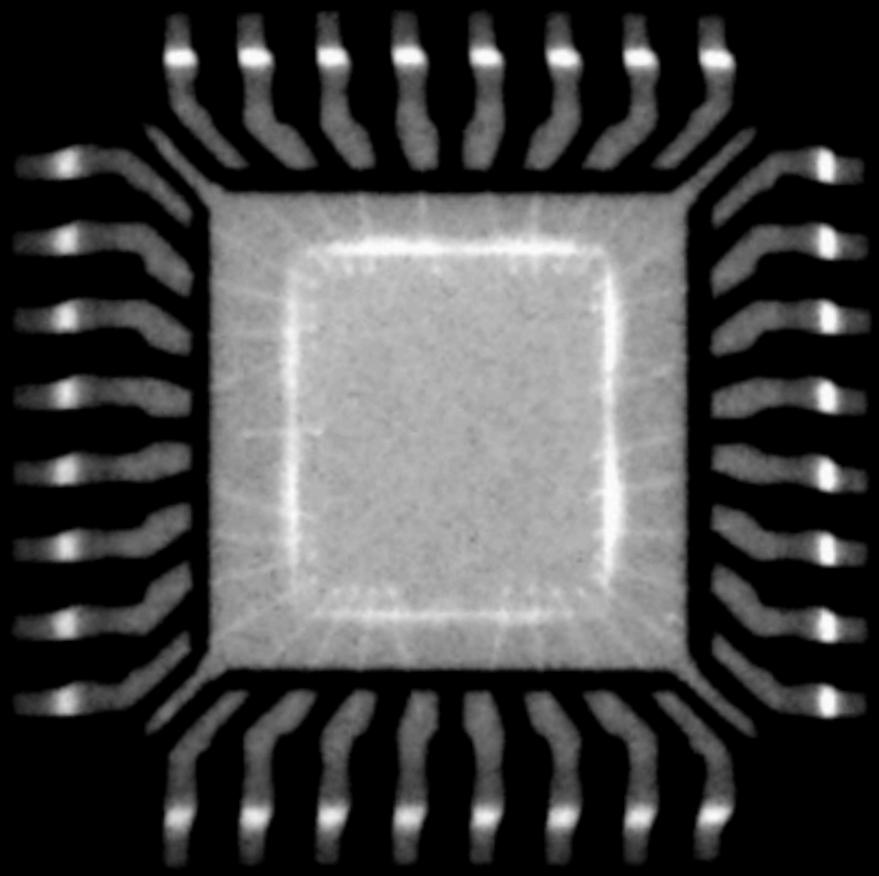
# LEARN TO MAKE, MAKE TO LEARN

Camille Moussette, 04.03.2012, Haptics Symposium 2012

UMEÅ UNIVERSITET

# 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

Sensing and moving atoms

Hardware is hard!

Prototyping skills

Hardware sketches

Making/building challenges

# Make to learn

# Learn to make

Sensing and moving atoms

Hardware is hard!

Prototyping skills

Hardware sketches

Making/building challenges

# Make to learn

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

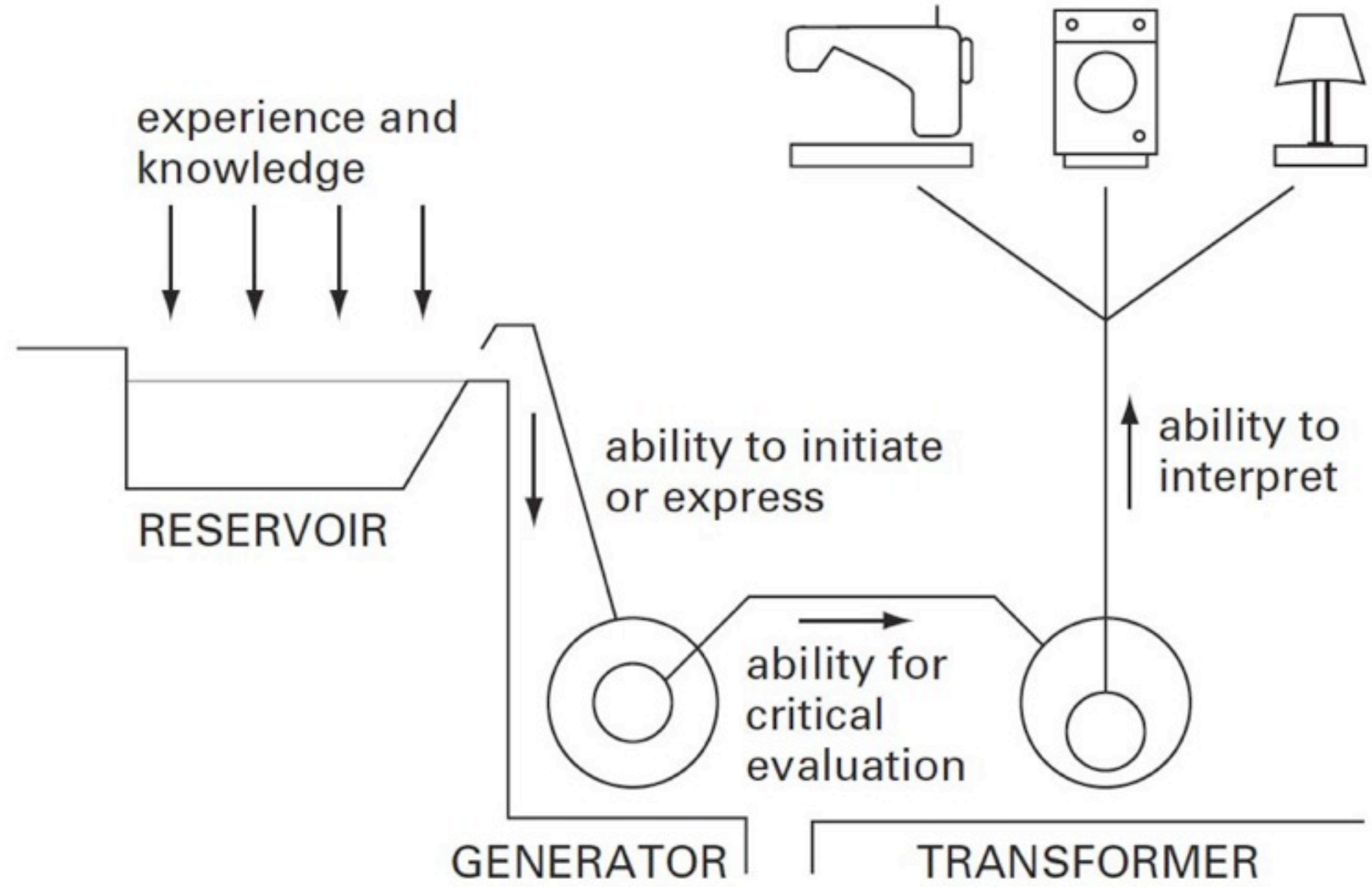
# SKETCHING (IN HARDWARE)

# PROTOTYPES

VS

# SKETCHES

# Laxton's 3 design skills model (1969)




from How Designers Think, Bryan Lawson (2005)

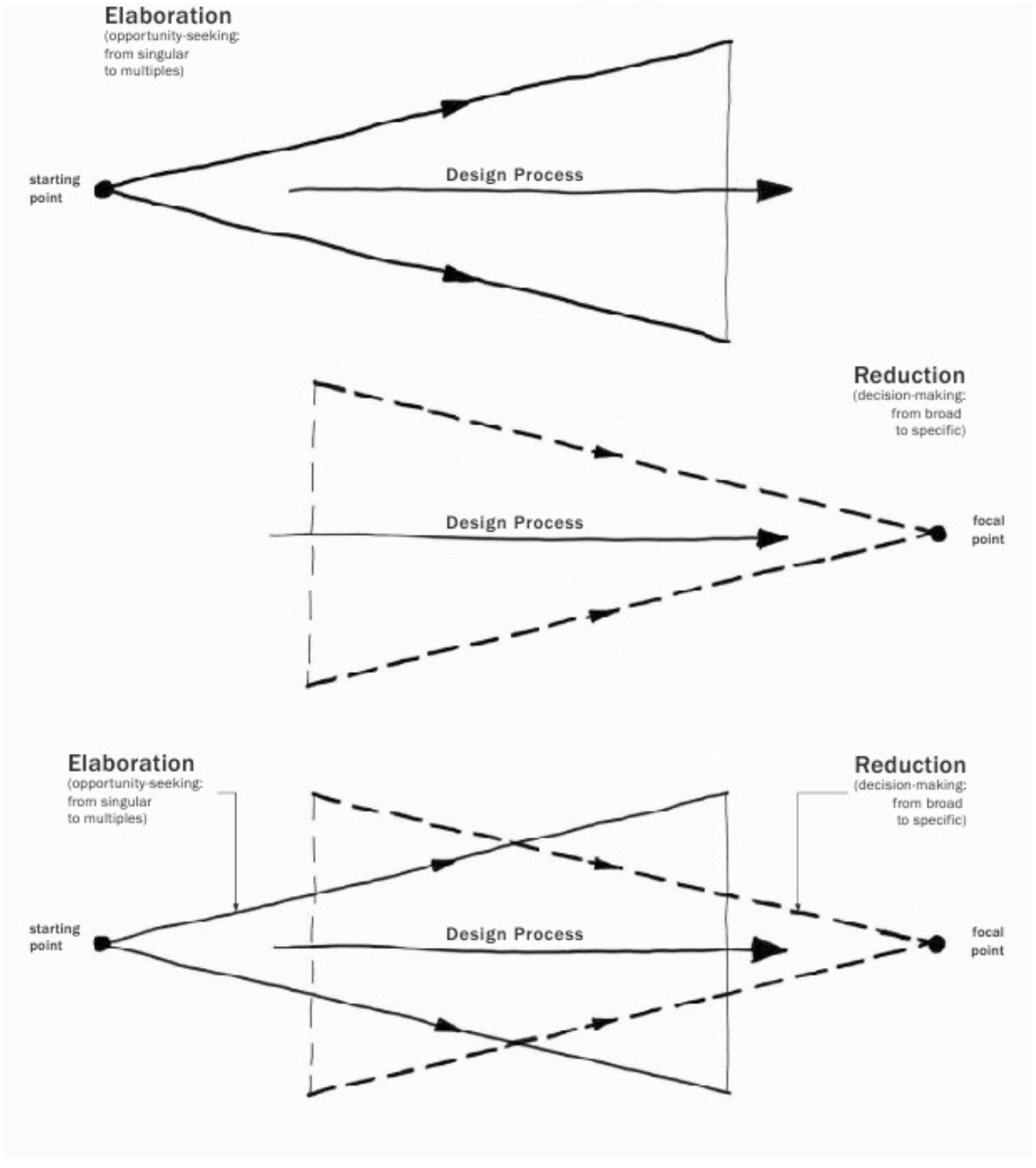
"Bill Buxton brings design leadership and creativity to Microsoft. Through his thought-provoking personal examples he is inspiring others to better understand the role of design in their own companies."
**Bill Gates—Chairman, Microsoft Corp.**

# Sketching User Experiences

## getting the design right and the right design

Bill Buxton

MORGAN KAUFMANN


Elaboration
(opportunity-seeking:
from singular
to multiples)
starting
point
Design Process
Reduction
(decision-making:
from broad
to specific)
Design Process
focal
point
Elaboration
(opportunity-seeking:
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point

