



# LEARN TO MAKE, MAKE TO LEARN

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Camille Moussette, 04.03.2012, Haptics Symposium 2012

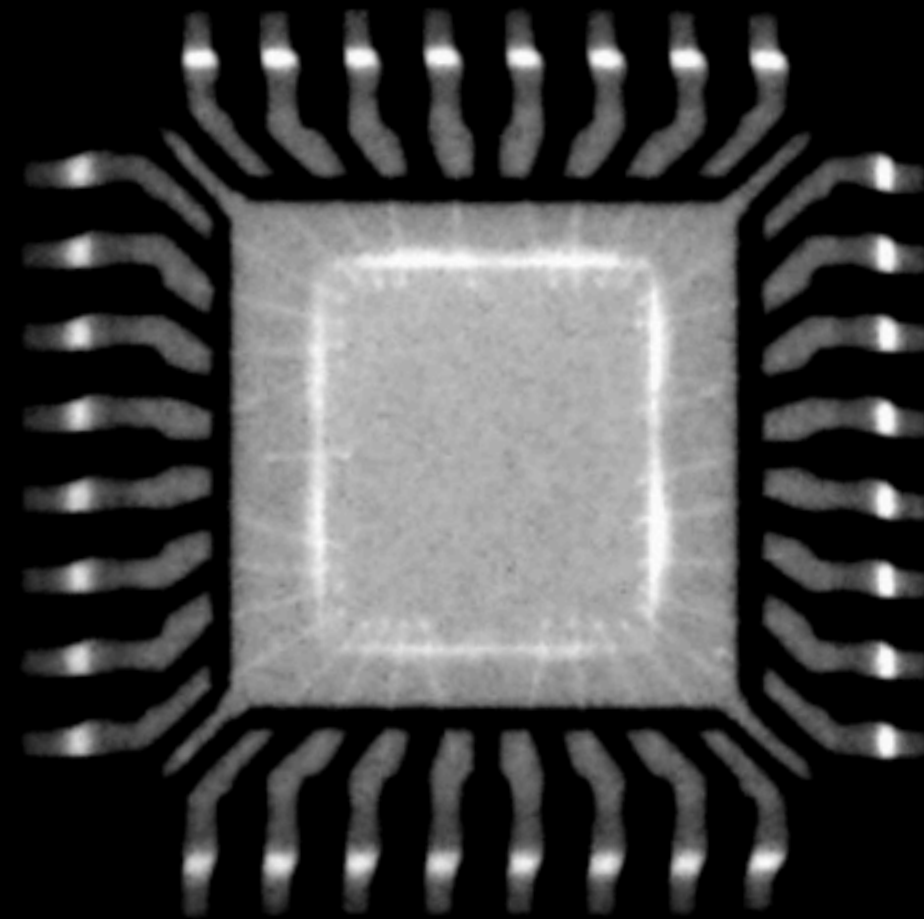


**CAMILLE MOUSSETTE**  
MONTREAL, CANADA





**PHYSICS, IBM, INDUSTRIAL DESIGN, FREELANCE,  
SWEDEN, INTERACTION DESIGN, PHD, TEACHING**



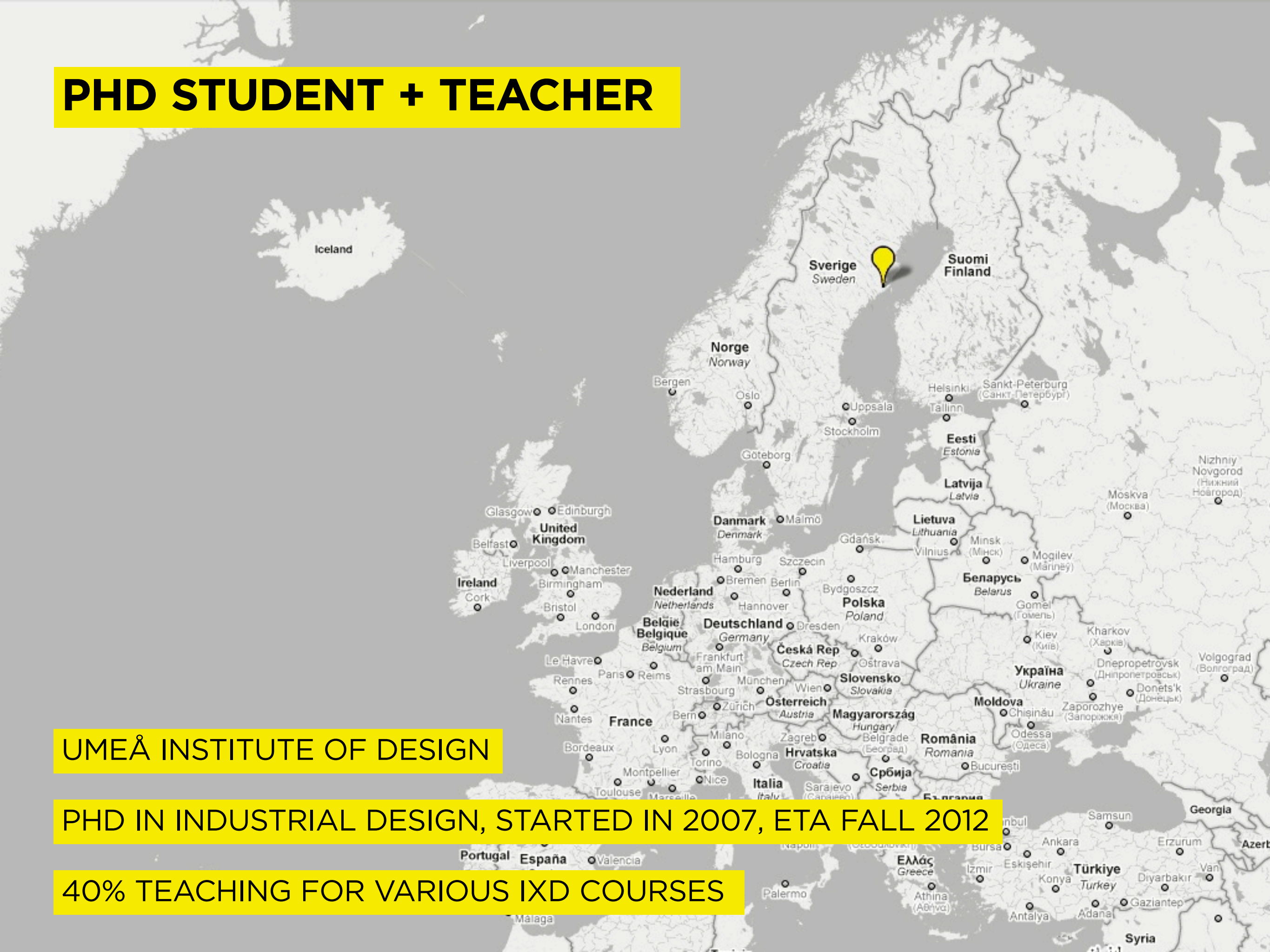
**IBM**

# PHD STUDENT + TEACHER

UMEÅ INSTITUTE OF DESIGN

PHD IN INDUSTRIAL DESIGN, STARTED IN 2007, ETA FALL 2012

40% TEACHING FOR VARIOUS IXD COURSES





PHD PROJECT

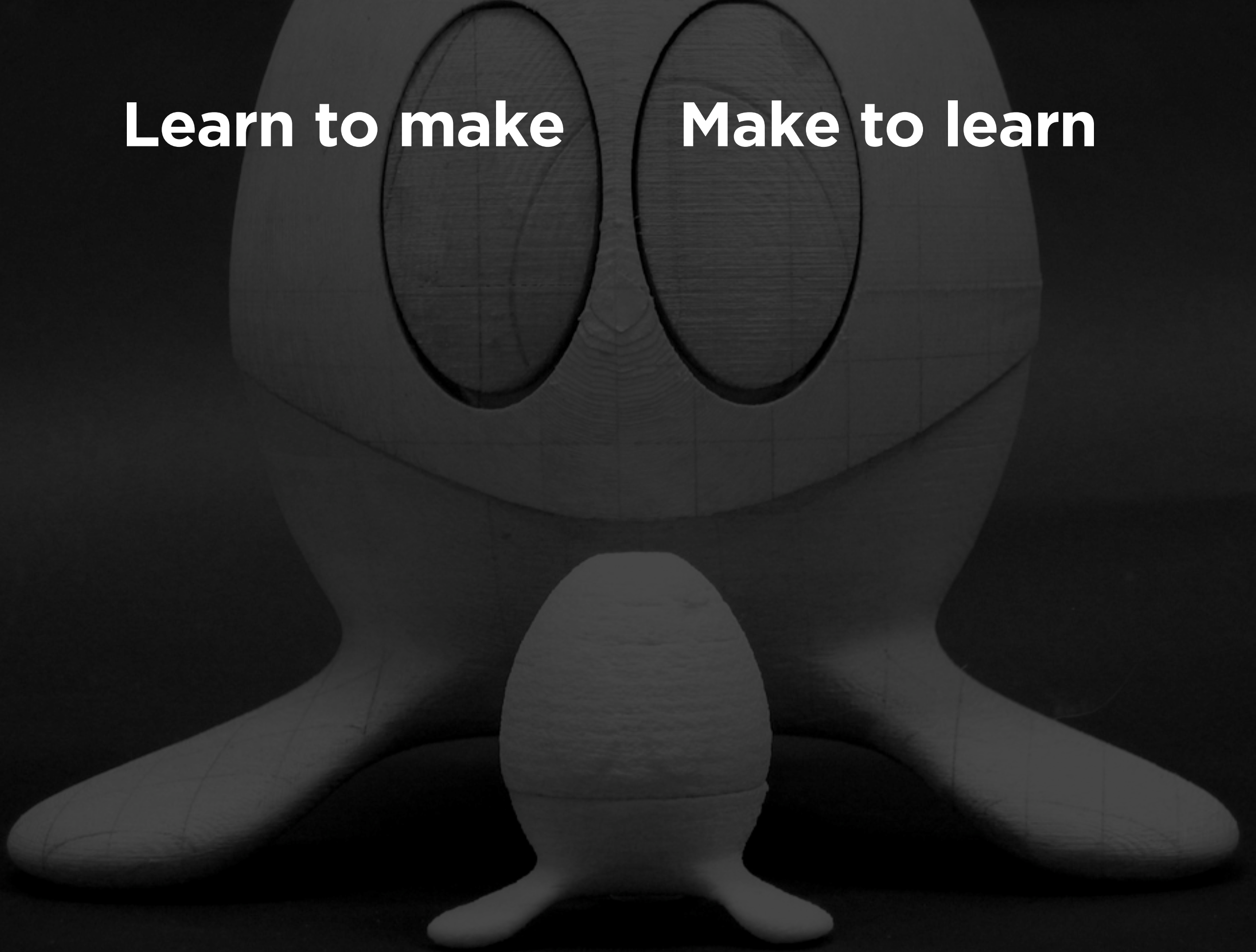
# SIMPLE HAPTICS, SKETCHING TOOLS FOR HAPTIC INTERACTION DESIGN

**DANIEL FÄLLMAN**, DIRECTOR - INTERACTIVE INSTITUTE UMEÅ

**BILL BUXTON**, PRINCIPAL RESEARCHER - MICROSOFT RESEARCH

**Learn to make**

**Make to learn**







# Learn to make

# Make to learn

Sensing and moving atoms

Hardware is hard!

Prototyping skills

Hardware sketches

Making/building challenges

# Learn to make

# Make to learn

Sensing and moving atoms

Hardware is hard!

Prototyping skills

Hardware sketches

Making/building challenges

Visual equivalent: build your monitor!

Platform to engage/discover haptics

Common/shared understanding

Affinity with your design materials

Variations and details



# **(EXPERIENCE) PROTOTYPING**

VS

# **SKETCHING (IN HARDWARE)**



**(EXPERIENCE) PROTOTYPING**

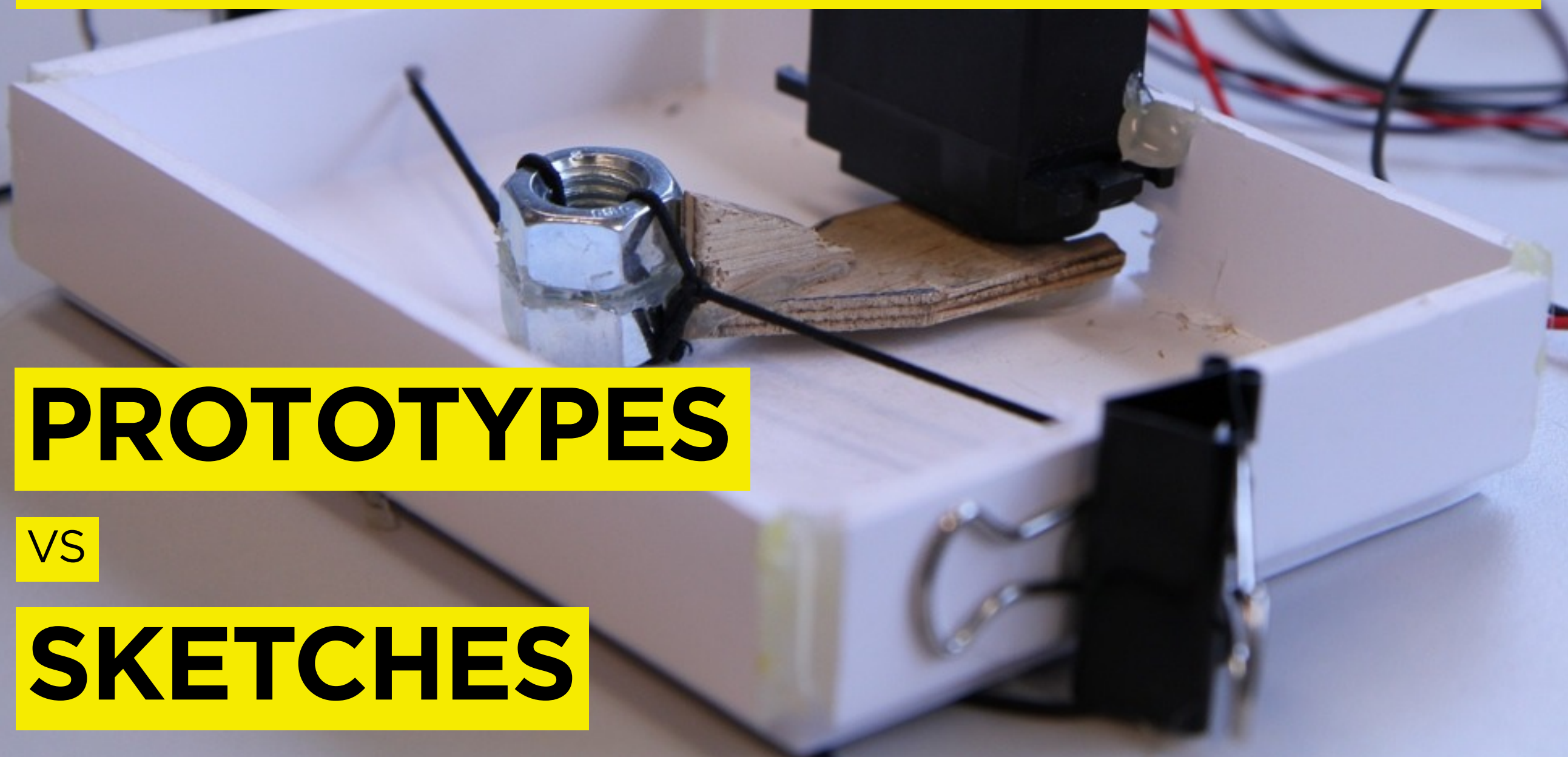
VS

**SKETCHING (IN HARDWARE)**

**PROTOTYPES**

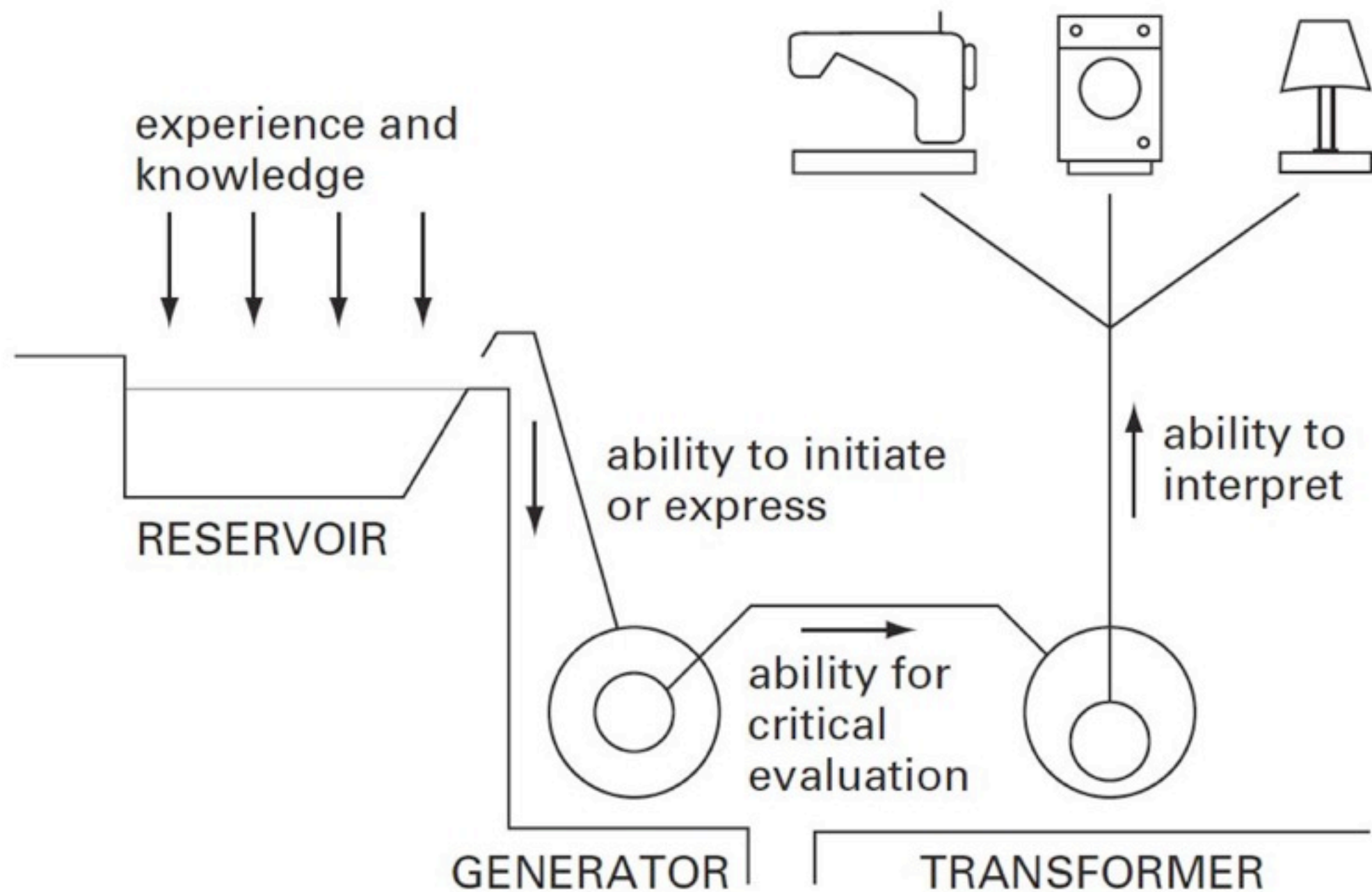
VS

**SKETCHES**





# Laxton's 3 design skills model (1969)



from How Designers Think, Bryan Lawson (2005)

"Bill Buxton brings design leadership and creativity to Microsoft. Through his thought-provoking personal examples he is inspiring others to better understand the role of design in their own companies."  
Bill Gates—Chairman, Microsoft Corp.

