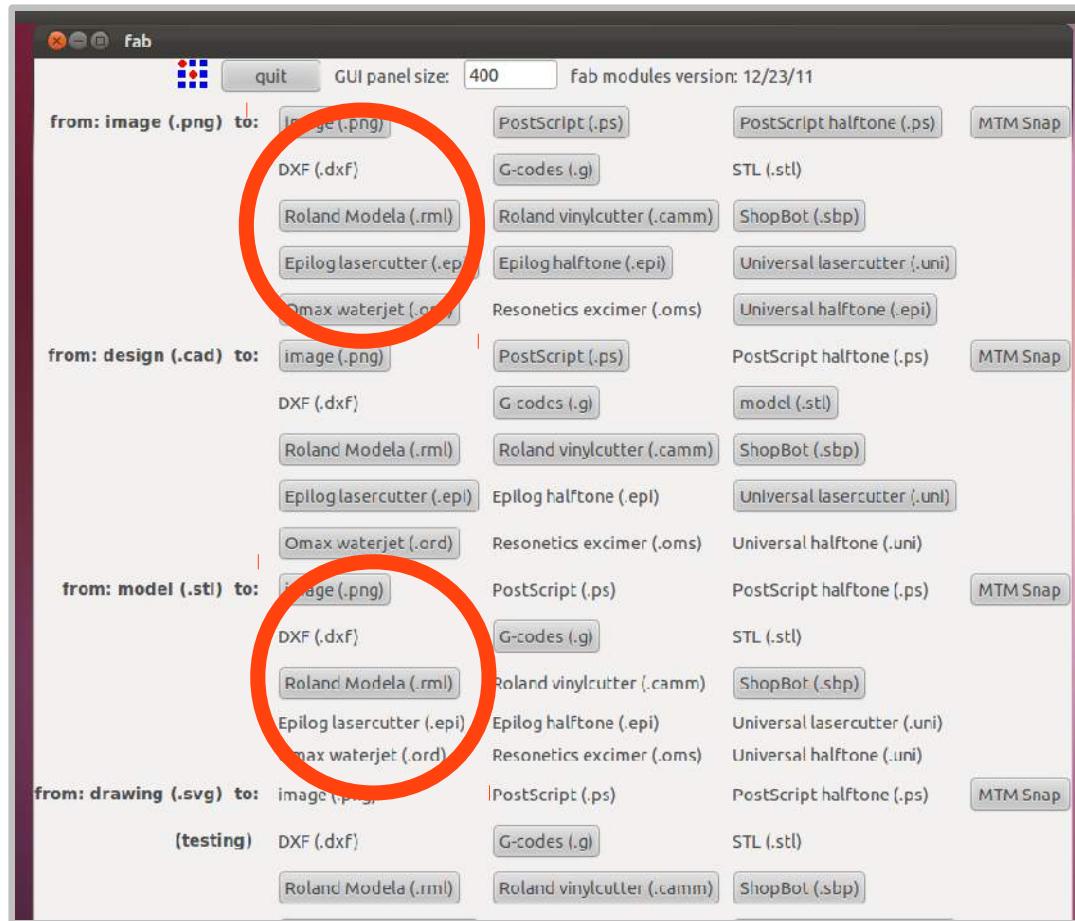
Layers: Ripples, by Toyo Ito



The whole manufacturing process of the table, it is worth watching not only for the CNC part but also for understanding the complexity behind the object.

Source: <http://youtu.be/TbwUMYnPfQM>

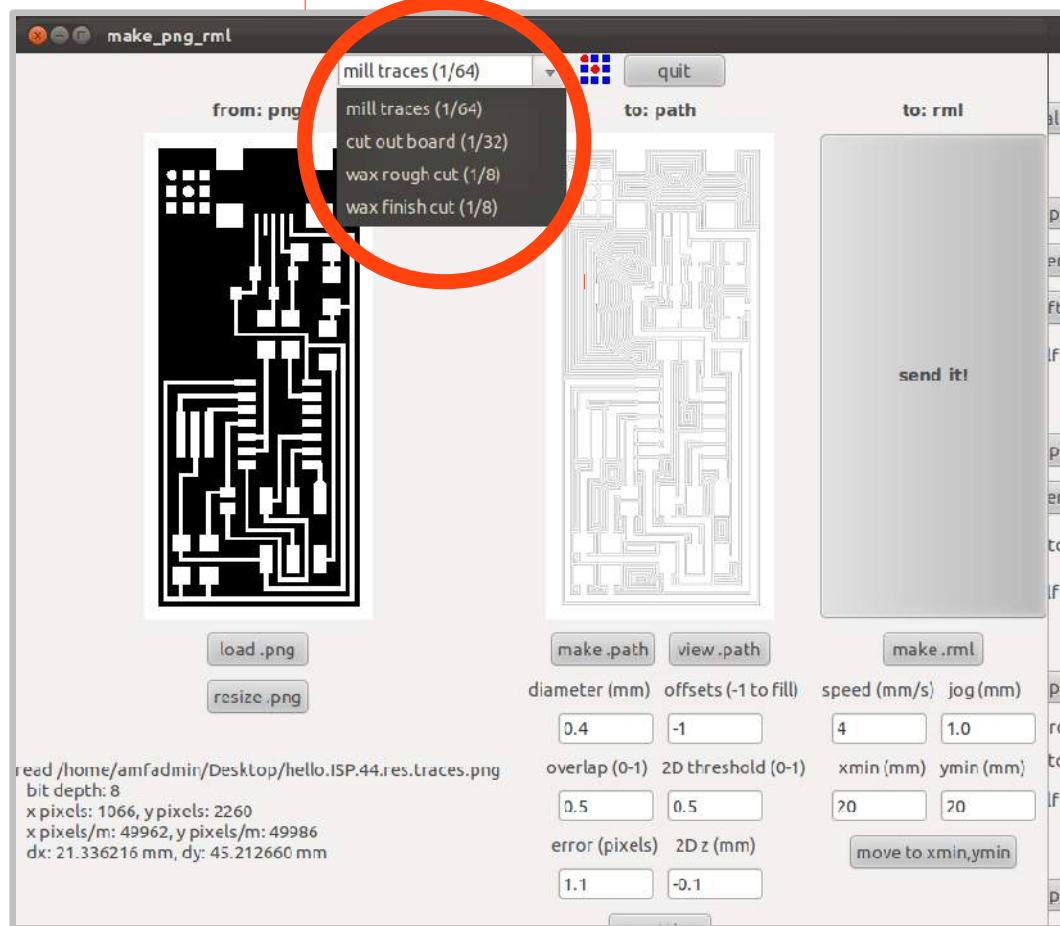
Fab Modules: the FabLab standard software



A software package to run all the FabLab machines on Linux and Mac (if you manage to install it ;-)).

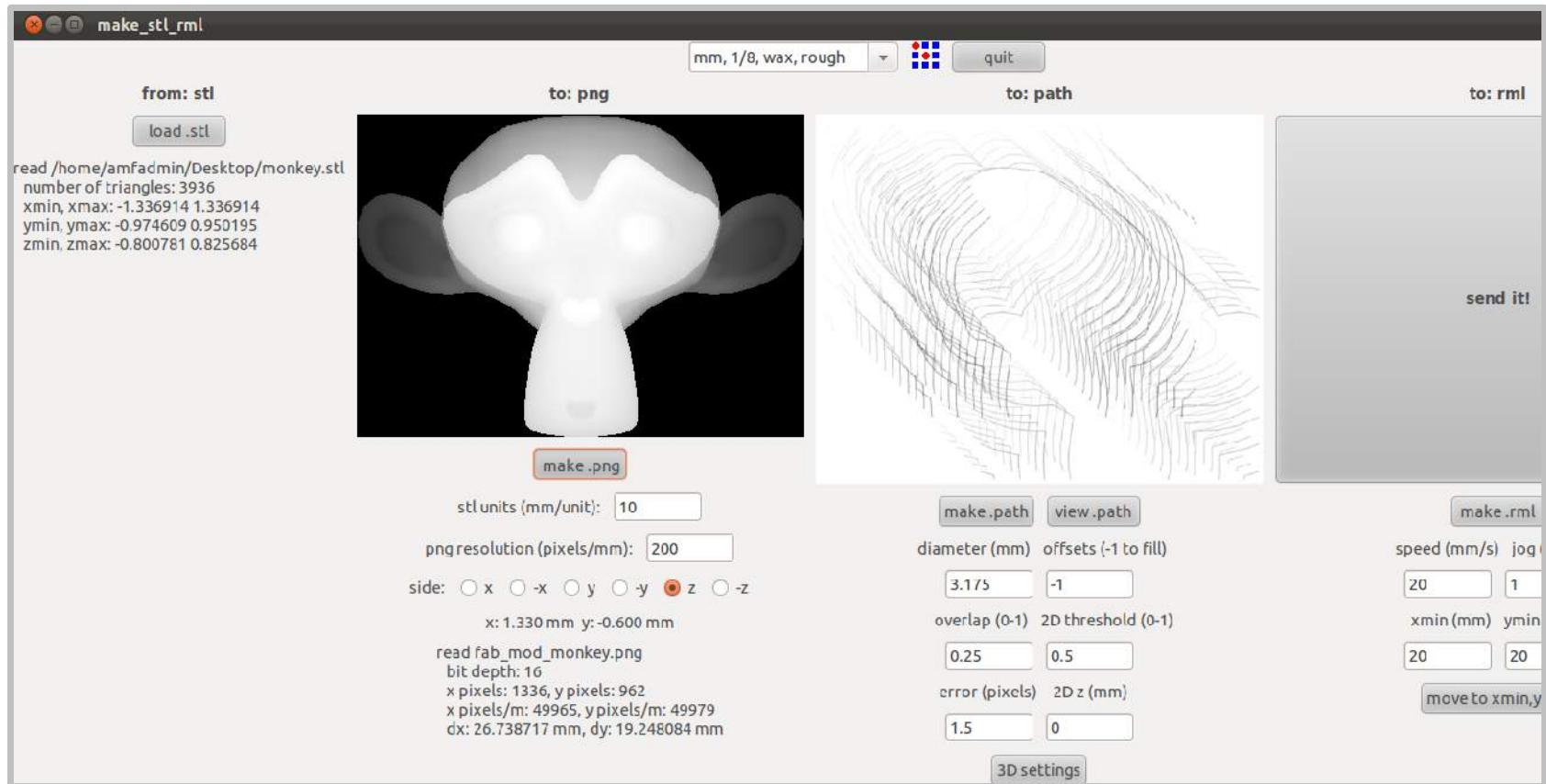
Source: <http://kokompe.cba.mit.edu/dist/index.html>