Buxton, 2007

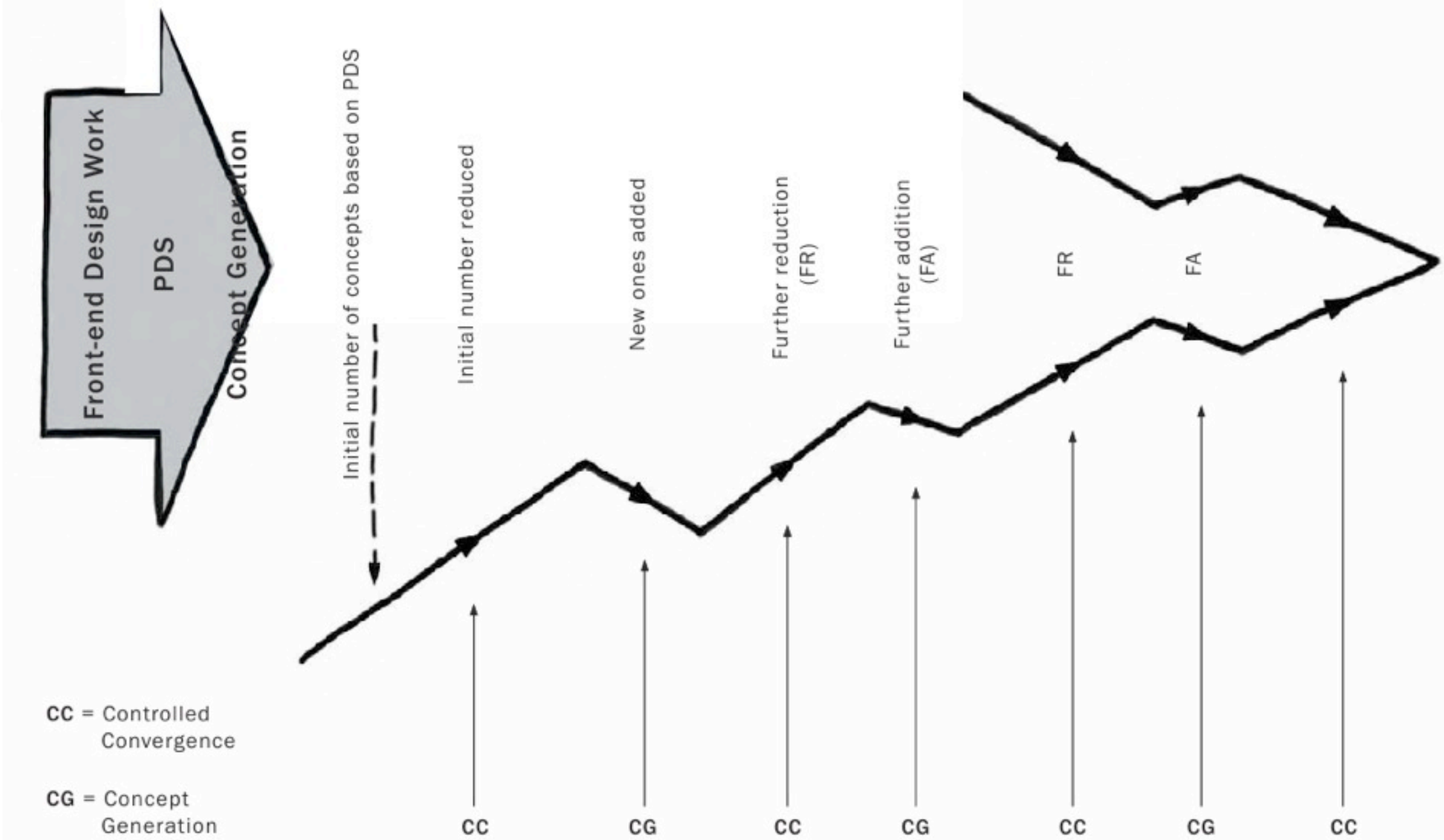



**Figure 54: Flexible Approach to Concept Generation and Selection**

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

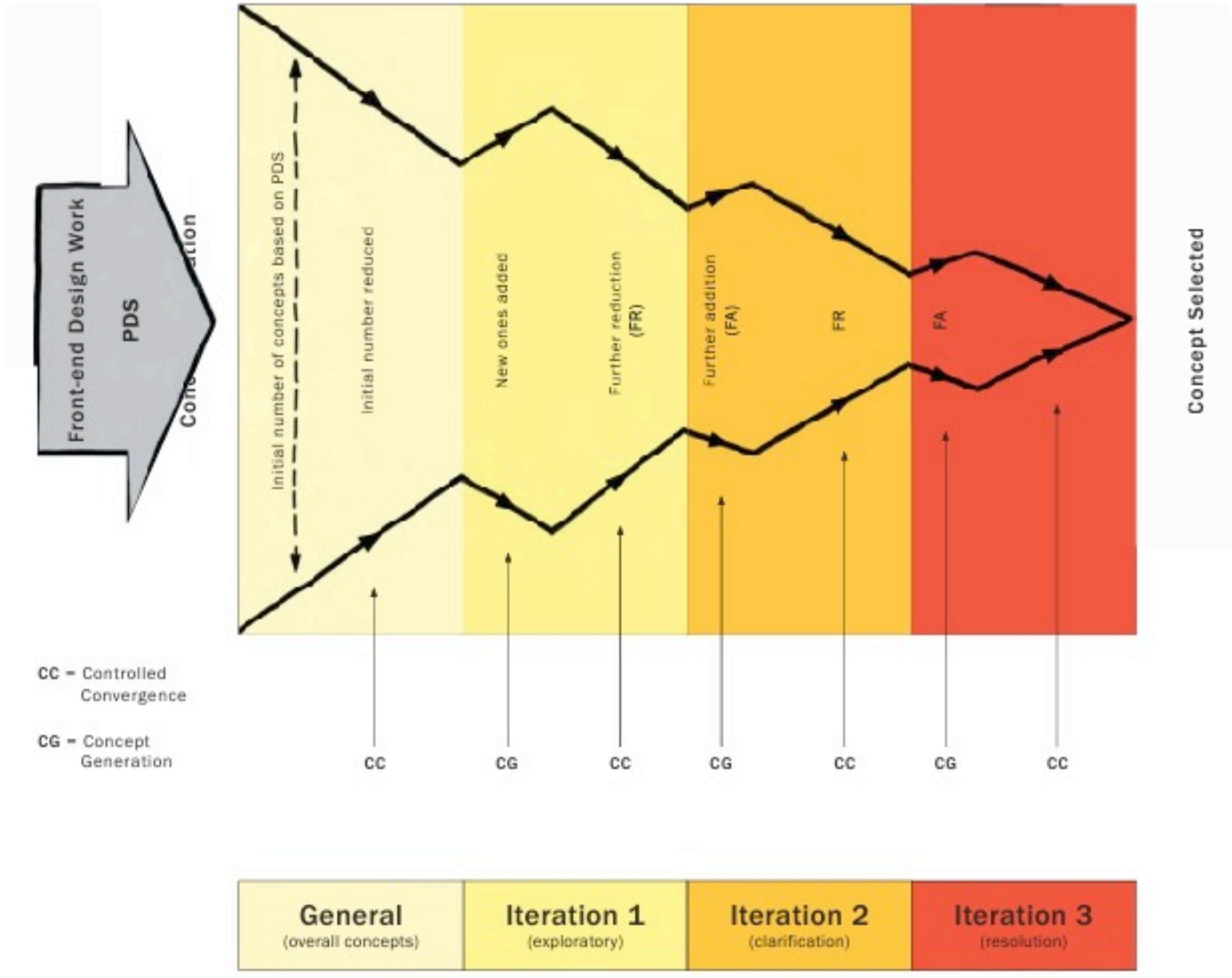
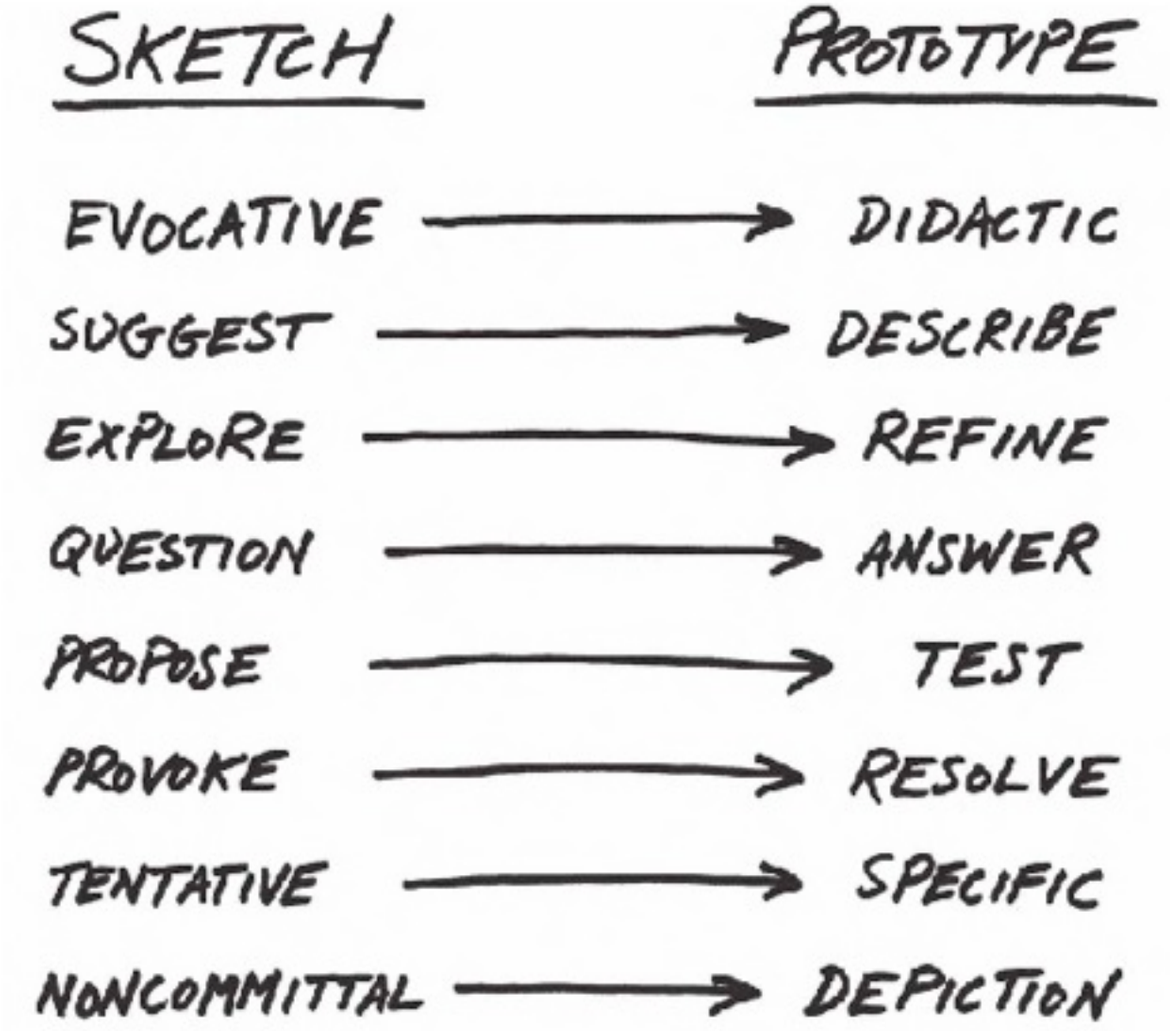
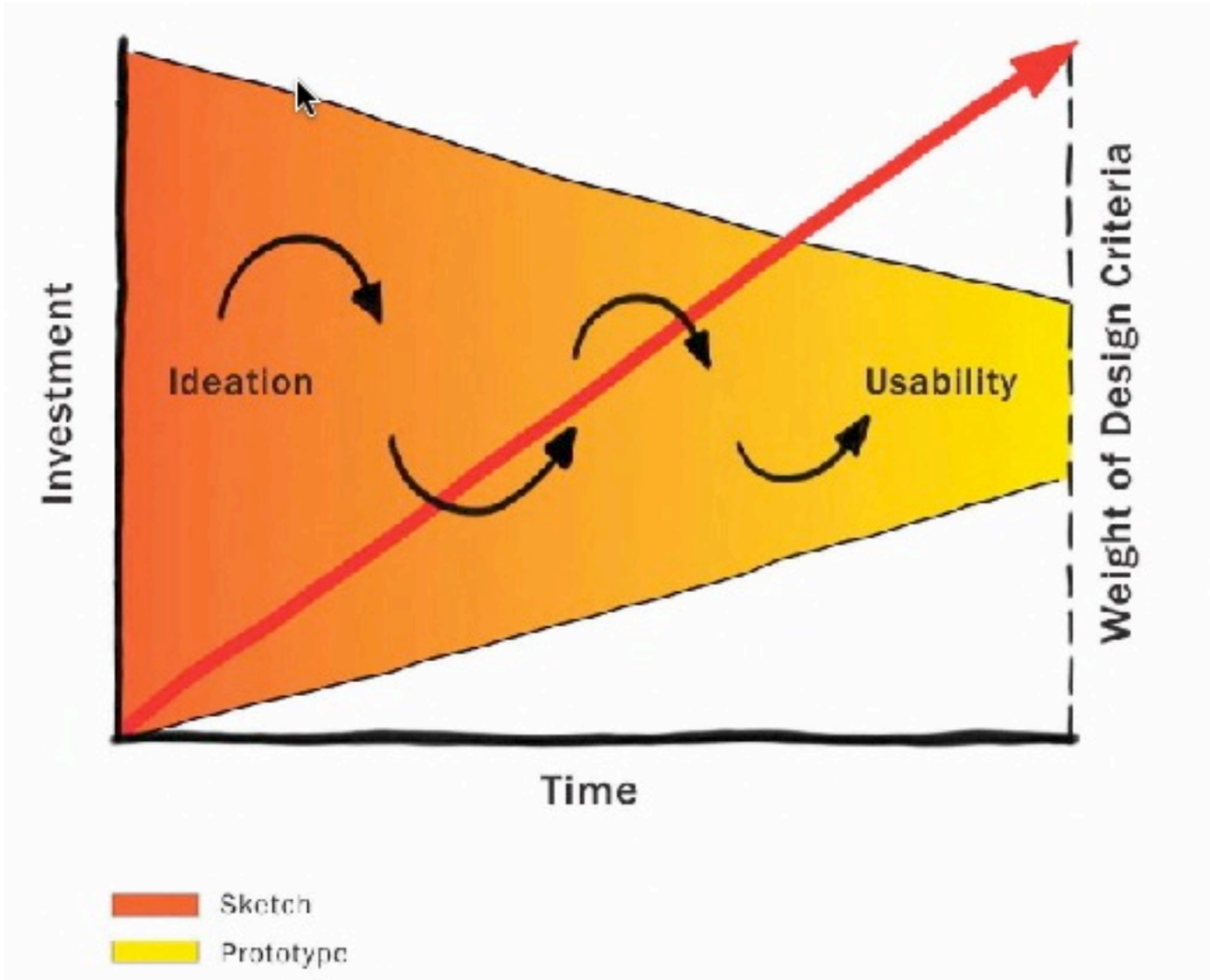