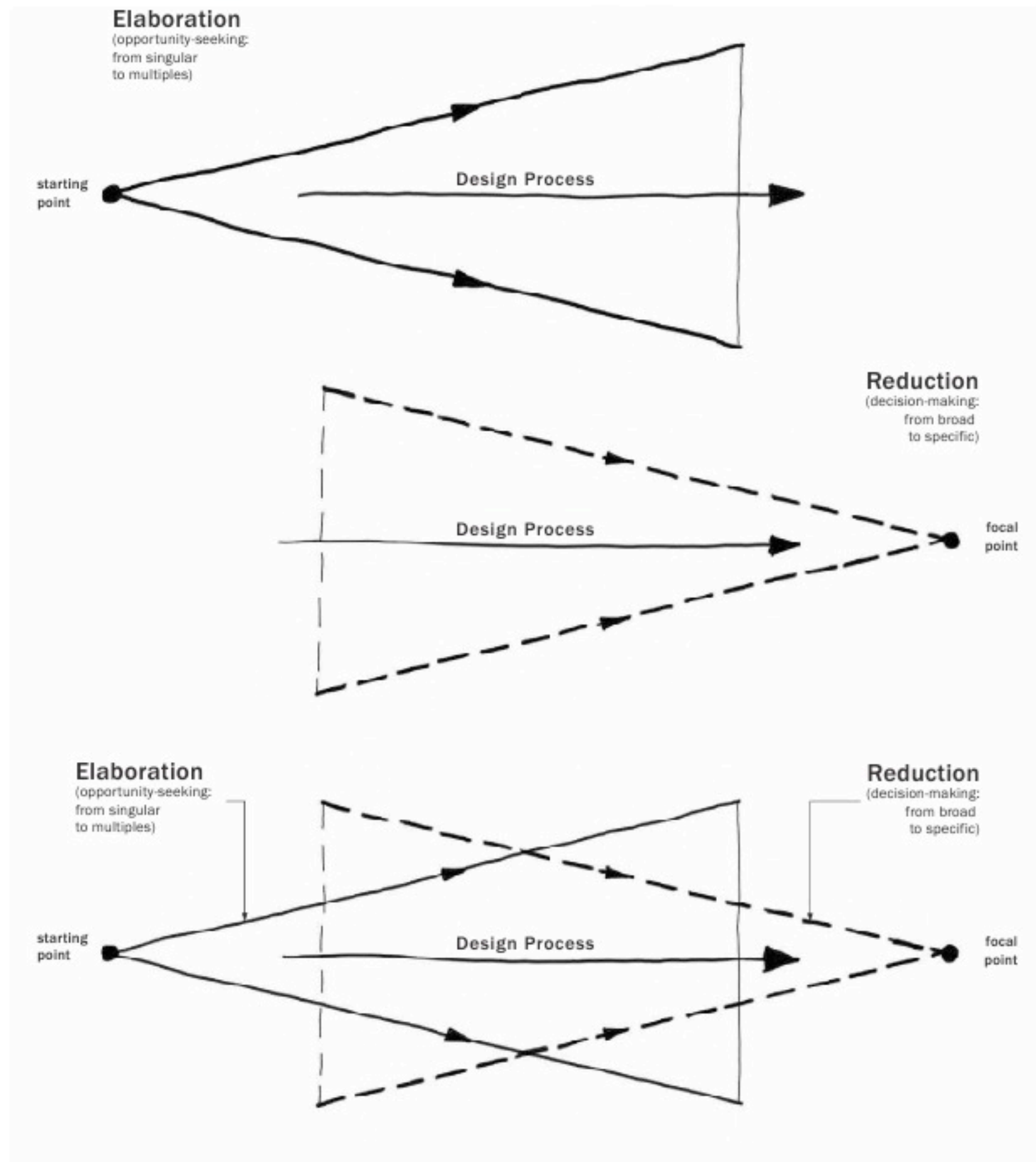
# Sketching User Experiences

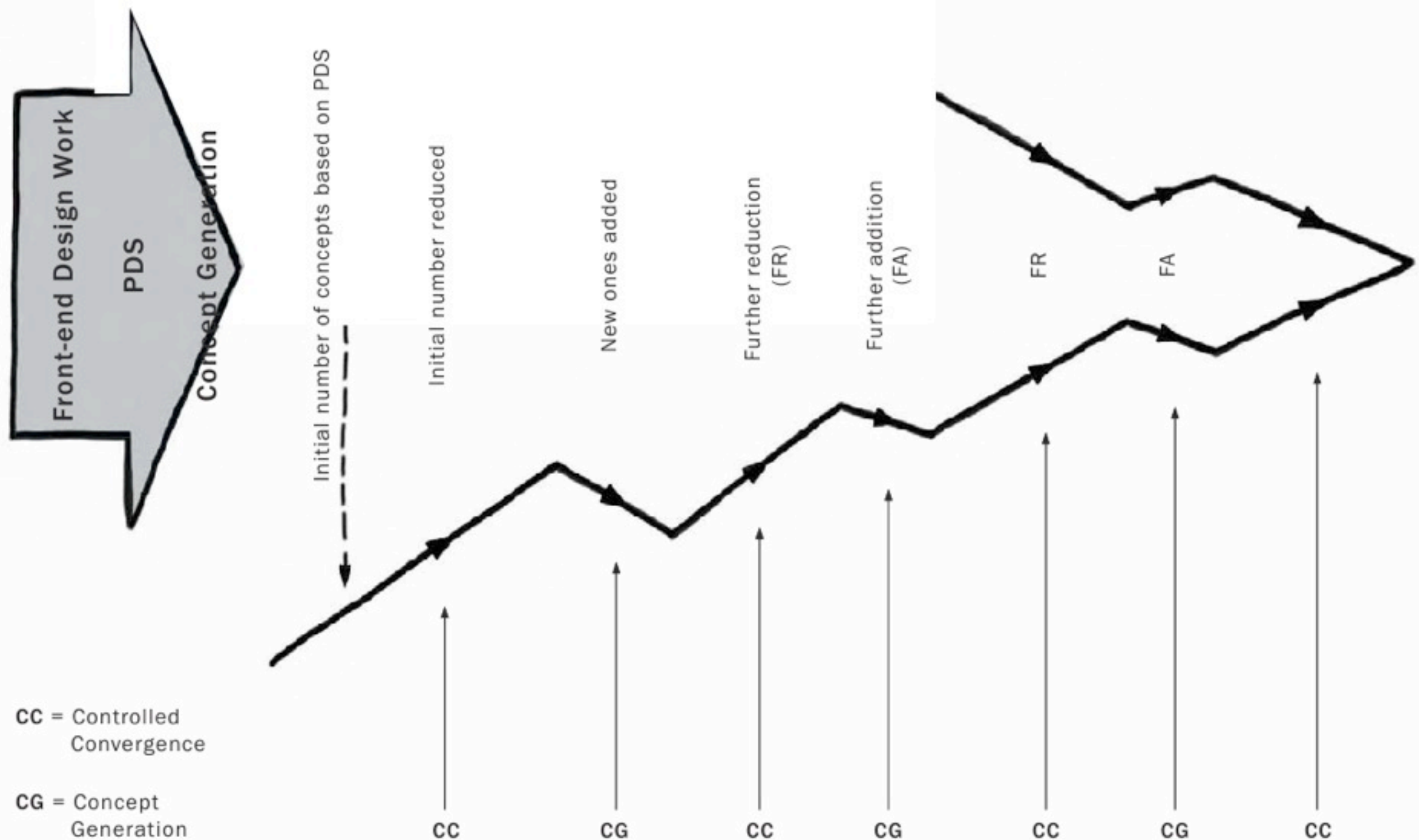
getting the design right and the right design

Bill Buxton

**MK**  
MORGAN KAUFMANN







**Figure 54: Flexible Approach to Concept Generation and Selection**

This is yet another variation on representing the design funnel. After the front-end design work and the Product Design Specification (PDS), we see the process alternating between concept generation (CG) and concept convergence (CC), with the overall process gradually converging to the final concept.

Source: Pugh 1990; p. 75

Buxton, 2007



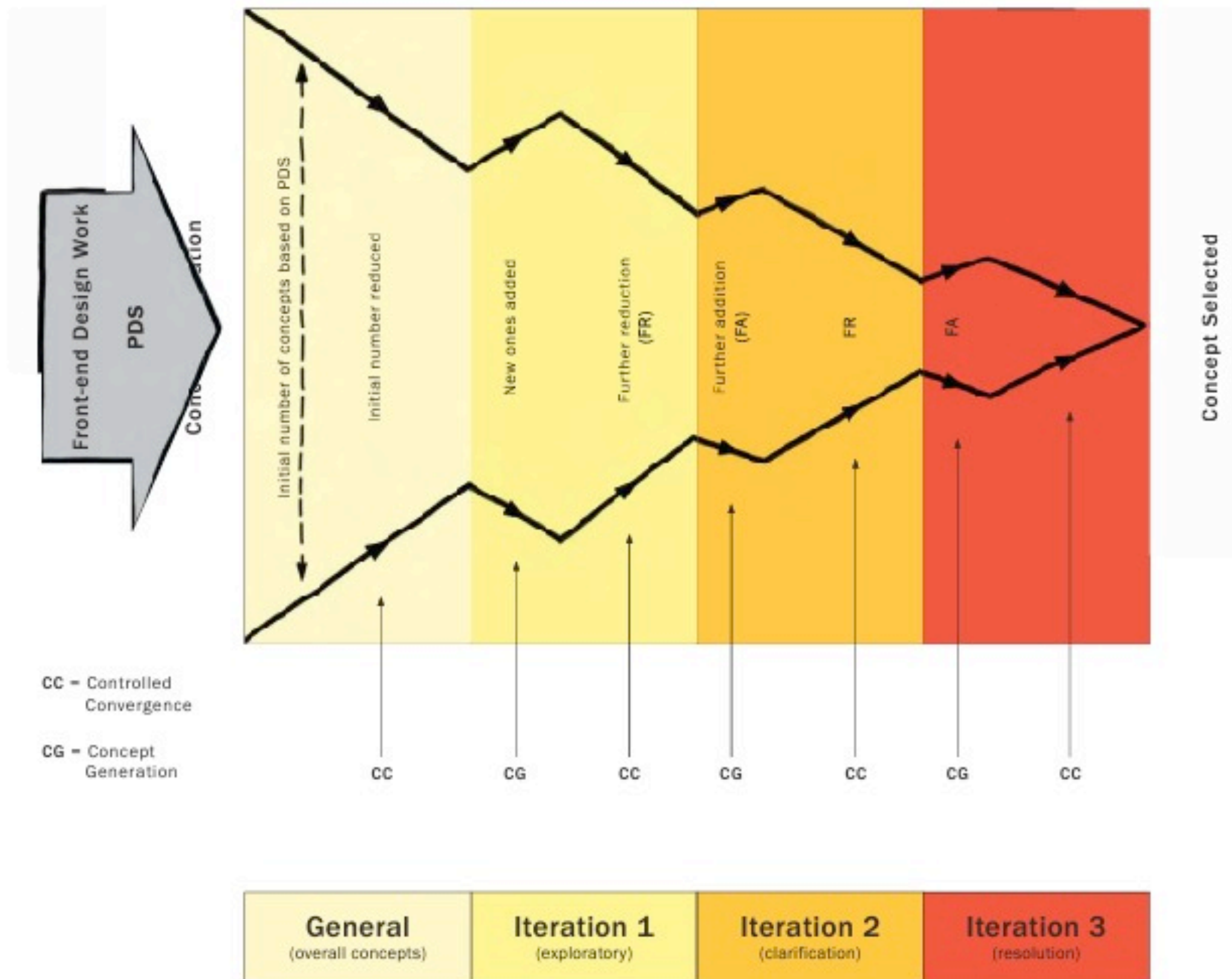


Figure 55: Another View of the Funnel

This variation on Pugh's illustration emphasizes the iterative nature of the process

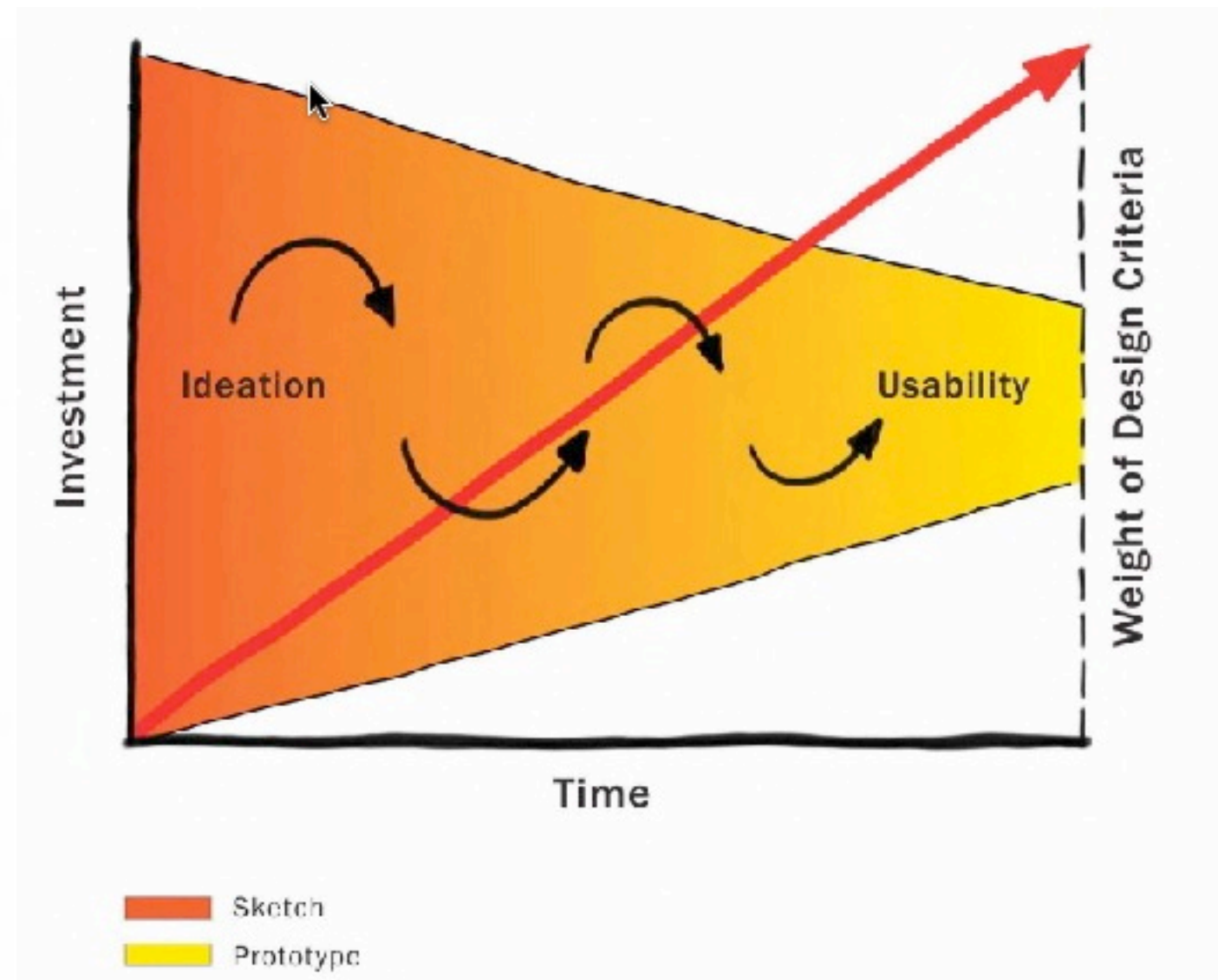
Source: Pugh 1990; p. 75

Buxton, 2007

## SKETCH

## PROTOTYPE

EVOCATIVE	→	DIDACTIC
SUGGEST	→	DESCRIBE
EXPLORE	→	REFINE
QUESTION	→	ANSWER
PROPOSE	→	TEST
PROVOKE	→	RESOLVE
TENTATIVE	→	SPECIFIC
NONCOMMITTAL	→	DEPICTION





# Prototypes are...

“the things we make to find out things”

How things should be

How things will be

How things can be

**Unfinished**, open for development

A way to **experience** a **future** situation

A way to connect **abstractions** into experience

A carrier for **discussions**

A prop to carry **activities** and tell **stories**

A **landmark** for **reference**

Provocations (Mogensen)

Sketches with technology (Buxton)

Embodiments of core ideas

**Hypotheses** (experimentalists)

**Interventions** (action research)

First run of a **production** line (traditional)

Prot

“the

How th

How th

How th

Provo

Sketch

Embo



# MANIFESTING IDEAS

FROM THE SKY DOWN TO EARTH , OR VICE-VERSA





# DESIGNING IN THE UNKNOWN

PROBLEM-SOLVING WITH DETOURS



# The Anatomy of Prototypes

Lim, Y.-K., Stolterman, E., and Tenenbergh, J. 2008

Prototypes are **filters** that traverse a design space and are **manifestations** of design ideas that concretize and externalize conceptual ideas.

A “good” prototype is very dependent on what you are trying to explore, evaluate, or understand.



# The Anatomy of Prototypes

Lim, Y.-K., Stolterman, E., and Tenenbergh, J. 2008

## The Principles of Prototyping

### Fundamental prototyping principle

Prototyping is an activity with the purpose of creating a **manifestation** that, in its simplest form, **filters** the qualities in which designers are interested, without distorting the understanding of the whole.

### Economic principle of prototyping

The best prototype is one that, in the **simplest** and the **most efficient way**, makes the possibilities and limitations of a design idea visible and measurable.

# Characterizing a sketch/prototype?

Fidelity scale (low/hi/mixed)

Audience, materials, resources

“Show & Tell” (sales)

“Show & Ask” (usability)

Prototype as a Hypothesis

(scientific method)

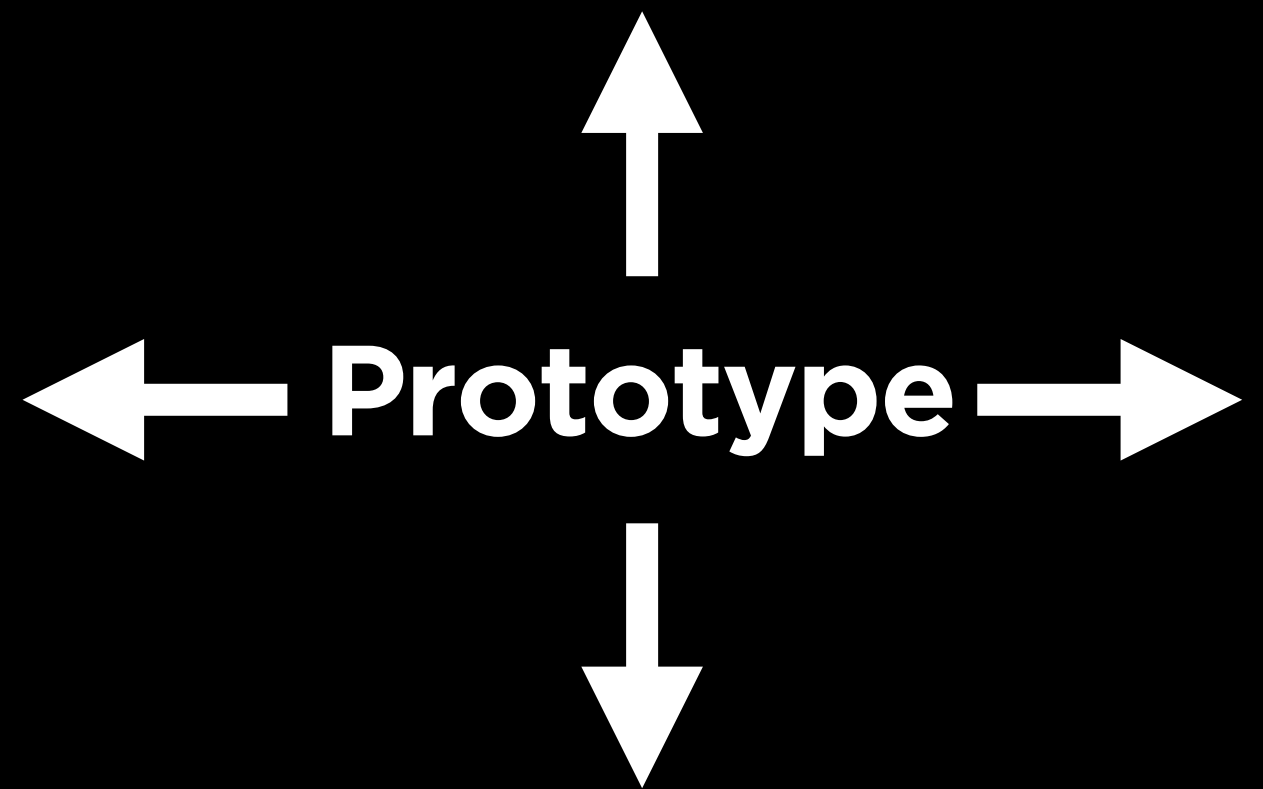
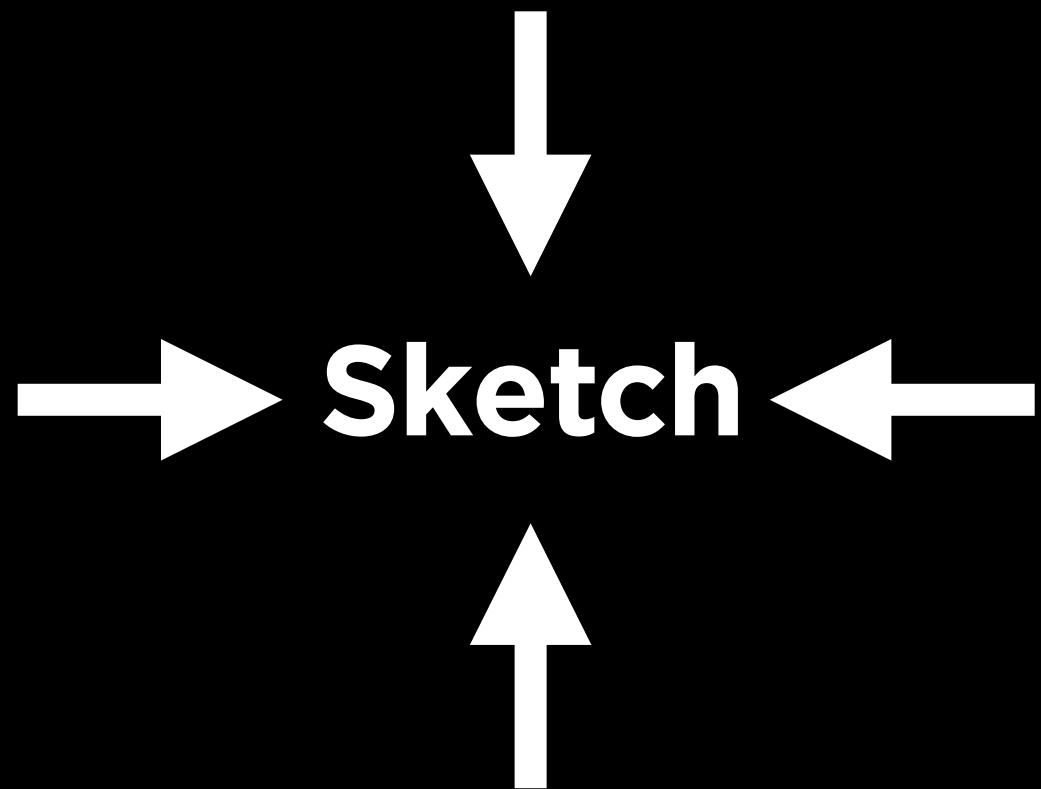
Prototype as a Marketplace

(exchange values, platform for productive collaboration, generation of knowledge/value)

Prototype as a Playground

(serious play, relaxation of rules, play vs serious vs real)





# Sketching vs prototyping

**Transaction cost** (Coase/Buxton)

When/where can you afford to **really** explore alternatives?