Fab Modules: milling a 2D PCB



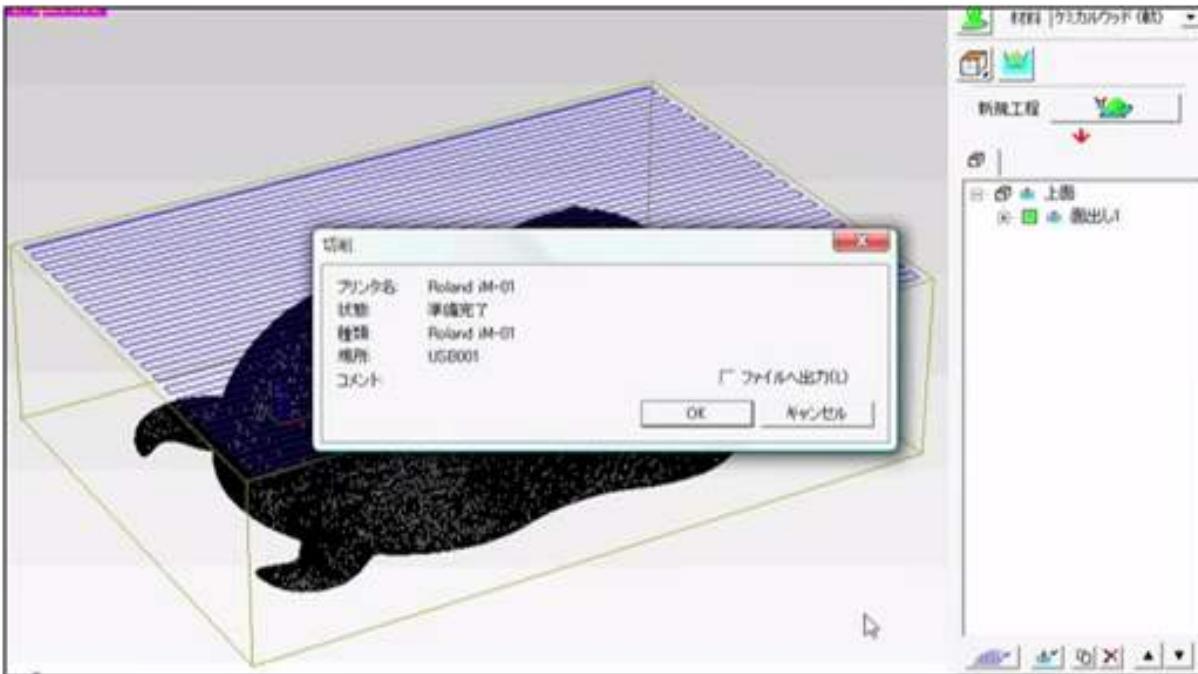
The white part will be milled away: the software generate the paths (each milling bit have its own function and path structure).

Fab Modules: milling a 3D object



The software will translate the 3D model into a BW gradient: white is the top, black the bottom (and then you can set the whole height).

Roland Modela Player 4: process



to start cutting.

Full screen

A tutorial for iModela, but the process is the same for the MDX-200 as the software is the same.

Source: <http://youtu.be/ijHoaG6Y5E>

Roland Modela Player 4: finishing



If you have only 3 axis, splitting the model into two halves can be a good technique for achieving complex shapes.

Source: http://youtu.be/DVfJIU_wD0c



Aalto University
Media Factory

06.

Mold:

what can you get out of it?

DIY Blow Molding Gun



Frustrated by the limited access to plastic blow-moulding equipment, George Fereday developed his own, outfitting a standard 'mastic gun'.

Source: <https://vimeo.com/12940879>

http://www.core77.com/blog/object_culture/george_feredays_personal_blow_molding_gun_16846.asp

Brickarms: hacking and casting LEGO toys

The screenshot shows the homepage of the BrickArms website. At the top, the logo "BRICKARMS" is displayed in large, bold, blue letters, with the tagline "Custom molded weapons and custom minifigs" below it. A horizontal menu bar includes links for Home, Products, Where to Buy, FAQs, Policies, Forums, and About. To the right of the menu is a banner featuring a group of various LEGO minifigures. On the left side of the page, there are four categories with corresponding images and labels: "Weapons" (a grid of different gun models), "Weapons Packs" (a collection of various weapons), "Minifigures" (a group of LEGO figures), and "Headgear" (a collection of hats). The main content area contains text about the products and two promotional images for specific weapon sets. The first promotional image is for the "Modern Combat Pack v3", showing soldiers in a combat setting with the text "Modern Combat Pack v3". The second promotional image is for the "World War II Limited Edition Weapons Pack", showing soldiers in a World War II setting with the text "World War II". Both promotional images include details about the contents and odds for each pack.

BrickArms offers building toy-compatible custom [weapons](#), [weapons packs](#), and custom [minifigs](#).

All BrickArms products are sized to perfectly fit your figs and designed and produced to meet the highest standards of quality. Each BrickArms toy will mesh seamlessly with your other building toys, and thousands of builders worldwide have used BrickArms to explore new ways of building and play.

Join other fans of BrickArms on the [BrickArms Forums](#) to see how others have used BrickArms in their building and even share some of your own BrickArms-equipped creations!

March 15, 2012 - MAAWS, Black Minigun w/Brass Ammo Chain, MCP v3, & WWII Pack w/Russian Protos!

Available at all resellers at 12AM March 16th, 2012!

BRICKARMS

Modern Combat Pack v3

©2012 BrickArms LLC

BRICKARMS
Limited Edition Weapons Pack

World War II

Contains 30 BrickArms
Each pack contains a special prototype WWII Russian Rifle!

Odds for each pack:
• SVT40 = 1 in 2
• DP28 = 1 in 10
• Mosin Nagant = 2 in 5

©2012 BrickArms LLC

BrickArms offers building toy-compatible custom weapons, weapons packs, and custom minifigs.

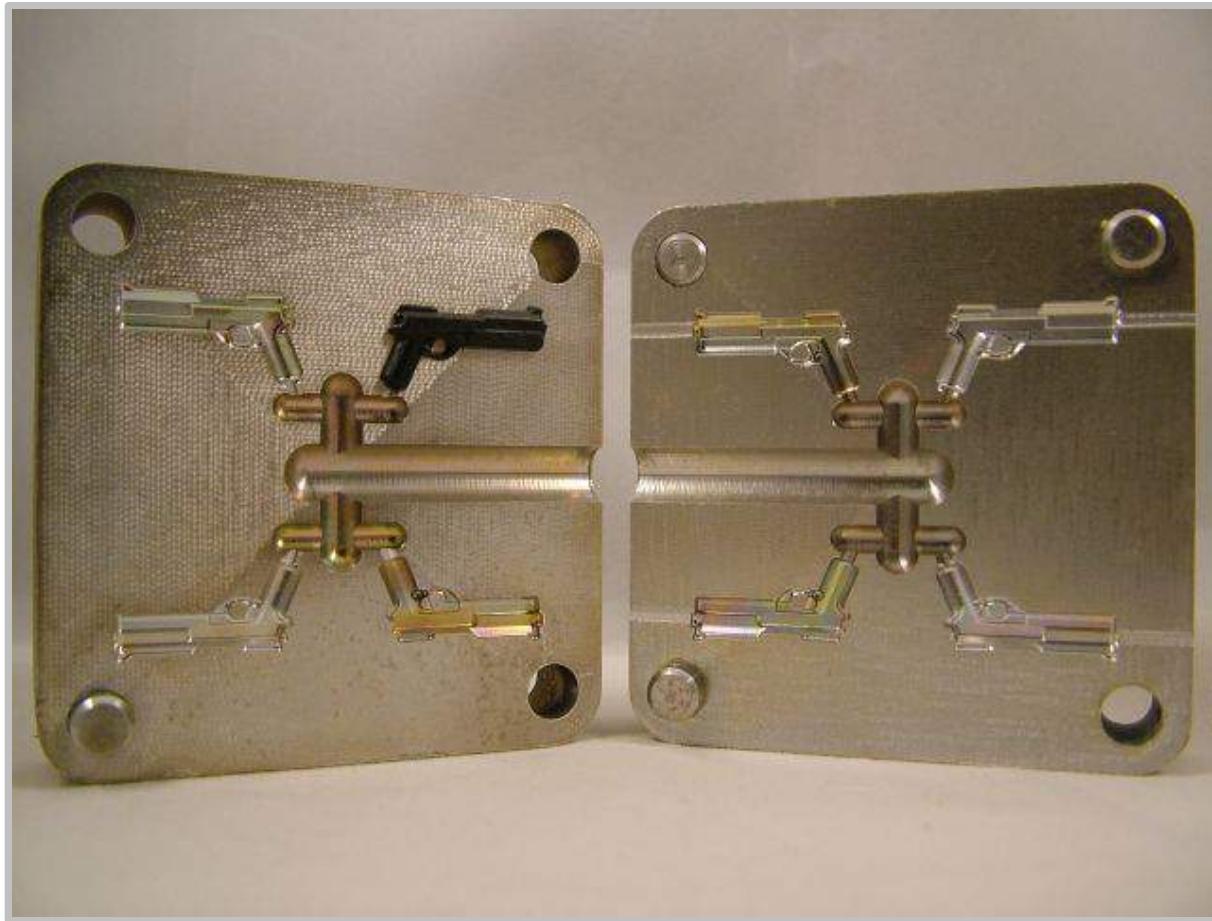
Source: <http://www.brickarms.com/>

Brickarms: hacking and casting LEGO toys



A set of pieces.

Brickarms: hacking and casting LEGO toys



The two-side mold (for injection moulding).

Brickarms: hacking and casting LEGO toys



The two-side mold (for injection moulding).