**Figure 55: Another View of the Funnel**
This variation on Pugh's illustration emphasizes the iterative nature of the process
Source: Pugh 1990; p. 75

Buxton, 2007


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


Ideation
Usability
Time
Weight of Design Criteria
Sketch
Prototype

Buxton, 2007

# Prototypes are...

"the things we make to find out things"

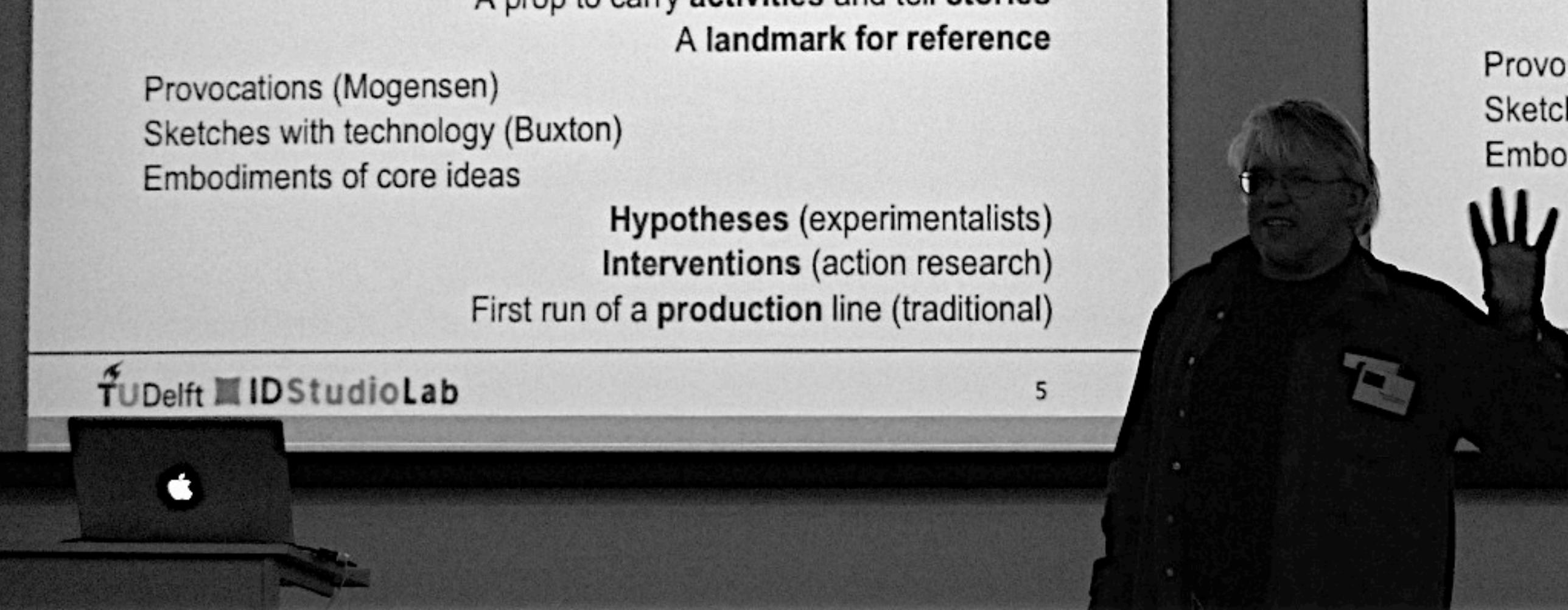
How things should be
How things will be
How things can be

**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)





# 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 Tenenberg, 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 Tenenberg, 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)

Sketch

Prototype

# **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

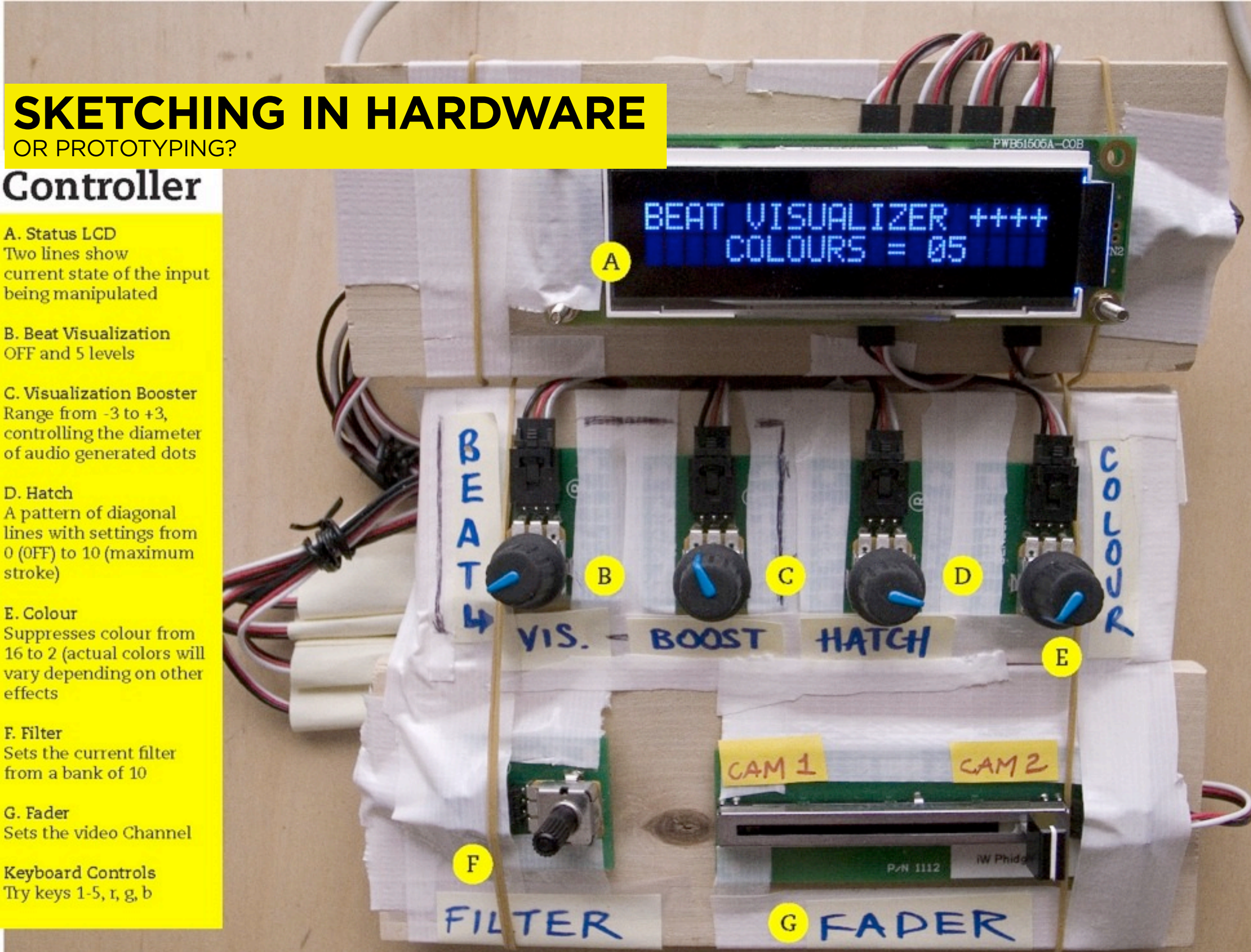
**D. Hatch**
A pattern of diagonal lines with settings from 0 (OFF) to 10 (maximum stroke)

