Introduction to Personal Fabrication

CTHCI'24 – René Schäfer

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Dark Patterns
Textile Interfaces

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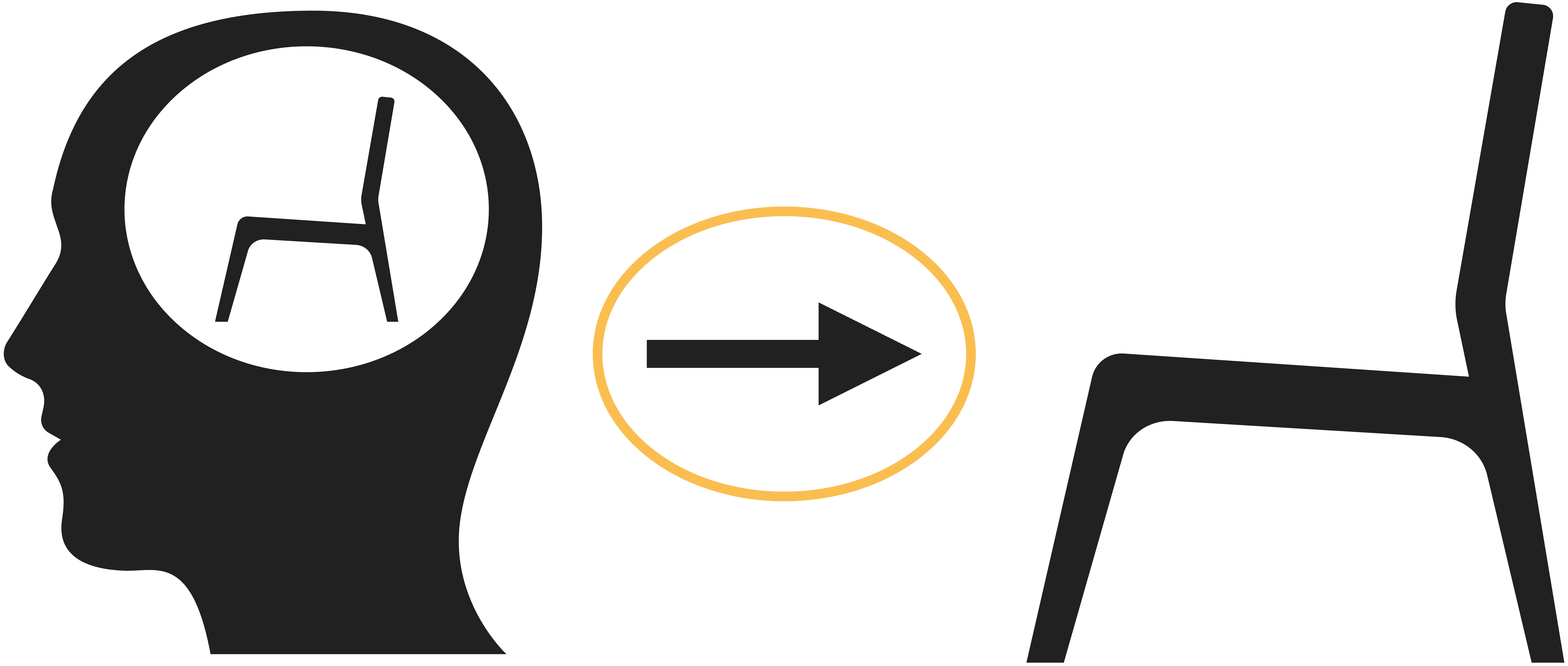
What is Personal Fabrication?



How can we empower **everyone** to create physical objects with ease?

Digital Fabrication

Digital fabrication tools turn bits into atoms, i.e. they create **material objects** from **digital designs**.

- Catarina Mota, The Rise of Personal Fabrication, C&C'11

https://www.bernina.com

Artwork
Embroidery
Library
Convert
New
Open
Recent
Save
Print
Preview
Write
Cut
Copy
Paste
Undo
Redo
Embroidery
Artwork
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Stamp
Morphing
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Size -20%
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Right 45°
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Position Y: 0.00 mm
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Height: 0.00 mm 100.00 %
Artistic
Dim
Stitches
Outlines
Points
Connectors
Bitmaps
Vectors
StumpWork
Appliqué Fabric
Hoop
Template
Grid
Rulers
Area
Toolboxes
Edit
Auto-Digitize
Digitize
Open Object
Closed Object
Open Freehand
Closed Freehand
Block
Ellipse
Rectangle
Lettering
Monogramming
Appliqué
Advanced Appliqué
PunchWork
Buttonhole
Buttonholes
Pattern Stamp
Basting Stitch Mar...
Insert Graphic Mar...
CutWork
StumpWork
Mirror-Merge
Layout
Arrange
Multi-Hooping
Applications
Profiles_W
Color Film
Overview Window
My Threads
Outlines:
Single
Triple
Sculpture
Backstitch
Stemstitch
Zigzag
Satin
Raised
Blanket
Blackwork
Candlewick
Pattern
Fills:
Step
Satin
Raised
Fancy
Sculpture
Ripple
Contour
Blackwork
Candlewick
Lacework
Pattern
Cross
Run
Stemstitch
Backstitch
Underlay
Edge
Corners
Couching
Star
Wave