Brickarms: hacking and casting LEGO toys



Do you know this guy?
(Here's the answer)

Source: <http://www.flickr.com/photos/enigmabadger/3643236010/in/photostream>

Brickarms: hacking and casting LEGO toys



Do you know this guy?
(Here's the answer)

Source: <http://www.flickr.com/photos/enigmabadger/6010441876/in/photostream>

Brickarms: hacking and casting LEGO toys



Do you know this guy?
(Here's the answer)

Source: <http://www.flickr.com/photos/enigmabadger/6174048858/in/photostream>

BrickForge: hacking and casting LEGO toys



The screenshot shows the homepage of the BrickForge website. At the top is a vibrant, cartoonish illustration of several LEGO figures, including a knight in blue armor, a wizard with a long white beard, and a Roman soldier. Below the illustration is a dark navigation bar with white text and icons. The main content area features a blog post titled "3rd Annual BrickMagic LEGO Festival". The post includes a small thumbnail image of a person, the date "April 25th, 2012", the author "admin", and a list of highlights for the festival. To the right of the post is a sidebar with a search bar and a section titled "Featured Items" displaying various LEGO custom builds like tactical helmets and vests. On the left side of the main content area is a sidebar with a "Recent Posts" section containing links to other blog entries.

3rd Annual BrickMagic LEGO Festival

April 25th, 2012 | Author: admin

Will you be attending [BrickMagic](#) in Raleigh, NC this year? If so here is what you have to look forward too....

- help build a 6-foot wide LEGO Deathstar
- see a huge hall filled with custom LEGO creations
- be the first to see top secret new sets the LEGO will unveil
- build with thousands of bricks in our Free Build Room
- participate in workshops on building techniques
- watch a robotics competition by teams from area schools
- shop for hard-to-find LEGO parts and sets

Registered attendees will receive an exclusive *BrickForge Doomsday Pack* featuring never-before-seen items in cool colors!

Tickets: \$12 adults, \$8 kids (age 4-16) and Seniors (get a \$1 discount when you order online).

Hilton North Raleigh/Midtown
3415 Wake Forest Road
Raleigh, NC 27609

Posted in [products](#) | [No Comments »](#)

Search Entries

Search

Featured Items



TACTICAL HELMET
BLACK CARBON STEEL
TACTICAL VEST
SHOCK TROOPER ARMOR
SHOCK TROOPER HELMSET

“We consider ourselves intermediaries between the community and the lumbering Danish company.”

Source: <http://www.brickforge.com/>
<http://blog.makezine.com/2011/10/12/make-interviews-indie-lego-molder-brickforge/>

BrickForge: hacking and casting LEGO toys

The screenshot shows a website for 'BRICK FORGE'. The header features a logo with the words 'BRICK' and 'FORGE' in a stylized font. A search bar with the placeholder 'Search:' and a link to 'Advanced search' are at the top. On the left, a sidebar titled 'Categories' lists items like Weapons, Headgear, Armor, Equipment, Instruments, Accessories, Hair/Beards, Animals, Decals, Chrome, Swag, Colors, and SALE. Below this is a 'Bestsellers' section listing items 1 through 5. The main content area shows a product page for a 'Scooter - Medium Blue (Rainbow print)'. The page title is 'Scooter - Medium Blue (Rainbow print)'. It features a large image of a blue scooter with a rainbow graphic on the side panel. To the right of the image is a logo for 'SCOOTER' with a flame-like graphic. Text on the page describes the scooter as a step-through design for minifigs, suitable for tours or daily use. It lists the included parts: Scooter (body) x1, Scooter (handlebars) x1, Scooter (wheels) x2, Front Tire (narrow) x1, and Rear Tire (broad) x1. It also notes that body, handlebars, and wheels are black. The 'Details' section provides SKU PL-VEHI-SCO0-MBR, quantity 775, weight 0.40 oz, and a price of \$6.25.

(Almost) anything that you cannot find in a
LEGO store...

Source: <http://www.brickforge.com/store/product.php?productid=17777&cat=0&page=1>

BrickForge: hacking and casting LEGO toys



(Almost) anything that you cannot find in a
LEGO store...

Source: <http://www.flickr.com/photos/42832748@N05/5680269752/in/photostream>

Few insights about their process

Having designed the element how do you create the mold?

Once the element is designed a mold is created out of aluminum stock using a CNC milling machine. Most of the time we bundle several accessories together on the same aluminum block. In dealing with such small scale elements we need to insure that every detail is accurate up to 1/10 of a millimeter!

I assume you use ABS. When you get it, in what sort of form does it arrive?

Once the aluminum mold is created it is slotted inside an injection machine and the magic begins. ABS pellets are mixed with a dye and then poured into a hopper. A heating cylinder and reciprocating screw located inside the injection machine feeds the molten ABS into the mold via gates and channels, that then defines the final shape of the object.

BrickForge: hacking and casting LEGO toys

The screenshot shows a website for 'BRICK FORCE' with a yellow header bar containing a search field and an 'Advanced search' link. A sidebar on the left lists categories like Weapons, Headgear, Armor, Equipment, Instruments, Accessories, Hair/Beards, Animals, Decals, Chrome, Swag, Colors, and SALE. Below this are sections for Bestsellers (listing items 1 through 5) and Manufacturers. The main content area displays a product titled 'Spill/Splat - Trans Clear'. It features a yellow LEGO minifigure holding a large, transparent yellow umbrella, standing on a dark base plate. To the left of the figure is a large, light-colored puzzle piece. The base plate has the words 'SPILL / SPLAT' printed on it. The product description includes a note about its use as a liquid surrogate and its design for creating messes. It also mentions it's designed by Thrash. The 'Details' section provides SKU PL-ACCS-SPI, stock quantity of 310, and a weight of 0.03 oz. The price is listed as \$1.00. An 'Add to cart' button and a 'Add to wish list' link are at the bottom.

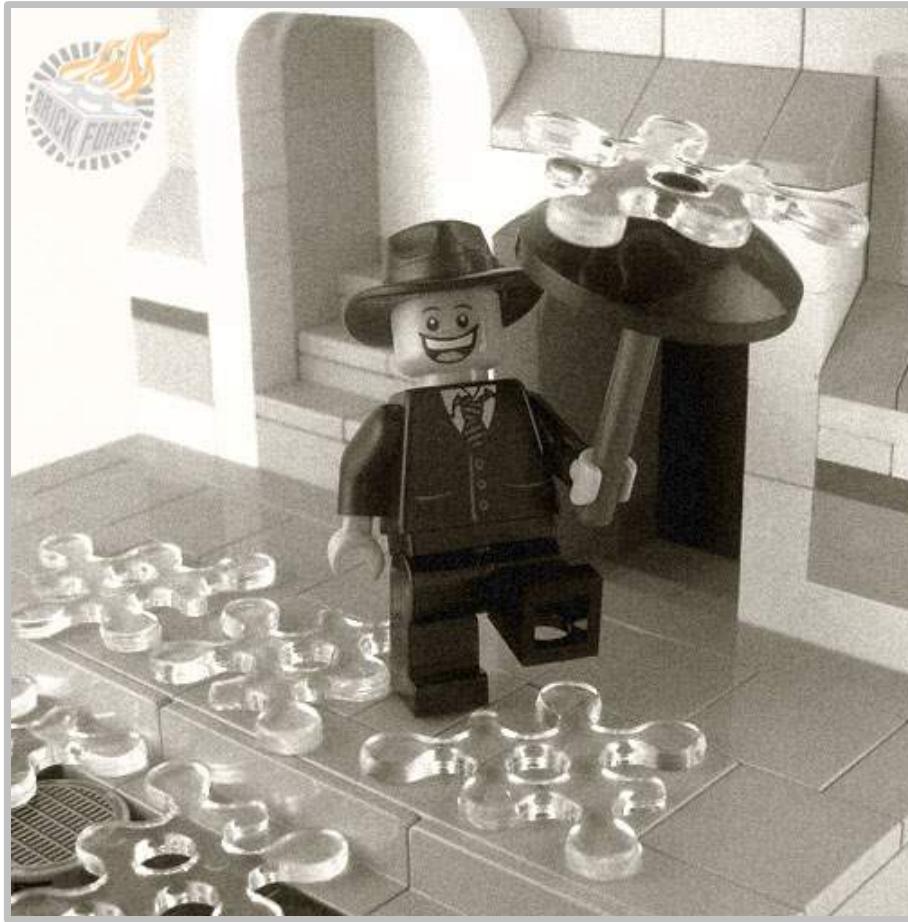
You can be even creative and play with the materials and their attached meanings...

BrickForge: hacking and casting LEGO toys



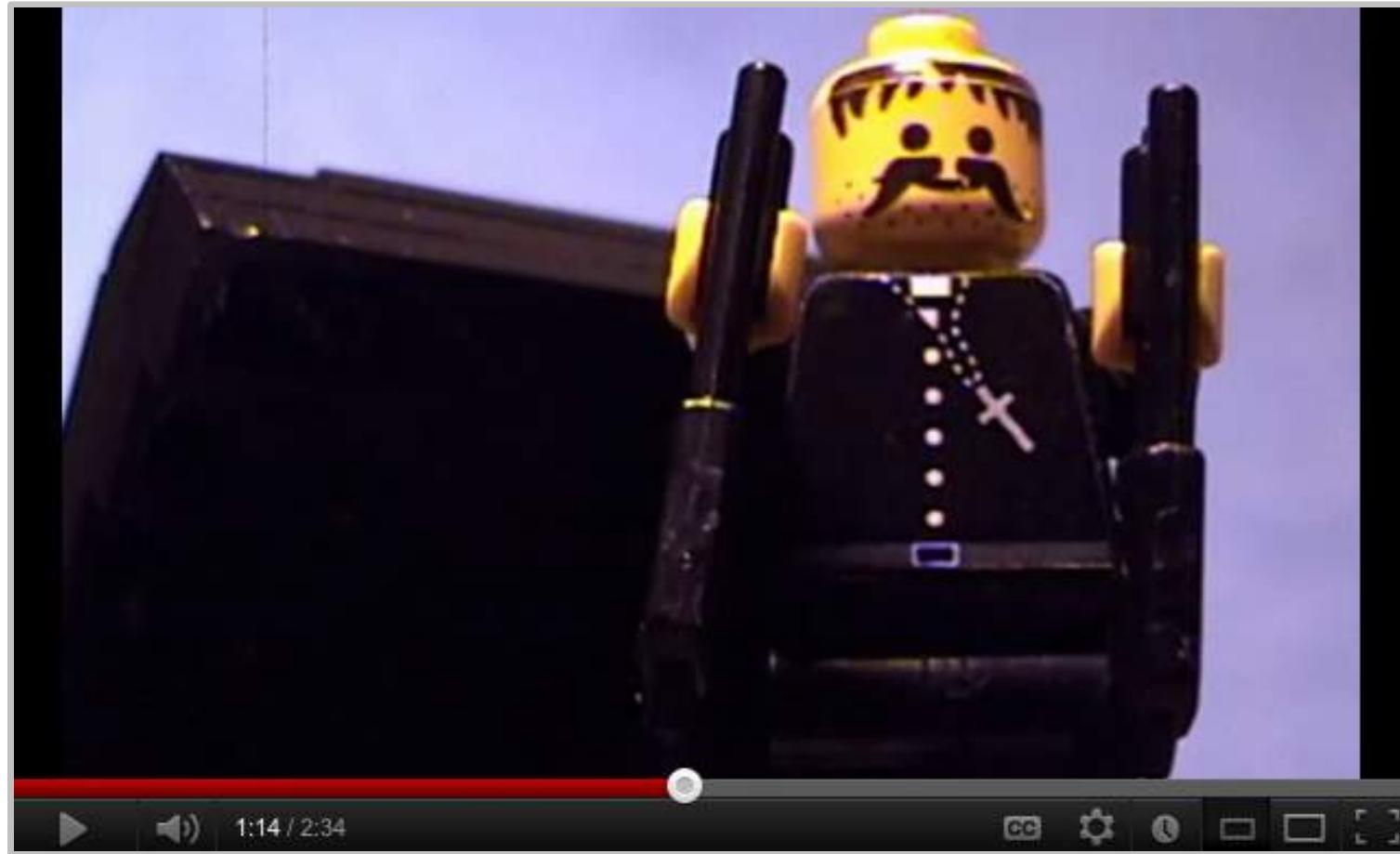
I mean, really creative....