Design calls for multiple equally viable variations?



# SKETCHING IN HARDWARE

OR PROTOTYPING?

## Controller

### A. Status LCD

Two lines show current state of the input being manipulated

### B. Beat Visualization

OFF and 5 levels

### C. Visualization Booster

Range from -3 to +3, controlling the diameter of audio generated dots

### D. Hatch

A pattern of diagonal lines with settings from 0 (OFF) to 10 (maximum stroke)

### E. Colour

Suppresses colour from 16 to 2 (actual colors will vary depending on other effects)

### F. Filter

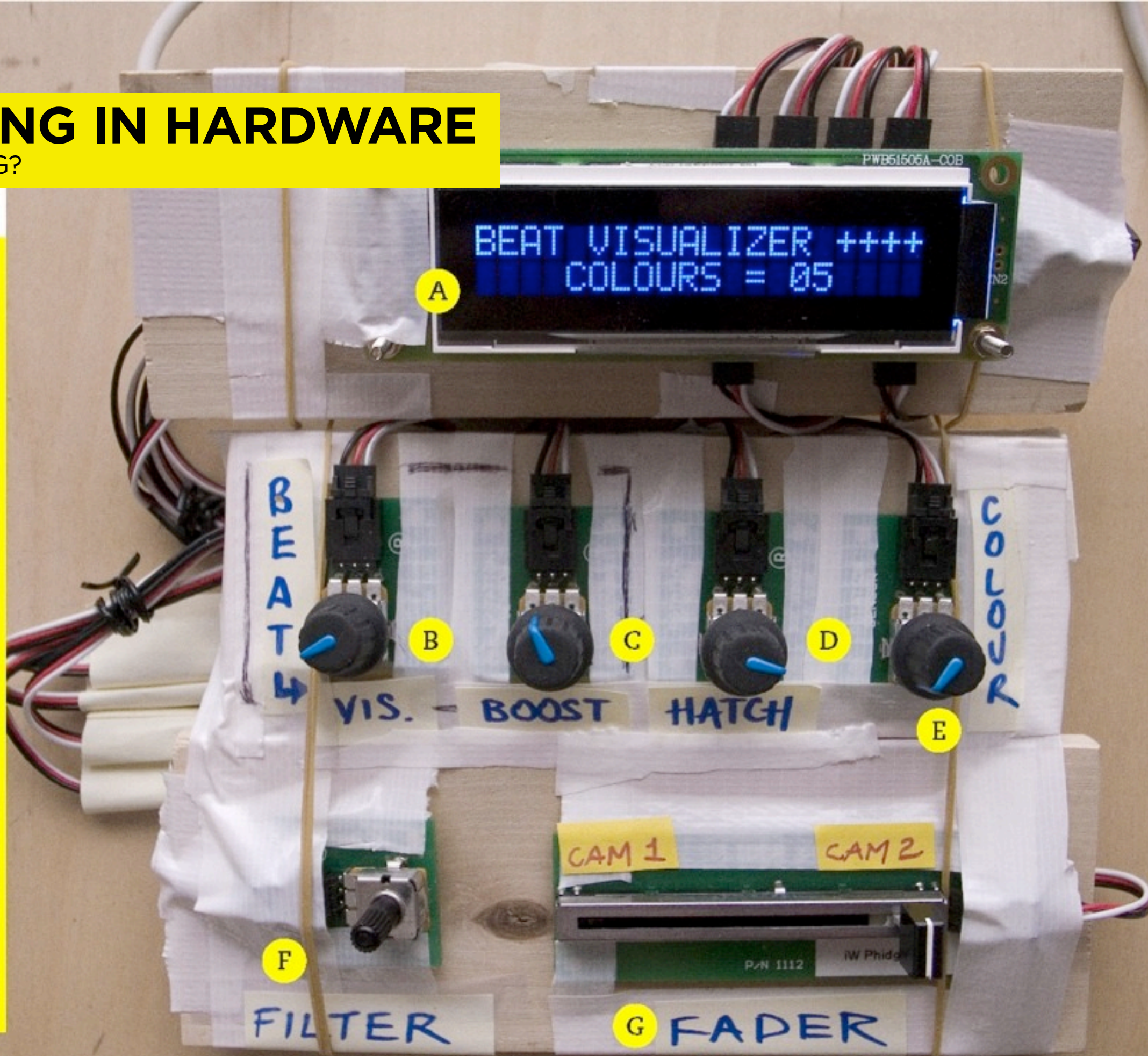
Sets the current filter from a bank of 10

### G. Fader

Sets the video Channel

### Keyboard Controls

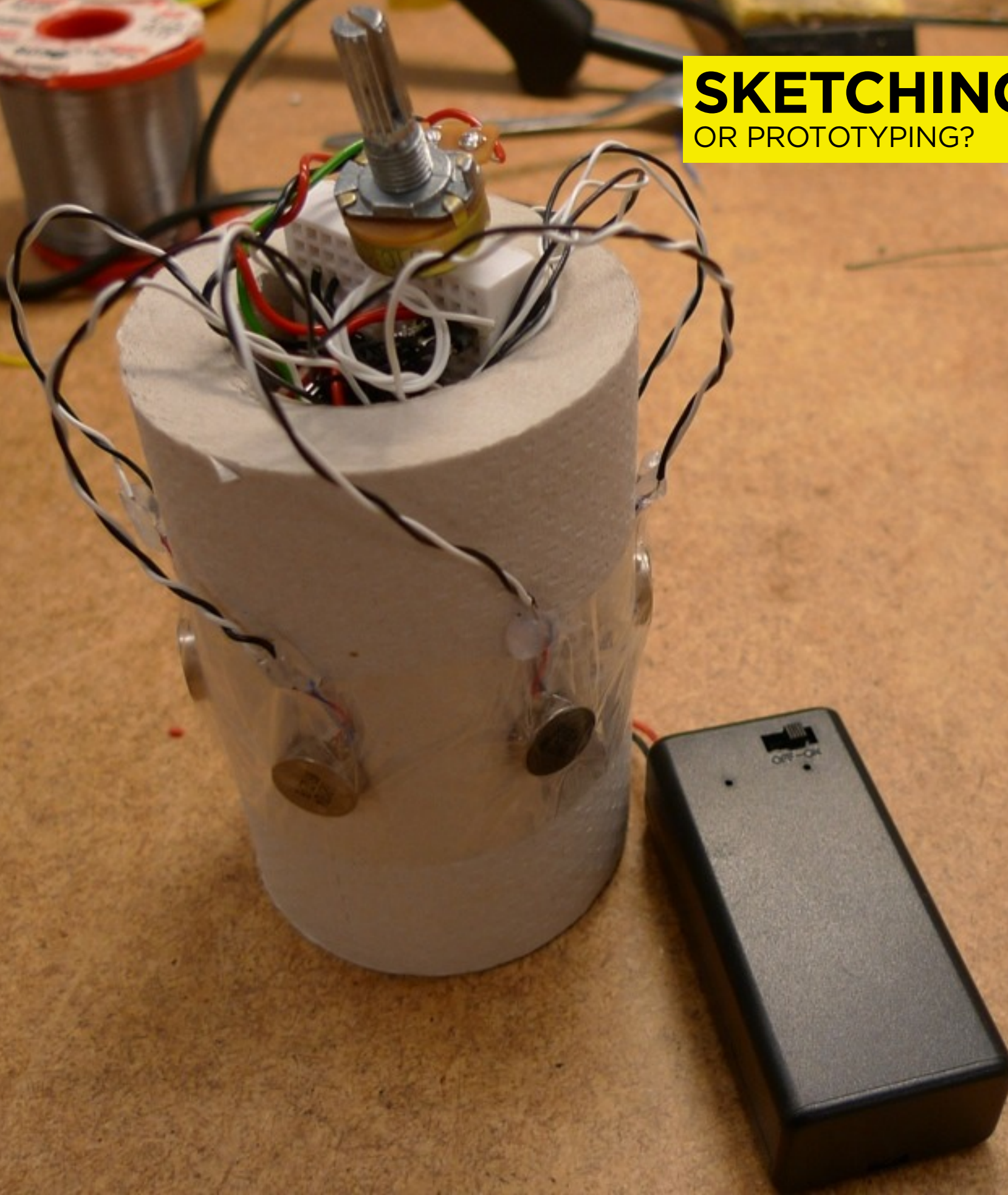
Try keys 1-5, r, g, b





# SKETCHING IN HARDWARE

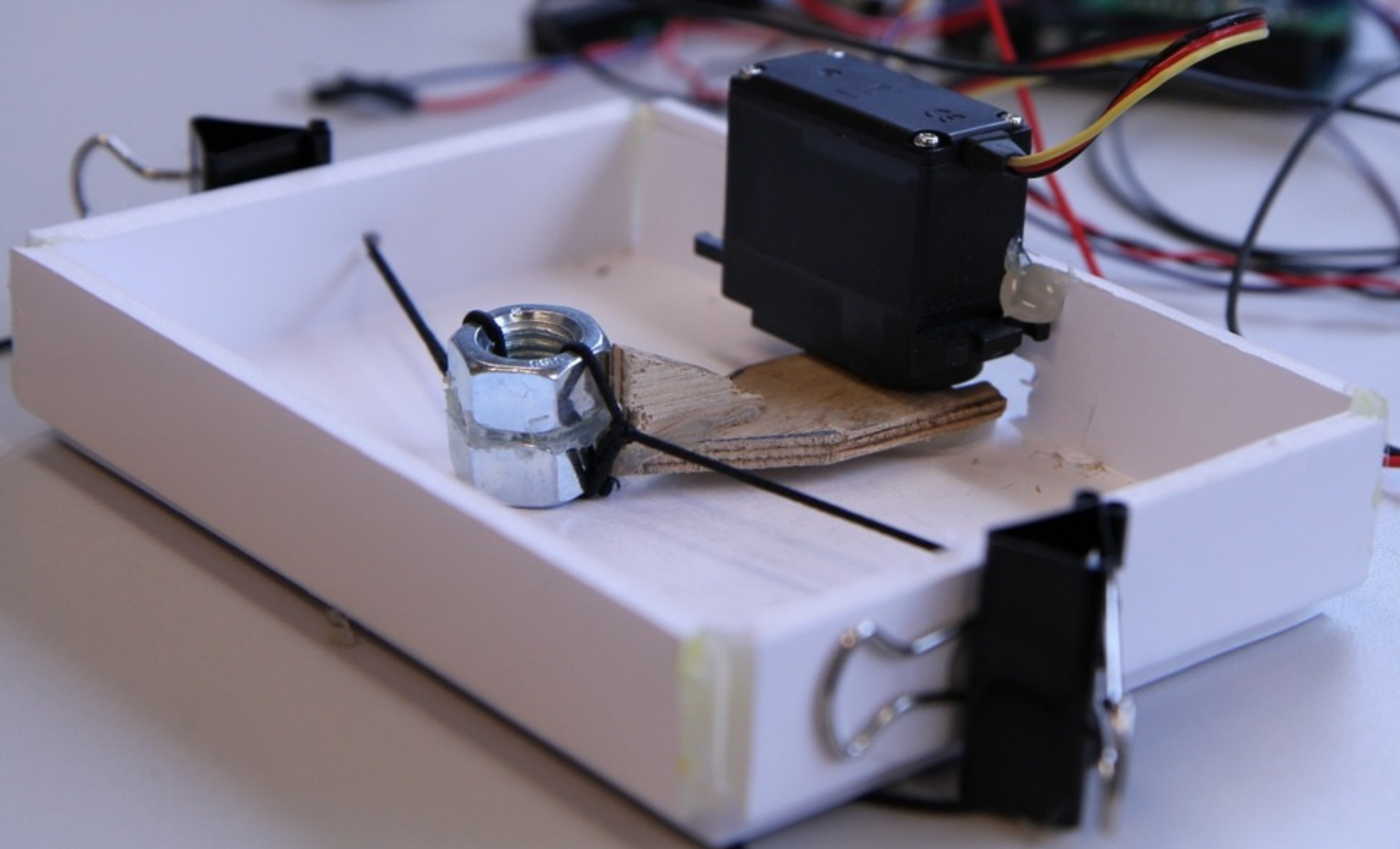
OR PROTOTYPING?





# SKETCHING IN HARDWARE

OR PROTOTYPING?





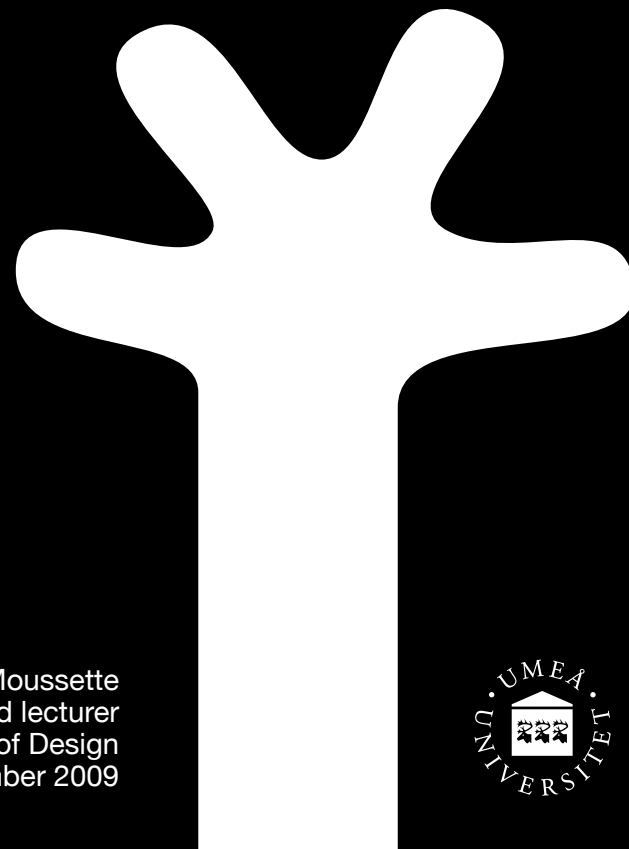
Umeå Institute of Design + IDEO





# Sketching and Prototyping Levels

Physicality Workshop - HCI 2009 | Cambridge



Camille Moussette  
PhD Student and lecturer  
Umeå Institute of Design  
September 2009



# Sketching and prototyping levels

Minutes and hours

Hours, one day

Multiple days

Week





# Minutes and hours

Rough

Crude

Human actuated, Wizard of Oz

Quick and dirty “how does this feel”

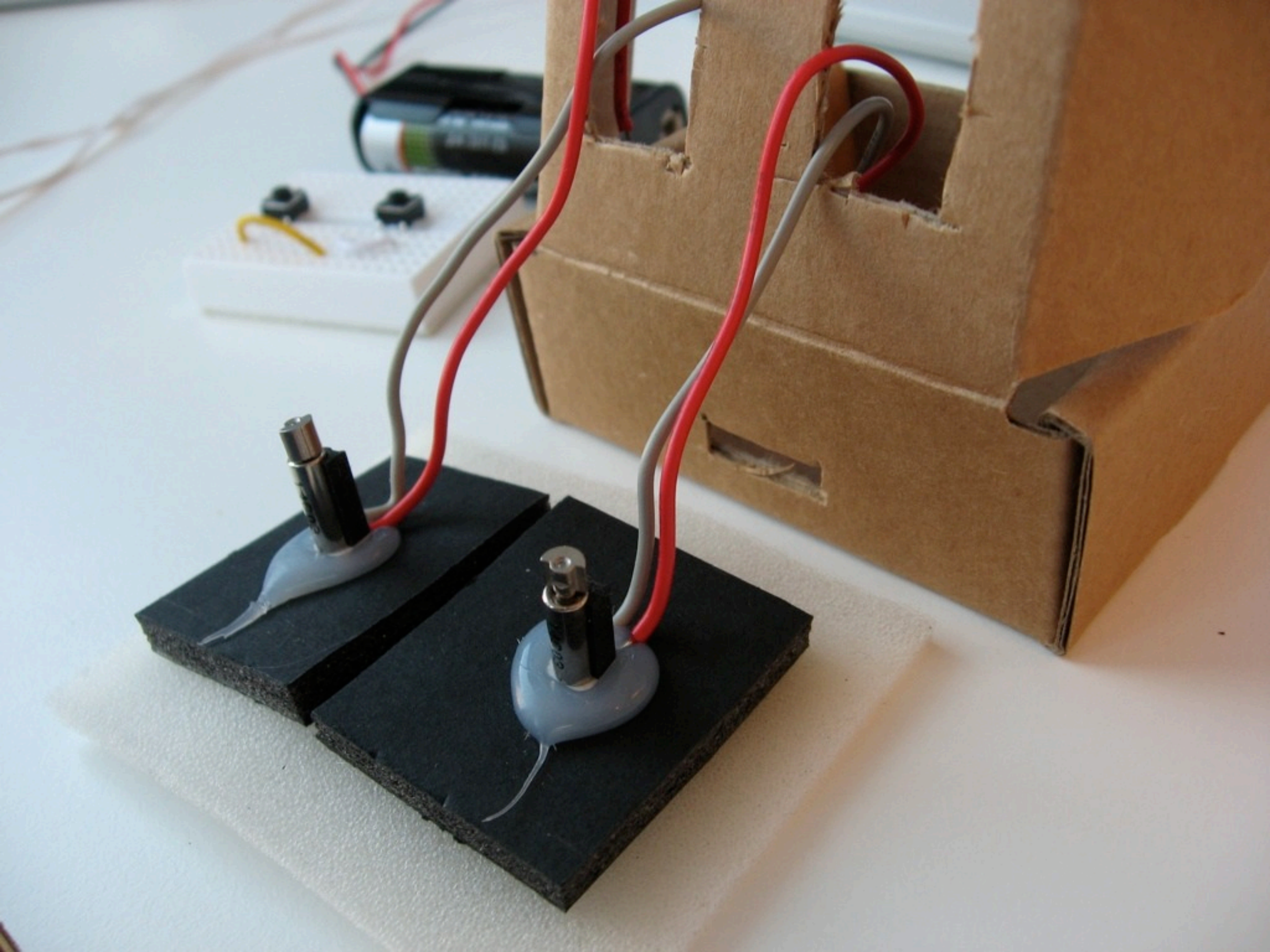
PD like (brainstorm, ideation workshop)

What you can do on your desk/table

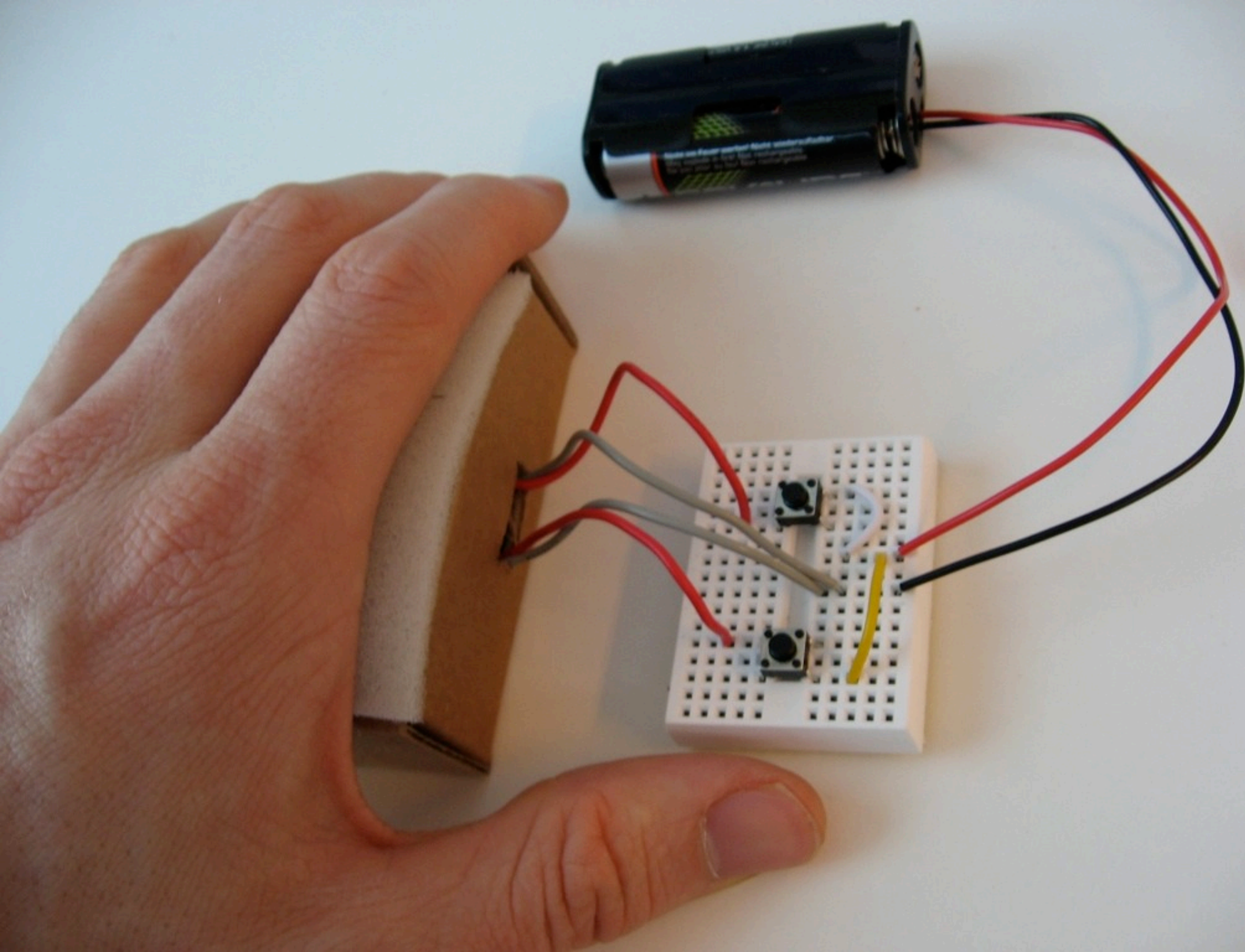
Low-tech (usually), low-fi (not necessarily)