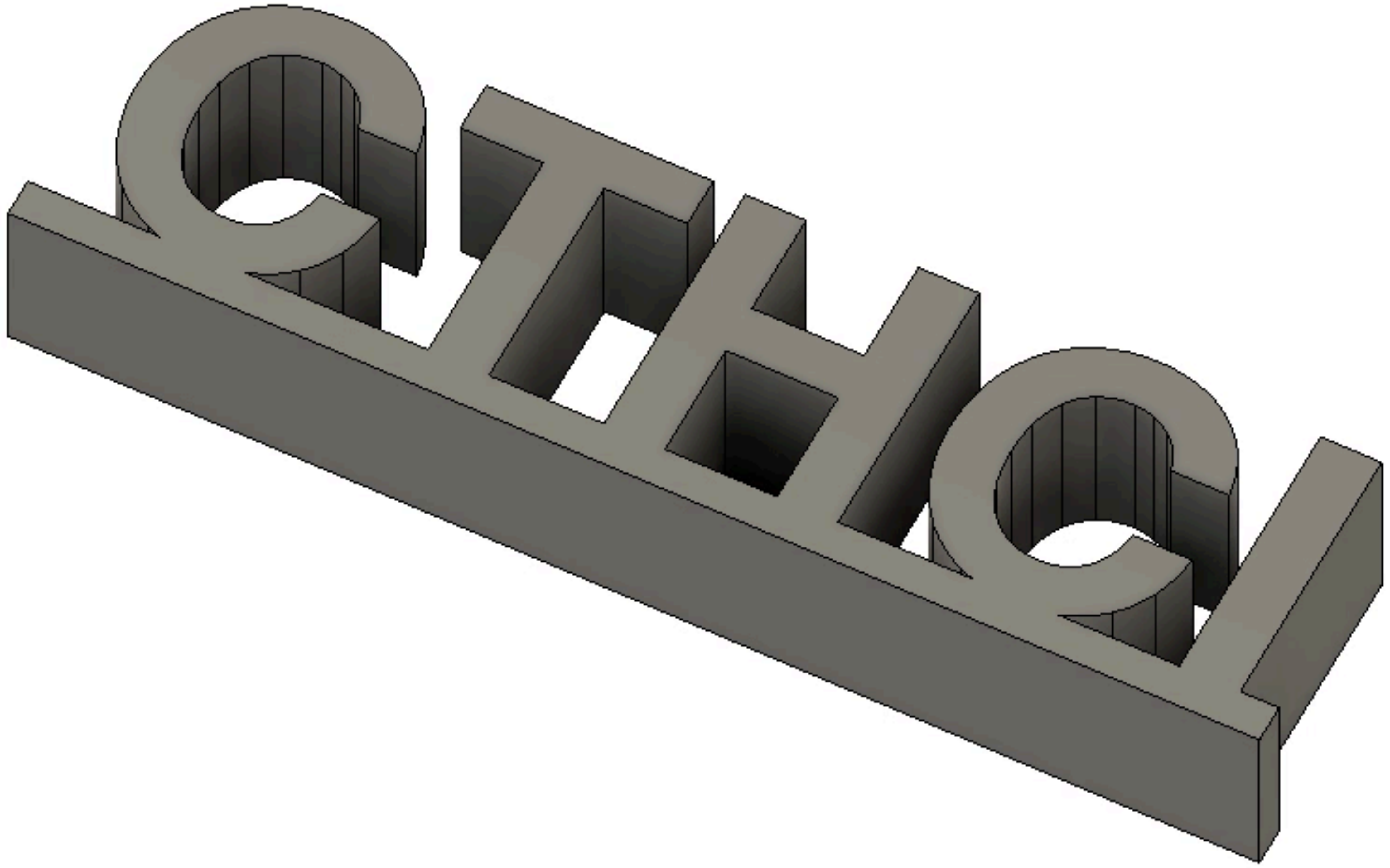
Shaping Textile Sliders

Nowak et al., CHI’22

Textile Icons

Schäfer et al., CHI’23

Autodesk Fusion 360


CTHCI

Digital fabrication tools turn bits into atoms, i.e. they create **material objects** from **digital designs**.

- Catarina Mota, The Rise of Personal Fabrication, C&C'11

Additive Manufacturing

Source: Ultimaker Press Room Images

https://formlabs.com/

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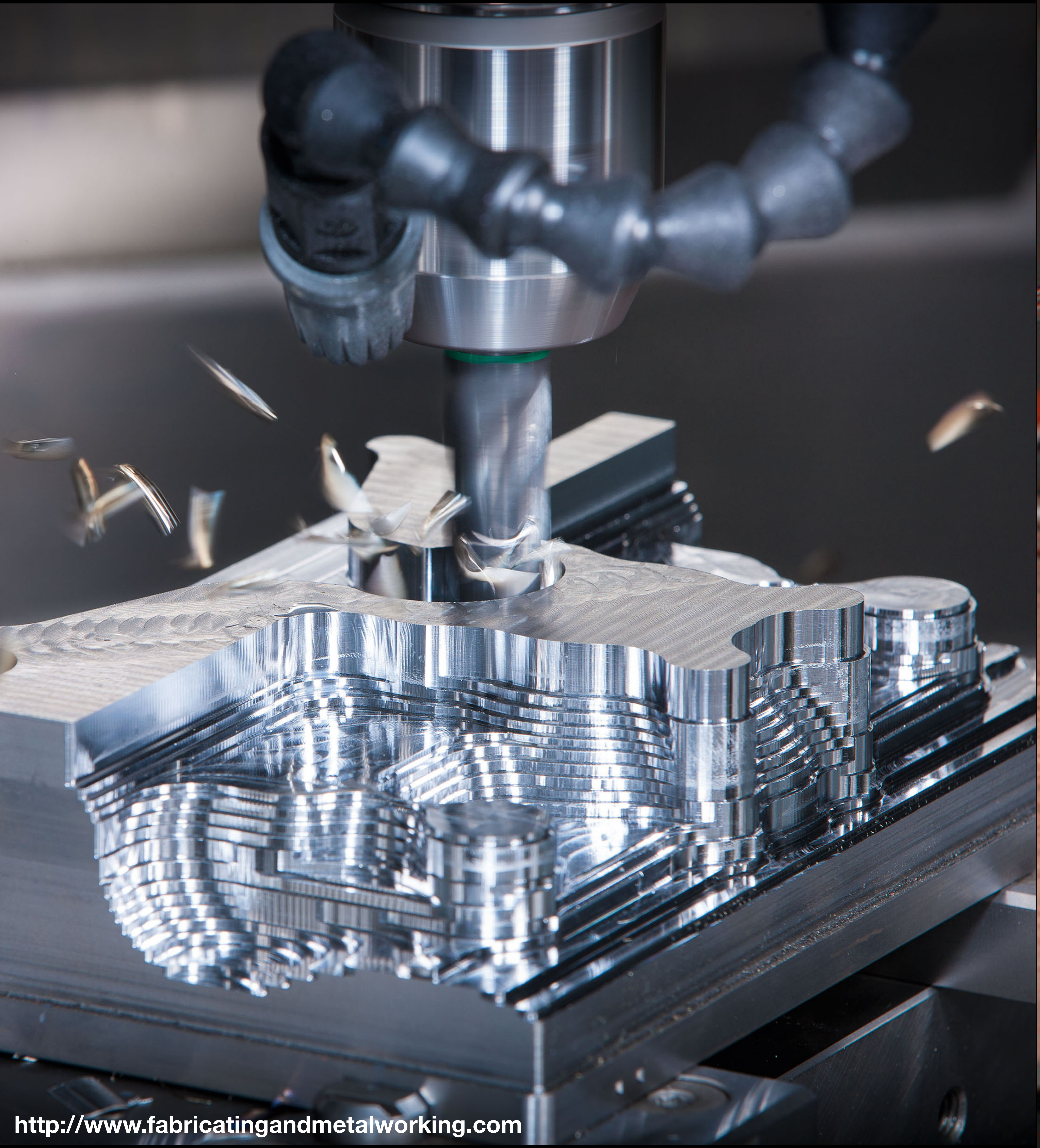
Subtractive Manufacturing

Machining a Jewelry Mold on a 5 axis CNC by NSCNC – Licensed under Creative Commons: By Attribution 3.0 License


http://www.fabricatingandmetalworking.com

http://en.hglaser.com

Prof. Neil Gershenfeld

One of 1,000+

TEDTalks

New ideas every weekday

TED.com

https://www.ted.com/talks/neil_gershenfeld_on_fab_labs#t-772771

FAB LAB

Lasercutter
Was macht er?
Wie geht's?
Materialien
Was geht noch?
Proxxon
EPILOG LASER
FUSION M2
Resistors & Potentiometers
Capacitors, loudspeakers, microphones, diodes, LEDs, transistors
SMD-components
Zollstock, Kleber & Bü
RWTH AACHEN UNIVERSITY

The Fab Charter

draft: October 20, 2012

What is a fab lab?
Fab labs are a global network of local labs, enabling invention by providing access to tools for digital fabrication

What's in a fab lab?
Fab labs share an evolving inventory of core capabilities to make (almost) anything, allowing people and projects to be shared

What does the fab lab network provide?
Operational, educational, technical, financial, and logistical assistance beyond what's available within one lab

Who can use a fab lab?
Fab labs are available as a community resource, offering open access for individuals as well as scheduled access for programs

What are your responsibilities?
safety: not hurting people or machines
operations: assisting with cleaning, maintaining, and improving the lab
knowledge: contributing to documentation and instruction

Who owns fab lab inventions?
Designs and processes developed in fab labs can be protected and sold however an inventor chooses, but should remain available for individuals to use and learn from

How can businesses use a fab lab?
Commercial activities can be prototyped and incubated in a fab lab, but they must not conflict with other uses, they should grow beyond rather than within the lab, and they are expected to benefit the inventors, labs, and networks that contribute to their success

http://fab.cba.mit.edu/about/charter/

Who can use a fab lab?
Fab labs are available as a community resource, offering open access for individuals as well as scheduled access for programs

How do we connect this to HCI research?