BrickForge: hacking and casting LEGO toys



I mean, really creative....

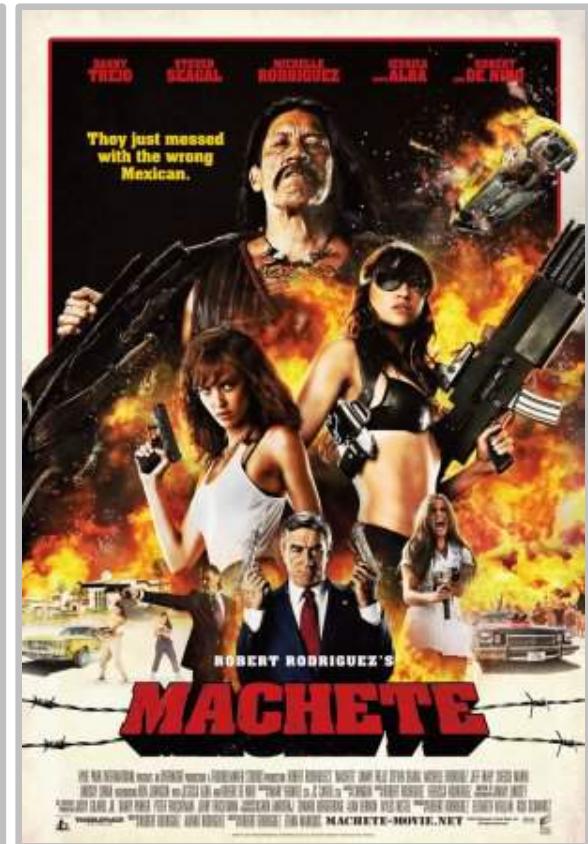
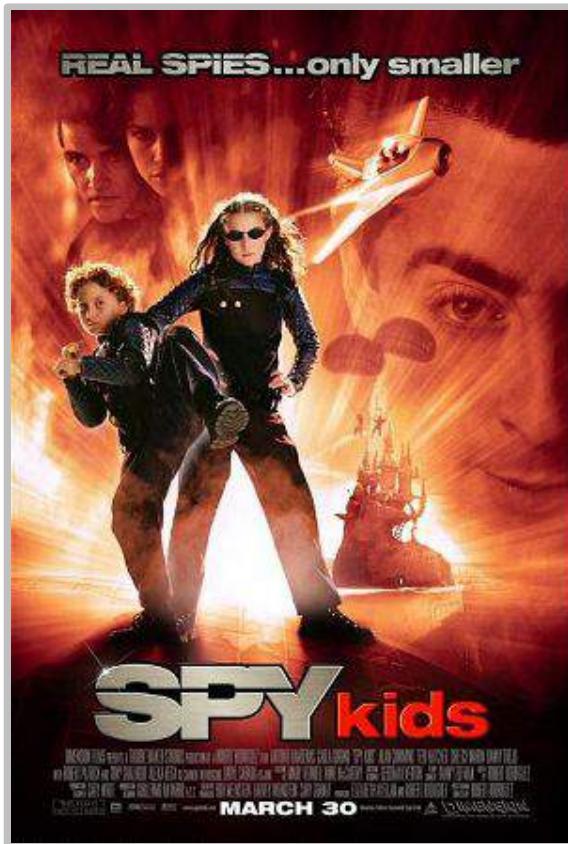
... and what can I do with these toys?



And then the fake trailer is so popular, that fans make even a Lego version..

Source: <http://youtu.be/XtkHygTC8A>

With more than one possible media strategy



A side character from a movie, then a trailer of a fake movie inside another movie, the the trailer becomes popular and becomes a real movie.

Source: http://en.wikipedia.org/wiki/Spy_Kids [http://en.wikipedia.org/wiki/Grindhouse_\(film\)](http://en.wikipedia.org/wiki/Grindhouse_(film))
[http://en.wikipedia.org/wiki/Machete_\(film\)](http://en.wikipedia.org/wiki/Machete_(film))

... and that's not the only case!



Many different adaptions, photos and videos can be found online.
(Solution for the above picture [here](#))

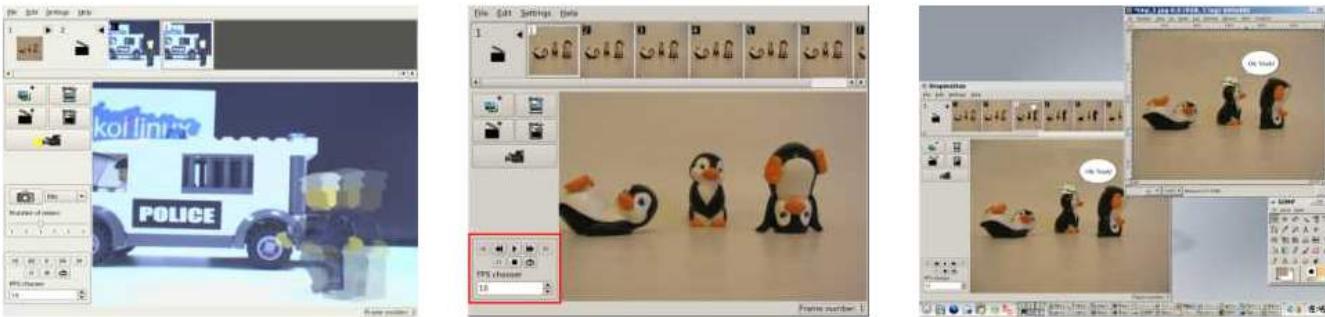
Source: <http://www.flickr.com/photos/catsy/5948099285/in/pool-1206921@N23>

<http://www.flickr.com/groups/1206921@N23/> <http://speckyboy.com/2009/06/12/24-lego-stop-motion-films-mimicking-cool-movies-scenes/>

... and there's an open software for this!



Home Download Support Development About



Linux Stopmotion

Linux Stopmotion is a Free Open Source application to create stop-motion animations. It helps you capture and edit the frames of your animation and export them as a single file.

Linux Stopmotion is a Free Open Source application to create stop-motion animations. It helps you capture and edit the frames of your animation.

Source: <http://linuxstopmotion.org/>



Aalto University
Media Factory

07.

Molding: how to design and mill a mold

Mold: choose your type

A mold can be 1-side or 2-side (or you may not need a mold). So start from these questions:

- * **positive or negative** shape? A mold or an object?
 - * **which material?** Silicon (soft object) or another plastic (hard)?
 - * so.. if you want **a soft silicon object: no mold**
 - * is your object **flat on one side or 360°?**
-

Mold: choose your material

The Smooth-On website features a prominent banner at the top with the text "Materials to **SCARE** the **LIFE** out of you™" and a "BUY NOW" button. A sidebar on the left lists various applications: Architectural Restoration, Aquarium Decoration, Candlemaking, Concrete Casting, Encapsulation & Display, Food Related Applications, Home Projects & Hobbies, Industrial, Lifecasting, Model Making, Orthotics & Prosthetics, Prototyping & Inventing, Sculpture & Art Casting, Special Effects & Props, Sprayable Materials, Vacuum Bagging, and Taxidermy. The main content area discusses SORTA-Clear® Translucent Silicone Rubber, highlighting its properties and applications in food production.

Smooth-On SINCE 1955
MAKE IT NOW!

Materials to **SCARE** the **LIFE** out of you™

About Us Seminars Tech Support Contact Us My Account BUY NOW

Home Technical Info How-To FAQ's Videos & More New Products Distributors Mold Makers Exchange

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Applications

- Architectural Restoration
- Aquarium Decoration
- Candlemaking
- Concrete Casting
- Encapsulation & Display
- Food Related Applications
- Home Projects & Hobbies
- Industrial
- Lifecasting
- Model Making
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- Prototyping & Inventing
- Sculpture & Art Casting
- Special Effects & Props
- Sprayable Materials
- Vacuum Bagging
- Taxidermy

Home >> SORTA-Clear® Translucent Silicone Rubber

SORTA-Clear® Translucent Silicone Rubber

SORTA-Clear® rubbers are premium water white translucent silicone rubber (platinum catalyst) that cures at room temperature with no shrinkage. SORTA-Clear® features exceptional tear and tensile strength. Rubber clarity is especially useful when extracting models via cutting. SORTA-Clear® rubber is ideal for making prototype, jewelry or other molds of any configuration where model visibility is important. Materials such as urethane, epoxy or polyester resins can then be cast into SORTA-Clear® silicone without application of a release agent. Other materials such as wax and low melt metal alloys can also be cast into SORTA-Clear®. SORTA-Clear® can be pigmented with **SILC Pig®** silicone pigments.