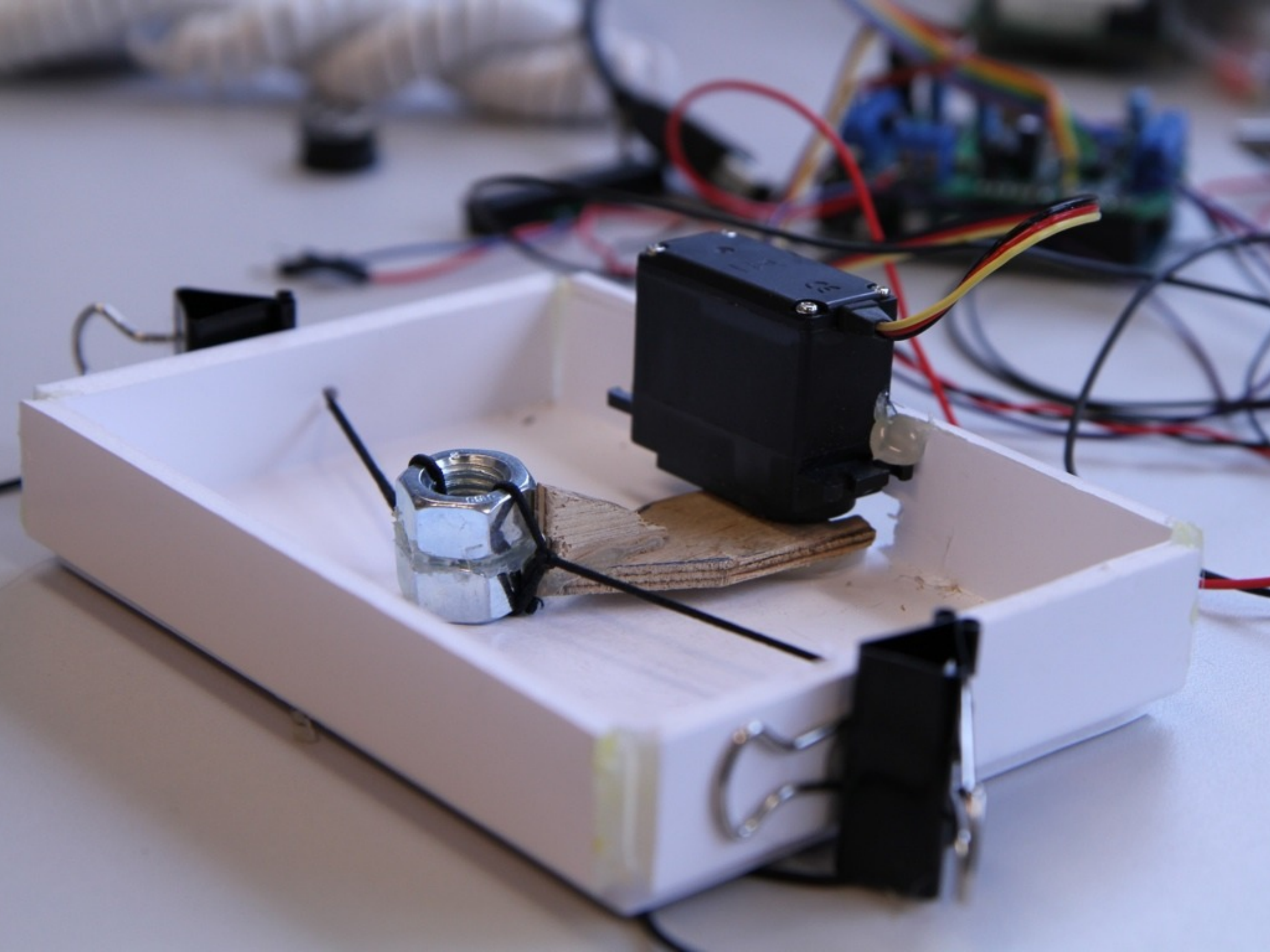




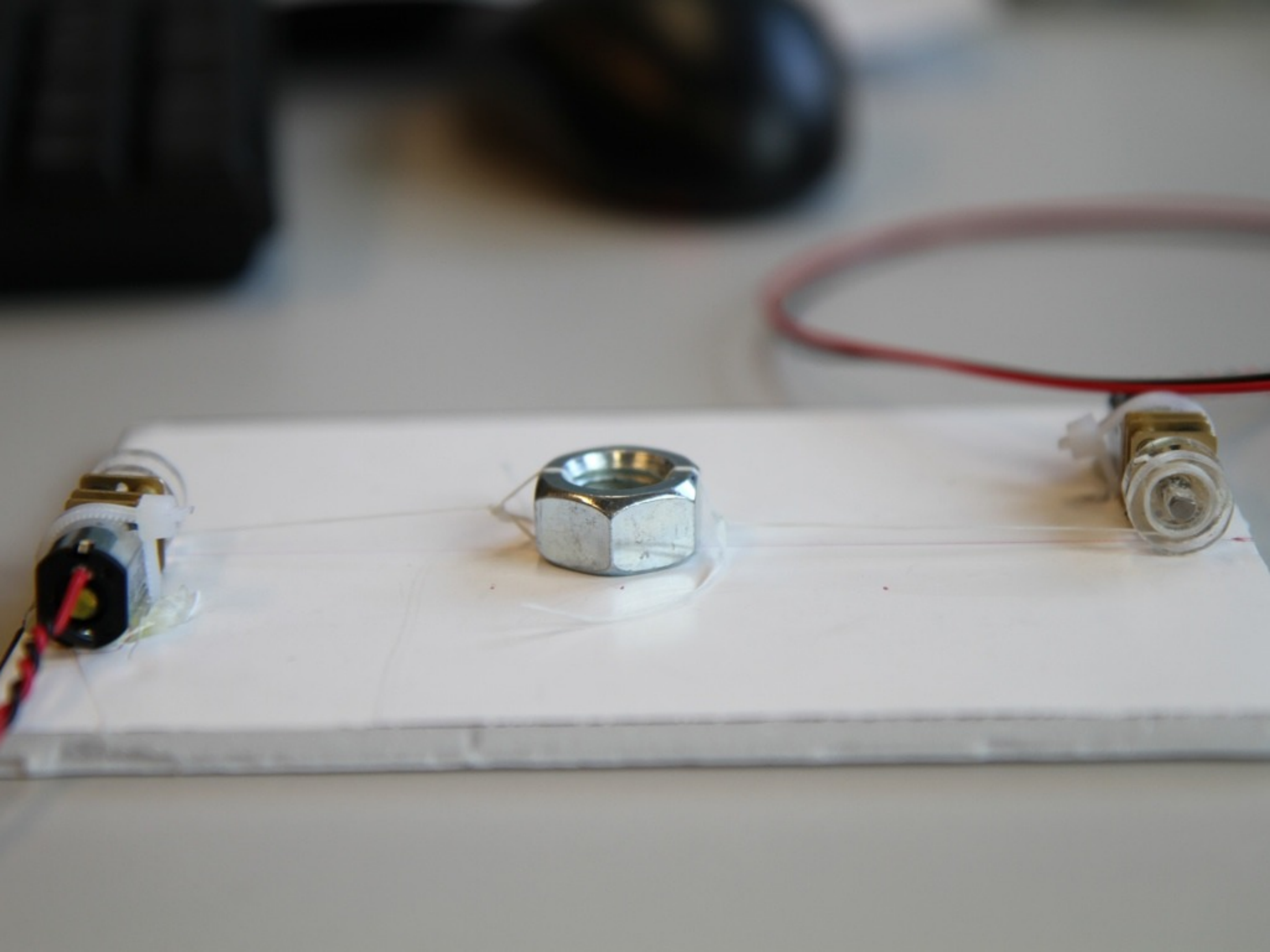












# Hours, one day

Explore variations

Not as clunky

Human actuated, Wizard of Oz

Basic assembly and construction elements

Simple trigger or control mechanism

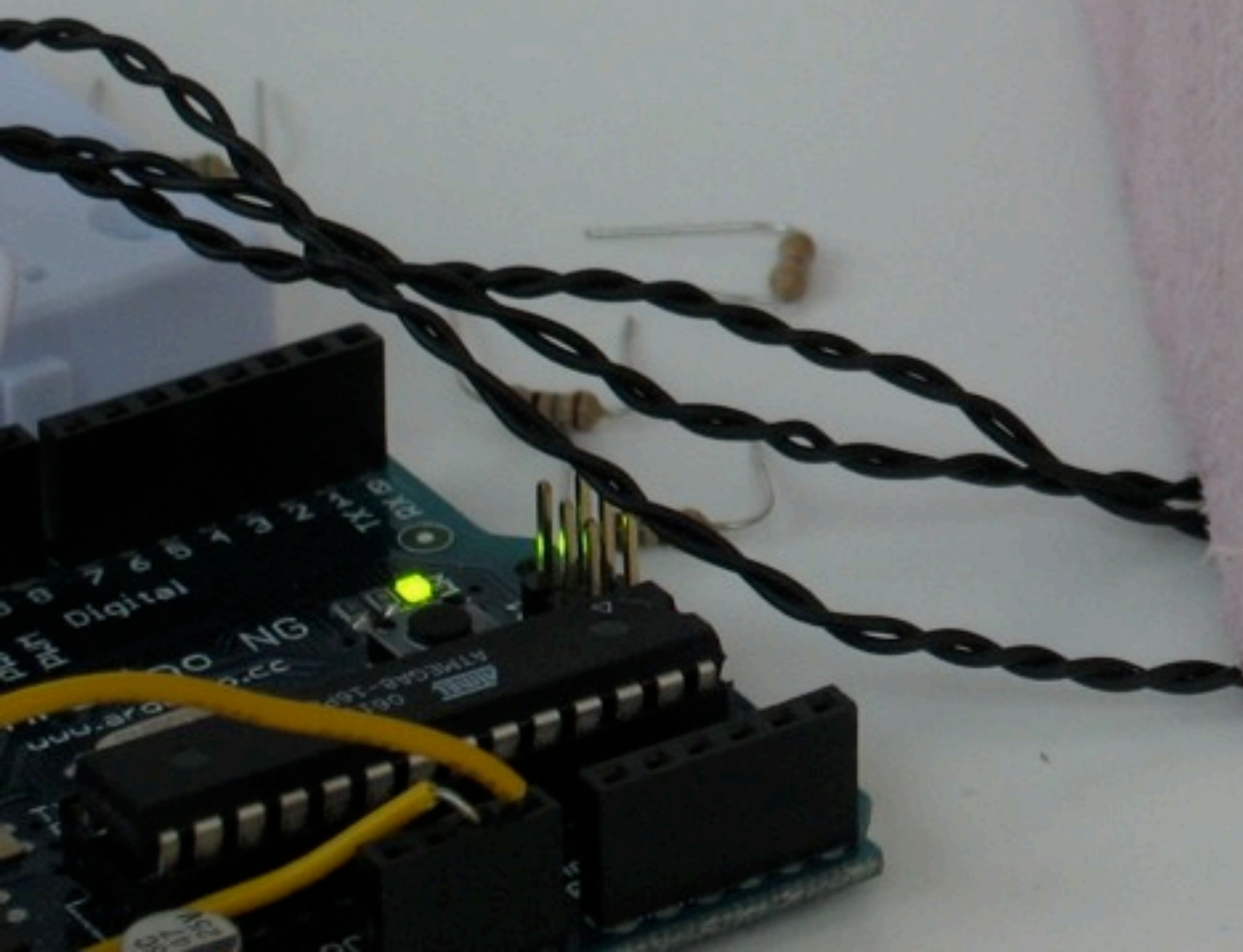
What you can do in your “garage”

Low-fi (not necessarily)