**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

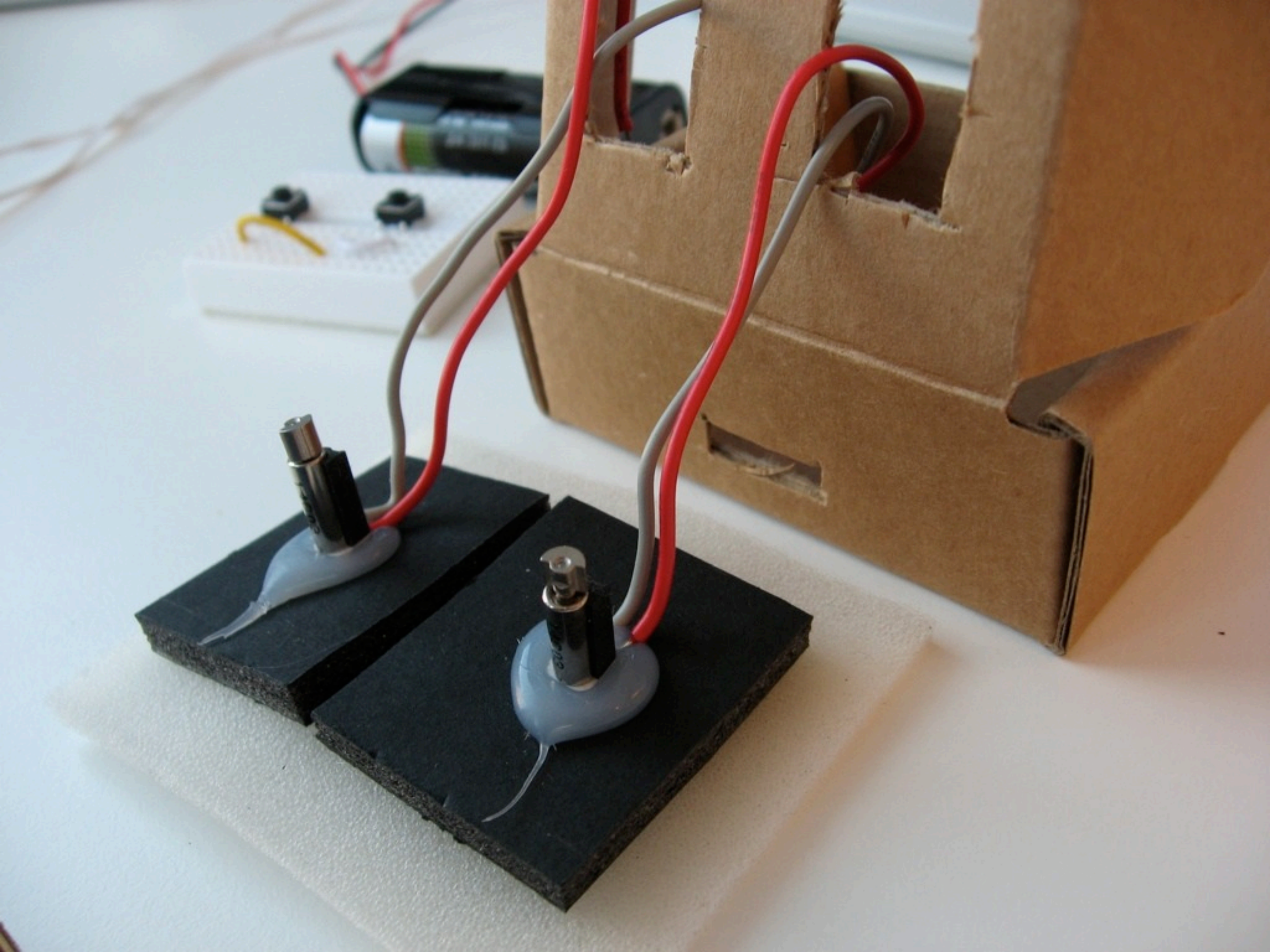
Human actuated, Wizard of Oz

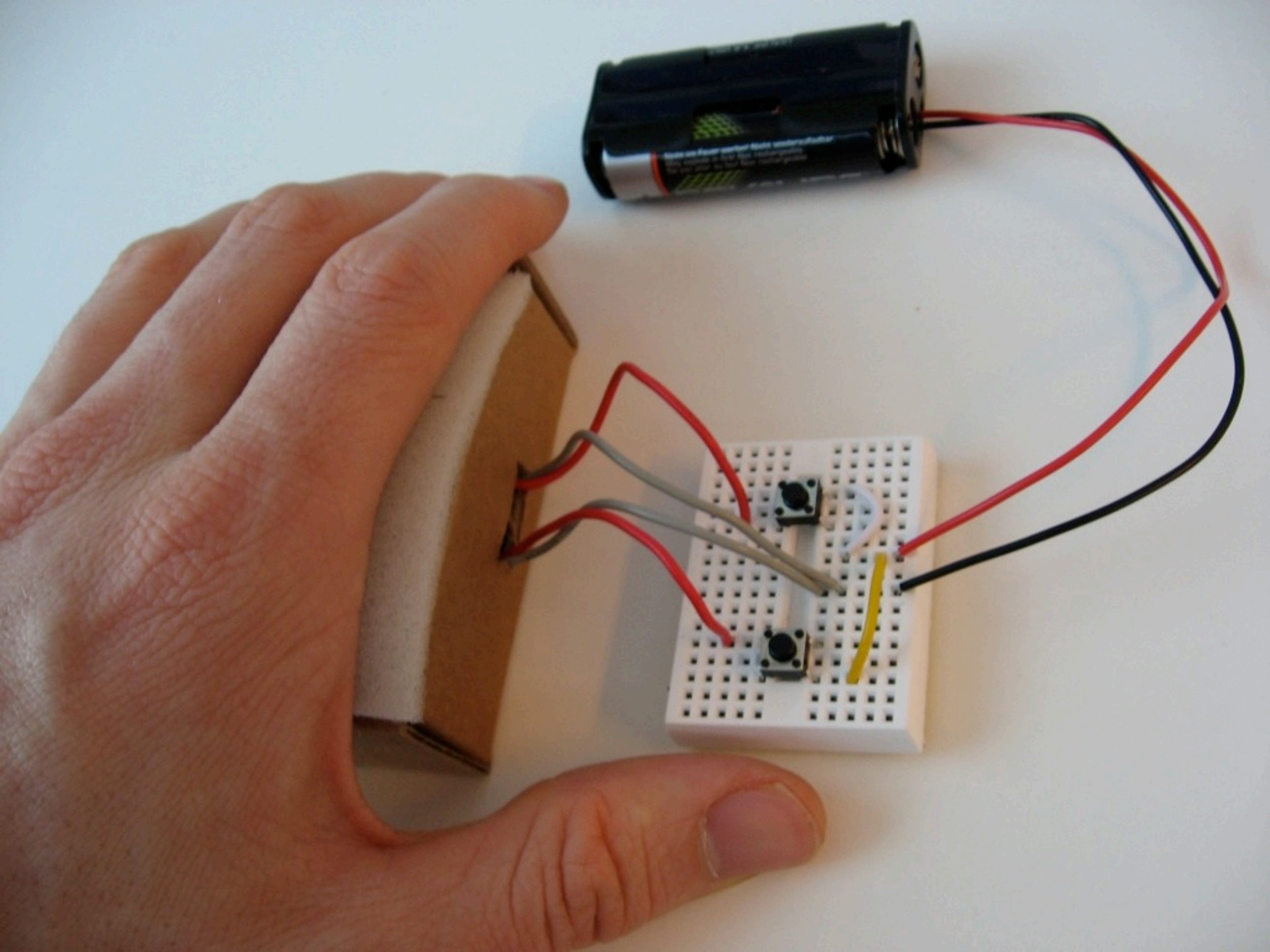
Quick and dirty “how does this feel”

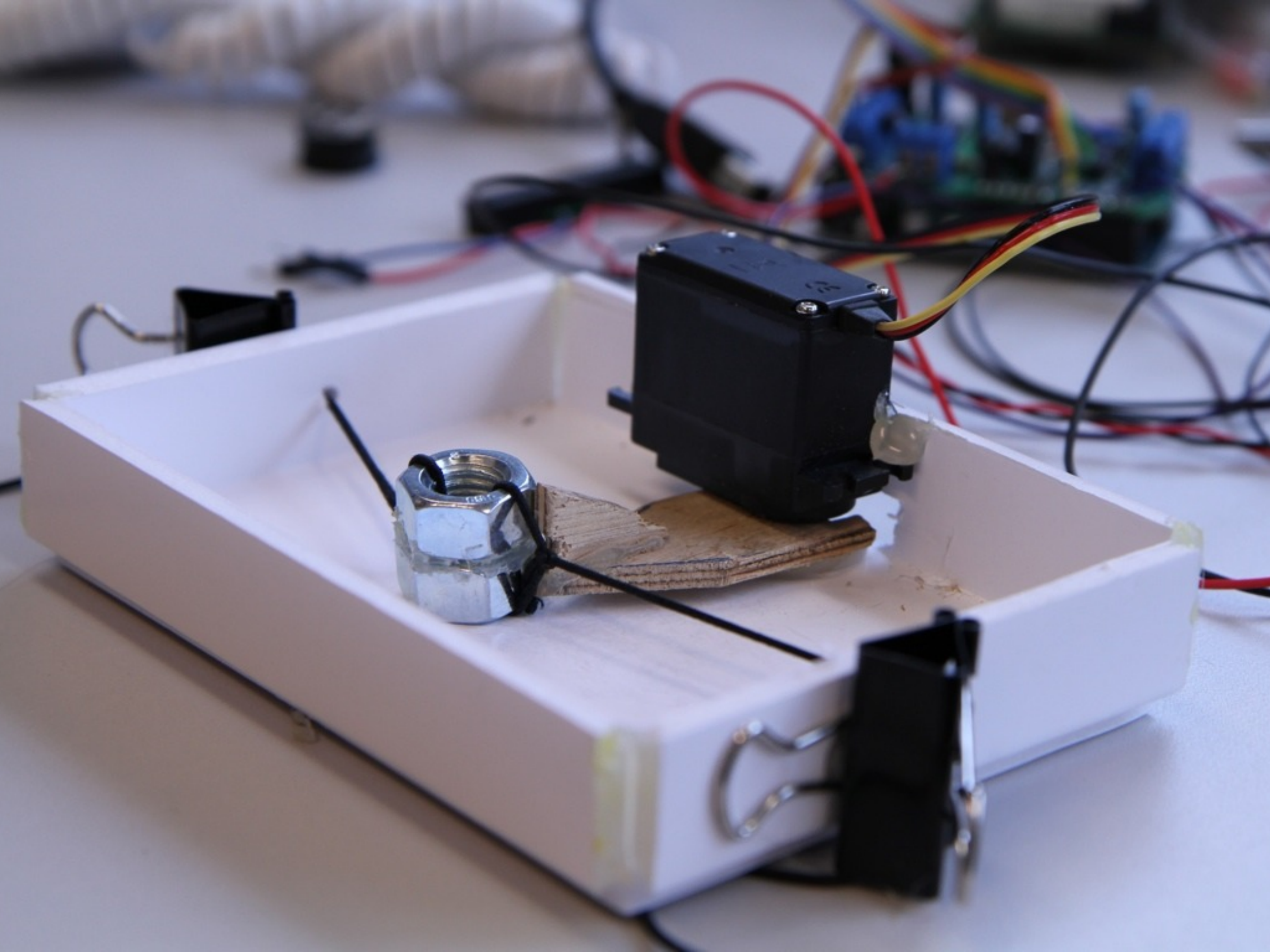
PD like (brainstorm, ideation workshop)