Click To Enlarge Image

TB Technical Bulletin

MSDS

Videos And Photos

SORTA Clear® 40 and SORTA® Clear 18 are both suitable for making molds for baking, casting ice, butter or chocolate and other applications used to produce food.

CLICK HERE

- SORTA-Clear® 18 - Shore 18A hardness
- SORTA-Clear® 40 - Shore 40A hardness

Smooth-On is one of the best manufacturers, but it's not the only one...

Mold: always read the instructions!

The screenshot shows the Smooth-On website with a banner featuring a zombie-like character and the text "Materials to SCARE the LIFE out of you™". The main navigation menu includes links for About Us, Seminars, Tech Support, Contact Us, My Account, and BUY NOW. Below the menu is a secondary navigation bar with links for Home, Technical Info, How-To, FAQ's, Videos & More, New Products, Distributors, and Mold Makers Exchange. A search bar and language selection dropdown are also present. The left sidebar lists various applications: Architectural Restoration, Aquarium Decoration, Candlemaking, Concrete Casting, Encapsulation & Display, Food Related Applications, Home Projects & Hobbies, Industrial, Lifecasting, Model Making, Orthotics & Prosthetics, Prototyping & Inventing, Sculpture & Art Casting, Special Effects & Props, Sprayable Materials, Vacuum Bagging, and Taxidermy. The main content area is titled "SORTA-Clear® Translucent Silicone Rubber". It describes the material as premium water white translucent silicone rubber (platinum catalyst) that cures at room temperature with no shrinkage. It features exceptional tear and tensile strength, especially useful for extracting models via cutting. It is ideal for making prototype, jewelry or other molds of any configuration where model visibility is important. It can be cast into urethane, epoxy or polyester resins without a release agent. Other materials like wax and low melt metal alloys can also be cast into it. It can be pigmented with SILC Pig® silicone pigments. A yellow callout box highlights that SORTA Clear® 40 and SORTA® Clear 18 are suitable for baking, casting ice, butter or chocolate. A red circle highlights a sidebar on the right containing links for "Click To Enlarge Image", "Technical Bulletin" (with a TB icon), "MSDS" (with a diamond icon), "Videos & Photos" (with a camera icon), and "FAQs" (with a question mark icon).

It is very important that you always read the technical bulletin, it will tell you how to work the material, its features and safety information.

Mold: always read the instructions!

The Smooth-On website features a prominent banner at the top with the text "Materials to SCARE the LIFE out of you™" and a "BUY NOW" button. A sidebar on the left lists various applications, and the main content area details the properties and uses of SORTA-Clear® Translucent Silicone Rubber, including a note about its suitability for food-related applications.

Smooth-On SINCE 1955
MAKE IT NOW!

Materials to **SCARE** the **LIFE** out of you™

About Us Seminars Tech Support Contact Us My Account BUY NOW

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Applications

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Home >> SORTA-Clear® Translucent Silicone Rubber

SORTA-Clear® Translucent Silicone Rubber

SORTA-Clear® rubbers are premium water white translucent silicone rubber (platinum catalyst) that cures at room temperature with no shrinkage. SORTA-Clear® features exceptional tear and tensile strength. Rubber clarity is especially useful when extracting models via cutting. SORTA-Clear® rubber is ideal for making prototype, jewelry or other molds of any configuration where model visibility is important. Materials such as urethane, epoxy or polyester resins can then be cast into SORTA-Clear® silicone without application of a release agent. Other materials such as wax and low melt metal alloys can also be cast into SORTA-Clear®. SORTA-Clear® can be pigmented with SILC Pig® silicone pigments.

SORTA Clear® 40 and SORTA® Clear 18 are both suitable for making molds for baking, casting ice, butter or chocolate and other applications used to produce food.

CLICK HERE

Click To Enlarge Image

TB Technical Bulletin

MSDS

Videos And Photos

Also check if your material is food safe!

Mold: choose your material

The image shows the homepage of the Silcom website. At the top left is the Silcom logo with the tagline "Muotista se kaikki alkoi". Below the logo are several product images: a hand holding a mold, a red brick building, a close-up of red circular objects, and three human figures. A horizontal menu bar follows, featuring links such as Restaurointi, kynttilät, betonityöt, koristeet, harrasteet, prototyypit, kuvanveisto, taide, erikoisefektit, and sekä lukuisia sovelluksia yrityskäytöön. To the right of the menu is a search bar with the placeholder "Haku: Käikki tuoteryhmät" and a "Hae" button.

Tarjoustuotteet: Uudet tuotteet, Silikonikumit, Lifecasting, Polyuretaanhartsit, Vaahtomuovit, Polyuretaanikumit, Oheistuotteet, Muotoilusavet, Kynttilä- ja saippuamateriaalit, Valmispaketit, Epoksit, Etusivu.

Ostoskorin valikkot: Haku: Käikki tuoteryhmät, Hae.

Facebook: Osallistu ideakilpailuun Facebookissa. Palkintona yht. 600 euron edestä lahjakortteja!

Tutustu uuteen upeaan Smooth-On katalogiin klikkaamalla kuvaketta

Betonista on moneksi!

- Smooth-Onin muottikumeja käytetään maailmanlaajuisesti erilaisissa betoniprojekteissa. Tutustu millaisissa sovelluksissa tuotteita on käytetty.

Kaikkea mitä tarvitset muotin valmistukseen ja valutöihin

Asiakaspalvelu: 0400 416 371, info@silcom.fi

Muottitietoa: Lue minih kaikkeen muottiteknikka soveltuu

Materiaallaskuri: Osta olkeaa määrä. Laske tällä.

Tutustu valmispaketteihimme

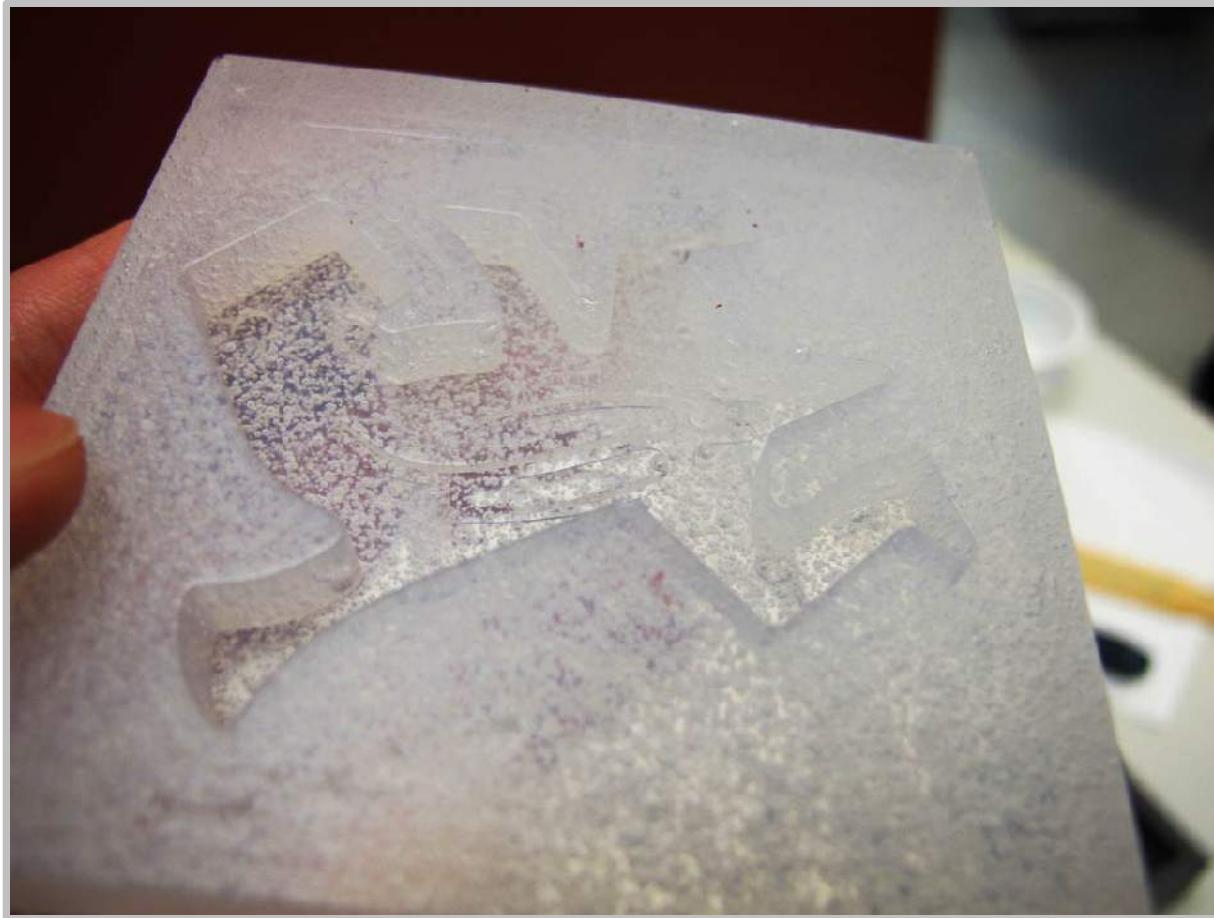
Media-galleria

Oletko vasta aloittelemassa?
Täältä löydät helnot

Silcom is the Finnish distributor of Smooth-On and other brands...

Source: <http://silcom.fi/>

1-side mold: relief objects (one flat side)



A 1-side mold for an object with one flat side
(and a food safe silicon).

