

Week 3: Computer Controlled Cutting

11.2. 2015

This week we will learn about the mechanical application of computer aided design.

The assignment for this week is to design, make, and document a press-fit construction kit.

The agenda:

tools knife laser waterjet hot wire wire EDM **CAM** printer drivers **fab**
modules **vinylcutter** *applications* signs pop-up cards, books screen printing
flex, multi-layer circuits antennas **materials** knives vinyl masking tape
transfer adhesive copper epoxy film (carpet tape) (sandblast stencil) *settings*
force speed cut depth temperature, humidity, ... *rollers, feeding weeding*
adhesion lift vs shear **lasercutter** *applications* marking, engraving raster
vector [grayscale](#), [svg](#), [path](#), [png](#), [path](#) screen printing [halftone holes path](#)
press-fit construction stick-slip, bistability clearance chamfer
parametric design [GIK](#) [gik.cad](#) [gik.sb](#) [gik.math](#) [gik.png](#) [flexures](#), [living hinges](#),
[mechanisms](#), [joints](#) *Light Amplification by Stimulated Emission of Radiation* state
diagram population inversion gain medium lasing threshold output coupling
beam mode, profile, waist diffraction limit *gain medium* CO2 (10.6 u) InGaAsP
(1-2 u) AlGaAs (600-900 nm) Nd:YAG (1064, 532 nm) Ti:sapphire (650-1100 nm)
excimer (100-300 nm) *cutting mechanisms* burning melting evaporation
ablation *airflow* assist exhaust filter *kerf models* [Epilog](#) [Universal](#)
[Trotec](#) [GCC](#) [Full Spectrum](#) [Lasersaur](#) [Coherent/Beam](#) [Resonetics](#)
[Oxford](#) [KM Labs](#) [safety](#) Class 1 venting cleaning optics supervision
air/gas flow fires *materials* [cardboard](#) Edge Crush Test (ECT) 44 [wood](#)
[acrylic](#) [polycarbonate] [metal] flame test *settings* power speed
rate coordinate system, origin vector, raster

We are going to be experimenting with the review format.

During student reviews we learned about GREEN Fablab:

<https://www.fablabs.io/greenfablab> which is located near Barcelona. This fablab is a digital fabrication lab that uses natural resources and is a partner in the international network of FabLabs led by MIT in Boston, and part of the Plan Avanza national network of laboratories in Spain. These fablabs aims for being self-sustainable.

Ronald Postma:

Kitchen appliance to grow mushrooms was the project.

Plugin Neon for Rhino and downloaded Bongo.

Sub-species of game-laptops – that have a good cpu, can be a good choice for modeling.

Pressure sensitive skateboard – modeled in Antimony.

Sabine Chacuchi

2D Sketching and paper prototyping

Make Human – software: <http://www.makehuman.org/>

EMG – stay away from. Wear excelerometer.

Blender – math engine can not do some things that Antimony can do.
Blender has a steep learning curve, necessary to go through some tutorials.

Roy – a programmer
Wants to make toys...

Shared tutorial – a place where you can leave your legacy

Or Shoval – free energy project, which is not doable

Antimony – by far with the best math engine

SVG – vectorising a drawing
Sketching – Inkscape

Tutorials:

<http://gomediamedia.us/zine/tutorials/from-sketch-to-vector-illustration/>
https://www.youtube.com/watch?v=_SvG0iq0d24

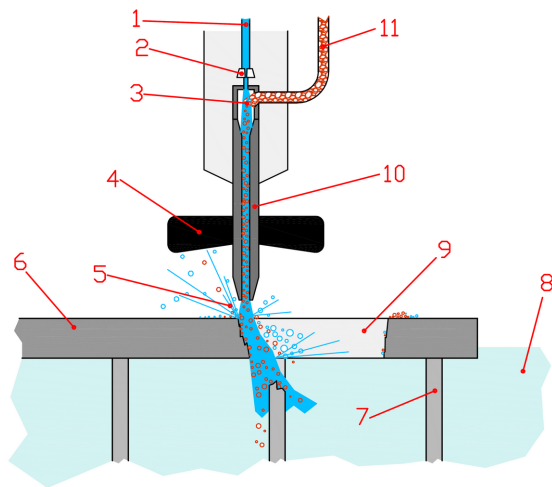
Roland -

Assignment: furniture, lights or an object

Cutting with a knife, flexible tool and neglected
Laser – laser cuts through materials



Waterjet – powerful, but expensive



Hot wire cutters – cutting foam, foil etc



CAM

The fabmodules started for internal research use: <http://fabmodules.org/>

Input format:

Common workflows for all the machines

Printer drivers build-in presumptions

Vynil Cutter



Anything you can cut with a knife you can cut on a vynil cutter.