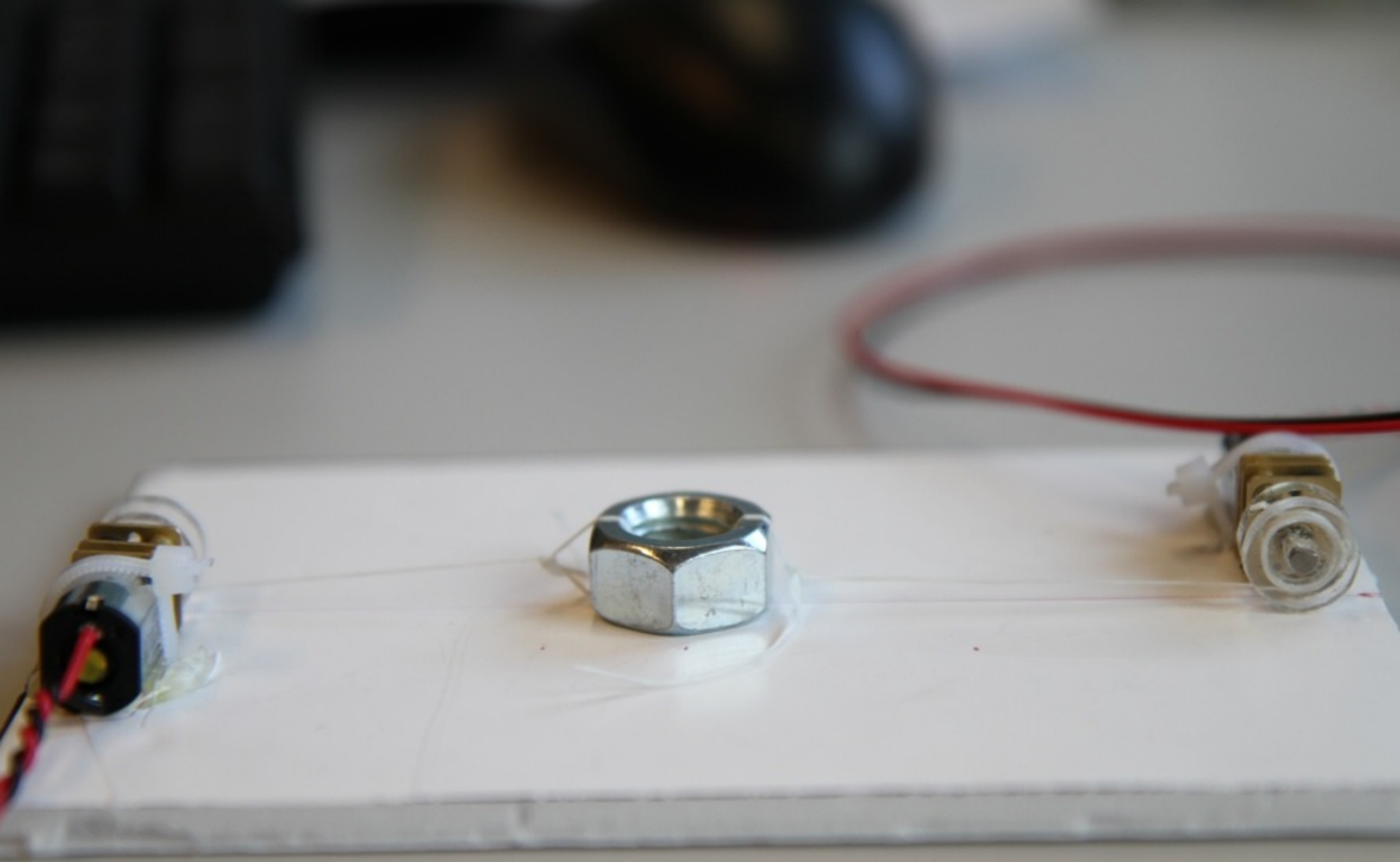
What you can do on your desk/table

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









# Hours, one day

Explore variations

Not as clunky

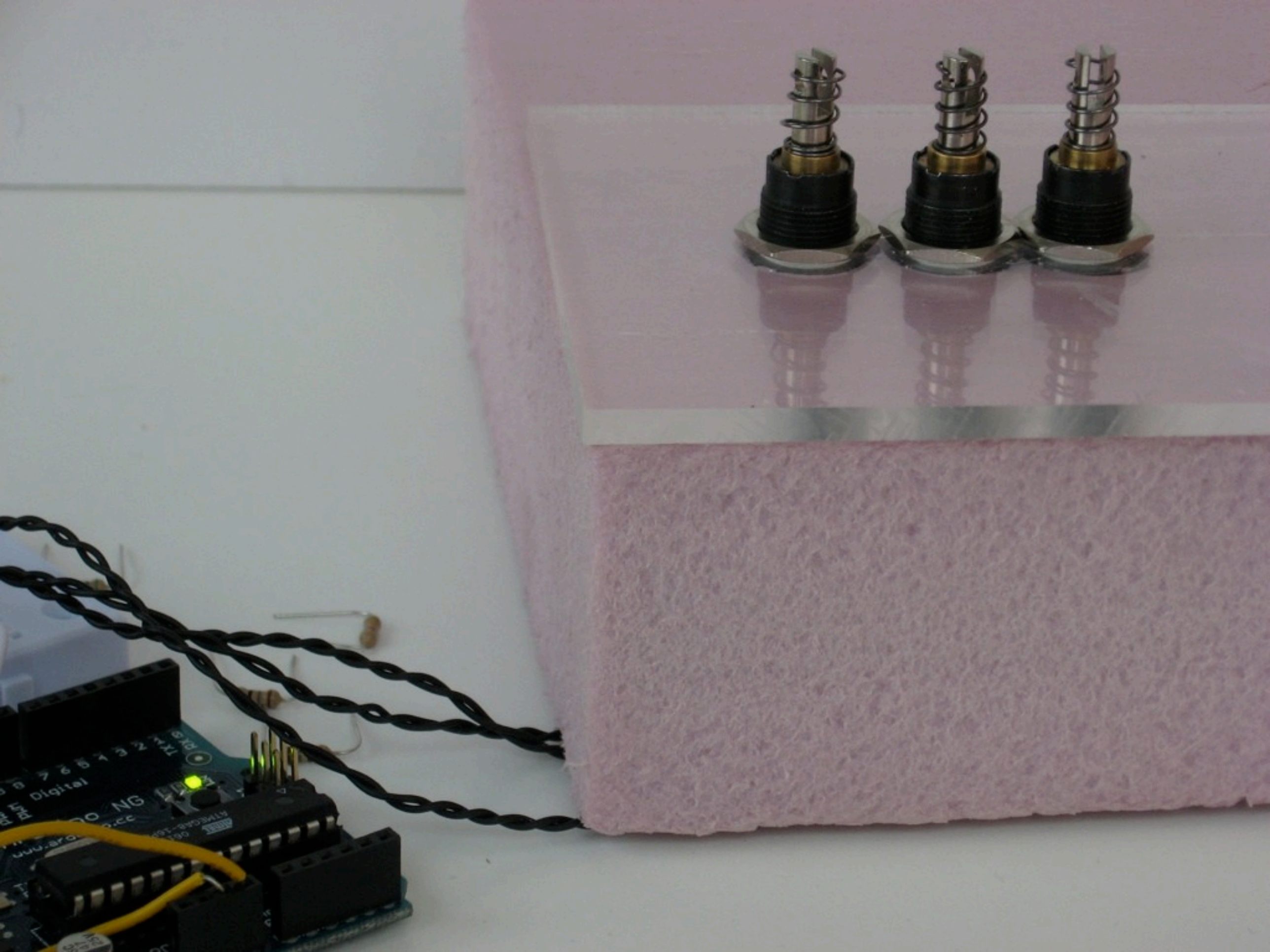
Human actuated, Wizard of Oz

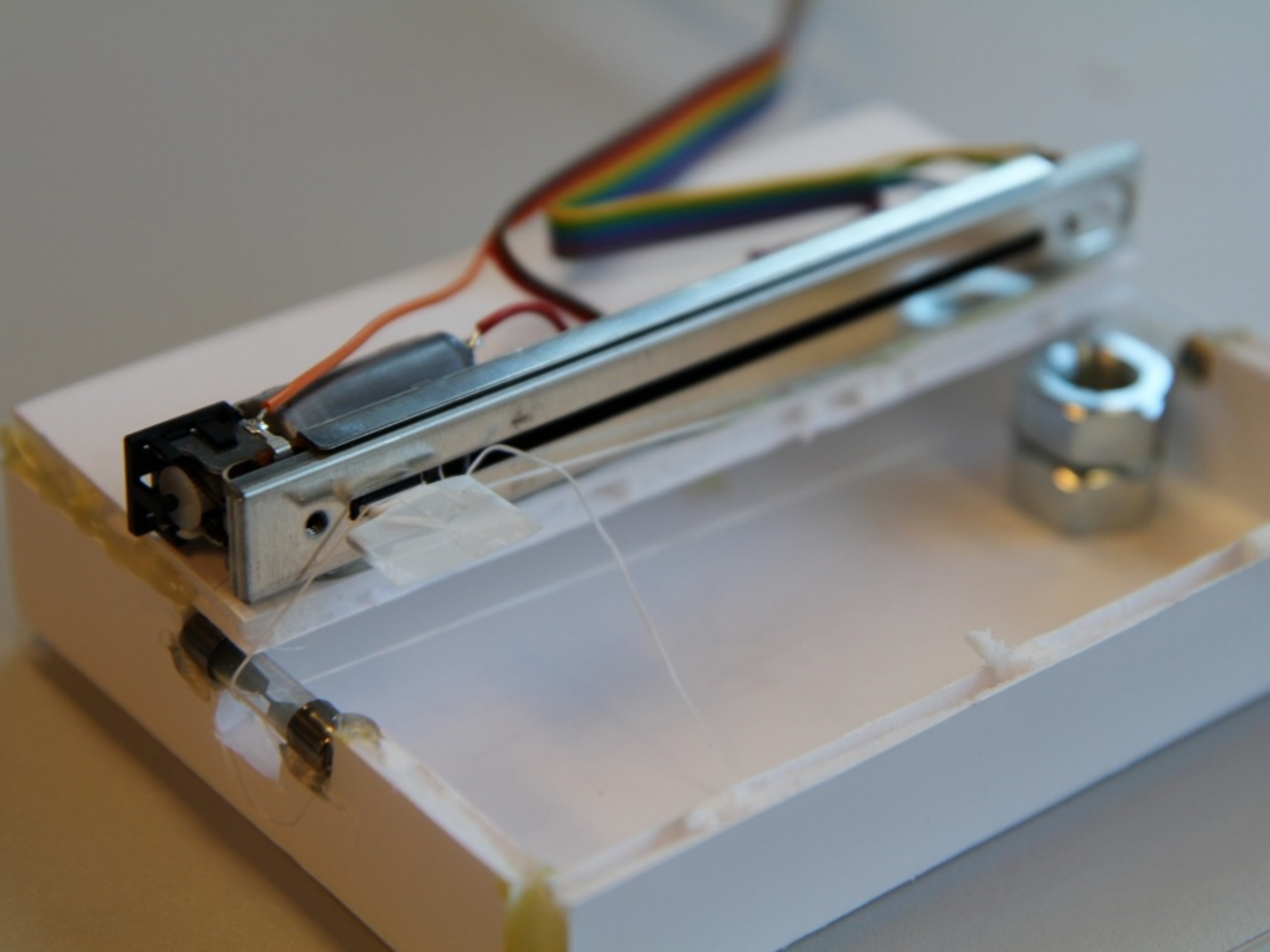
Basic assembly and construction elements

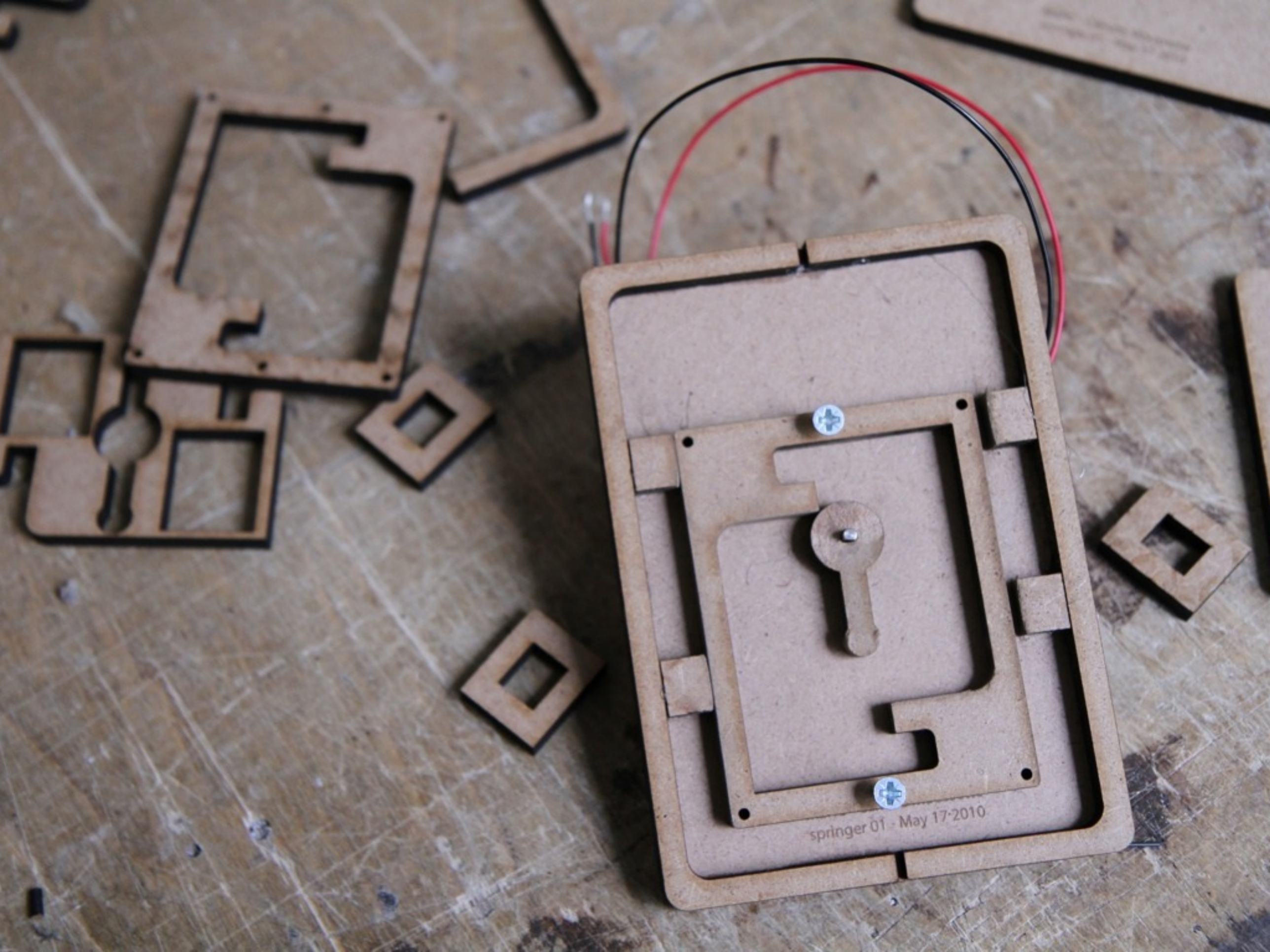
Simple trigger or control mechanism

What you can do in your “garage”

Low-fi (not necessarily)