Creality Ender 3 3D Printer

5 reviews

Sale €179,00 ~~€199,00~~ 7 AVAILABLE

SHIP FROM

Czech

OPTIONS

Ender 3

QUANTITY

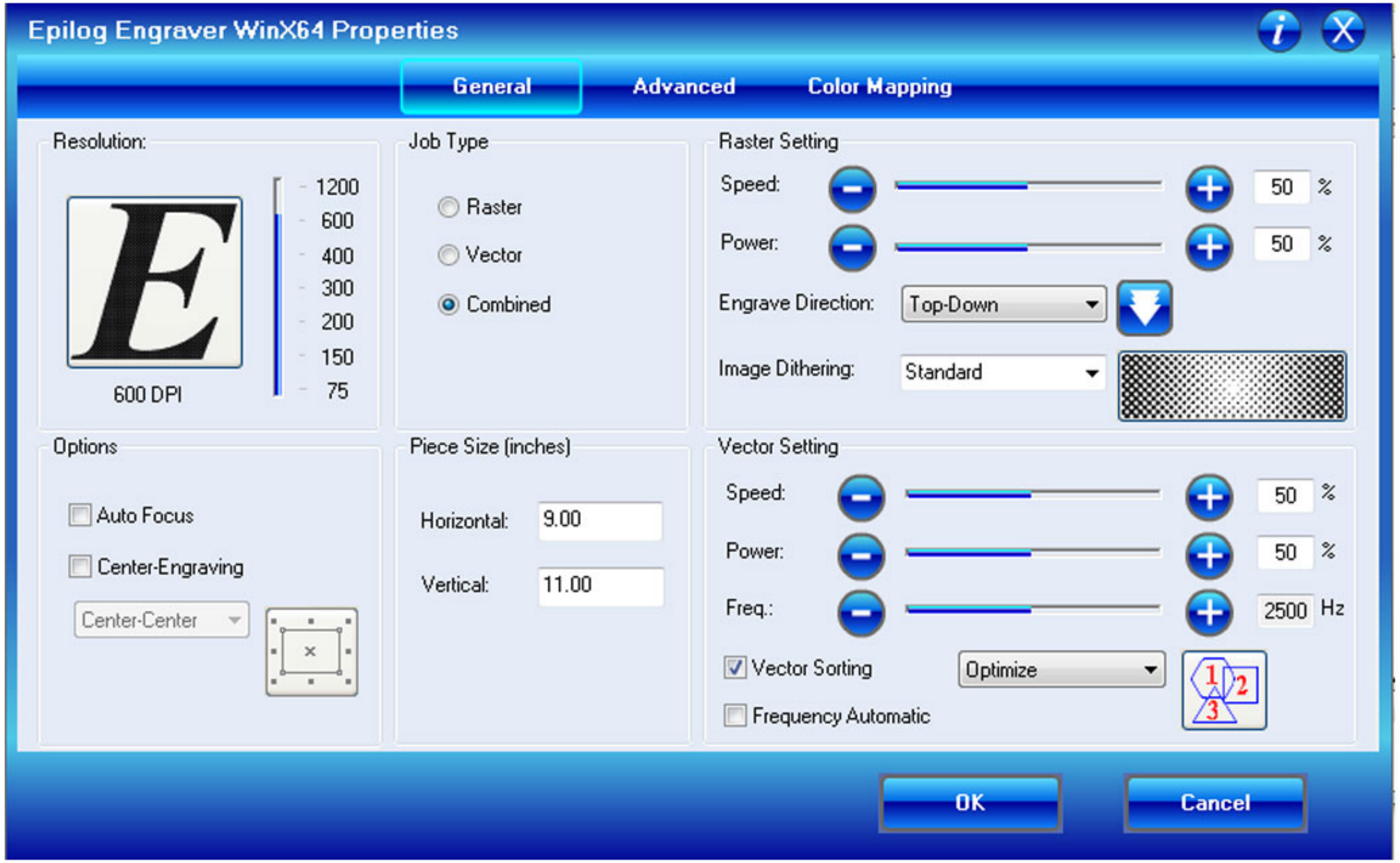
– 1 +

Add to Cart

Buy it now

https://www.creality.shop/products/ender-3-3d-printer – 23th June 2023

Interfaces


Epilog Engraver WinX64 Properties
General
Advanced
Color Mapping
Resolution:
1200
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300
200
150
75
600 DPI
Job Type
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Vector
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Raster Setting
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Power:
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Top-Down
Image Dithering:
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Auto Focus
Center-Engraving
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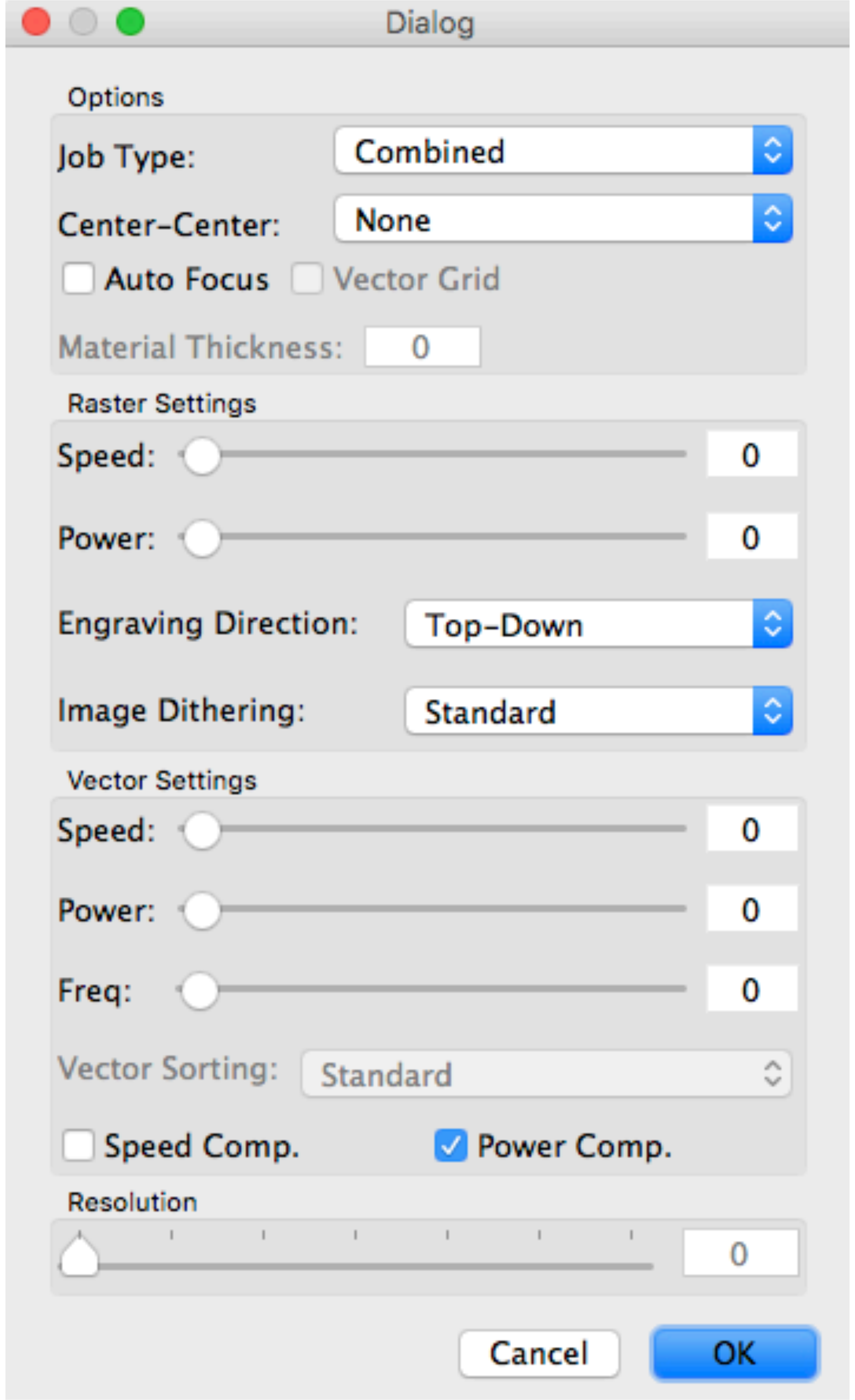
Dialog
Options
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Material Thickness:
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Image Dithering:
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Vector Settings
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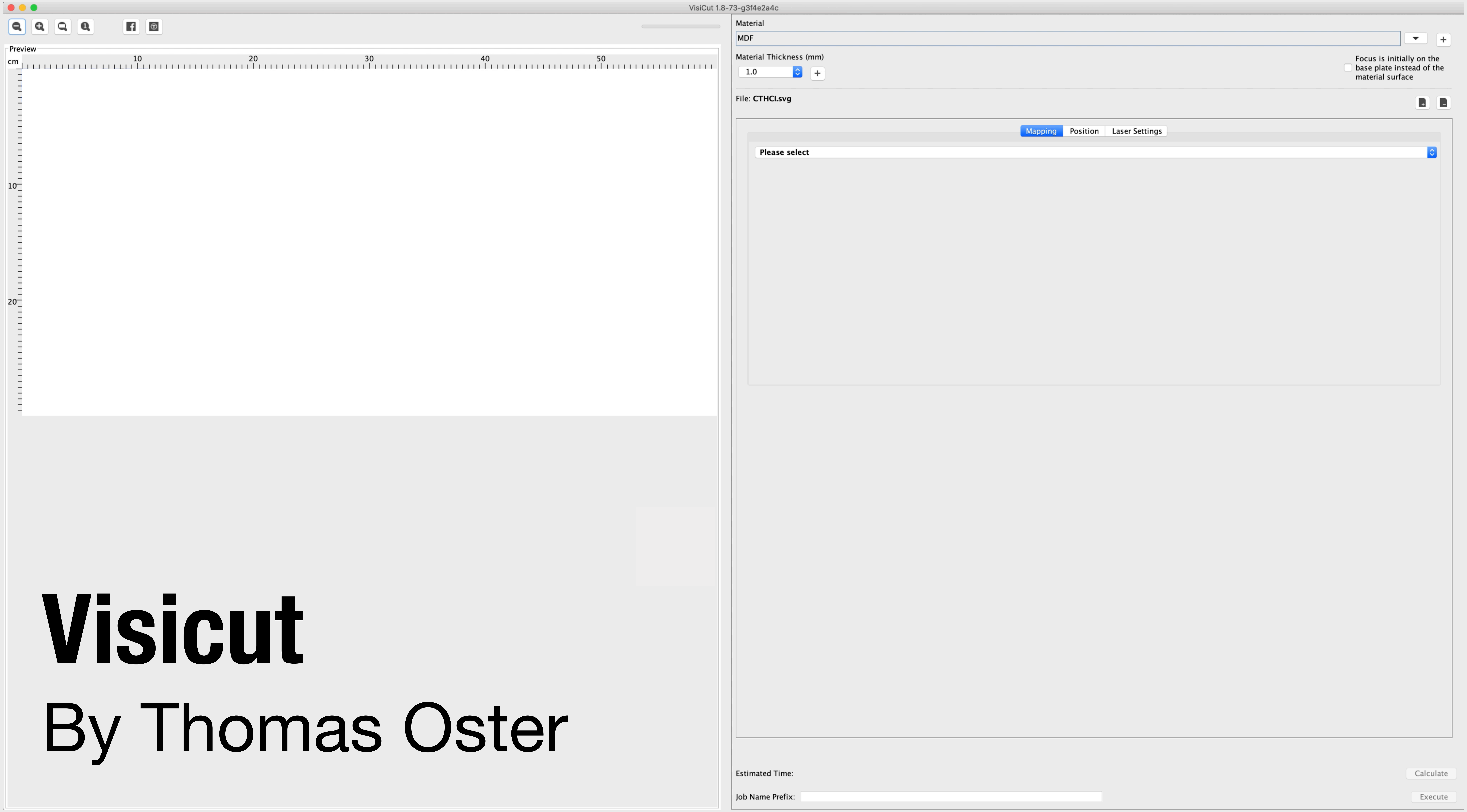
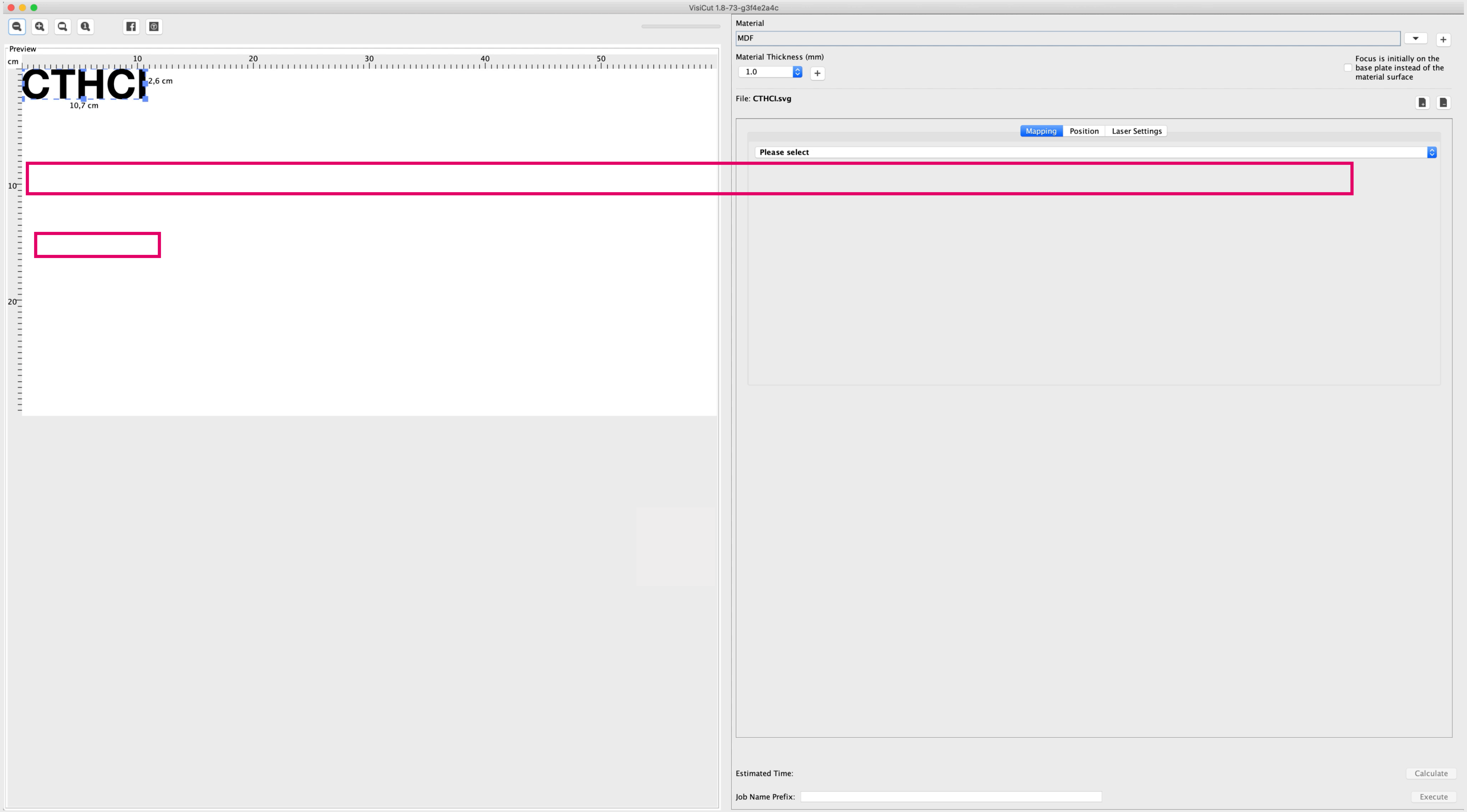
OK