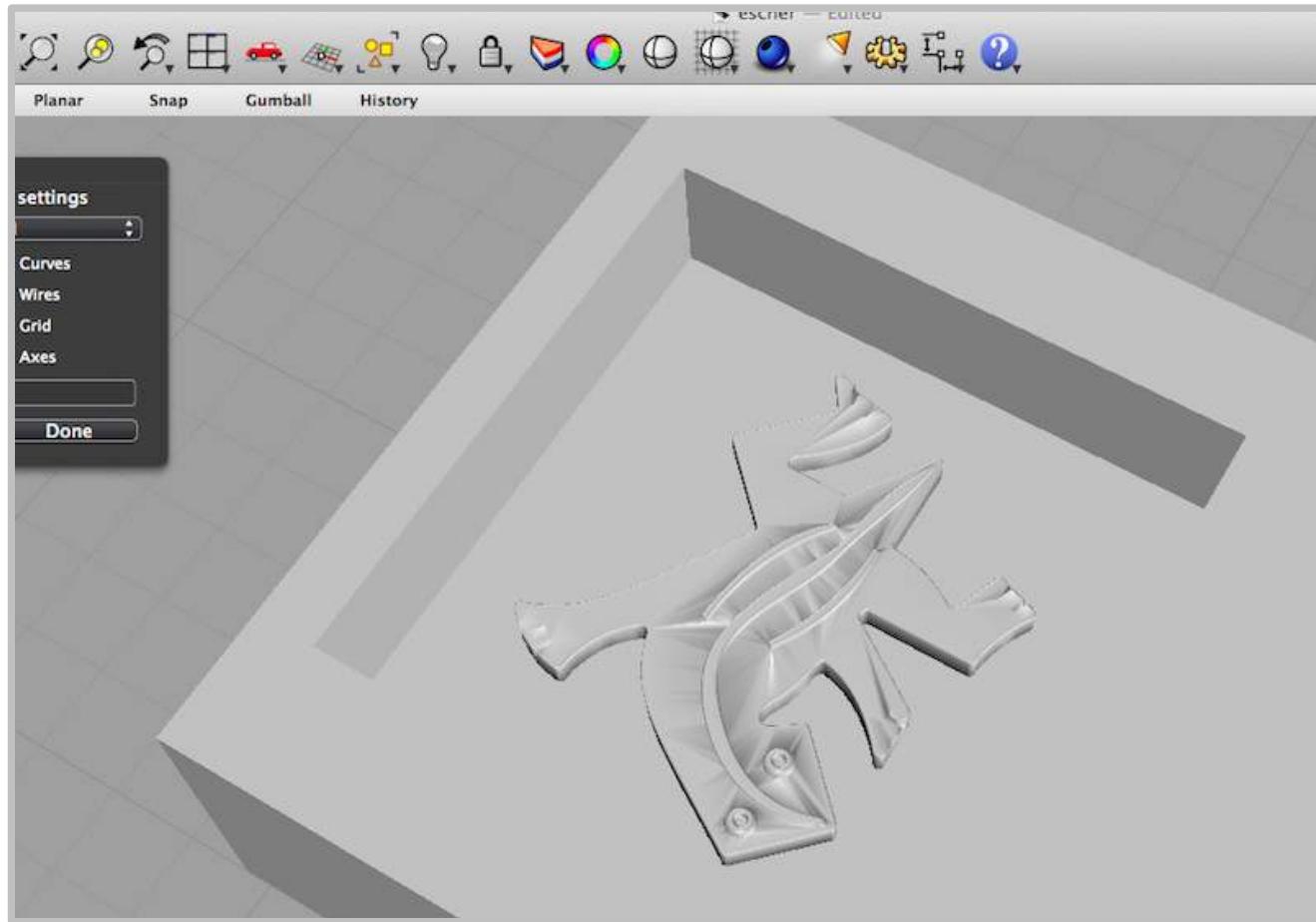
Source: <http://www.flickr.com/photos/aaltofablab/7073792943/in/photostream>

1-side mold: relief objects (one flat side)



The final flat object (chocolate).

1-side mold: relief objects (one flat side)



The mold designed for milling: it is the negative of what you want to get as a real object!

Source: <http://academy.cba.mit.edu/2012/students/menichinelli.massimo/index.html>

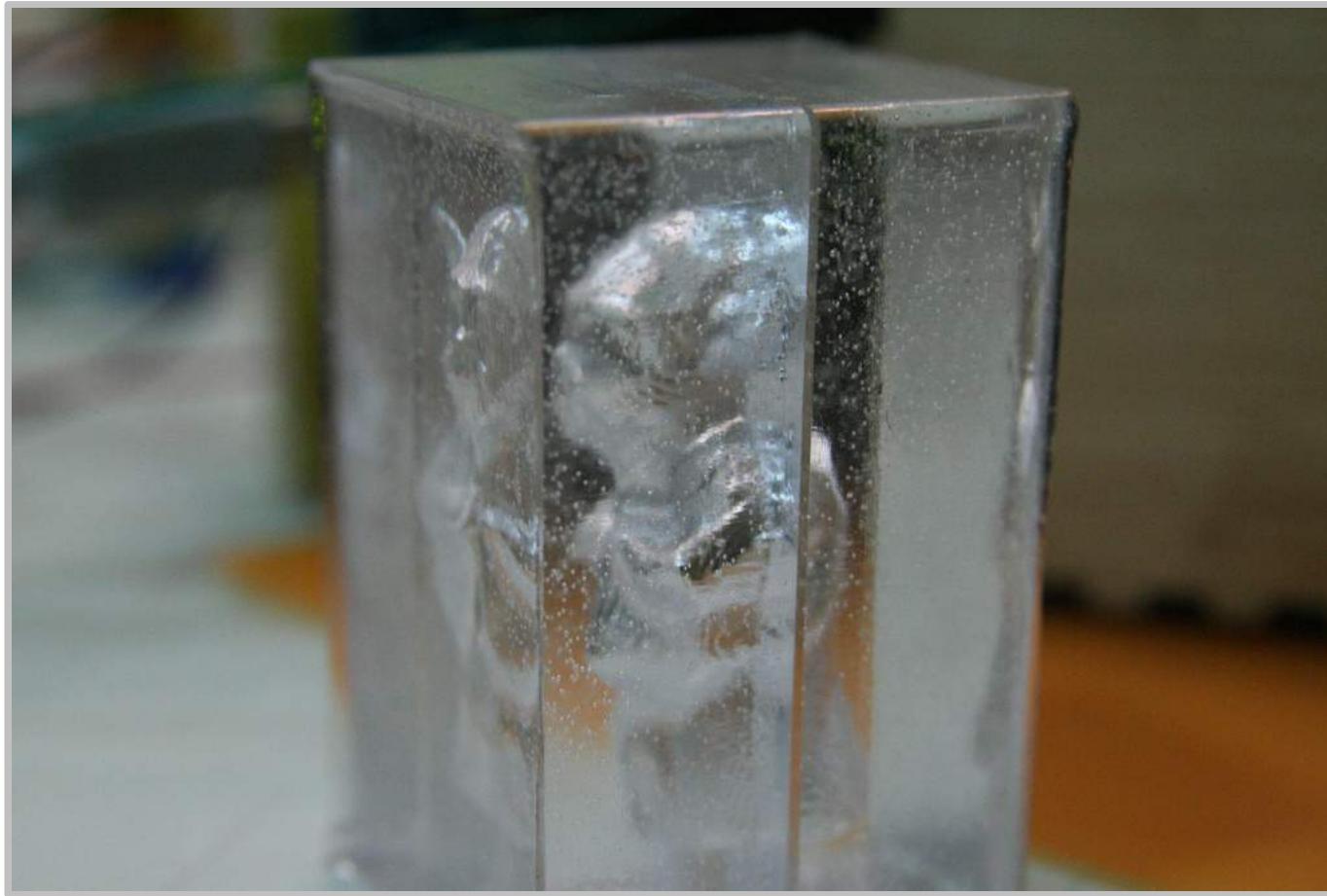
2-sides mold: full 360° objects



For objects that are 360° (not just a relief) you will need a two-sides mold, so think about how to split the model in two.

Source: http://www.flickr.com/photos/massimo_menichinelli/6766269767/in/photostream

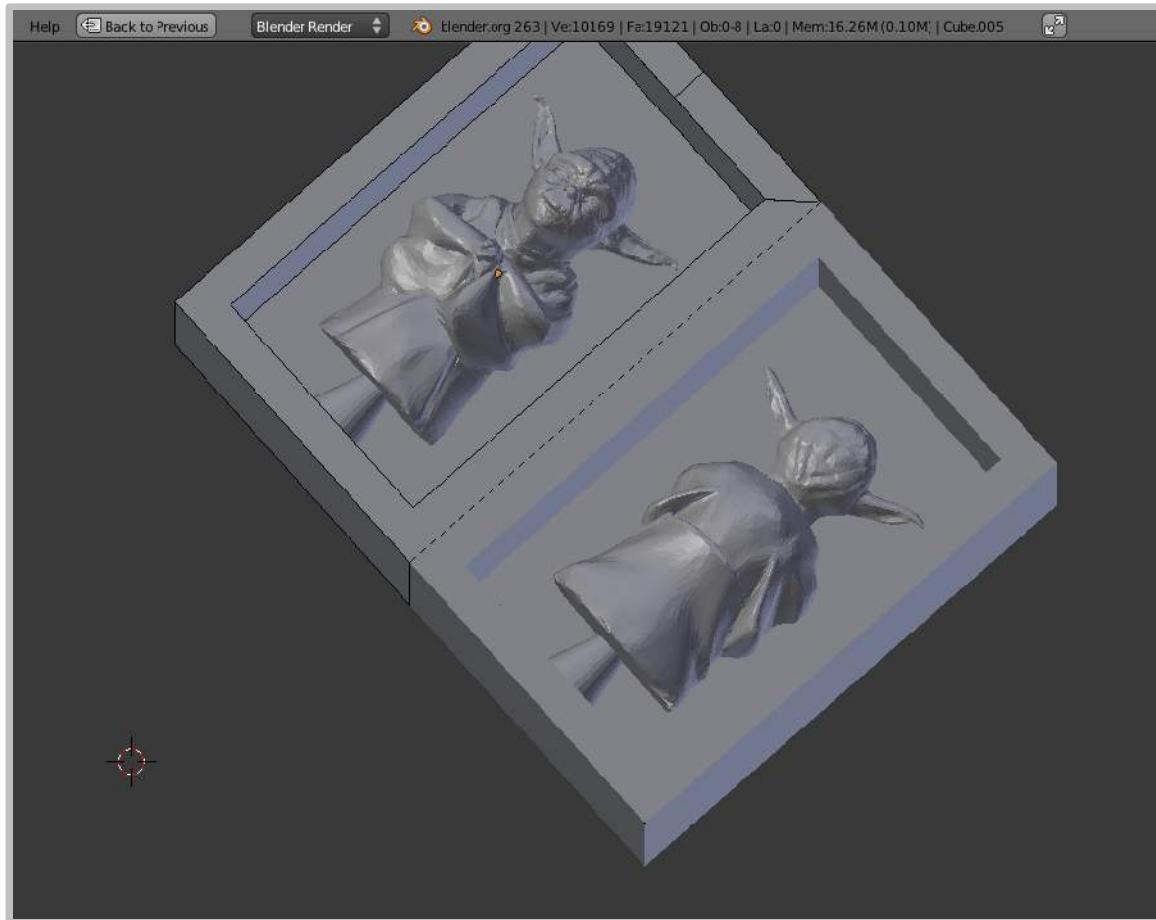
2-sides mold: full 360° objects



For objects that are 360° (not just a relief) you will need a two-sides mold, so think about how to split the model in two.