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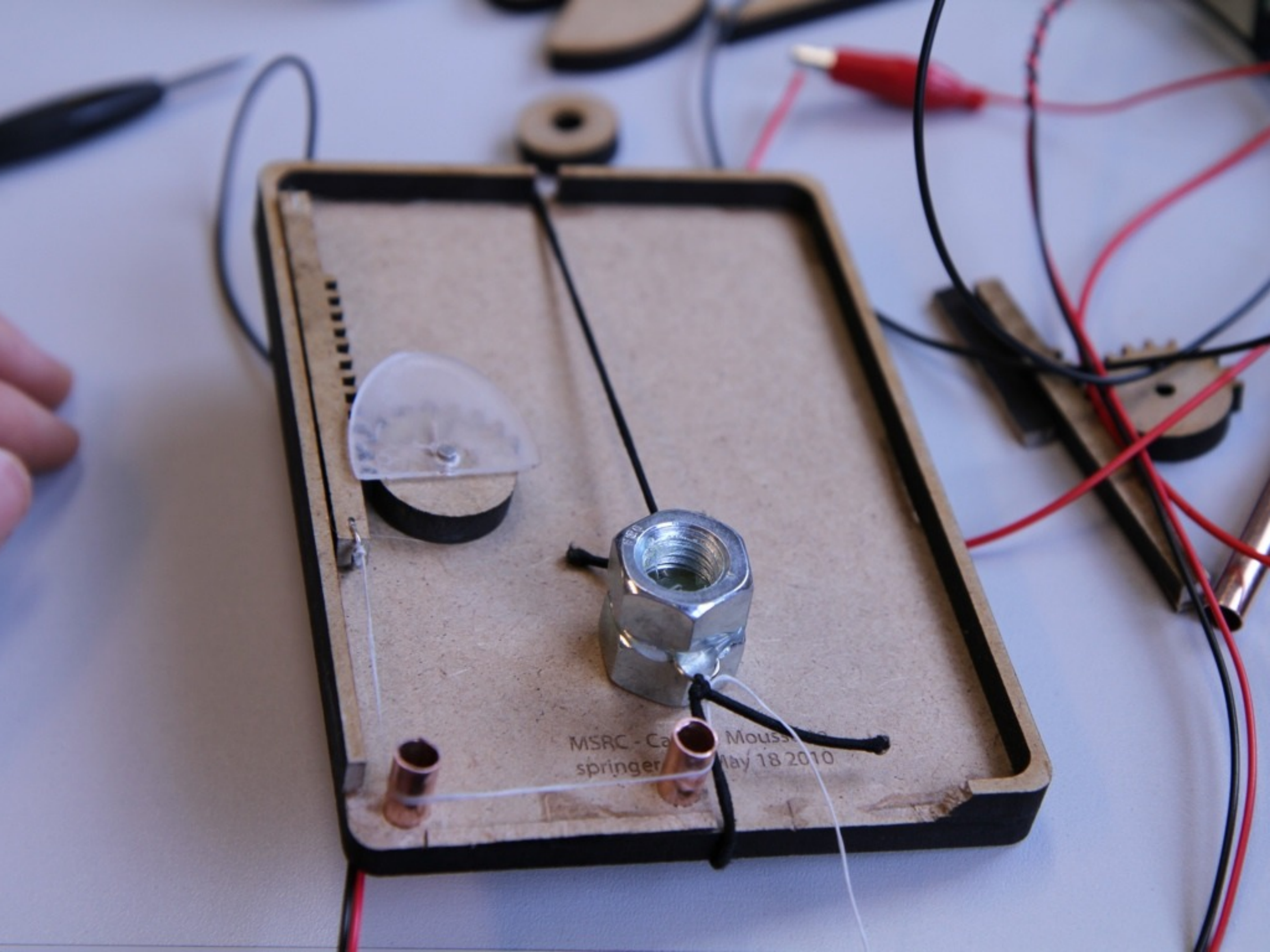
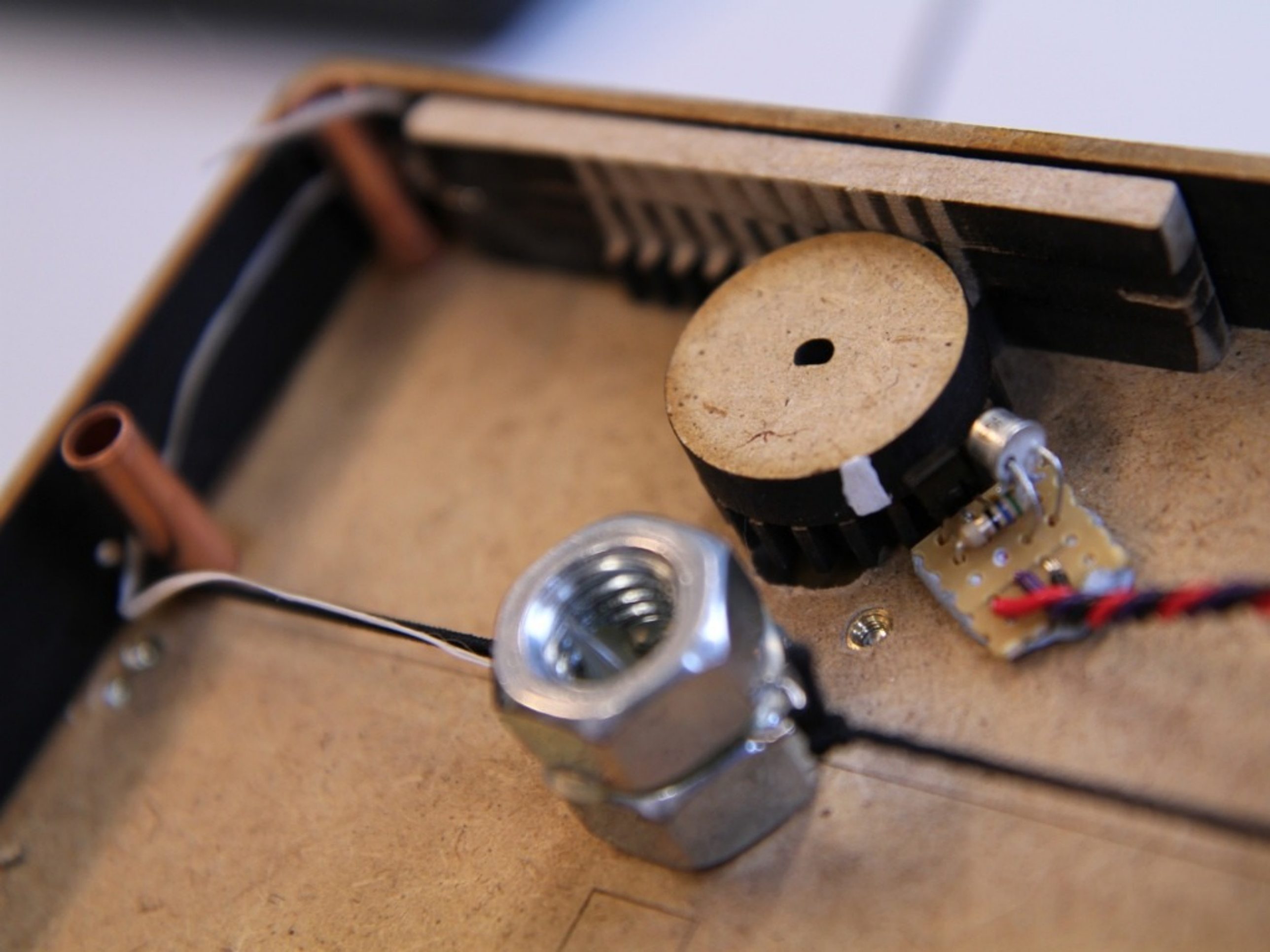
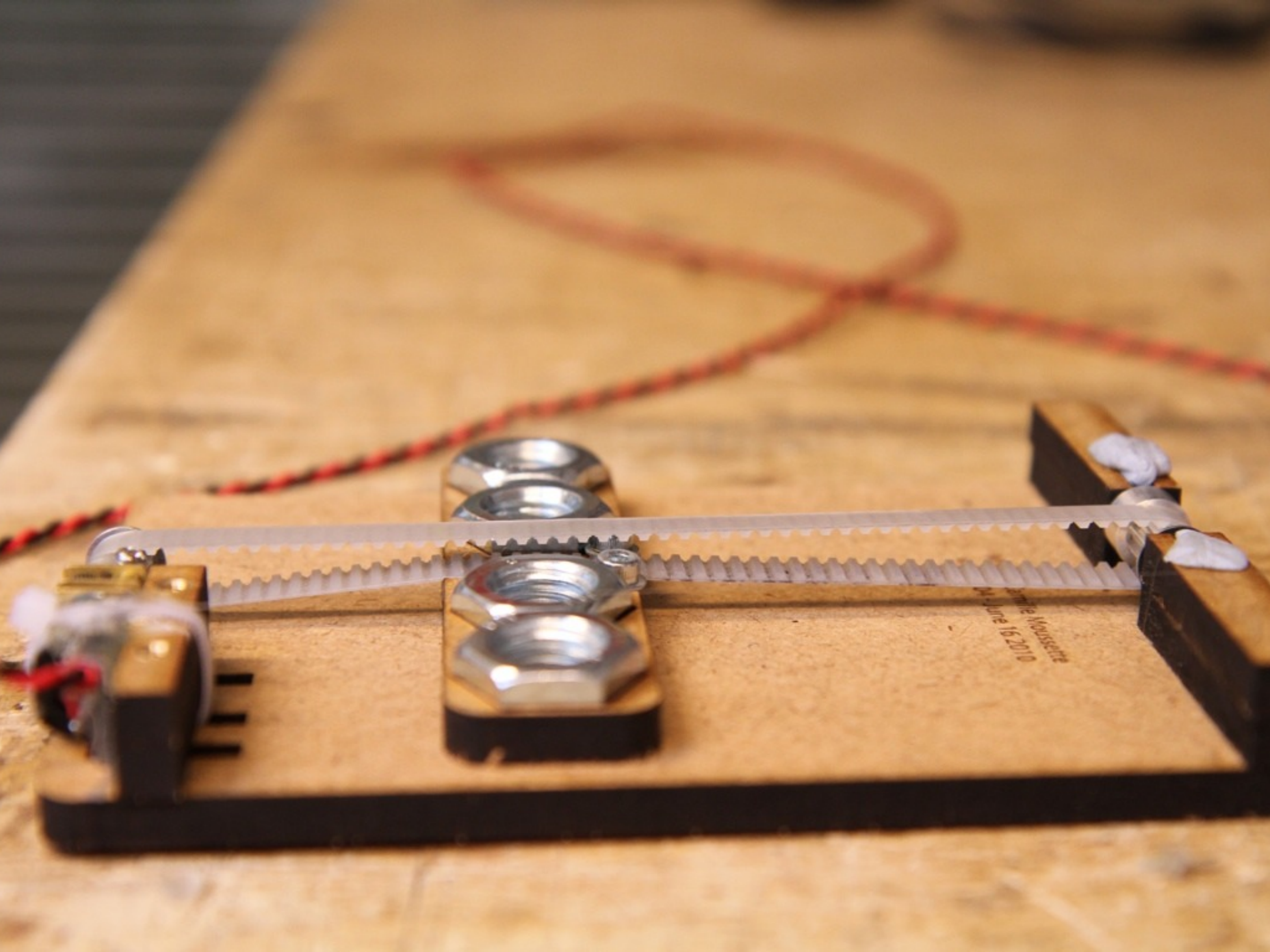