Visicut

By Thomas Oster




VisiCut 1.8-73-g3f4e2a4c
Preview
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20
CTHCI
2,6 cm
10,7 cm
Material
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Material Thickness (mm)
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Focus is initially on the base plate instead of the material surface
File: CTHCI.svg
Mapping
Position
Laser Settings
Please select
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Job Name Prefix:
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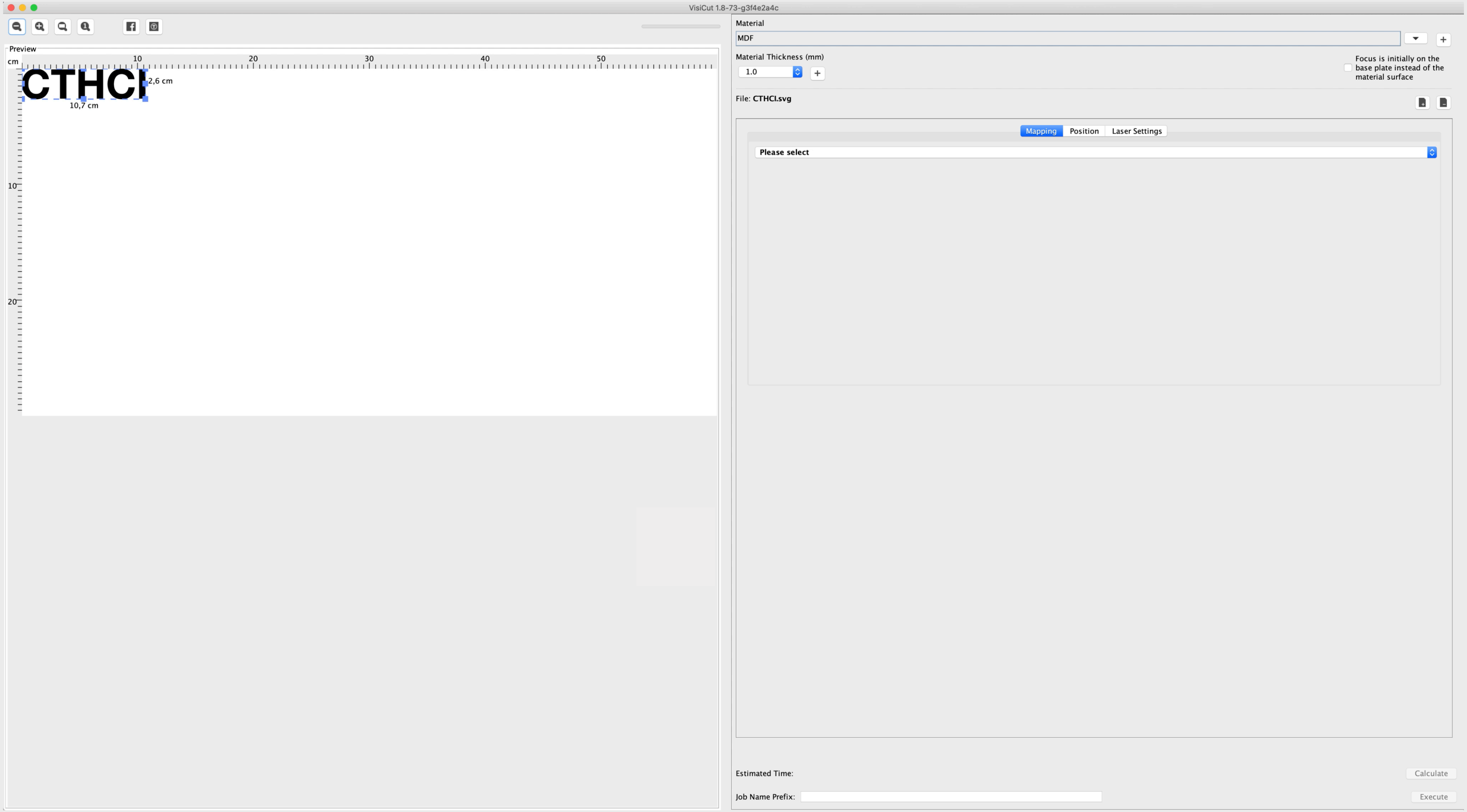
VisiCut 1.8-73-g3f4e2a4c