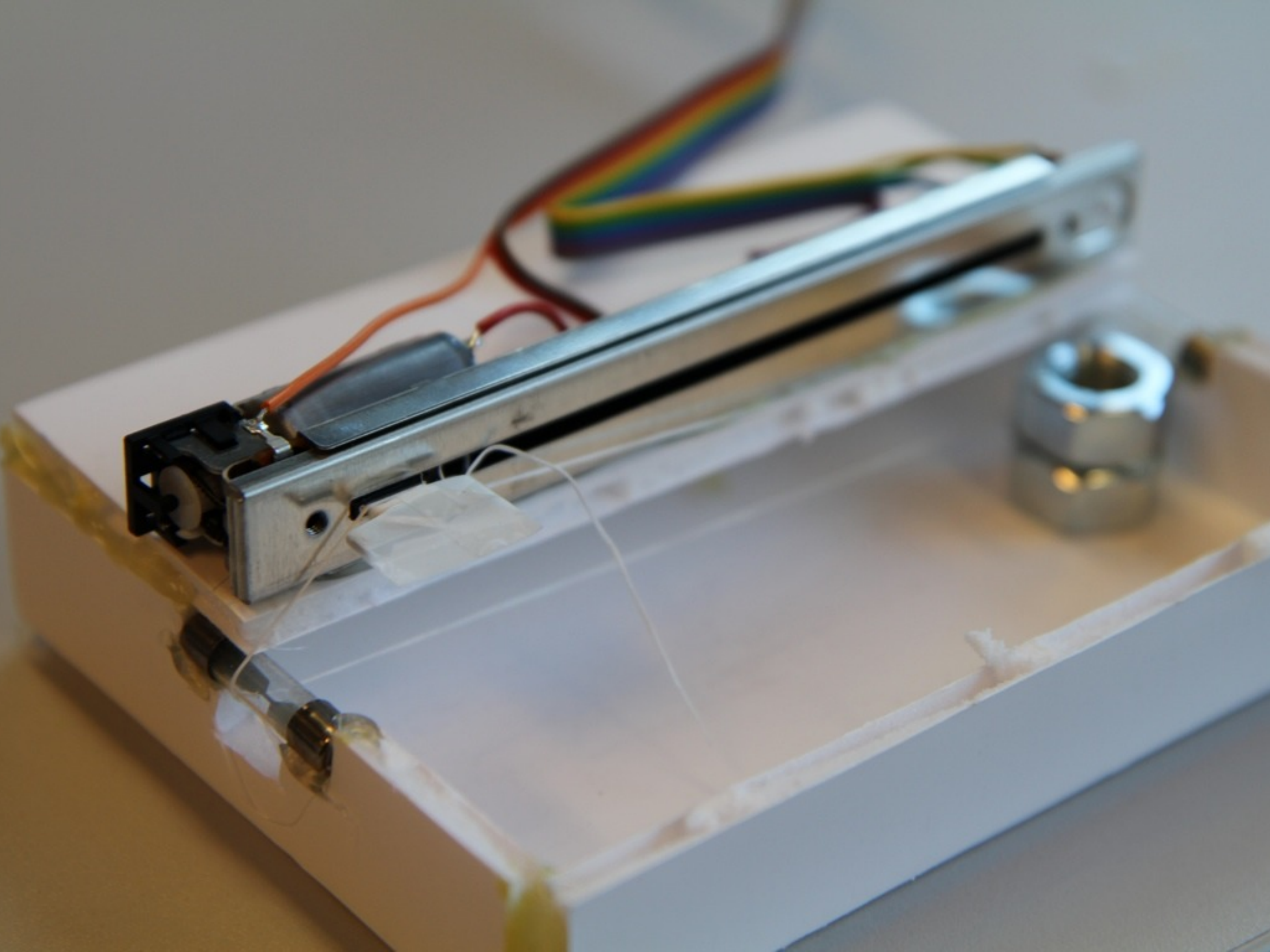




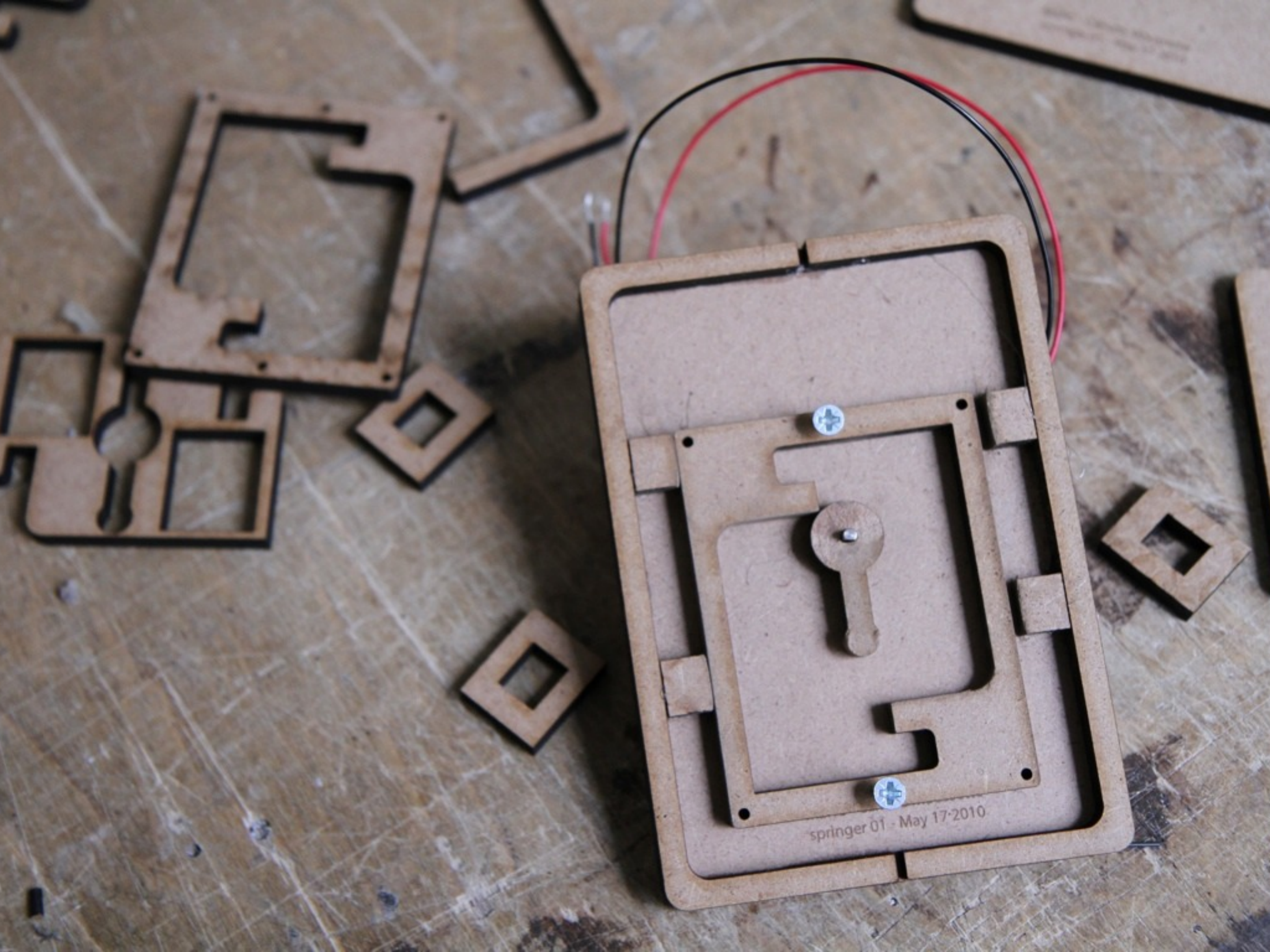






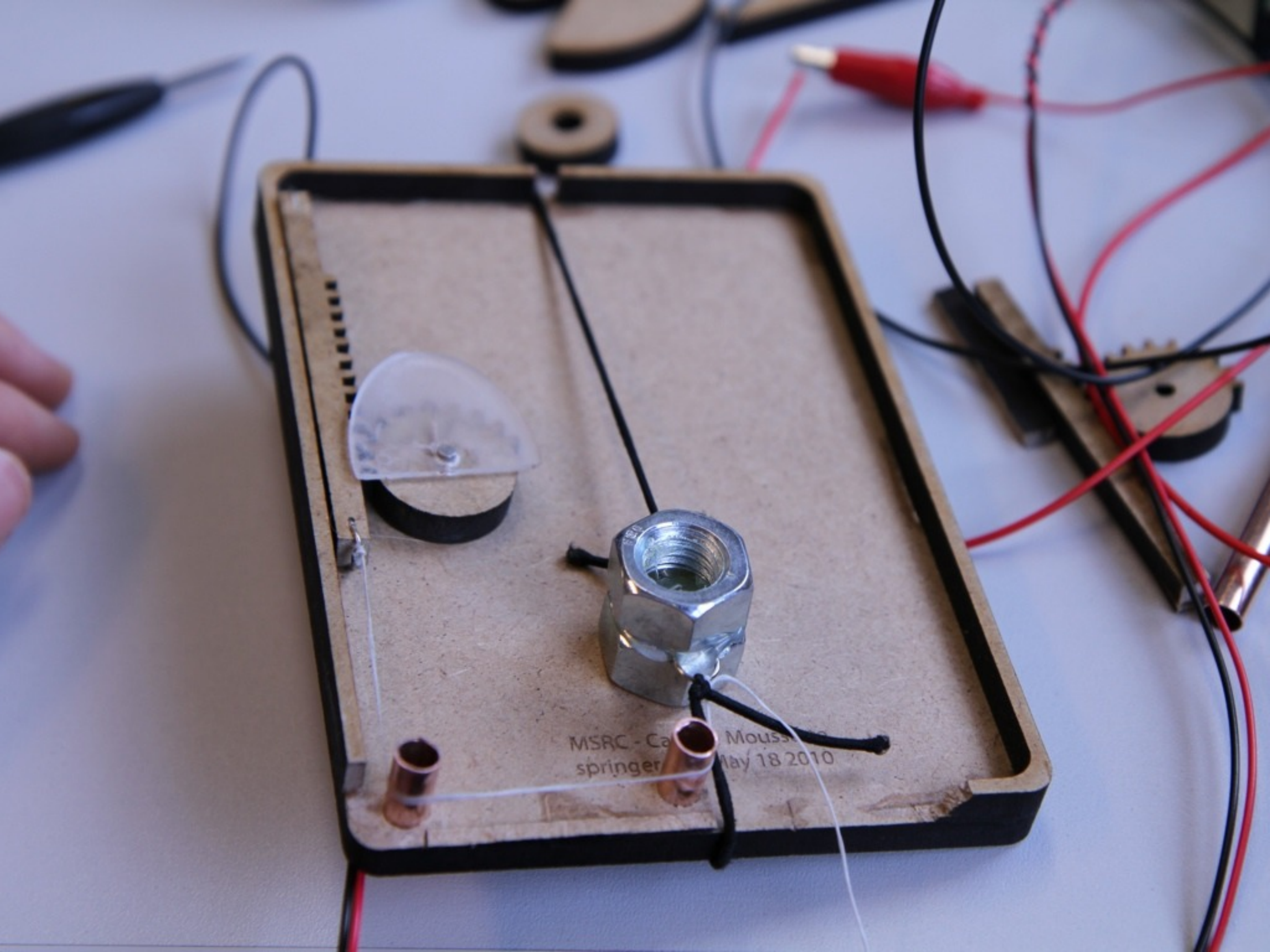






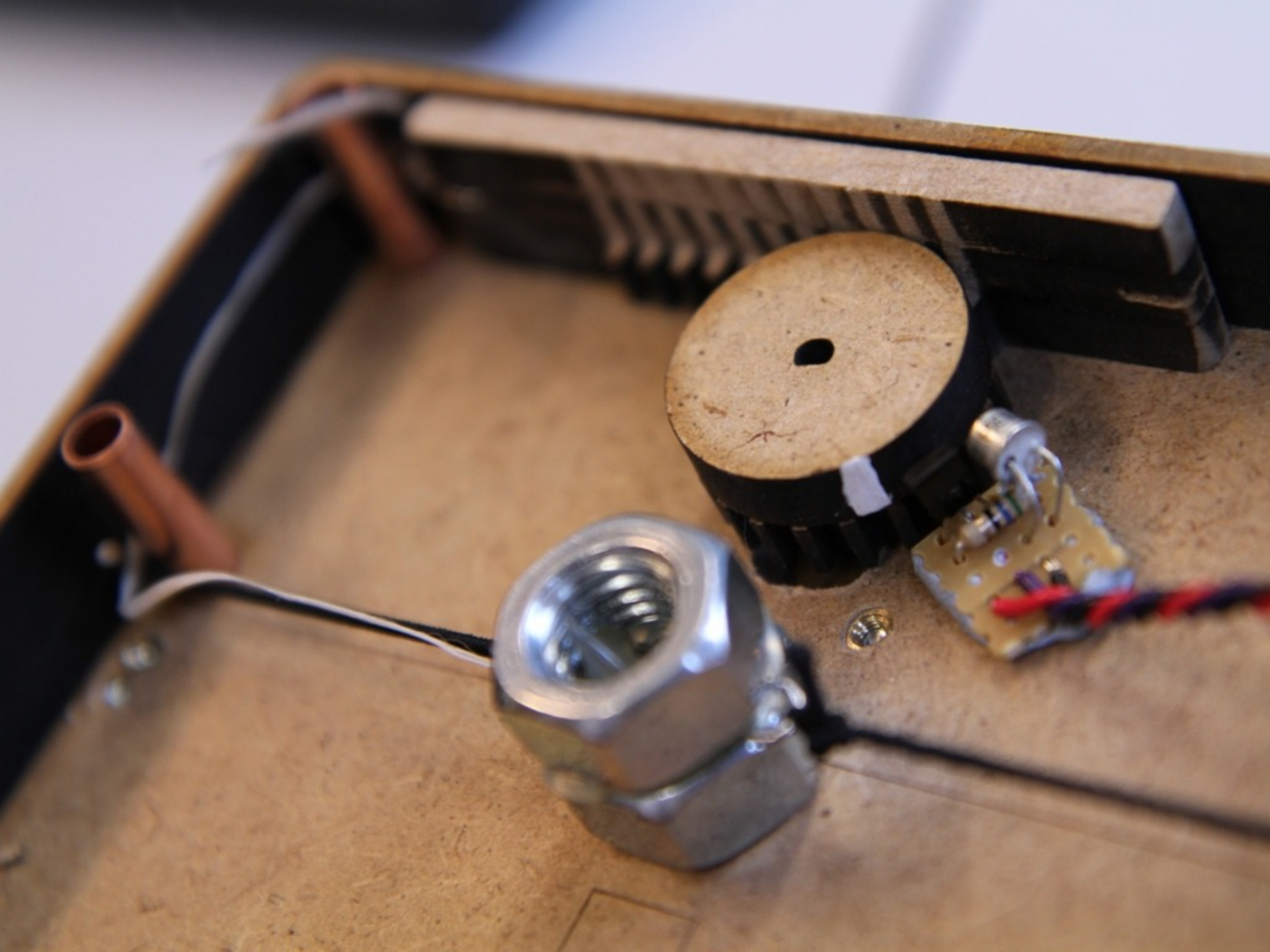
springer 01 - May 17-2010



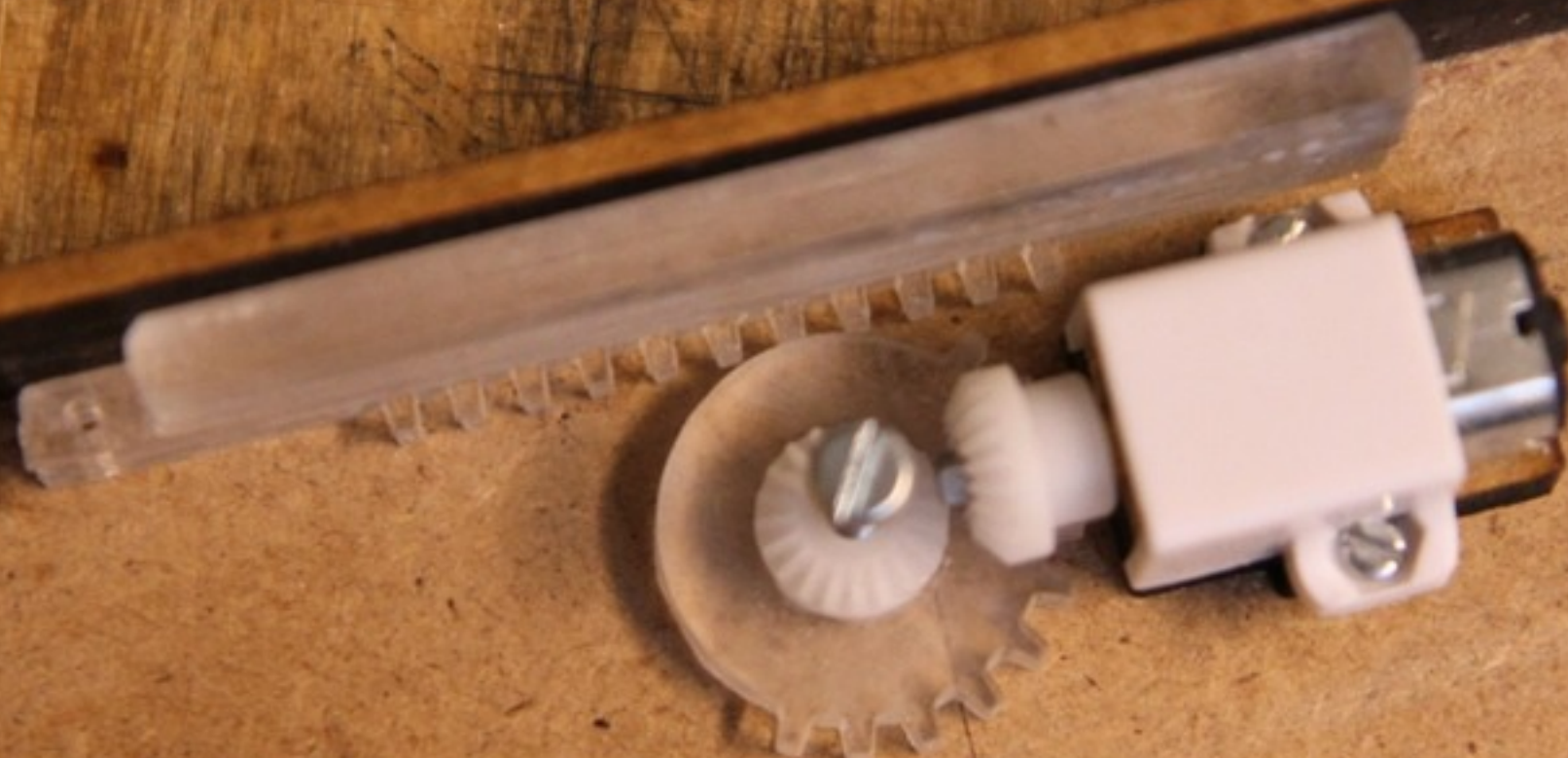


MSRC - Ca Mouss  
springer May 18 2010



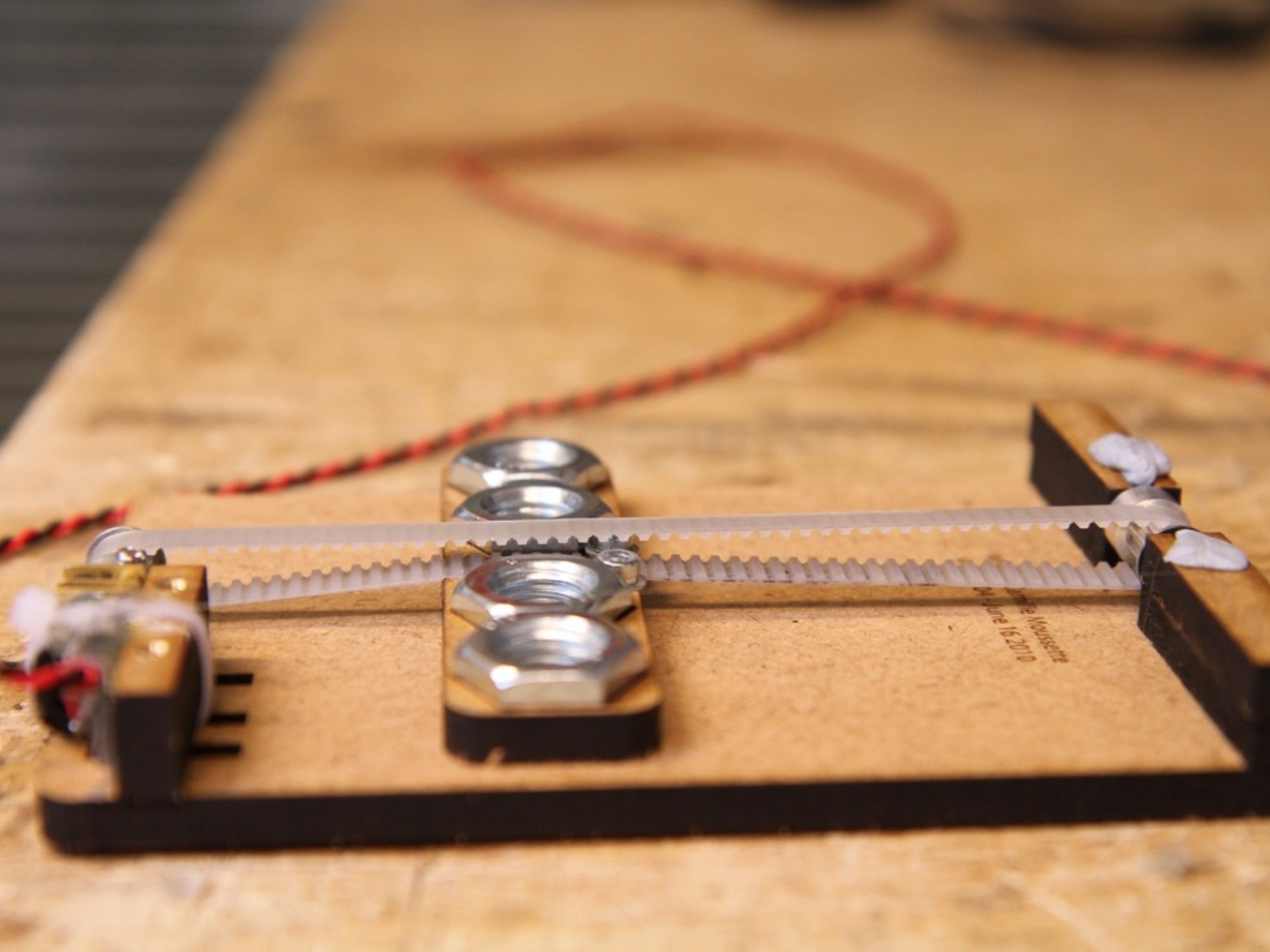






MSRC - Camille Moussette  
Springer 07 - June 18 2010





June 15, 2010  
Mosses



# Multiple days

Adjustability and more control

Repeatability

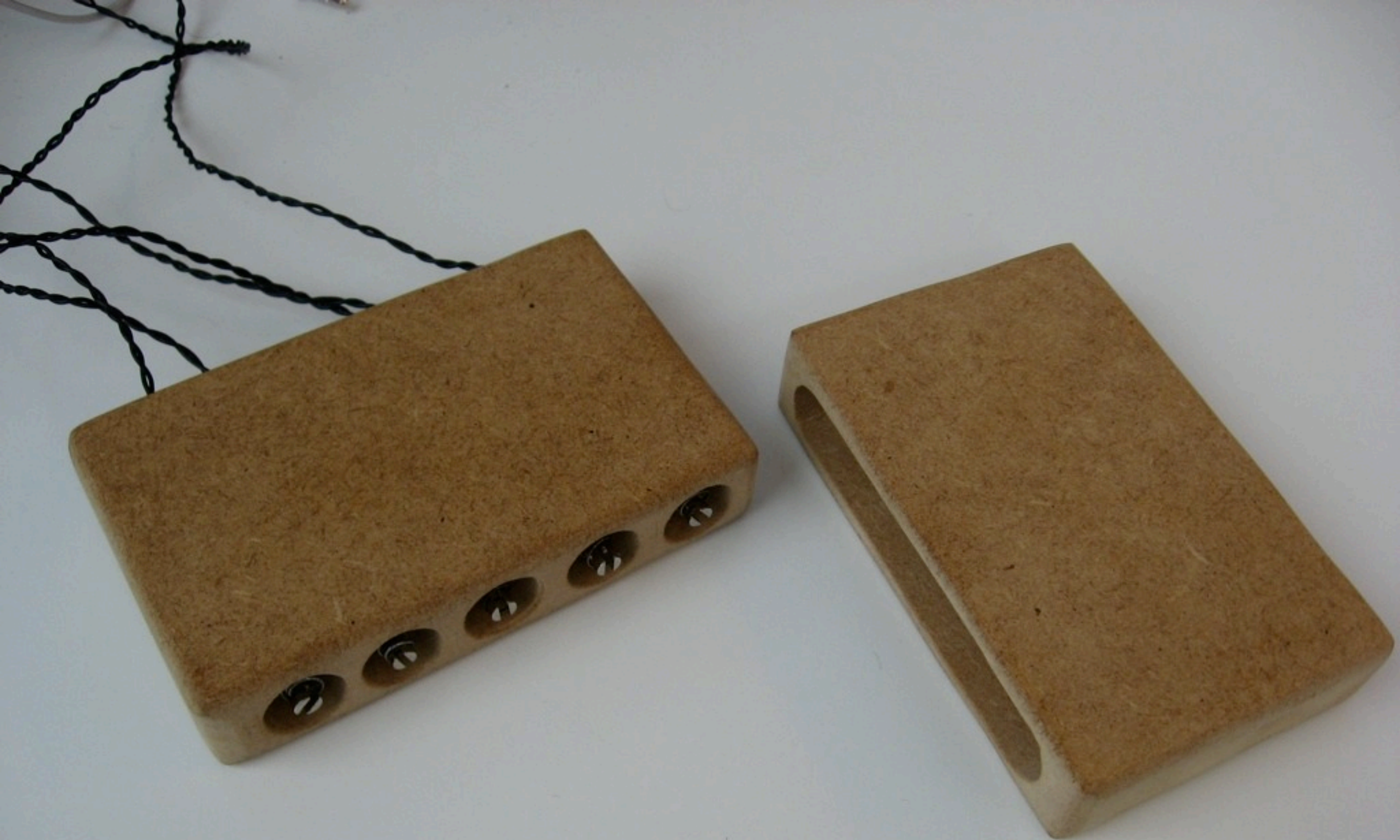
Some machine control

Fancier mechanisms or actuation systems

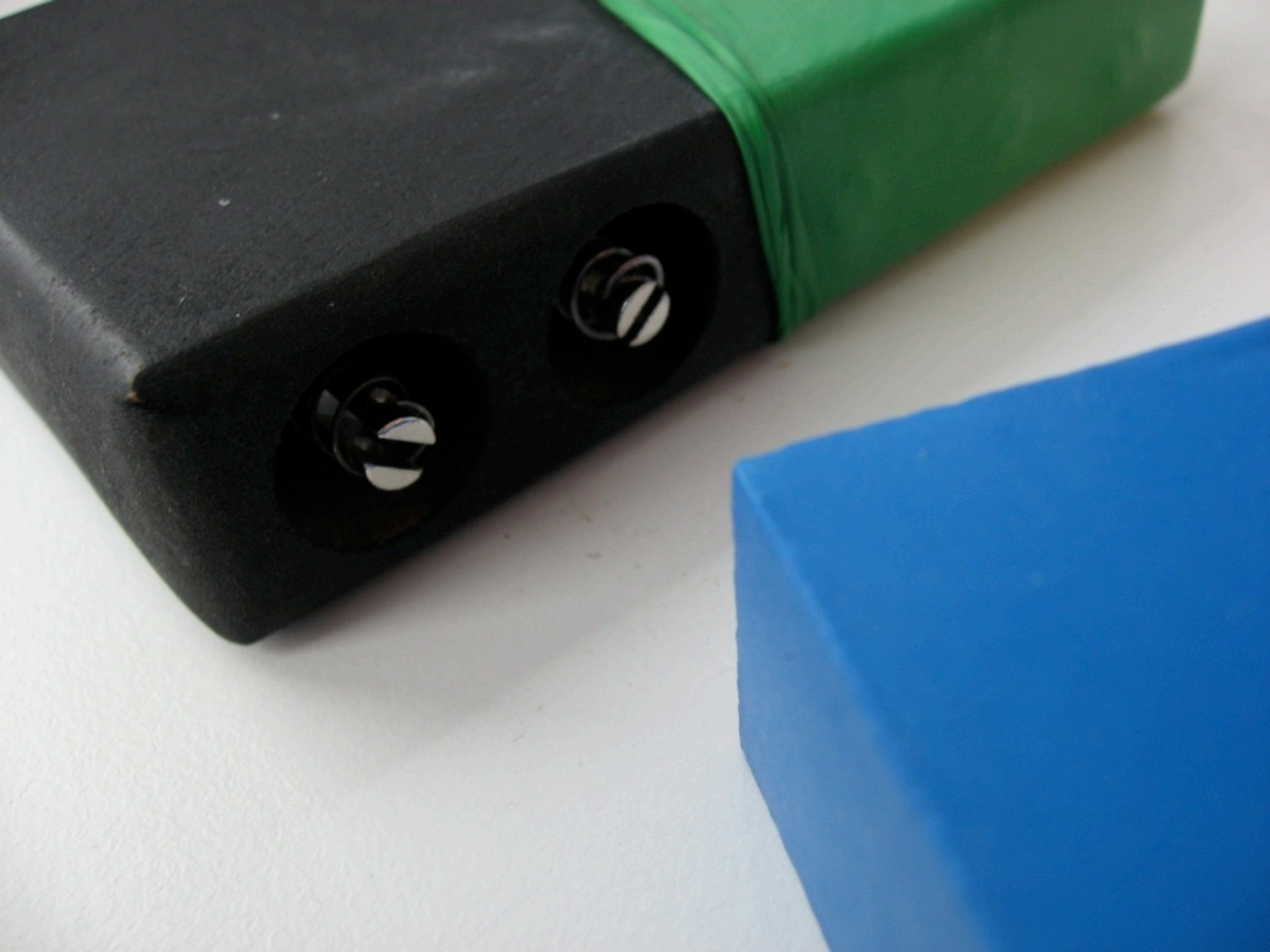
Electronics (maybe) and measuring capabilities