MSRC - Ca Mouss
springer May 18 2010



MSRC - Camille Mousseitte
Springer 07 - June 18 2016



# Multiple days

Adjustability and more control

Repeatability

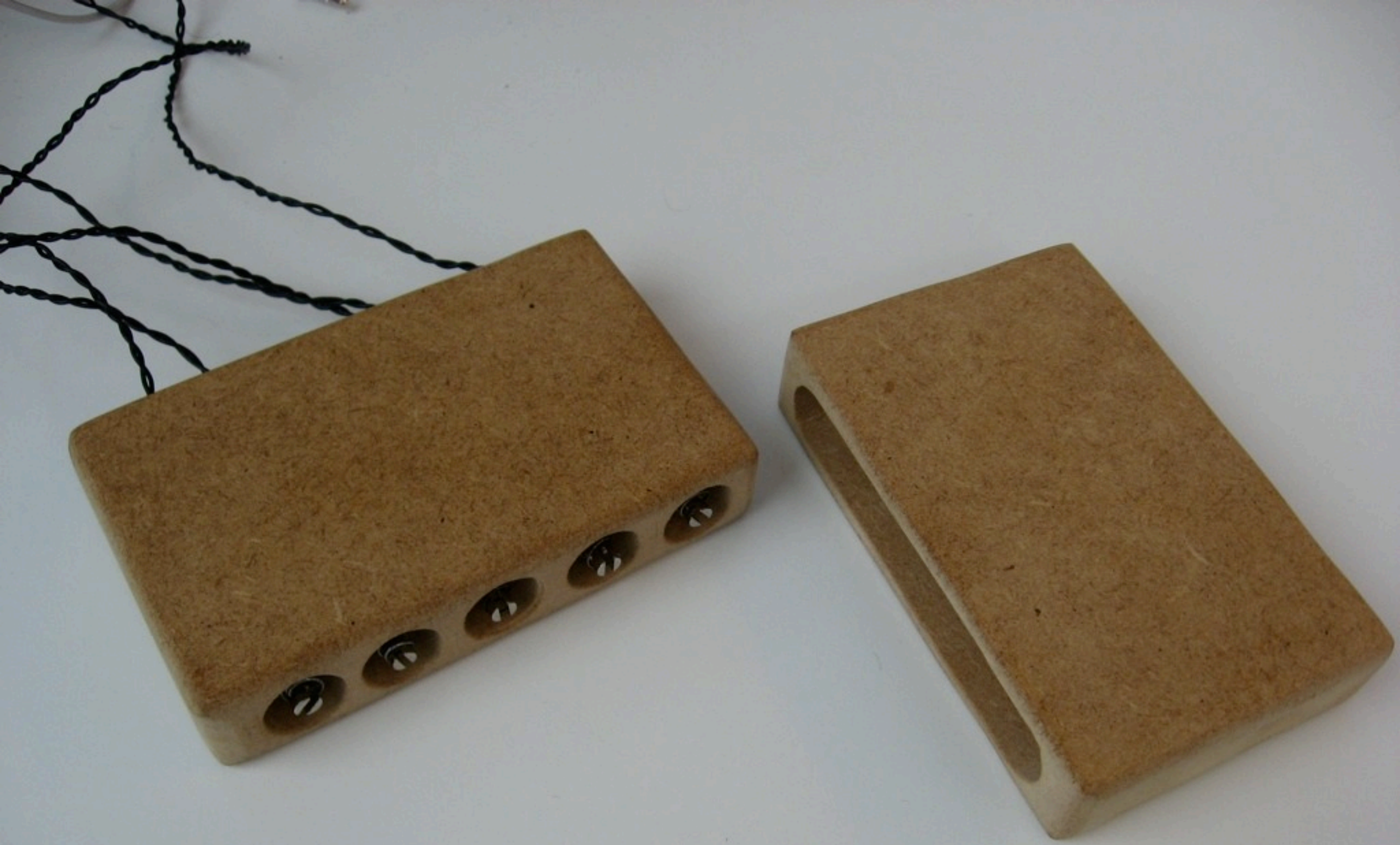
Some machine control

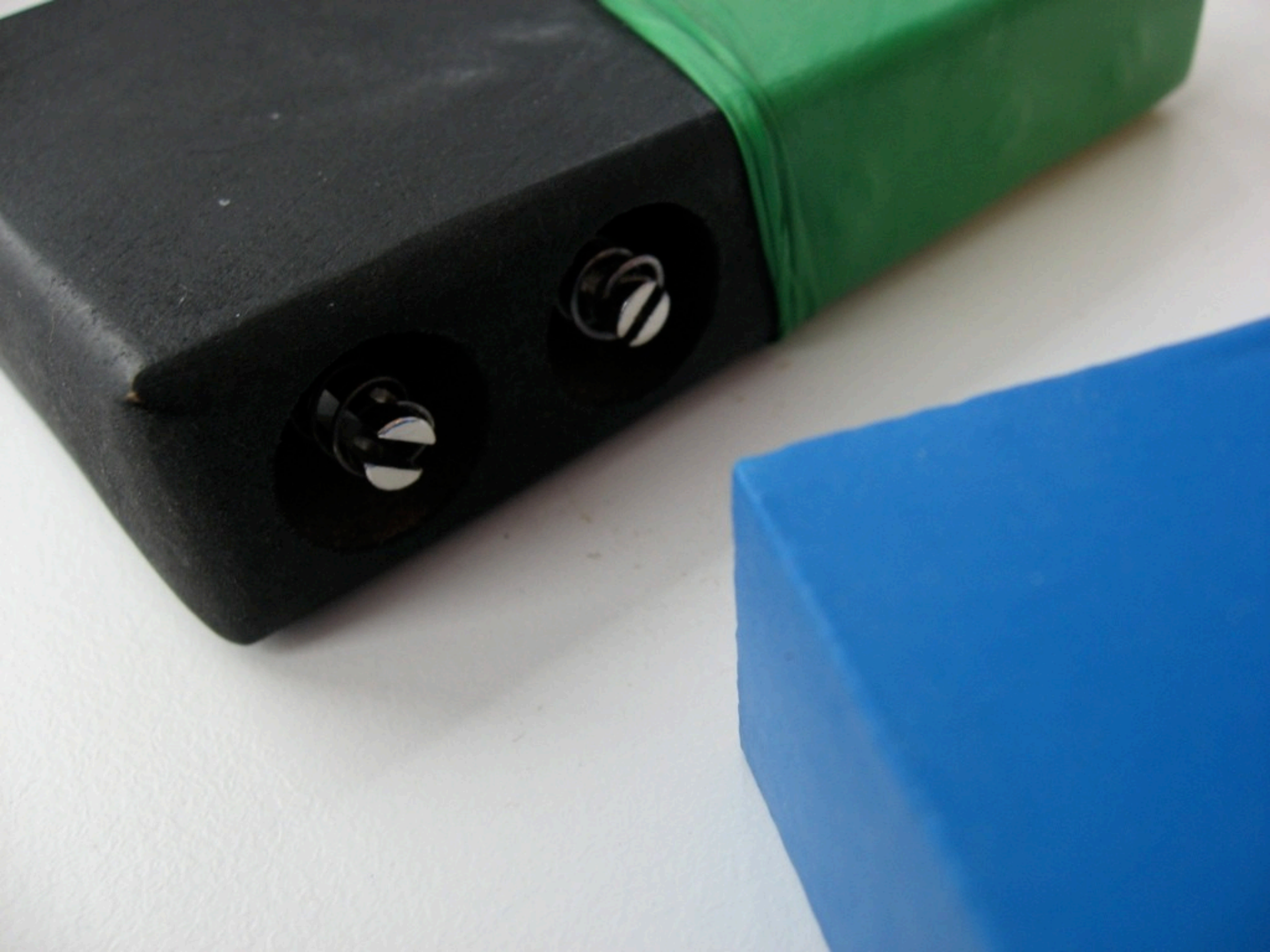
Fancier mechanisms or actuation systems

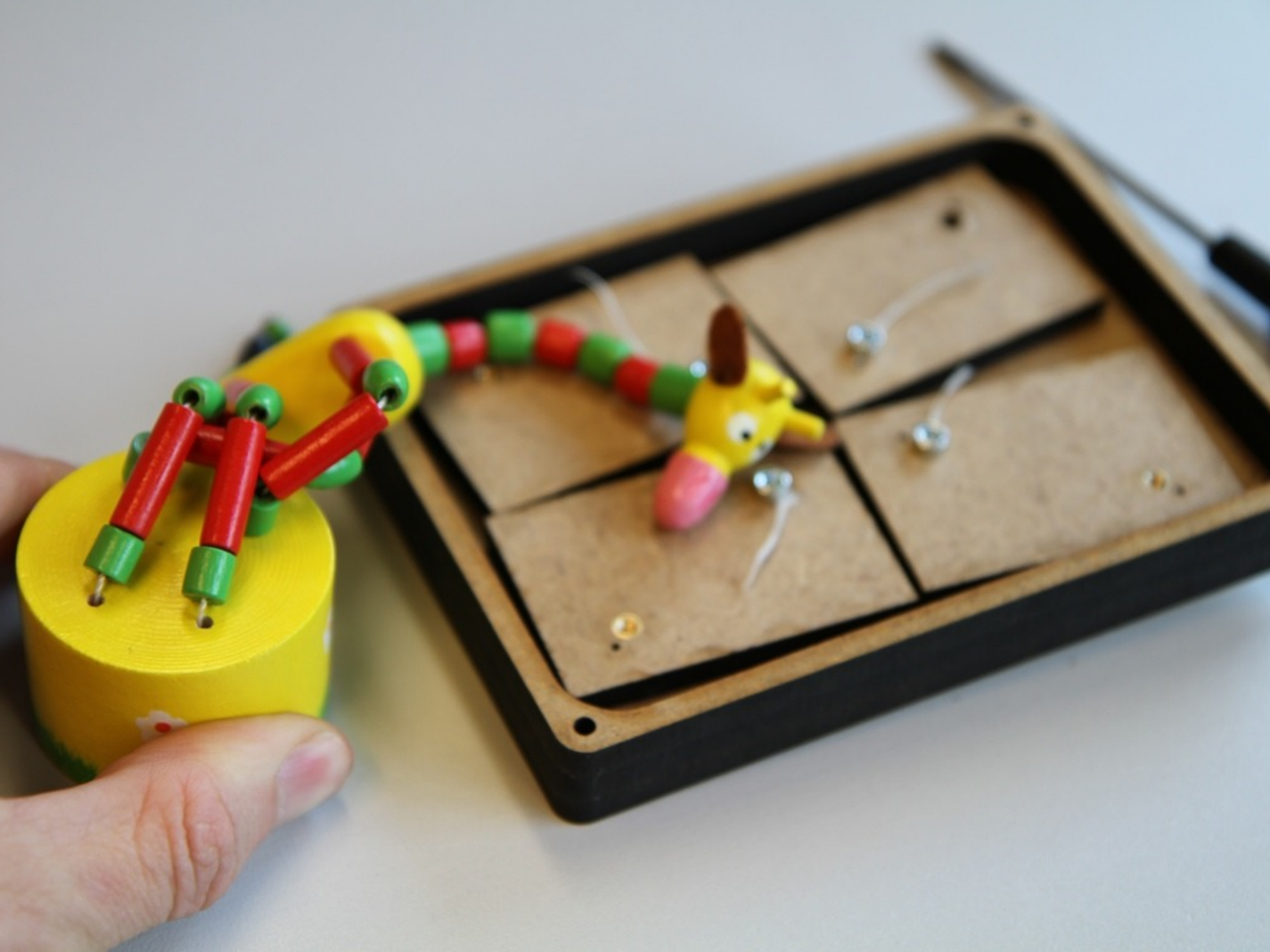
Electronics (maybe) and measuring capabilities