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CTHCI
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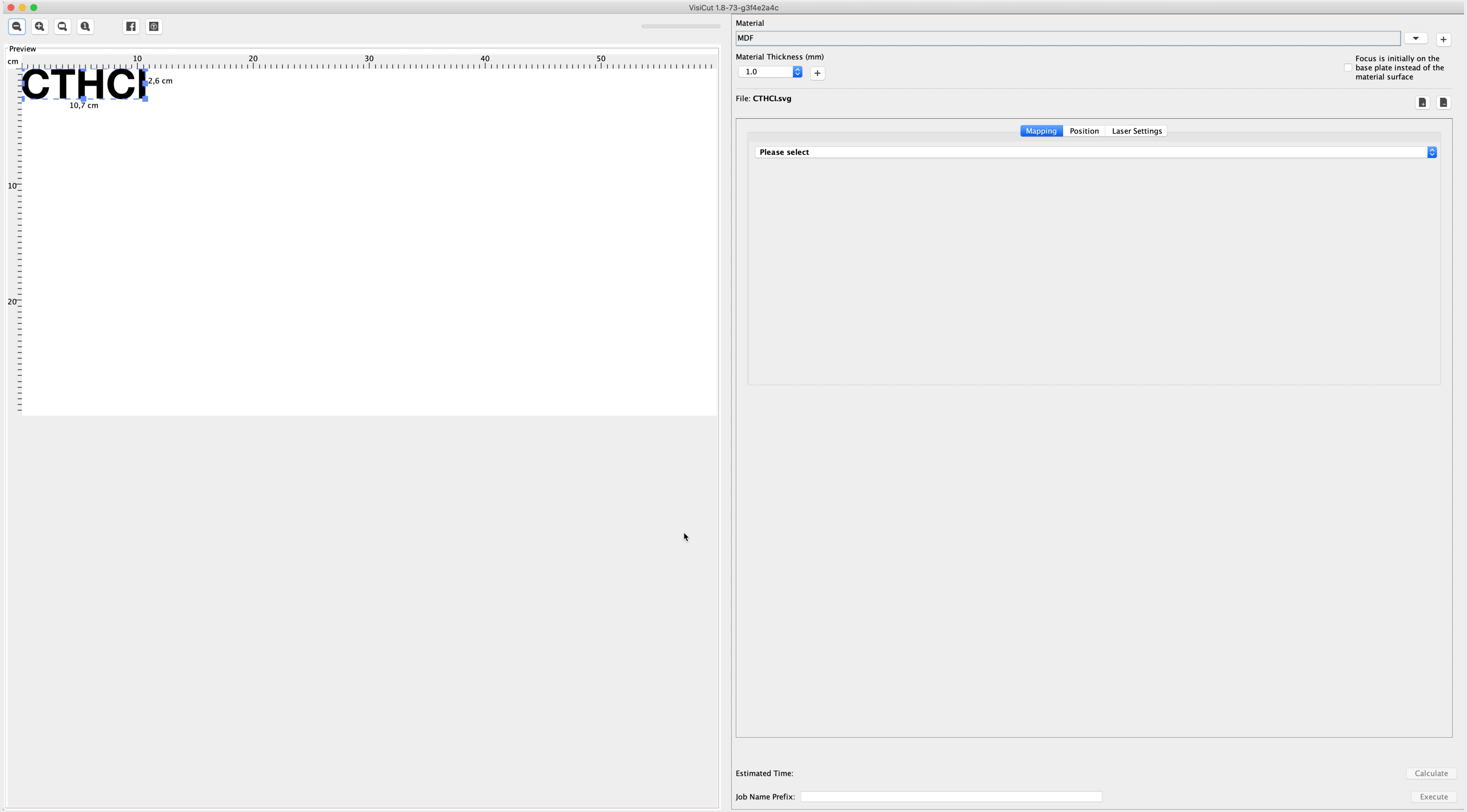
VisiCut 1.8-73-g3f4e2a4c
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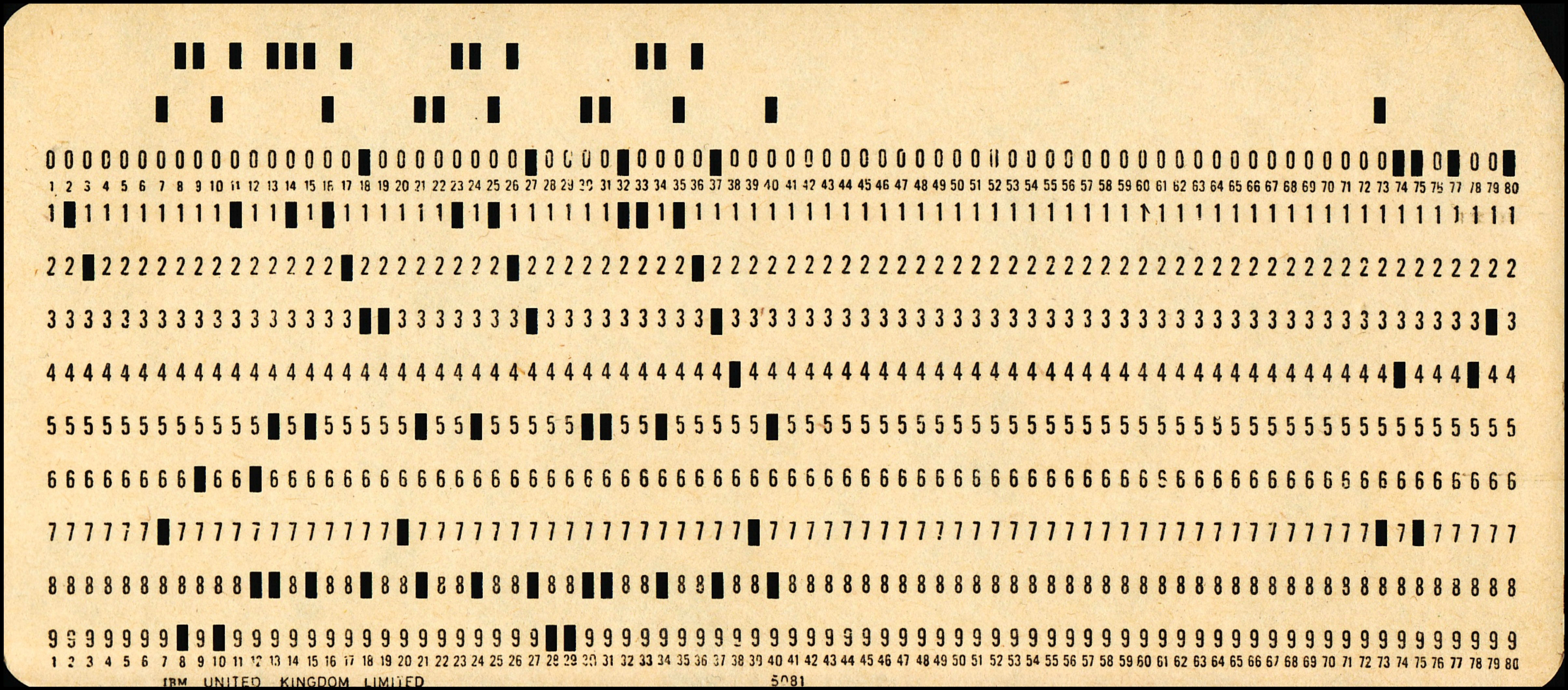
Processes


IBM UNITED KINGDOM LIMITED
5081

If we go back to the beginnings of interactive computing, early computer users were probably reasonably happy placing their punch cards into the reader and **waiting for their out-put** to arrive hours later—which is pretty much where 3D printing stands today