What you can do in a workshop

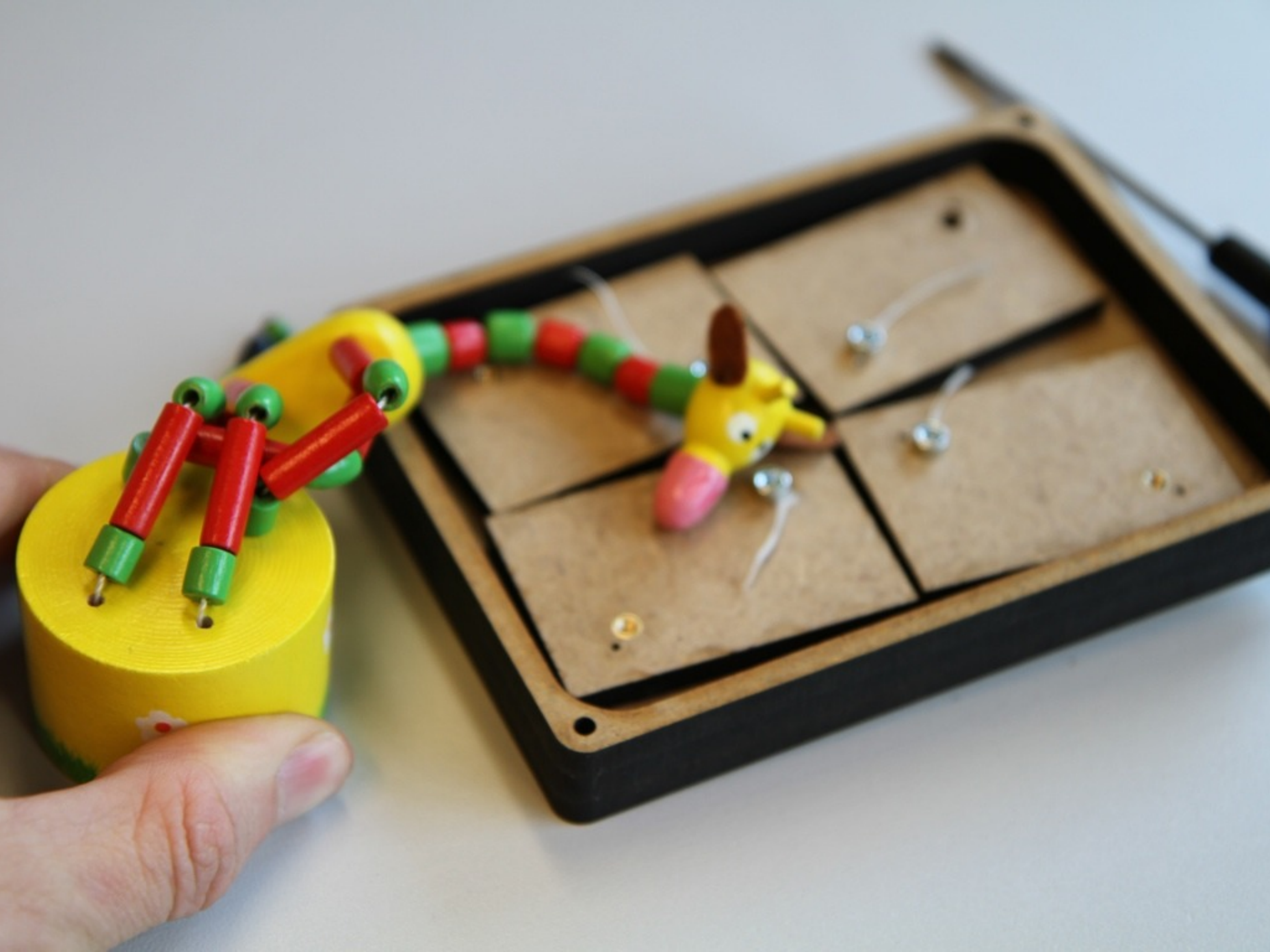
Full range of fidelity



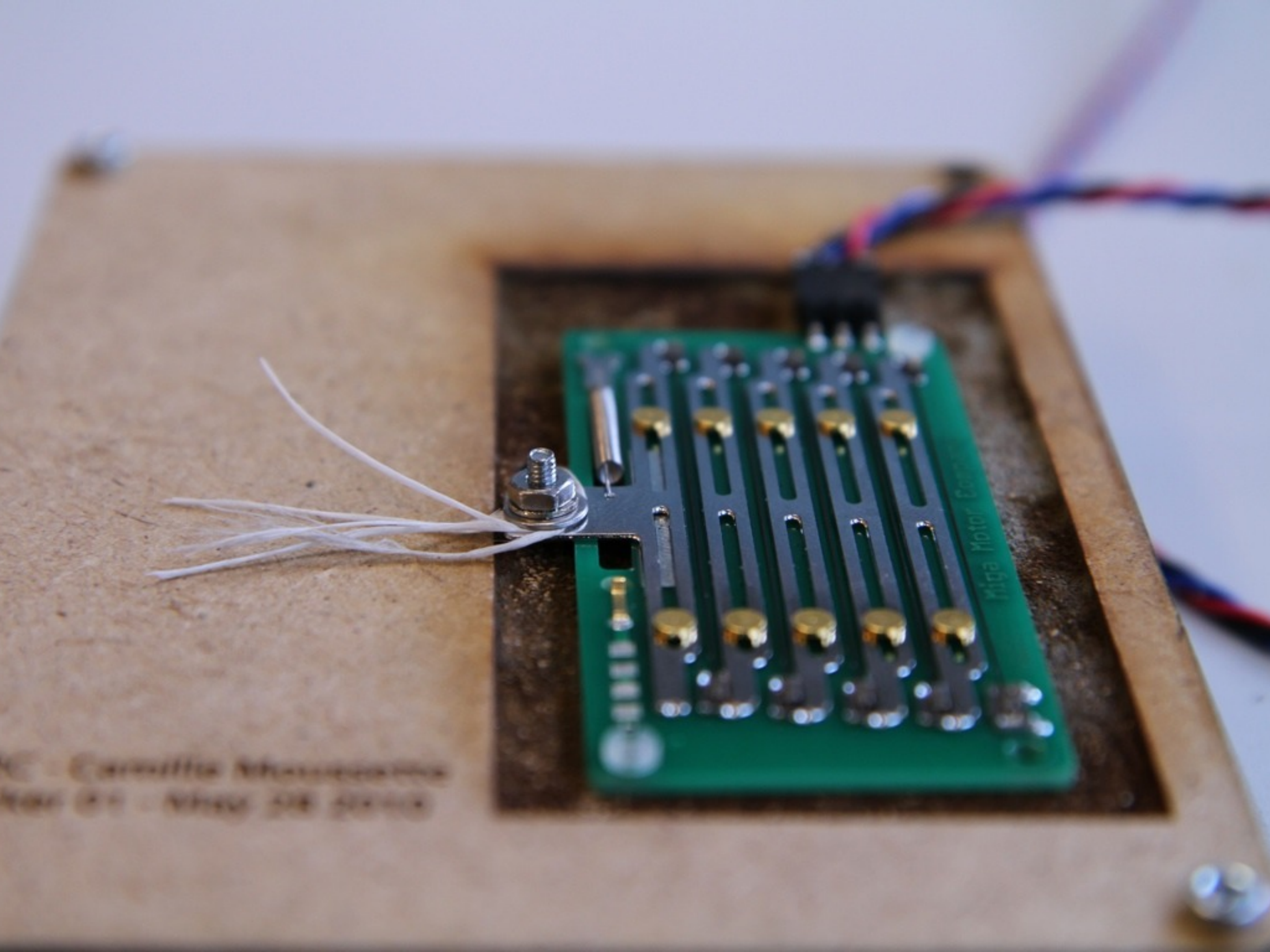




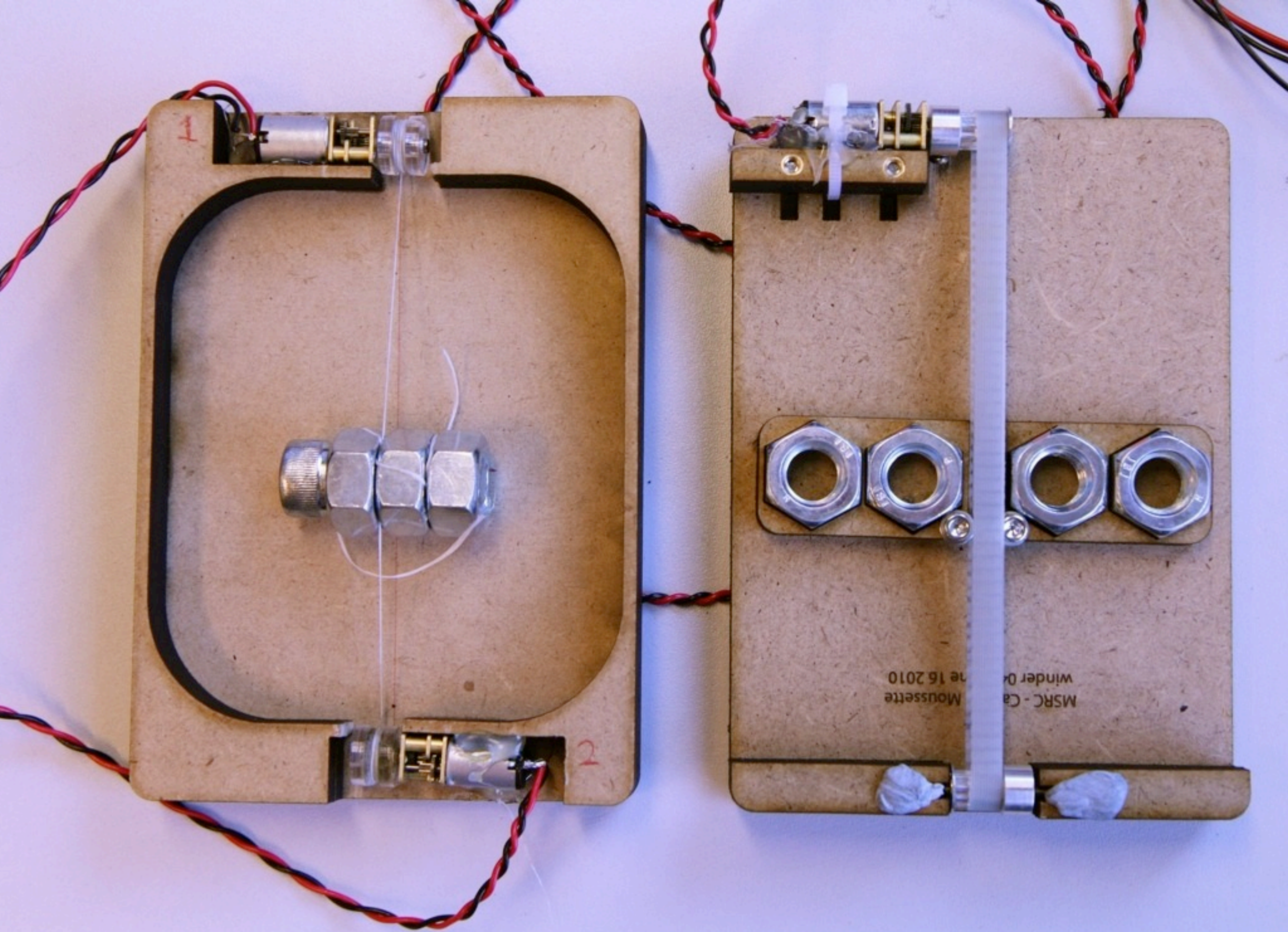




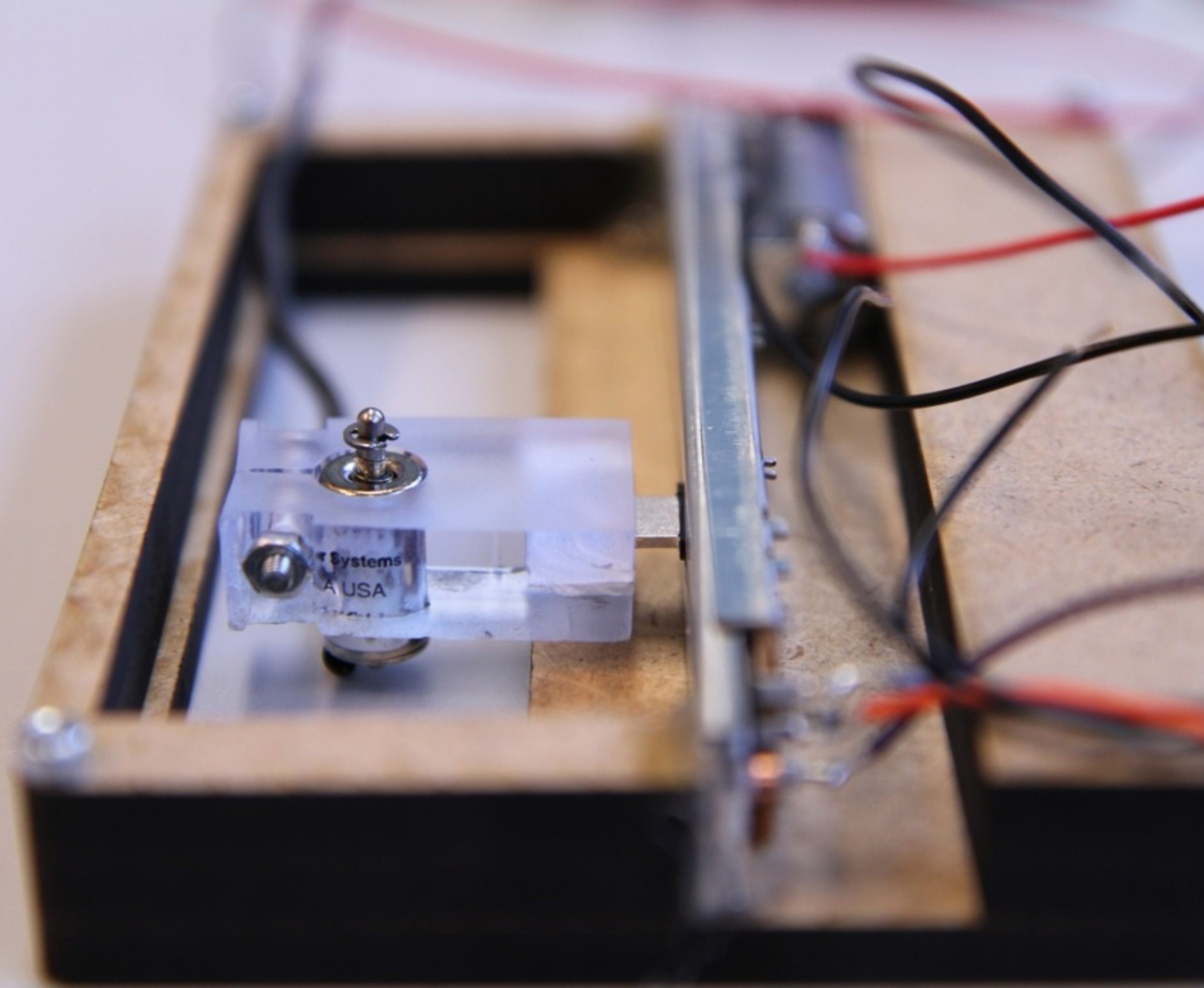












# Week

Finer control

Relatively costly but necessary

Machine autonomy

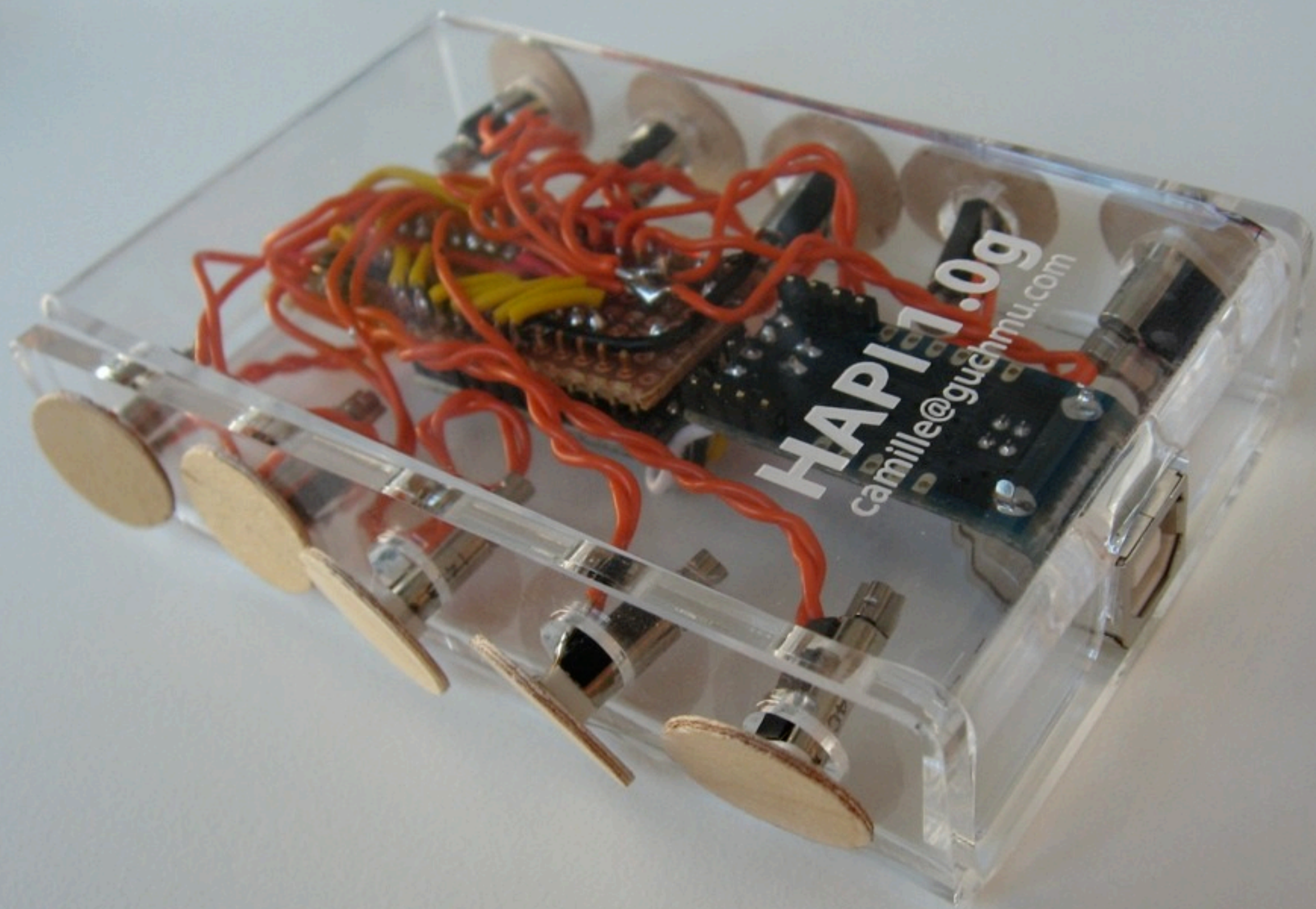
Optimized but fixed configurations

A mix of hardware, software and humanware

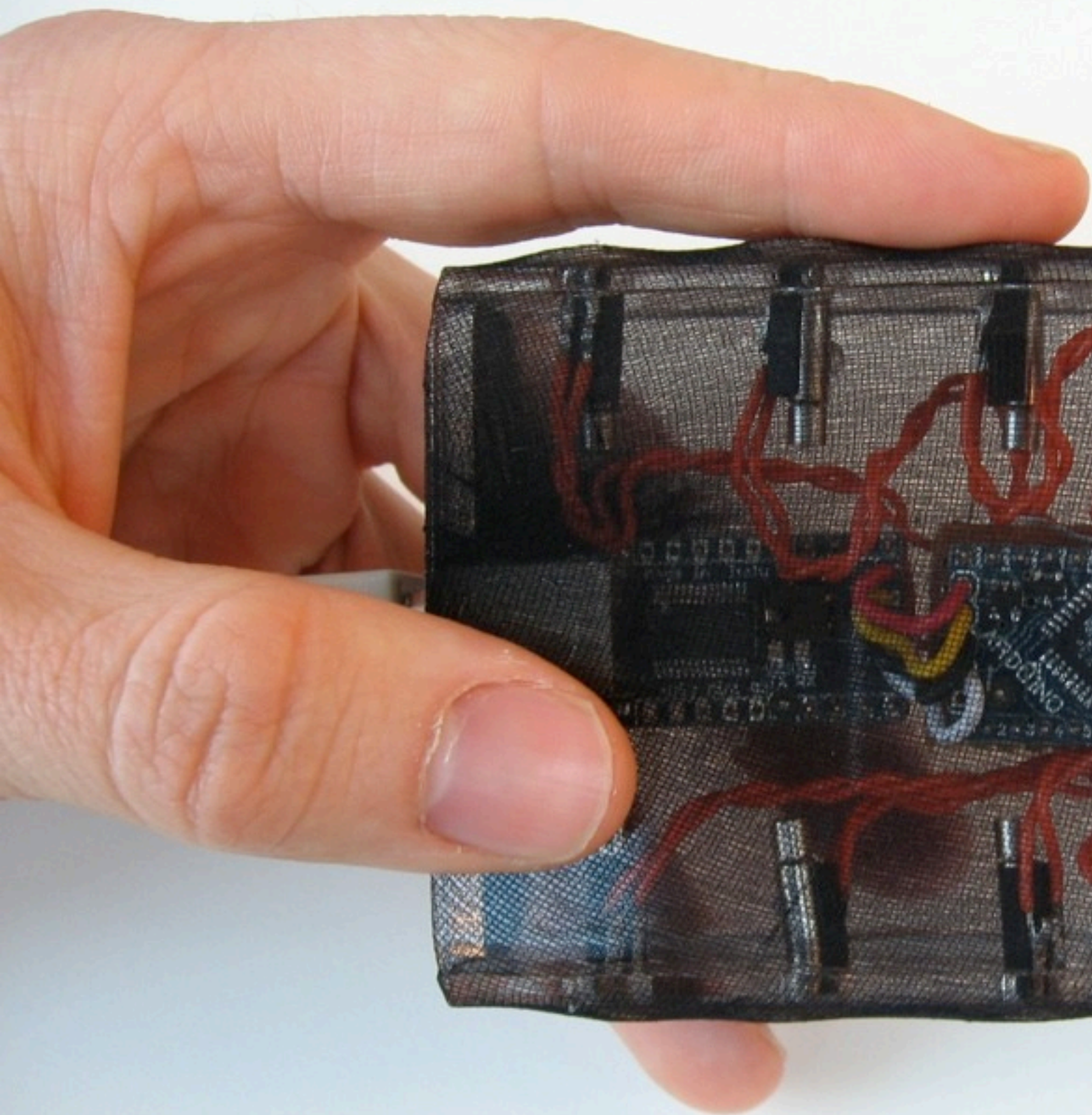
Dedicated haptic modules and equipment

Almost the *real* thing







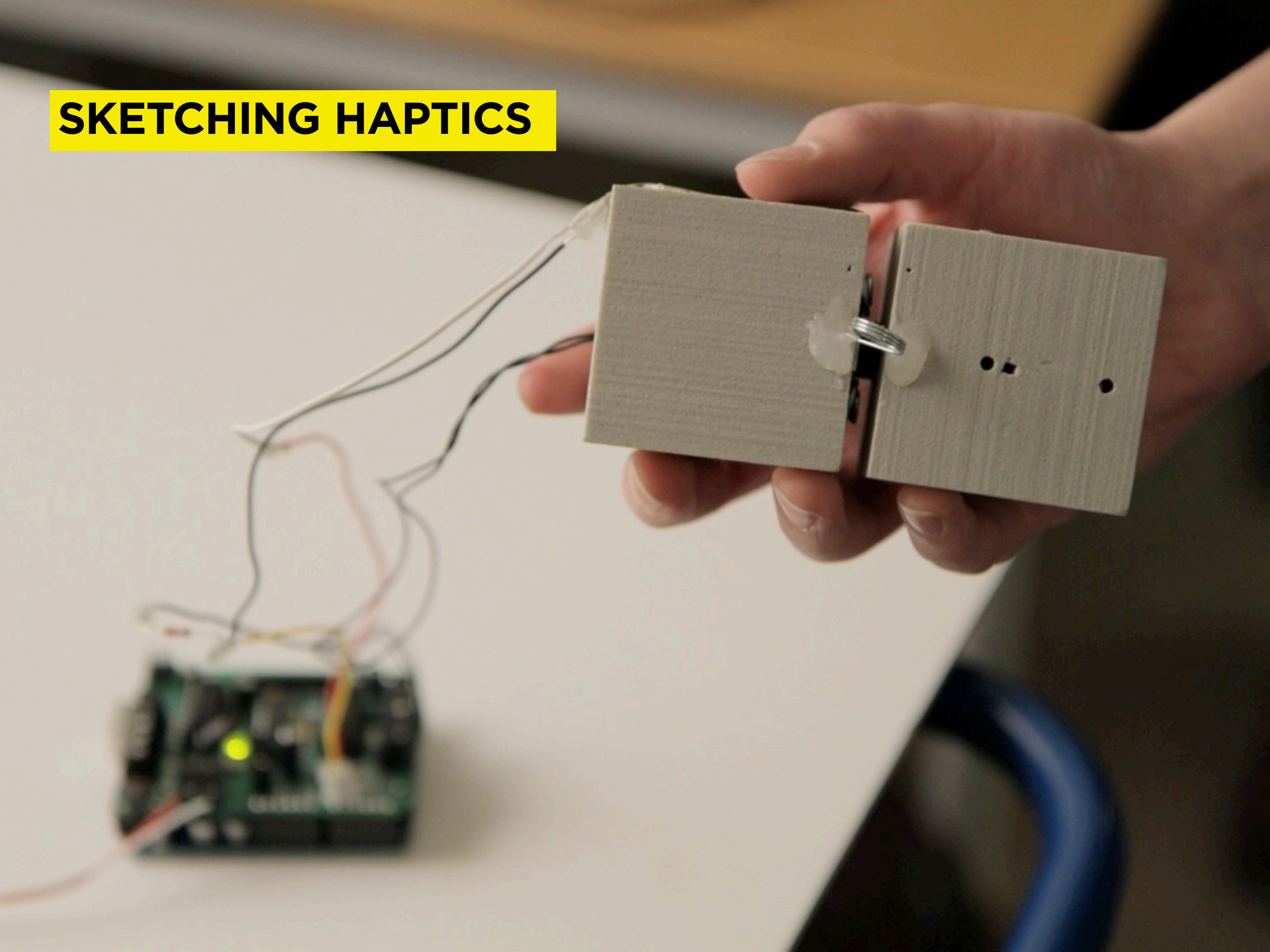






**TECHNOCENTRIC ↔ HUMAN CENTRIC**

# SKETCHING HAPTICS





grow, explode, shrink, scale, rotate,  