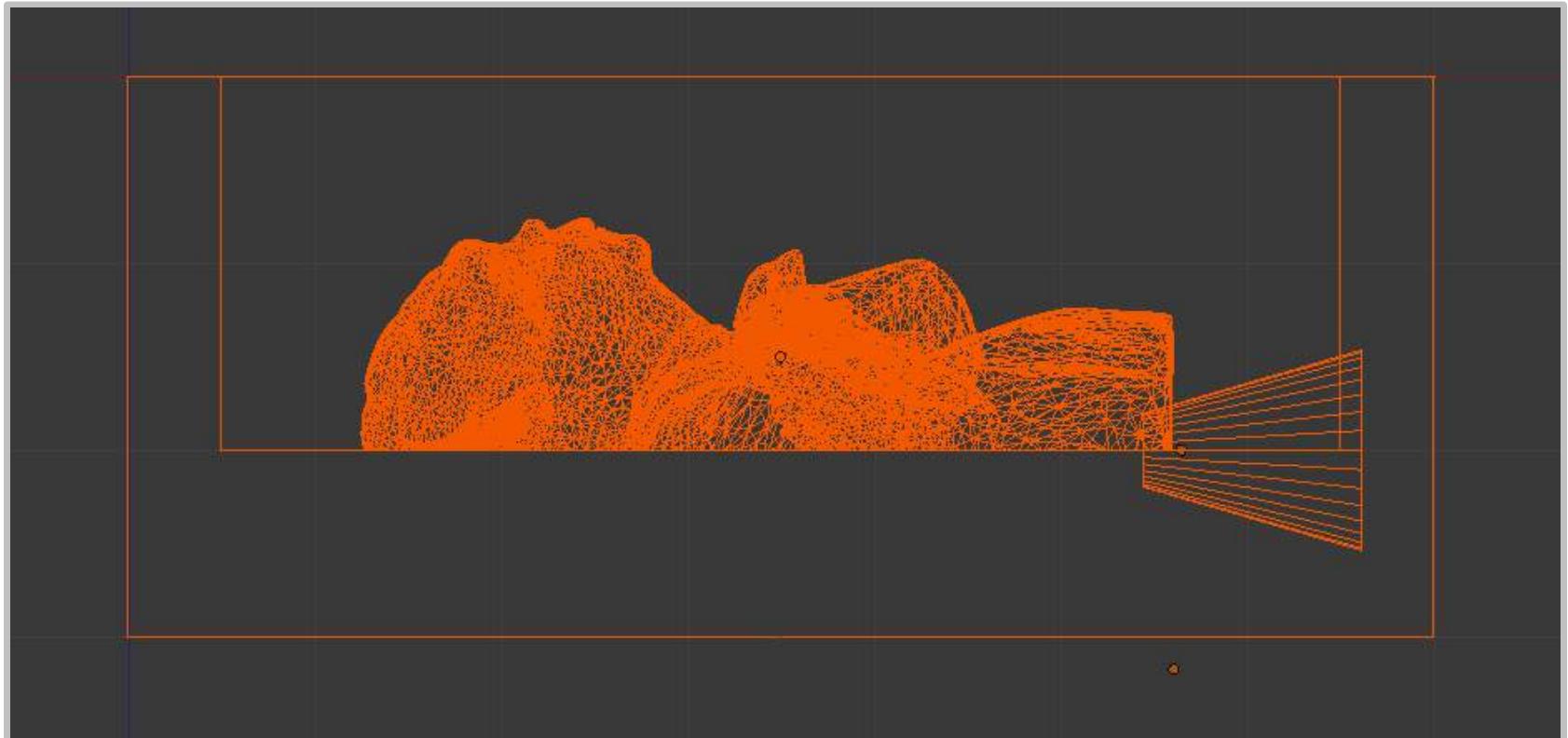
Source: http://www.flickr.com/photos/massimo_menichinelli/6766270509/in/photostream

2-sides mold: full 360° objects



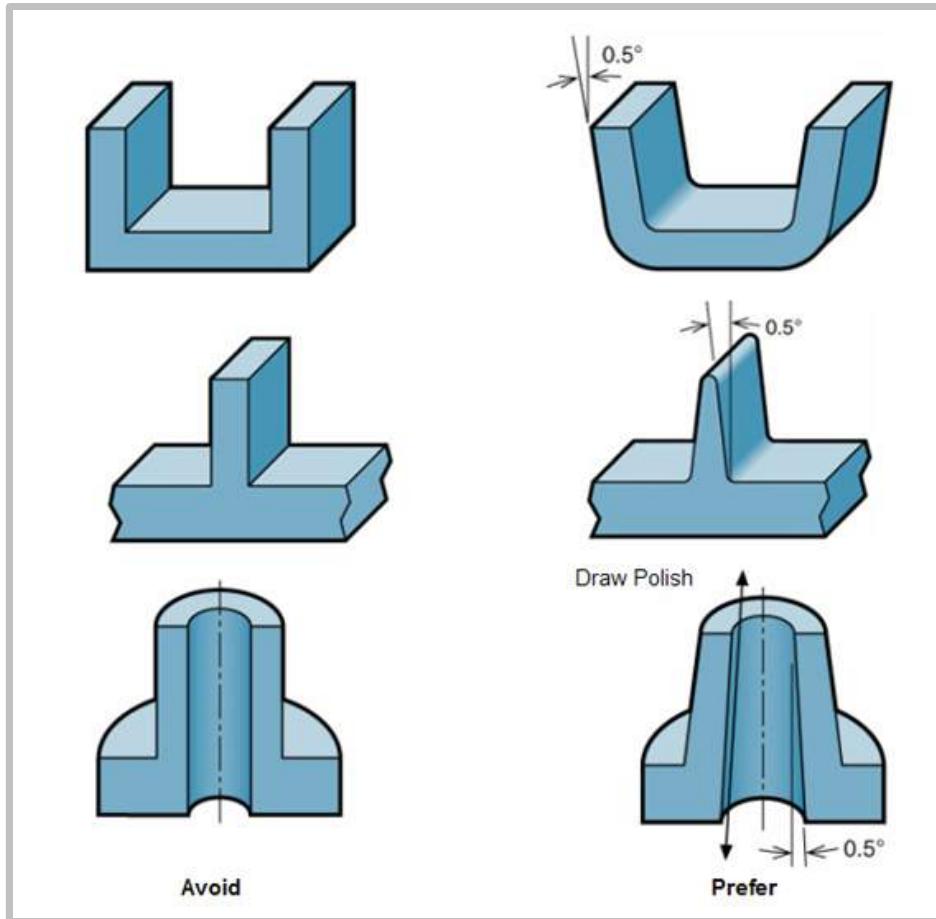
For objects that are 360° (not just a relief) you will need a two-sides mold, so think about how to split the model in two.

2-sides mold: full 360° objects



Add a cone for pouring the final plastic into
the mold (the mold will be vertical!).

Draft angles: it may be hard to remove the part



In engineering, draft is the amount of taper for molded or cast parts perpendicular to the parting line. It can be measured in degrees or mm/mm (in/in).

Source: http://www.bayermaterialsciencenaftha.com/checklist/draft_angle.html
[http://en.wikipedia.org/wiki/Draft_\(engineering\)](http://en.wikipedia.org/wiki/Draft_(engineering))

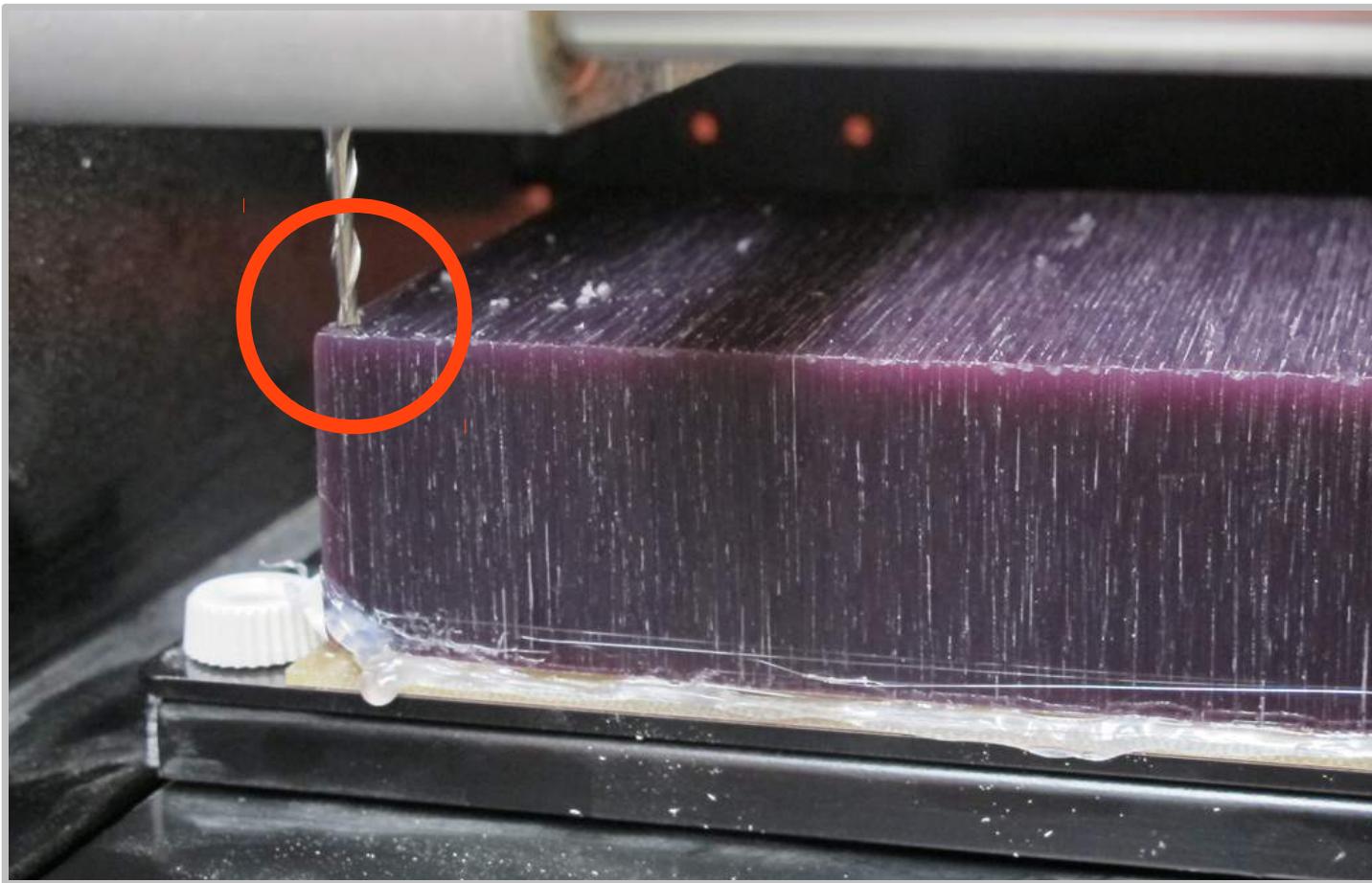


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08.