- Patrick Baudisch, Personal Fabrication in HCI: Trends and Challenges, AVI'16

ReForm: Integrating Physical and Digital Design through Bidirectional Fabrication

Christian Weichel
John Hardy
Jason Alexander
Hans Gellersen

From Lancaster University

UIST'15

Christian Weichel
John Hardy
Jason Alexander
Hans Gellersen

Lancaster University

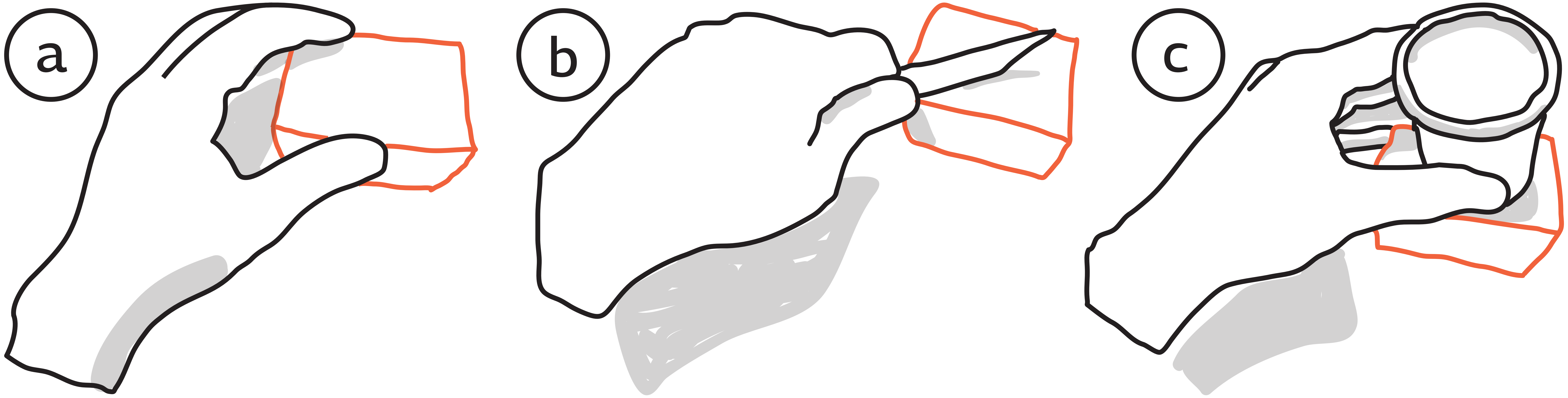
ReForm

Integrating Physical and Digital Design through Bidirectional Fabrication

video: Robert Potts and Daniel Morrell (Ourus LTD)

Bidirectional Fabrication

Physical Shaping



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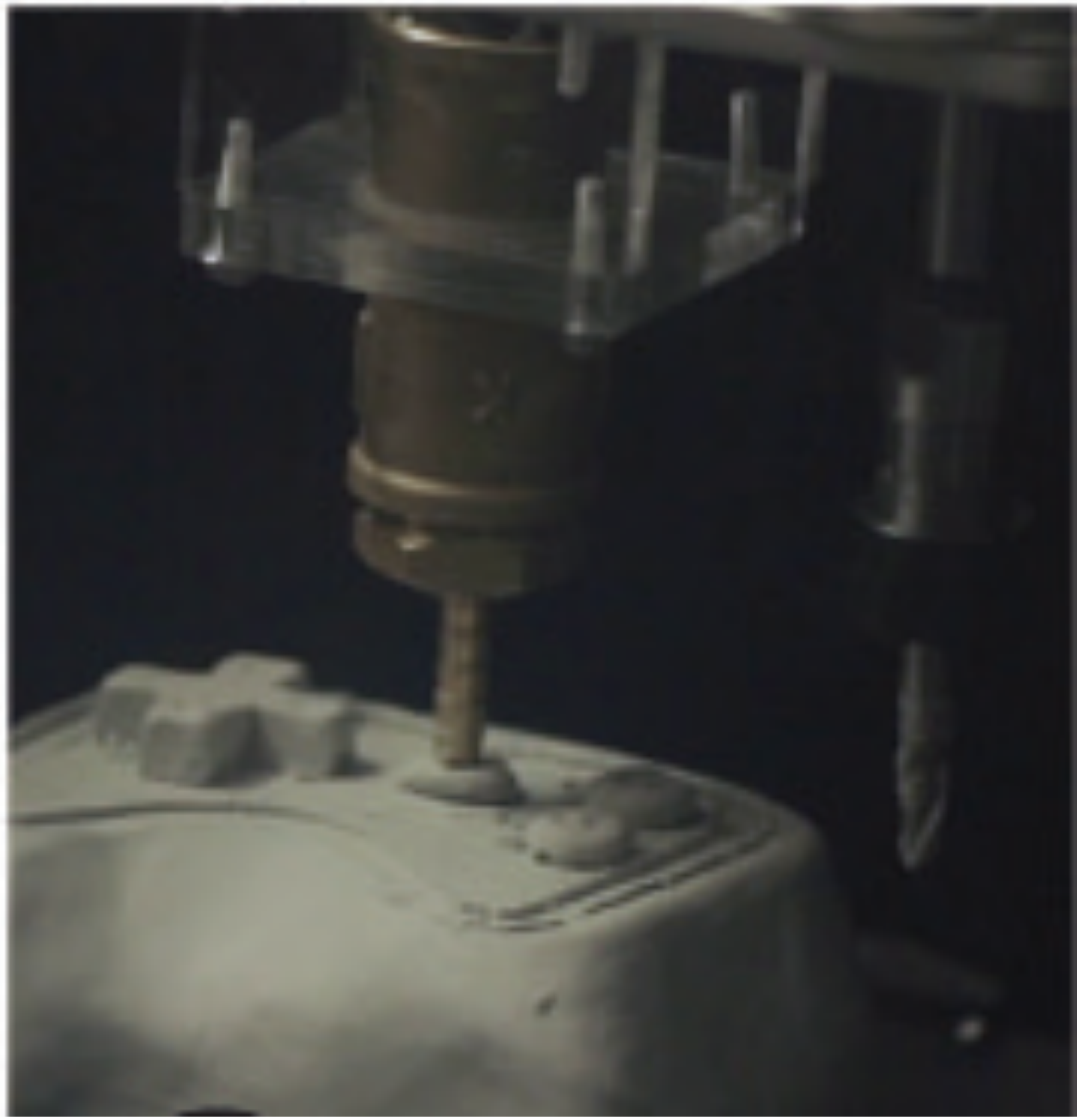
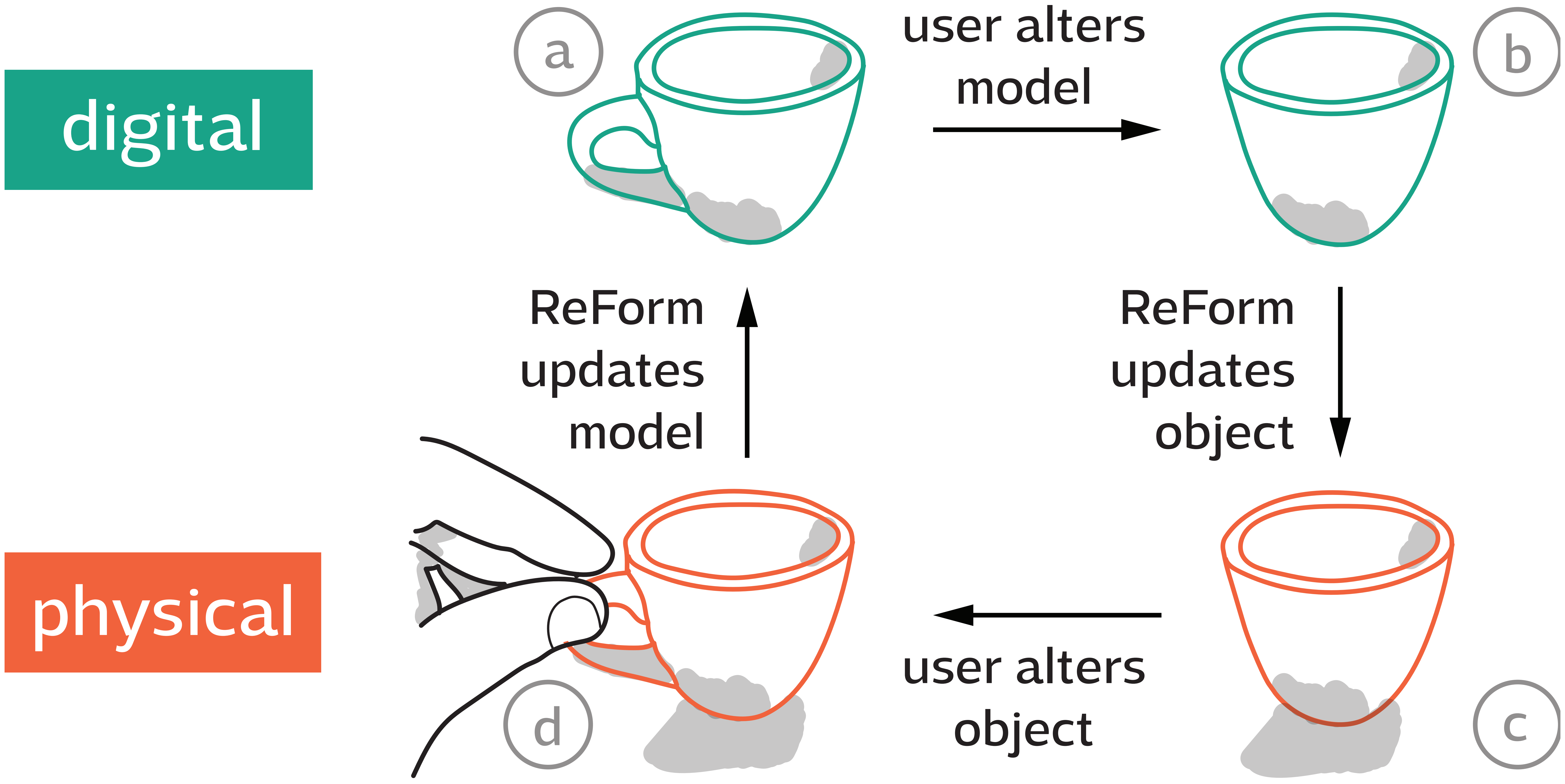