pulse, flick, rest, disappear, clutch,  
release, hold, capture, pin, prompt,  
confirm, repeat, stable, glide, slide,  
stop, hit, kick, cancel, ease in/out,  
ramp, augment, increase, decrease,  
agitate, shake, twist, transform, bounce,  
cycle, follow, guide, grab, screw,  
implode, circulate, constrain, channel,  
force, lead, invite, smooth, hard, harsh,  
solid, soft, compliant, bounce, spring,  
break, stop, collide, permute,  
accelerate, react

# SKETCHING HAPTICS

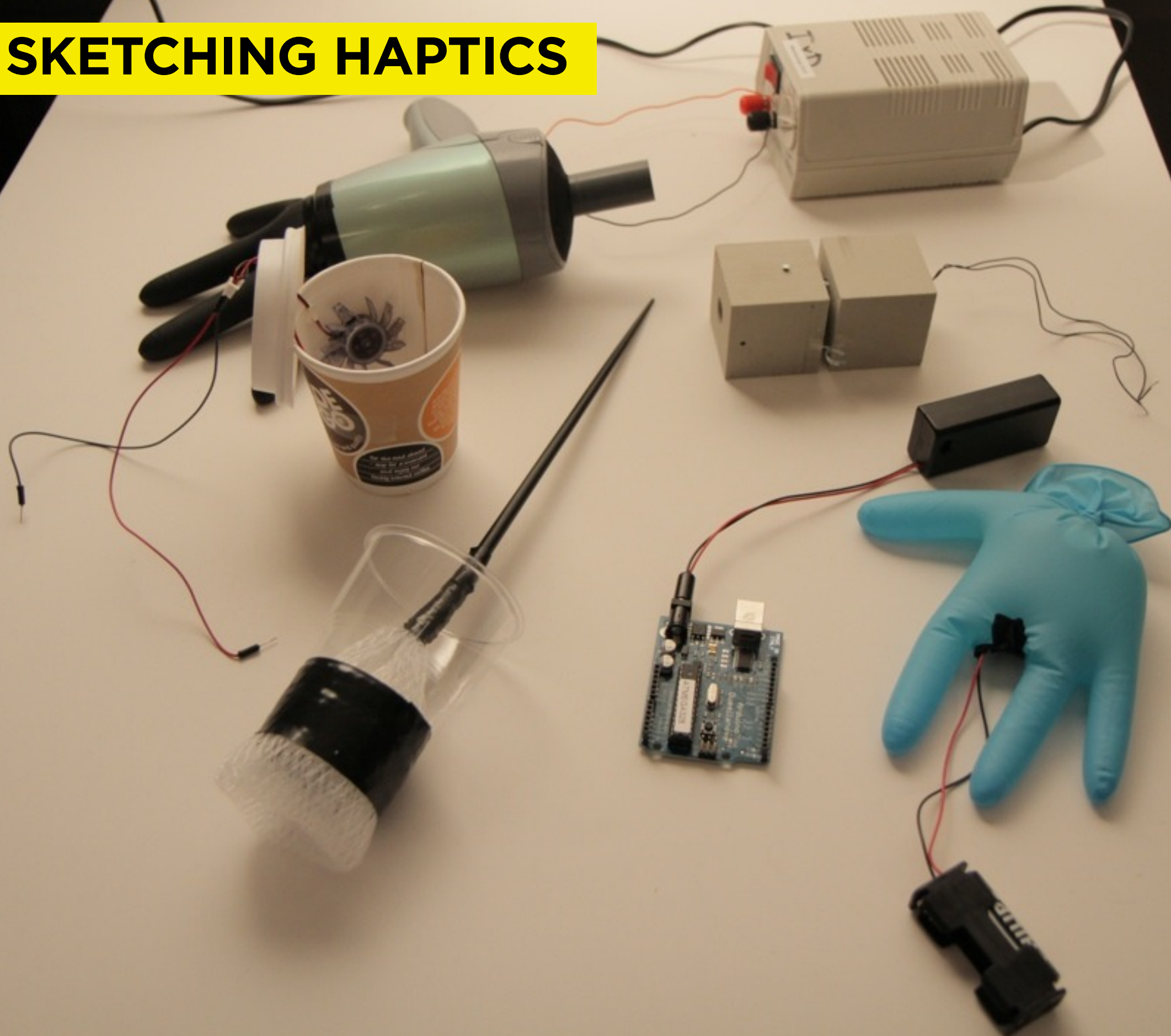




# SKETCHING HAPTICS

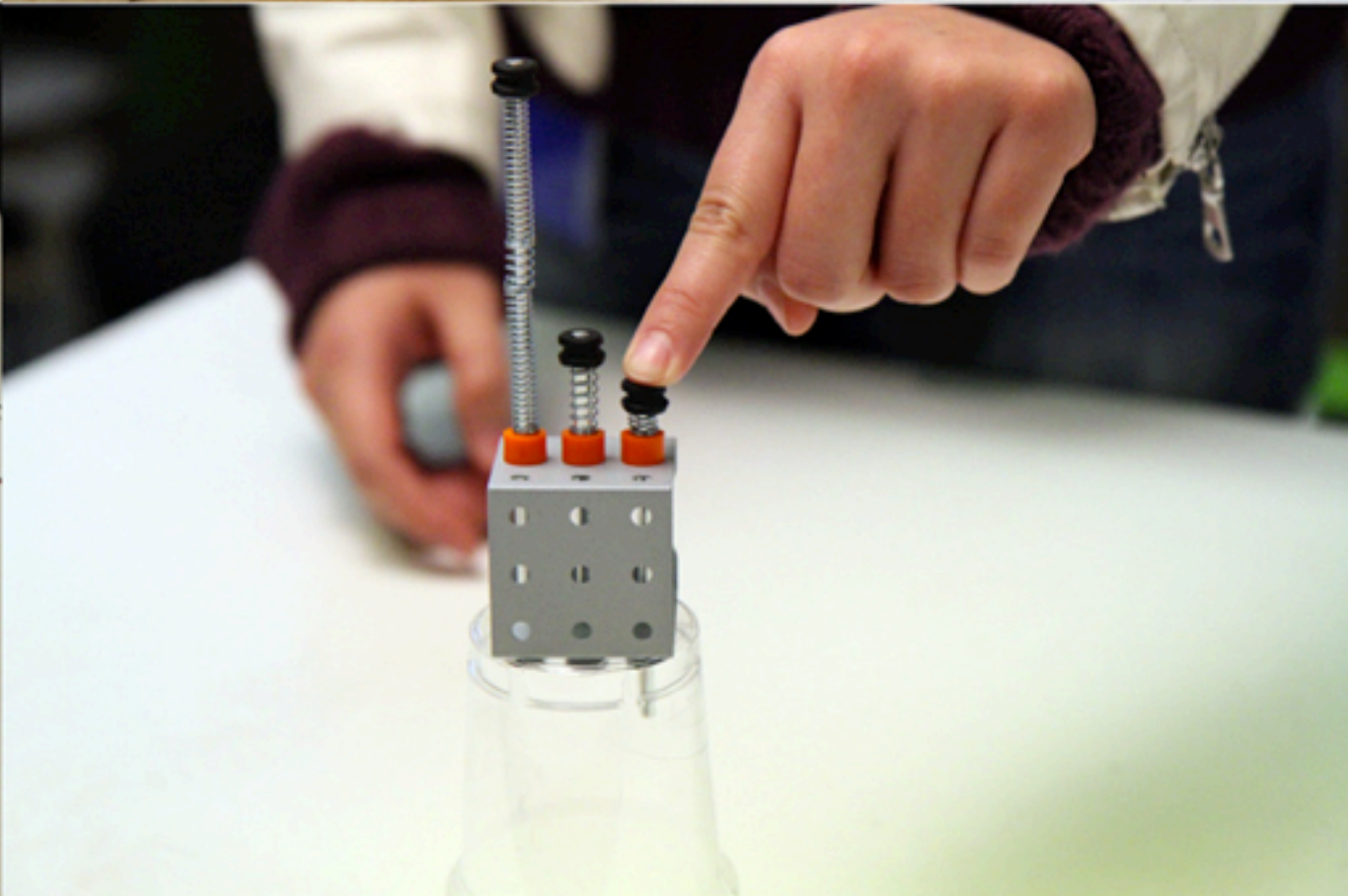
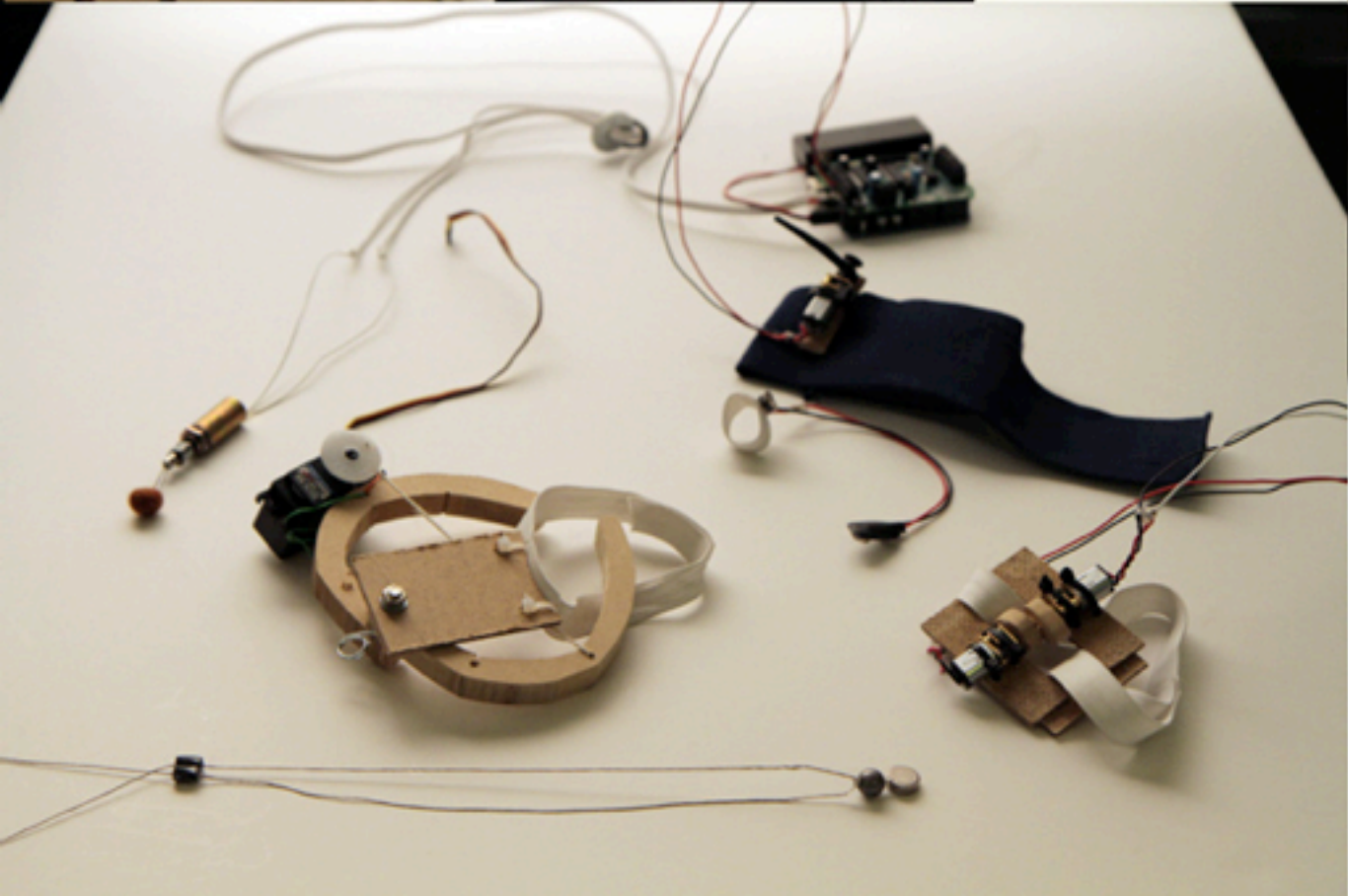
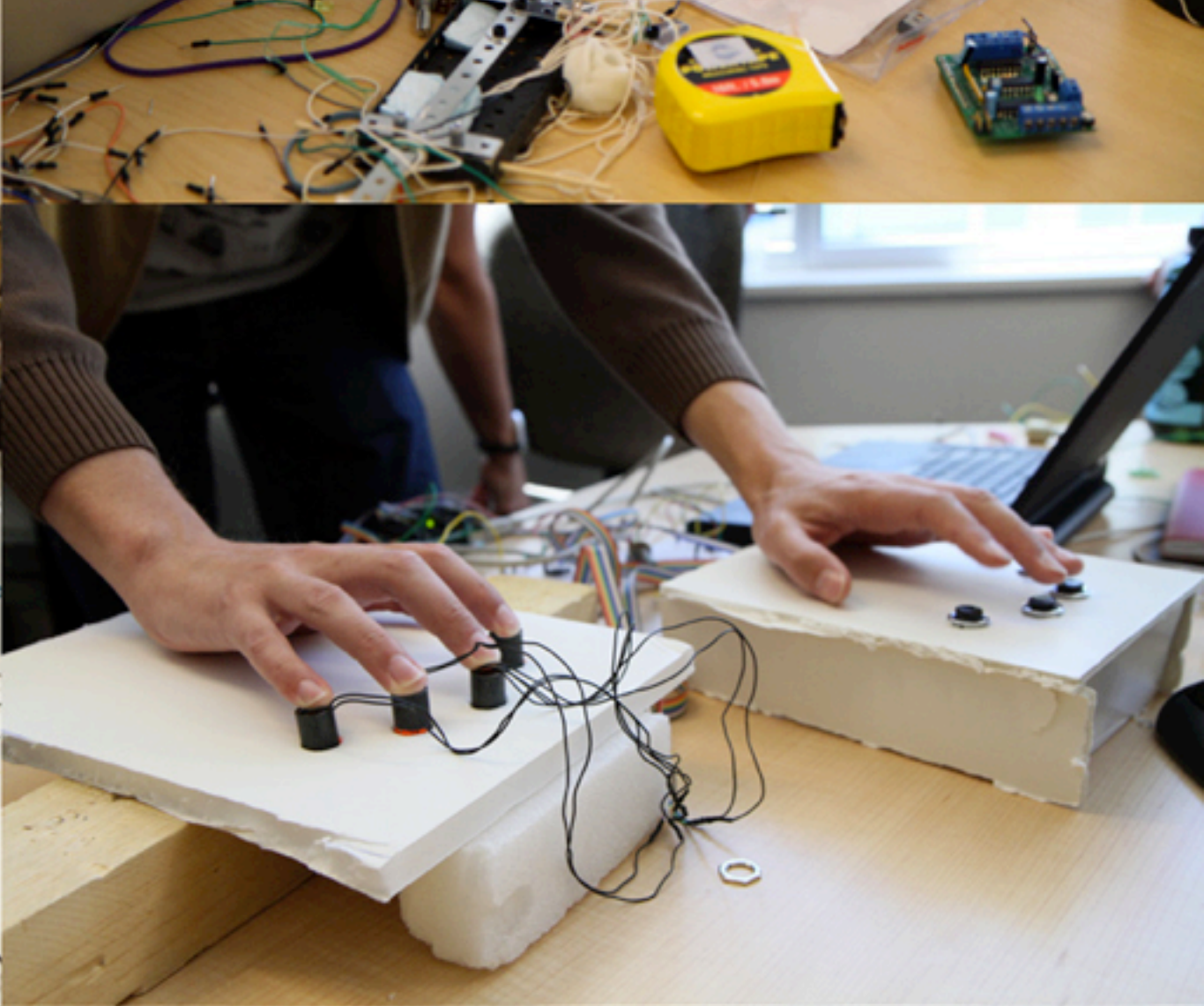