Milling and Casting: How to create a mold and use it

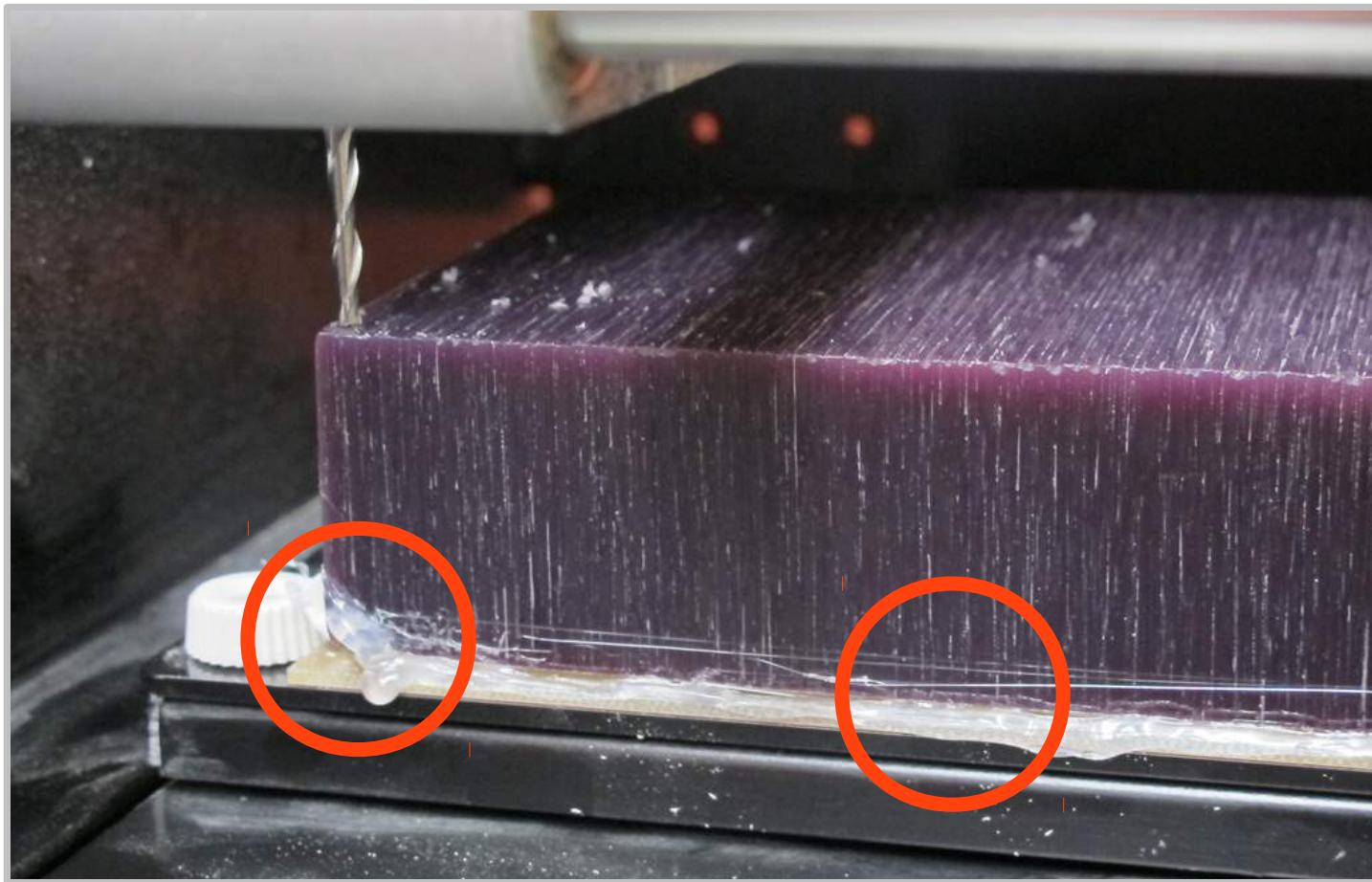
Always, set the Zero: X, Y, Z



And write down the X and Y coordinates! Furthermore, don't mill around it, so you can preserve it for future passes.

Source: <http://www.flickr.com/photos/aaltofablab/6924563776/in/photostream>

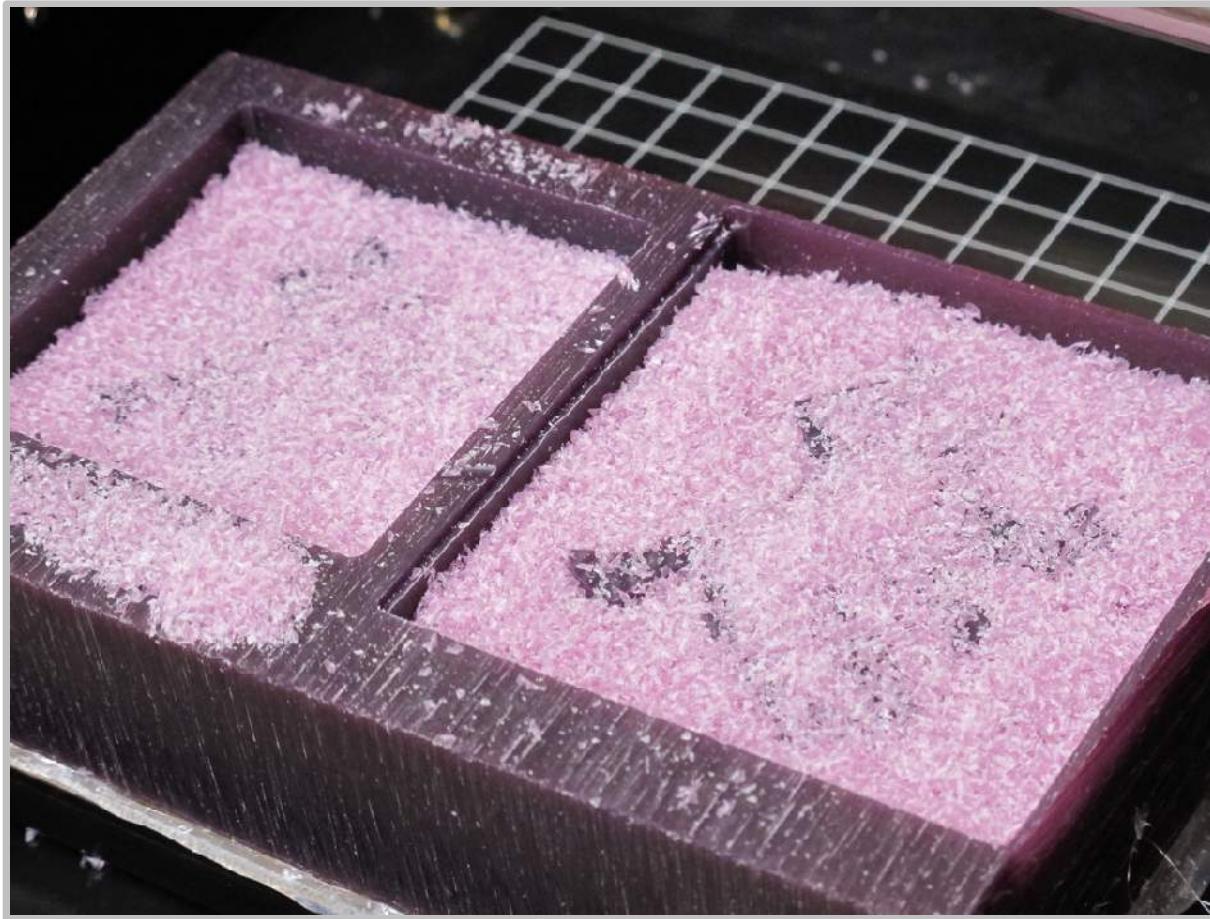
Always, use double side tap



Use double side tape to stick the modeling wax block to the milling machine, and hot glue if the tape is not strong enough.

Source: <http://www.flickr.com/photos/aaltofablab/6924563776/in/photostream>

Mill it :)



You may need to clean the machine to check the progress, but
always press the View button before doing it!!!

Source: <http://www.flickr.com/photos/aaltofablab/6924566732/in/photostream/>

Mix and stir the components



Most of the time you will have to mix two separate components, **always check the instructions**, you may need to balance by volume or by weight.

Source: <http://www.flickr.com/photos/aaltofablab/7070850521/in/photostream>

Use the demoulding spray



It will help you when taking the mold away from the wax block.

Pour the silicon with a steady flow



You want to avoid the formation of bubbles inside the mold (or you will have to cast it again), so be careful when pouring the silicon.

Source: <http://www.flickr.com/photos/aaltofablab/6924789764/in/photostream>

Wait ... and repeat!



Check the instructions! Sometimes it help for demoulding
to leave the stick on the mold ... sometimes not!

Source: <http://www.flickr.com/photos/aaltofablab/7073738569/in/photostream>

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Thank you!!

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