Print


digital
physical
a
user alters
model
b
ReForm
updates
model
ReForm
updates
object
d
user alters
object
c

Toolkits

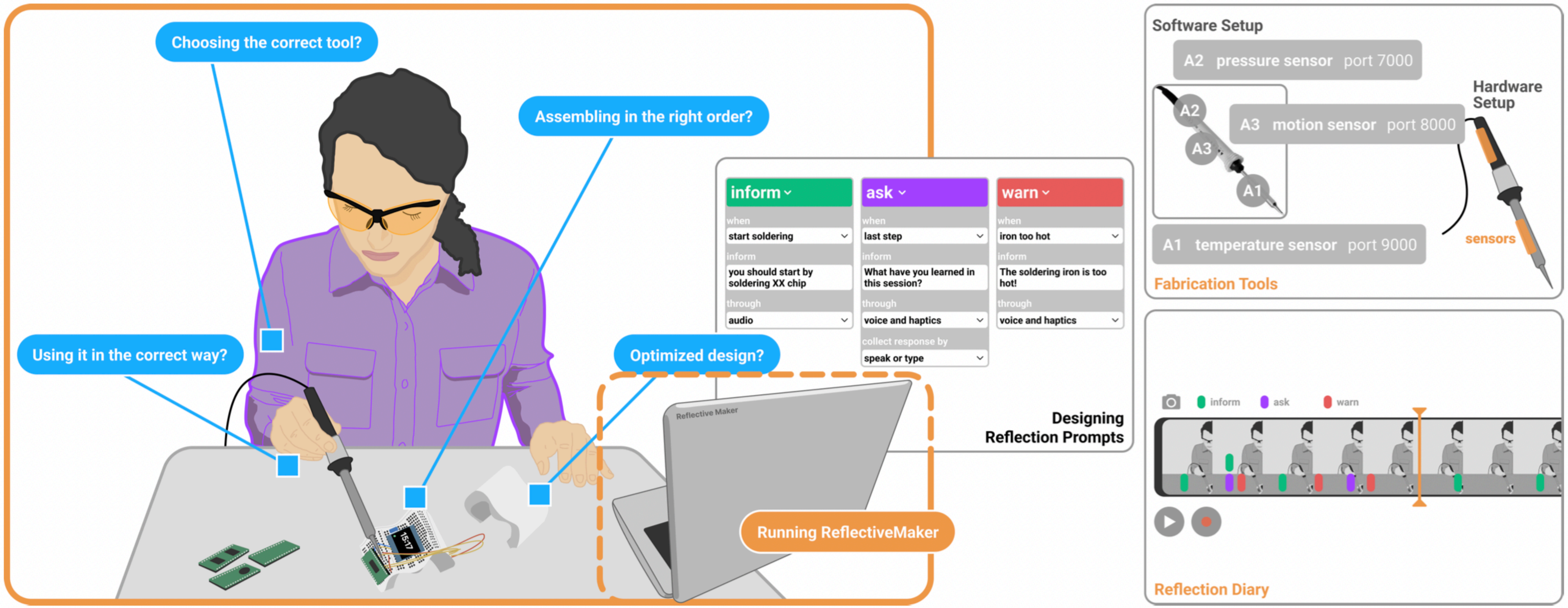
Kyub: A 3D Editor for Modeling Sturdy Laser-Cut Objects

Patrick Baudisch
Arthur Silber
Yannis Kommana
Milan Gruner
Ludwig Wall
Kevin Reuss
Lukas Heilman
Robert Kovacs
Daniel Rechlitz
Thijs Roumen

From Hasso Plattner Institute

CHI'19


kyub



The Reflective Maker: Using Reflection to Support Skill-learning in Makerspaces

Dishita Turakhia
Peiling Jiang
Brent Liu
Mackenzie Leake
Stefanie Mueller

From MIT

CHI'22

Digital Fabrication

Manufacturing

Fab Labs

Novice Users

Research