# SKETCHING HAPTICS



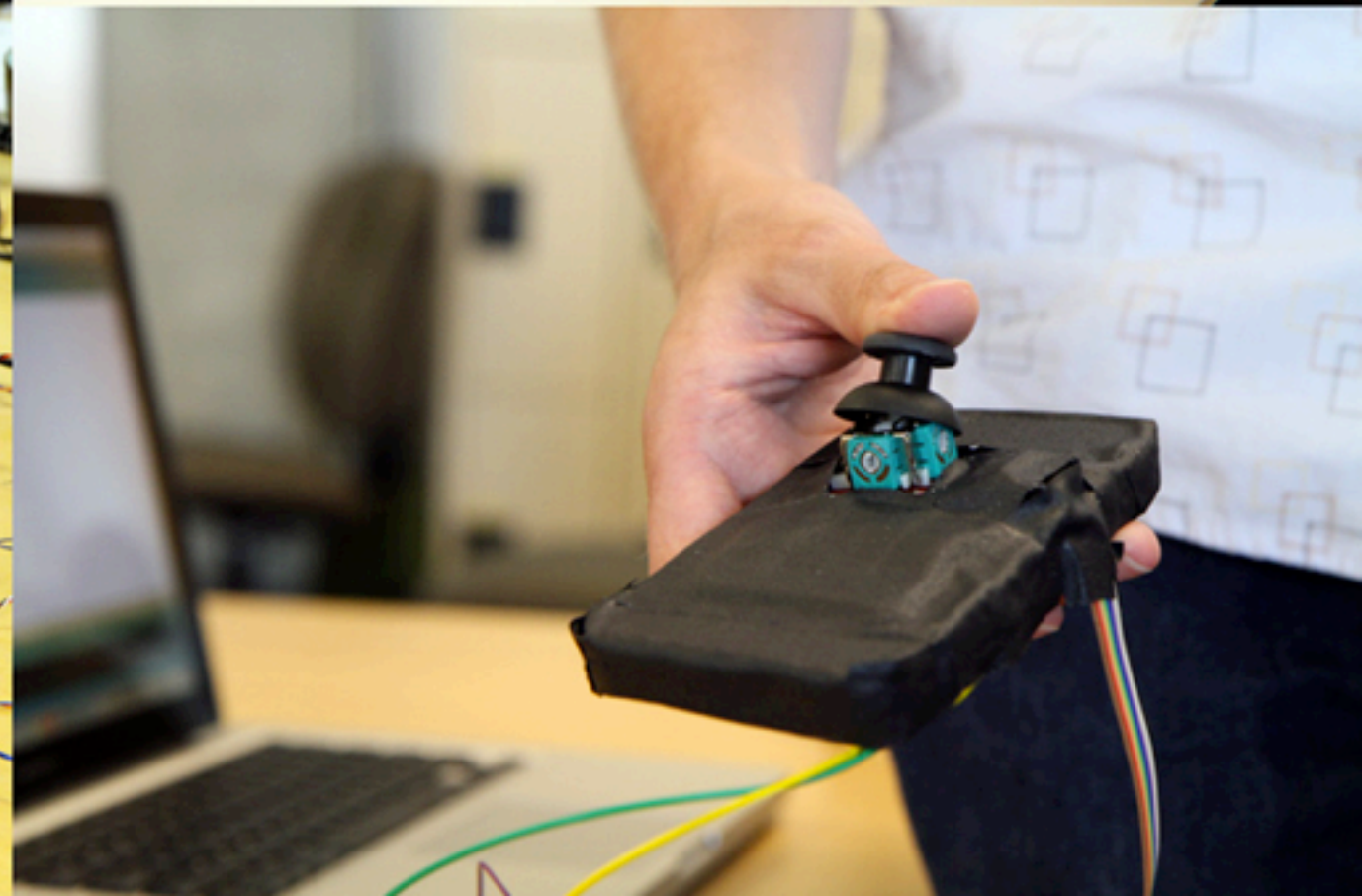
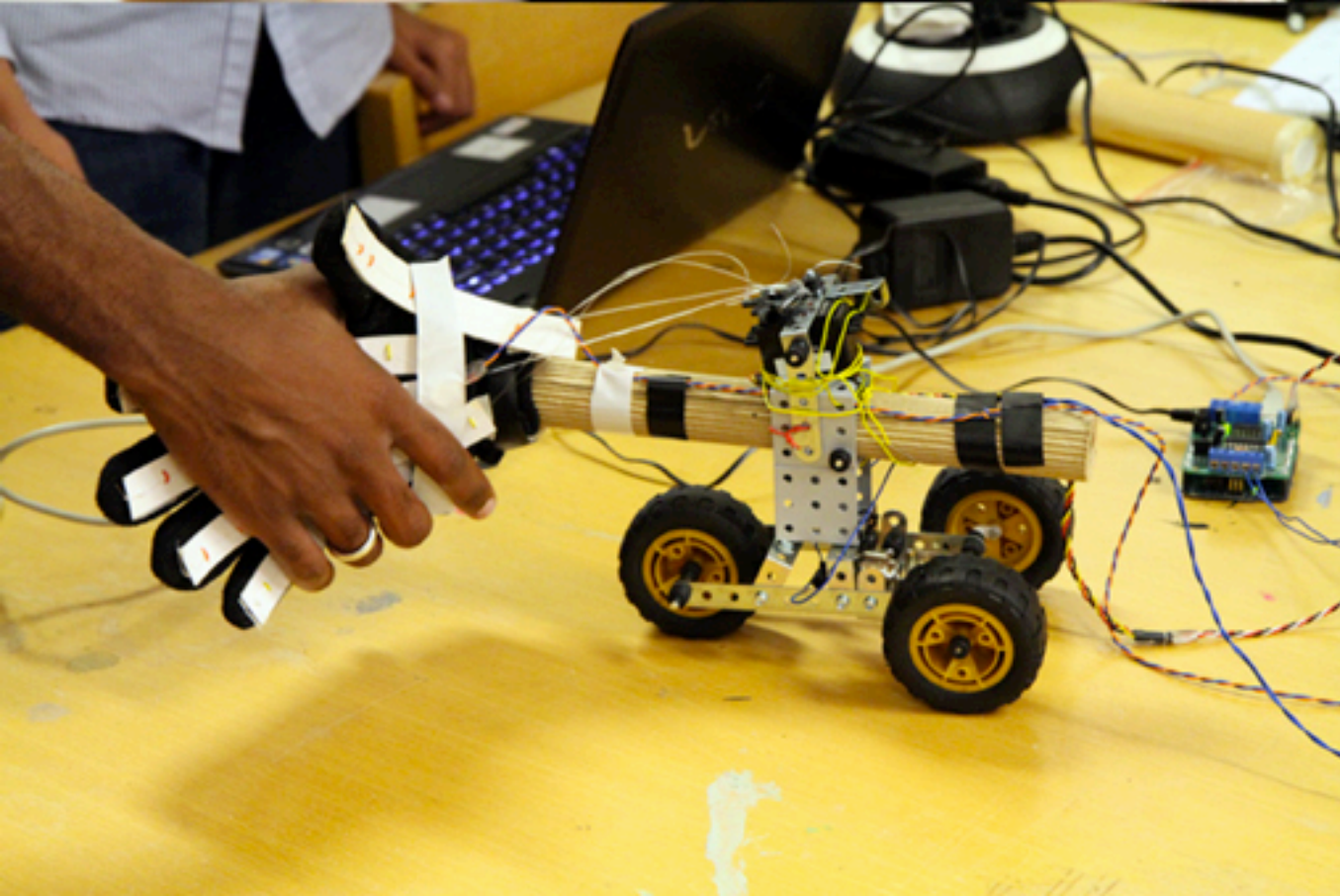


# SKETCHING HAPTICS





# SKETCHING HAPTICS





# DESIGN CONSTRAINTS @ MICROSOFT RESEARCH

Build 4-5 haptic concepts in 12 weeks, 1 person team

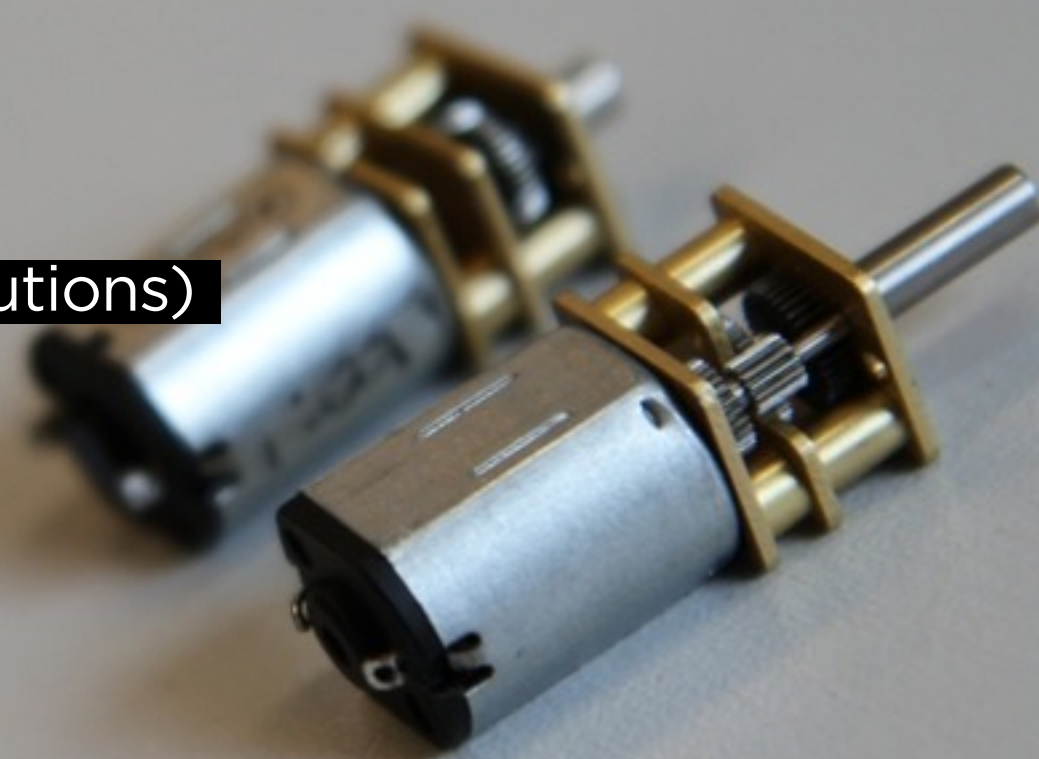
Handheld, ungrounded, fixed shell & size, one material (MDF)

Linked with UI, if appropriate

Simple components and parts (no high-end solutions)

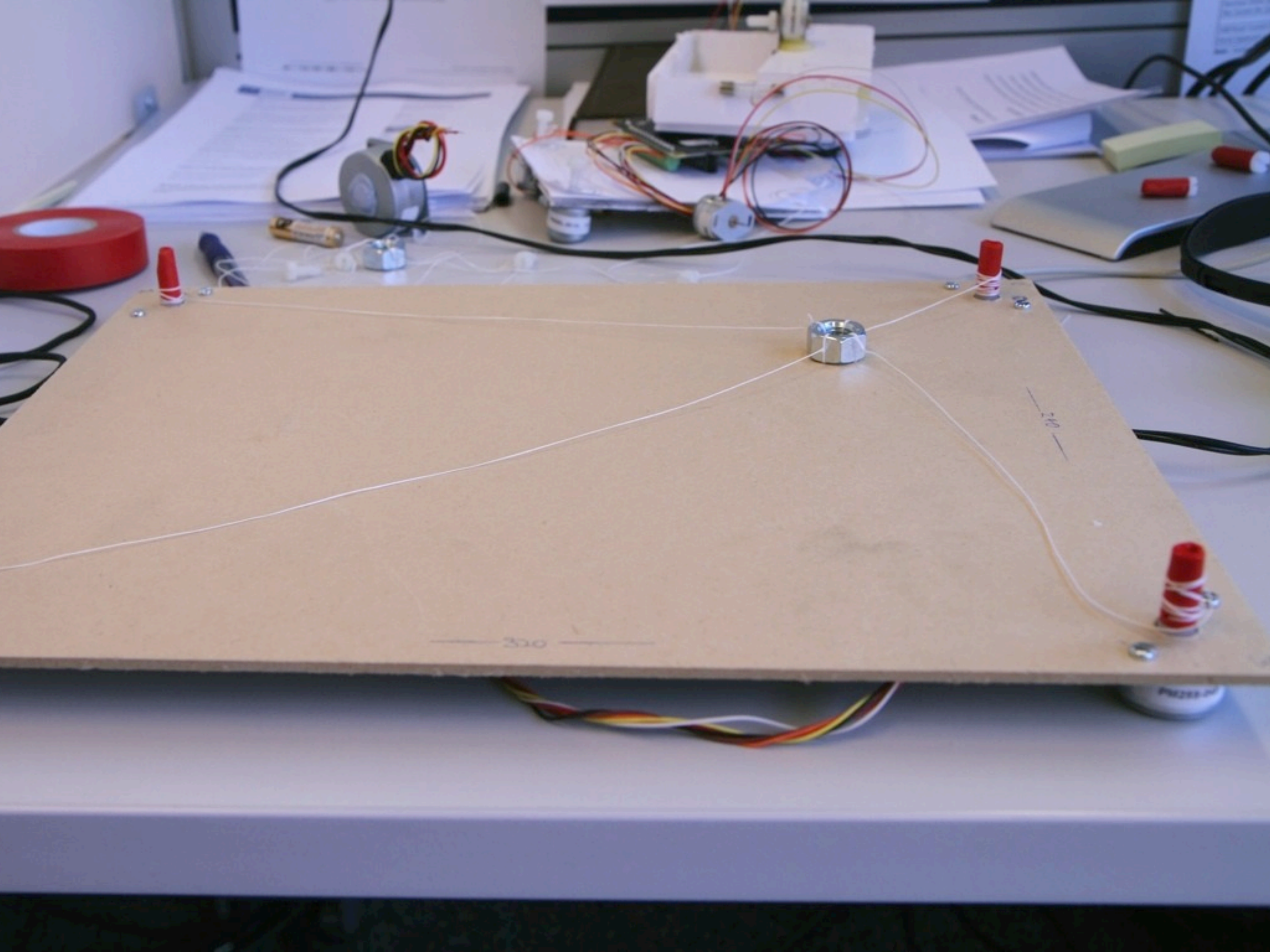
Stimulation first, more abstract than feasible

Self-control (no experimenter intervention)





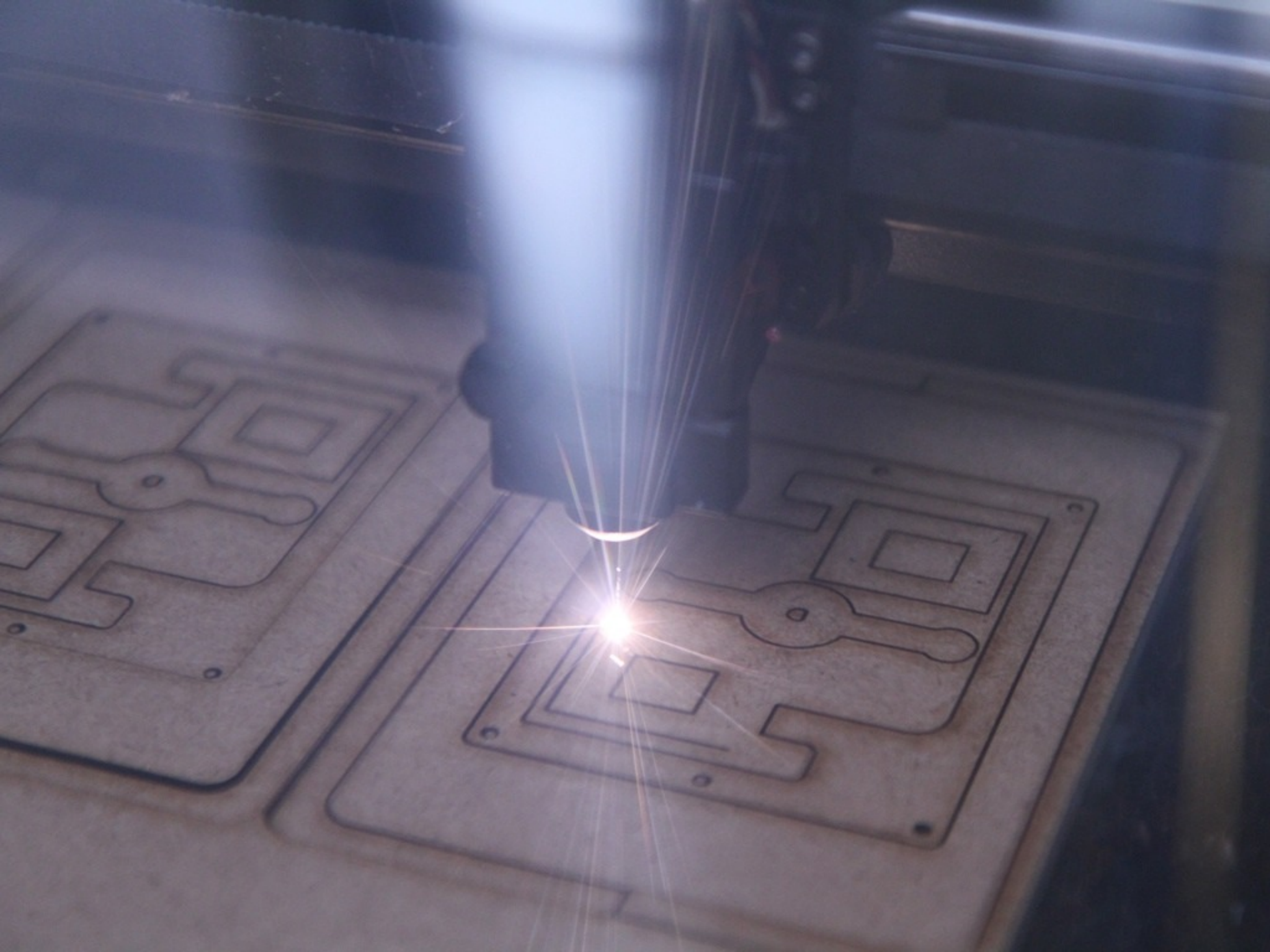




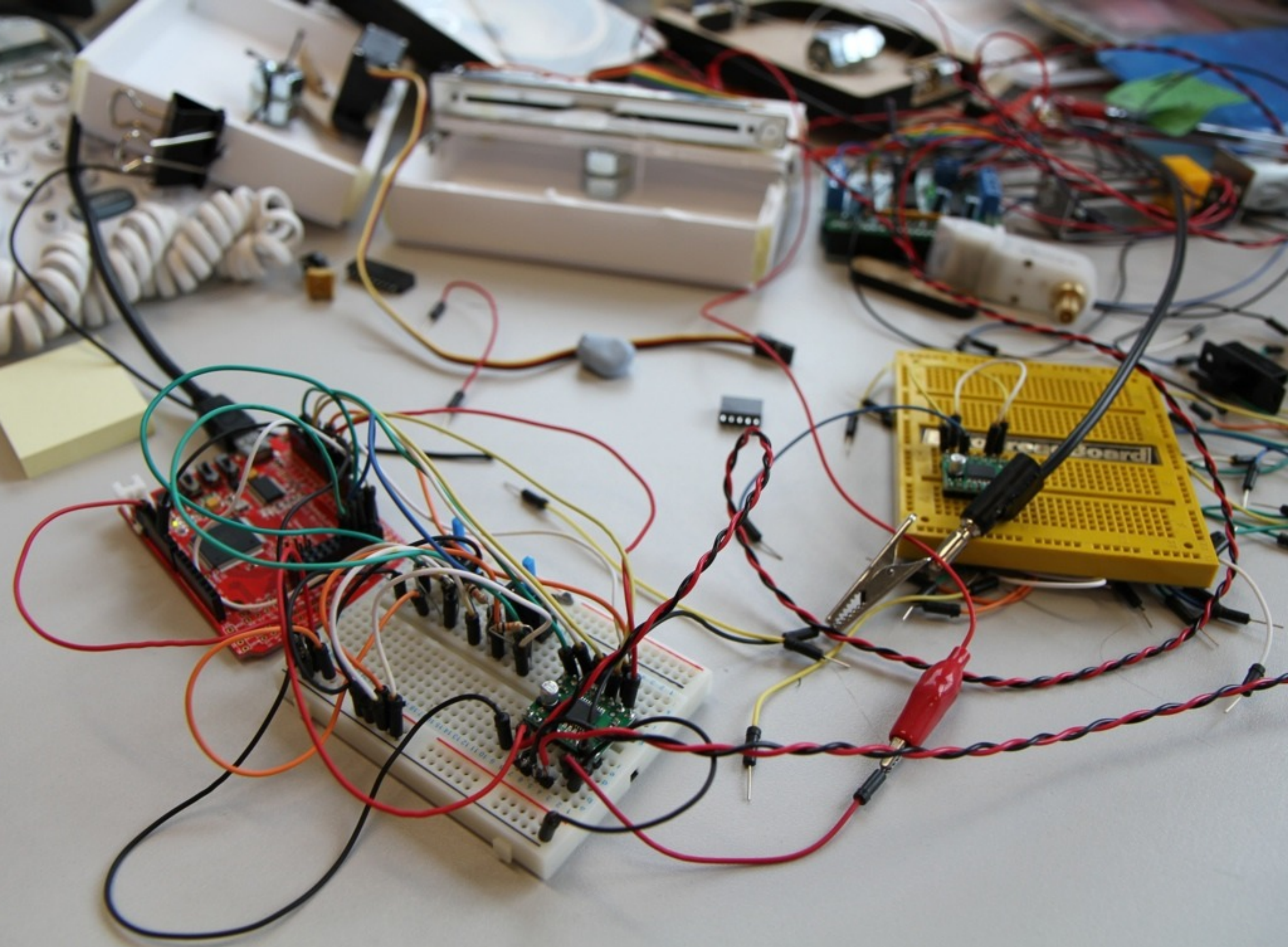














**5 UNITS: TODAY AND AS DEMOS AT HS2012**



# FINDINGS AND INSIGHTS

Assembly technique matters (glued vs screwed)

Noise is almost inevitable and always felt

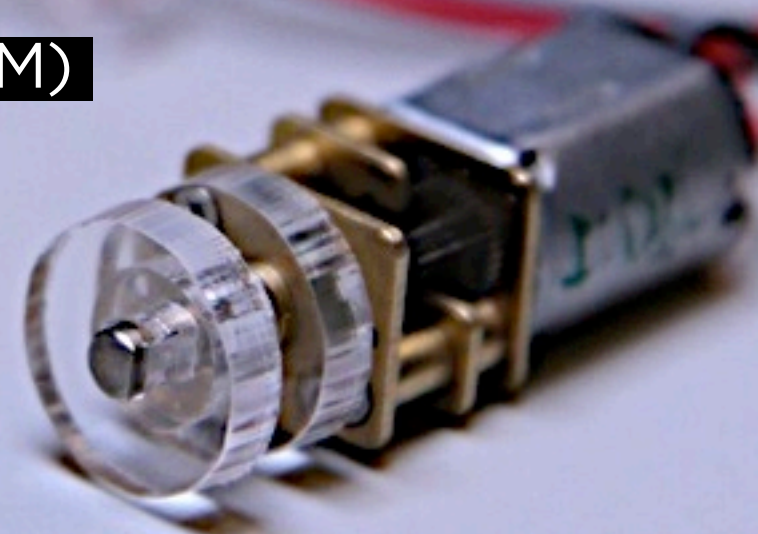
Exploit material properties

Absolute vs relative change (specially for CoM)

A good medium for shared understanding

Technical but valuable

Build modular (parts, connectors, controls)





# scaling challenges

number

power



size

price

time

# unscientific complexity gamut



n	2n	n <sup>x</sup>
large	compact	micro
ephemeral/transient		robust/permanent
wall powered		battery powered
3-5V	12V	110-220V
wired		wireless
binary output		PWM
binary input	ADC	SPI/I <sup>2</sup> C
self-contained	one-way comm.	duplex comm.



# Rapid Prototyping/**Sketching Haptics**

**people + hardware + control + psychophysics + context**

(design) constraints are stimulating

fail early, fail often, multiple valid alternatives

**human centric** vs technology centric

know and exploit material properties

assembly mechanisms matter

“use the world to control the world”

**“FAIL EARLY AND FAIL OFTEN”**

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