Special material to cut into: vynil, acrylic

Masking tape -

White roll of tape -

Transfer tape -

Setting depth, speed and the force of your cutting. Turning to set the depth of cut, cutting through the top layer, not the bottom layer.

Testing your cutting

Apply the masking tape to the backing and weed, using tweezer. Common mistake not to treat the tweezers as fine tool. Pulling in plane. Lifting it off.

Othercutter Box Demo – YouTube

Take a .png – take onto the cutter in fabmodules

By default the Roland cutter to use this setting: calculate – diameter of the blade
0.25 – 1 – 50 – 1.5 – .5 – 3 – 1.1 – -1

Lasercutter

Engrave, mark things

Screenprint

Picture turned into a halftone – turn it into little holes

Make transparencies – varying the laser power

Cutting – Stick in slip

Static and a sliding friction, you press as a spring

Interesting designs

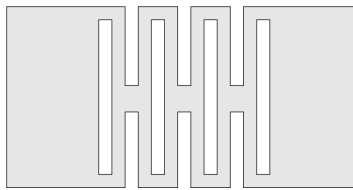
Too big, or too small – a very small fraction of an inch, find the tolerance of press fit. Try first out one fit. Then go and make a full project.

3 ways to make it parametric:

1. clones in inkscape - in my paint / angled face = chamfer
2. cutting hinges
3. lasers – so2

Degrees of freedom

Stage that move in 2 dimensions




Deferred Procrastination co. uk



Need to offset for the tool

DIY lasers emerging

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Create a square indented shape in Inkscape:

Measure thickness of material

Remember to set the mm

Set color of fill

Make a square

Cut out 2 pieces

Make the parts in Inkscape exactly like you want them to be

Give the line 0.2 thickness

Path – Stroke to path

File – Save PDF, make sure that “Export area is drawing”

Vynilcutting

Preparation of drawing can be done in photoshop and illustrator, as well as in inkscape.

I selected a photo of a hand to hold the apple on my computer and worked on the image in Photoshop where it was resized and adjusted (Adjustment – Threshold) to create a black and white image. This was further worked on and the image redrawn and saved as a .png. It was then taken into Illustrator, where I did a conversion on it, to change it into a vector drawing. Object – Image Trace – Make. Then the image was saved as a .pdf.

There are instructions on vynilcutting on the Fab Lab Reykjavik webpage:
http://wiki.fablab.is/wiki/Skera_%C3%BA%t_l%C3%ADmmi%C3%B0a#Youtube

The image preparation:

- Við hönnun á vektormynd sem á að skera út er gott að notast eingöngu við fyllingu og engar útlínur eða öfugt (þ.e.a.s engar fyllingar og aðeins útlínur sem eru 0,01 mm á þykkt).

- Sjá stillingar [Object-> Fill and Stroke](#) og hafa No Fill).
- Best er að vista Inkscape skjalið í PDF formi og skera þannig út.

The Roland Vynil Cutter:

Activation and settings:

- Kveikið á Roland vinylskeranum.
- Ákveða lit sem á að nota.
- Setjið efni í Roland vinylskerann. Hægt er að setja efnið í að framanverðu sem og að aftanverðu.
- Láta efnið ná fram yfir ljósnemann sem er framan á vélinni. Skerinn sker á efnið milli hjólanna tveggja.
- Hjólin eru stillt með því að færa þau til ofan á efnið. Vinstra hjólið á að vera staðsett nálægt endanum vinstra megin eða á hvíta breiða svæðið. Hægra hjólið á svo að vera við þá reiti sem eru merktir eru með hvítum límmiða.
- ATH hægt er að losa um á bakhlið til að setja inn efnið, eftir það verður að læsa bakhliðinni aftur.
- Smellið á pílur upp eða niður sem eru hægra megin á skeranum og veljið Edge ef notaður er bútur en Roll ef notuð er rúlla.
- Síðan er smellt á Enter á vinyl skeranum.

Cutting:

- Veljið File > Print > Roland GX 24.
- Veljið Preferences > Smella á Get data from Machine.
- Ef notuð er rúlla er ágætt að setja lengd skjalsins inn. Smella á File > Properties. Neðarlega á síðunni sést Page size. Seinni talan er lengd skjalsins sem færa þarf inn í File > Print > Properties > length. Þá er smellt á OK.
- Ef notaður er bútur þarf ekki að setja inn lengdina heldur sér skerinn sjálfur um að skanna bútin og veit því stærð hans.
- Áður en skorið er út þarf að stilla Page Scaling á NONE
- Og taka hakið af Auto Rotate and Centre.
- Smellið svo á OK eða Print.
- Ef hætta á við aðgerð, Unsett er smellt tvisvar á Menu á skeranum.

See further description on website:

http://fabacademy.org/archives/2015/eu/students/kjartansdottir.skulina_hlif/assignments/week3.html