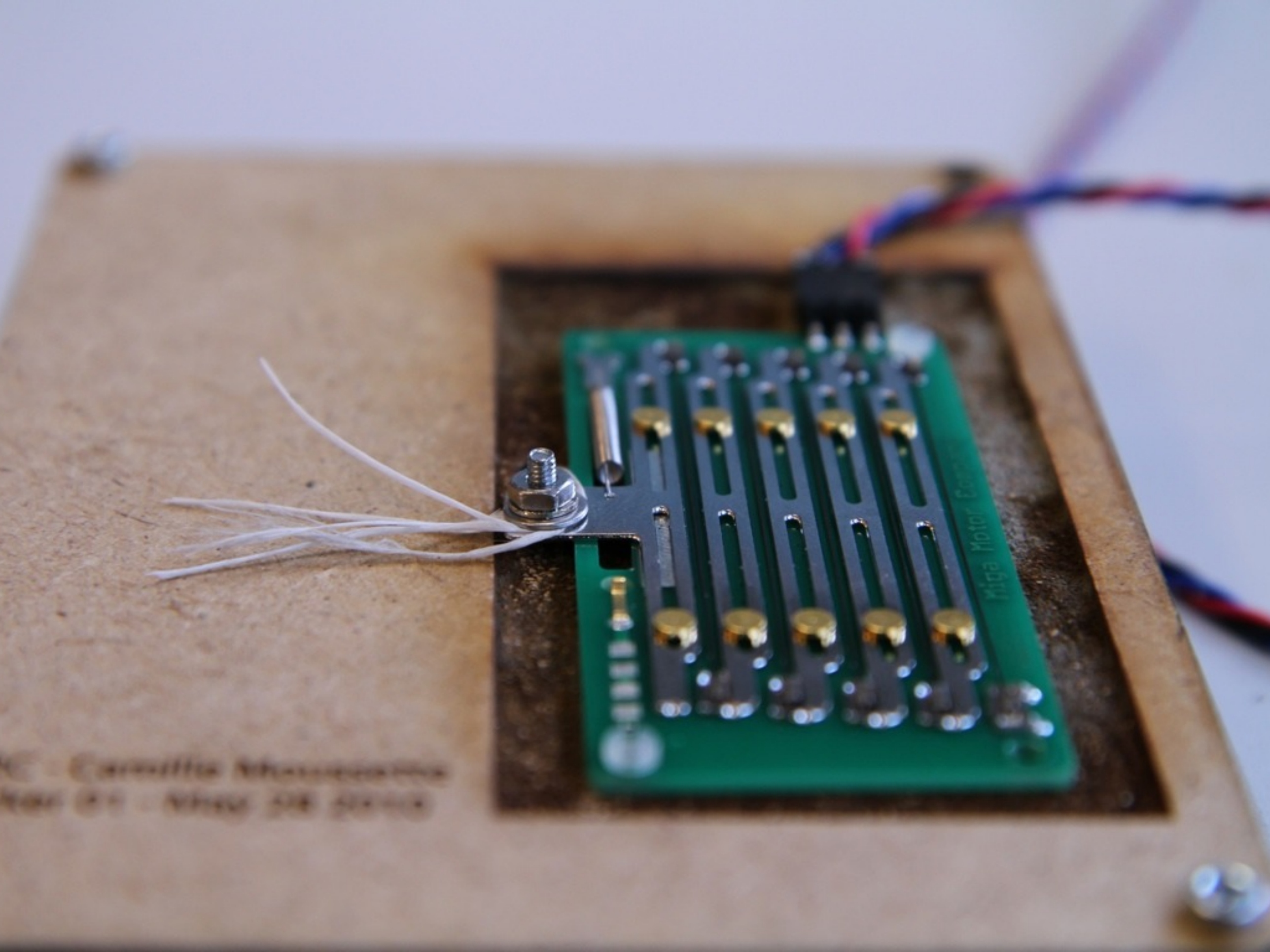
What you can do in a workshop

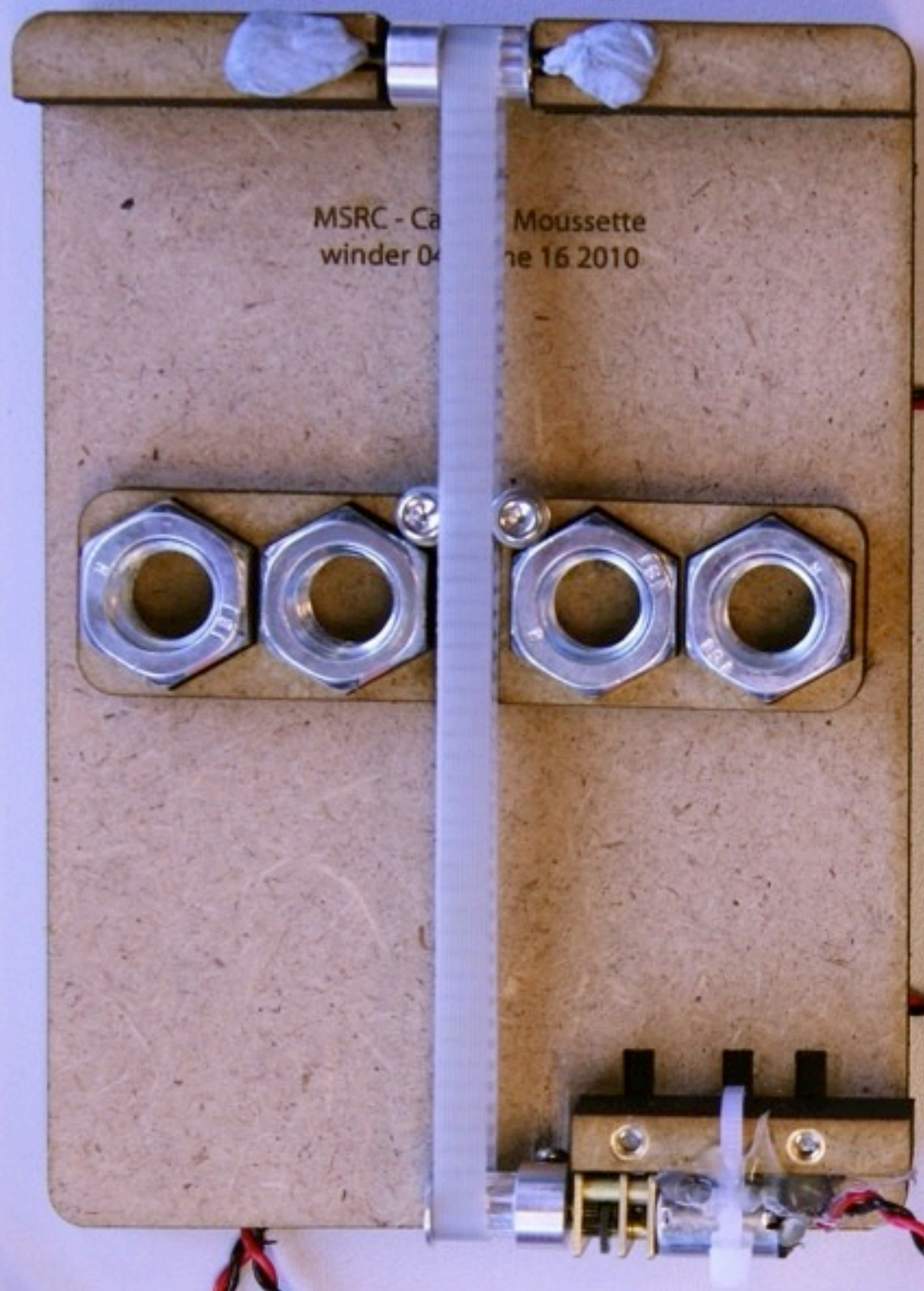
Full range of fidelity







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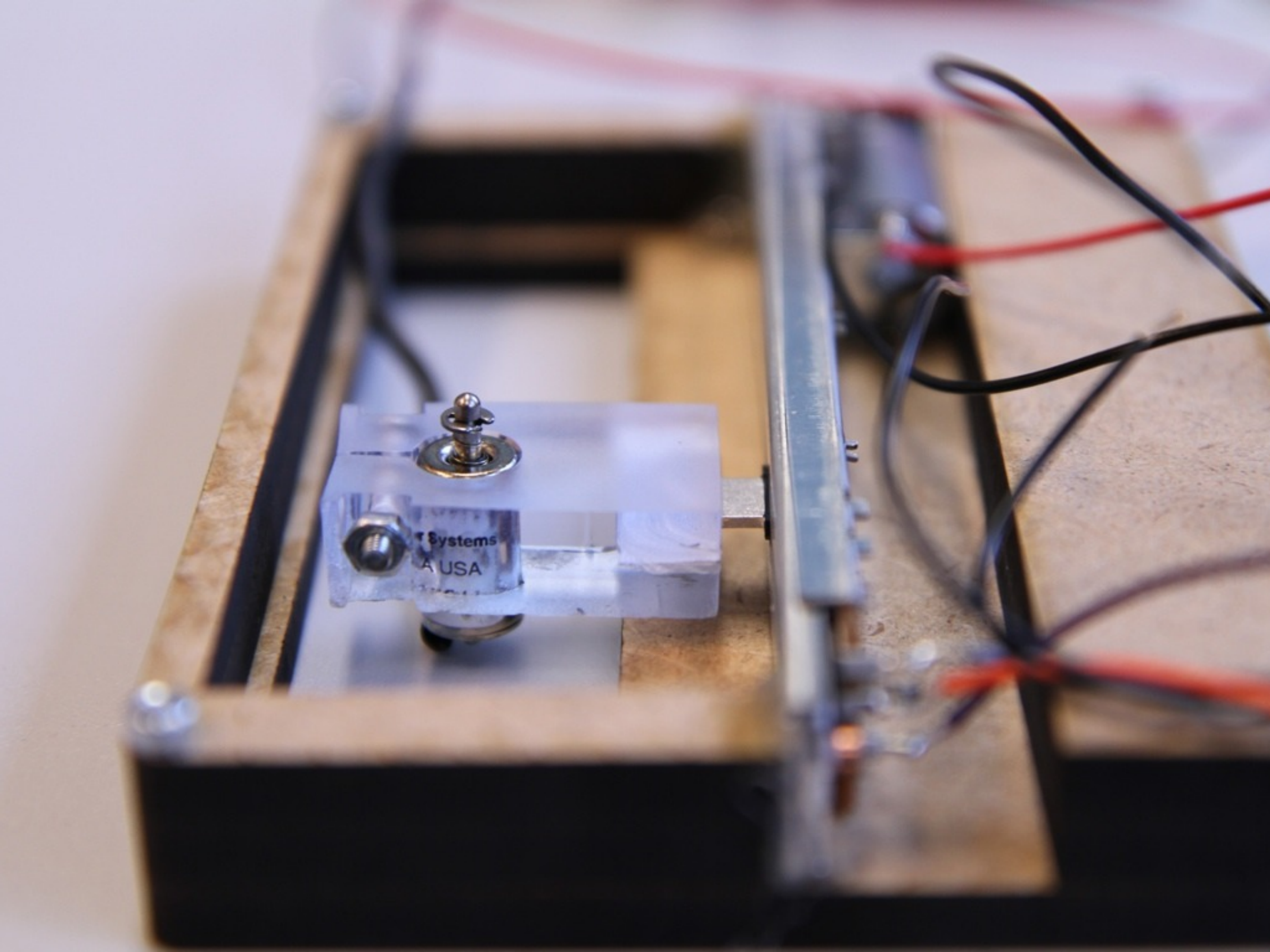
Systems
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# Week

Finer control

Relatively costly but necessary

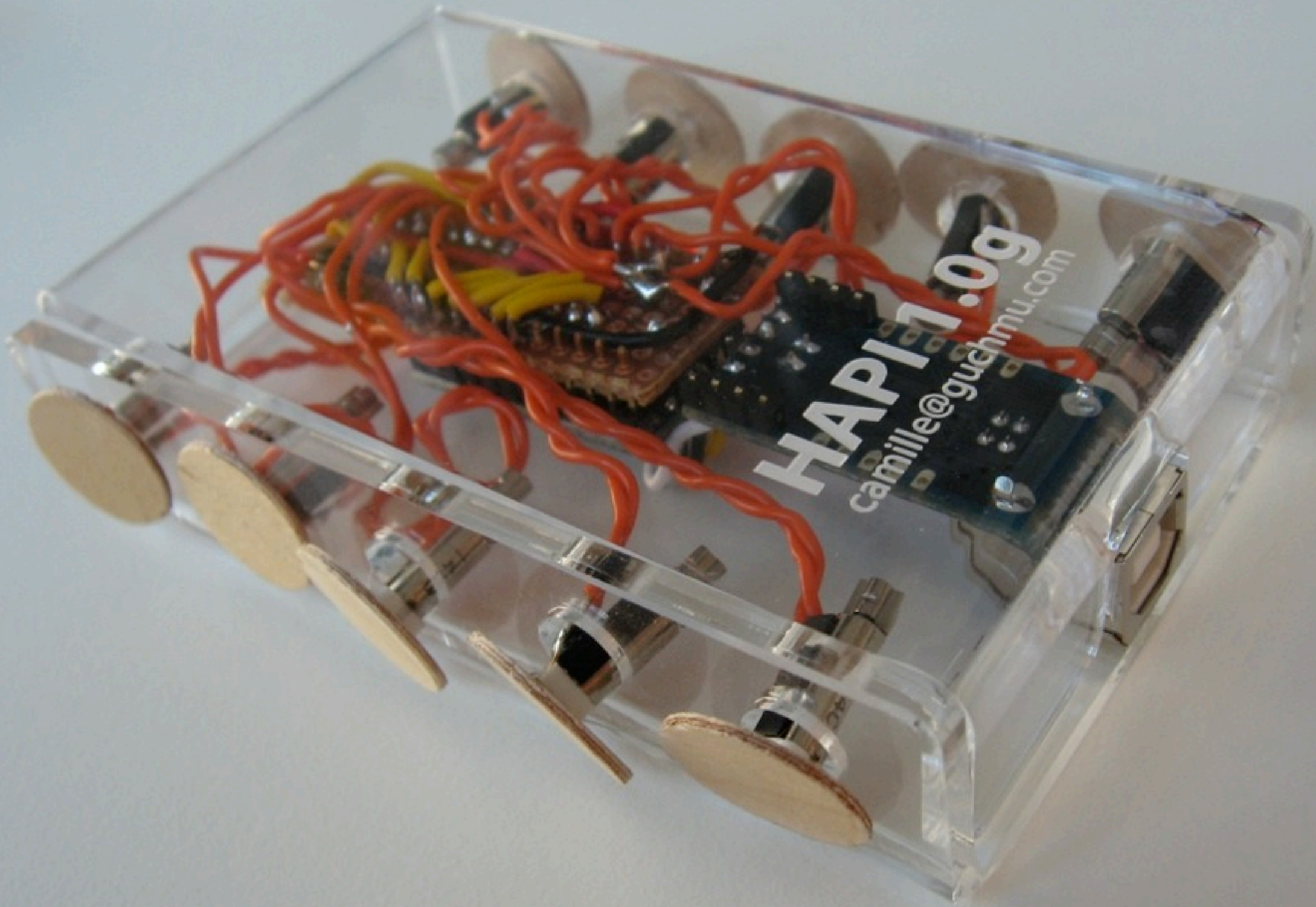
Machine autonomy

Optimized but fixed configurations

A mix of hardware, software and humanware

Dedicated haptic modules and equipment

Almost the *real* thing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camille@guichmu.com


ARDUINO

# 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

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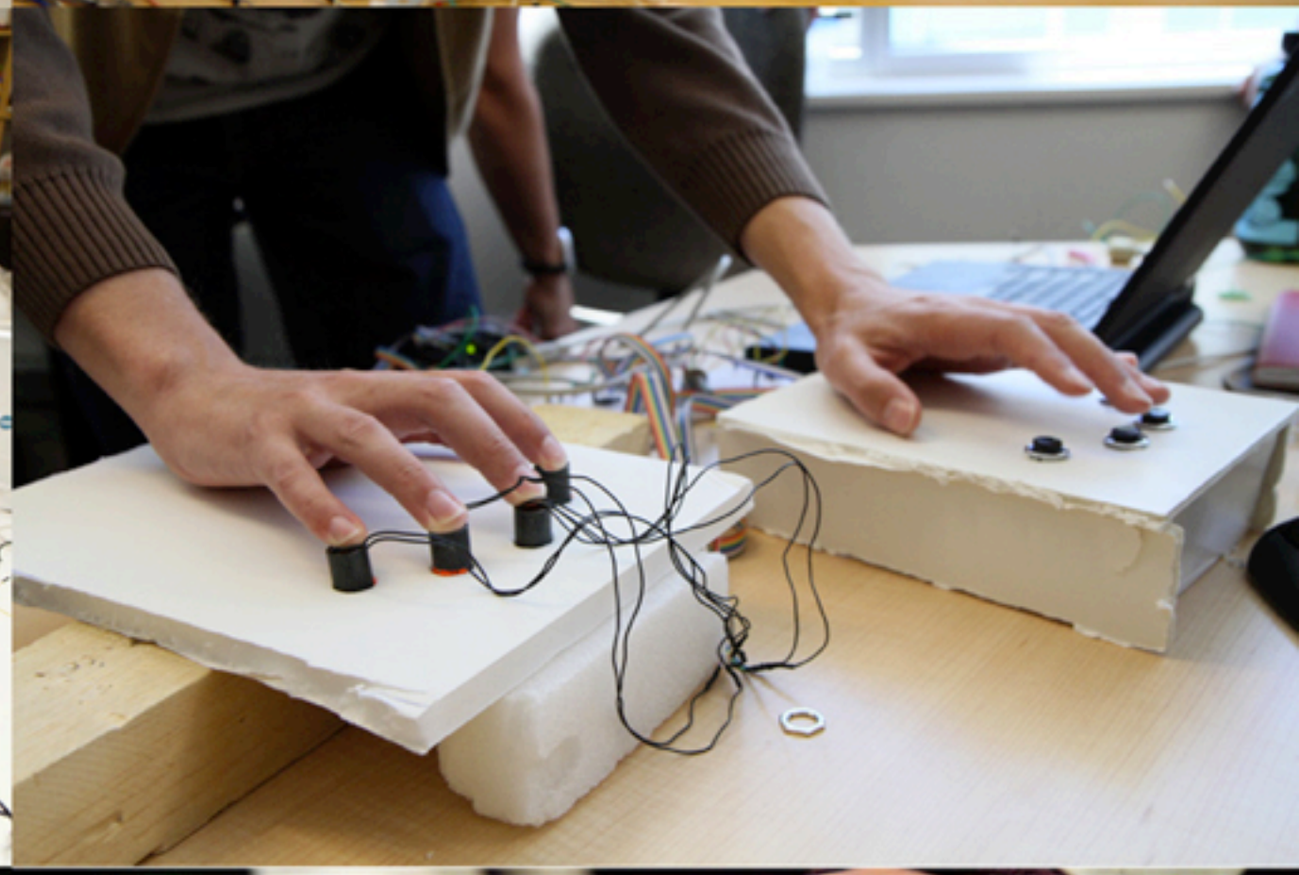
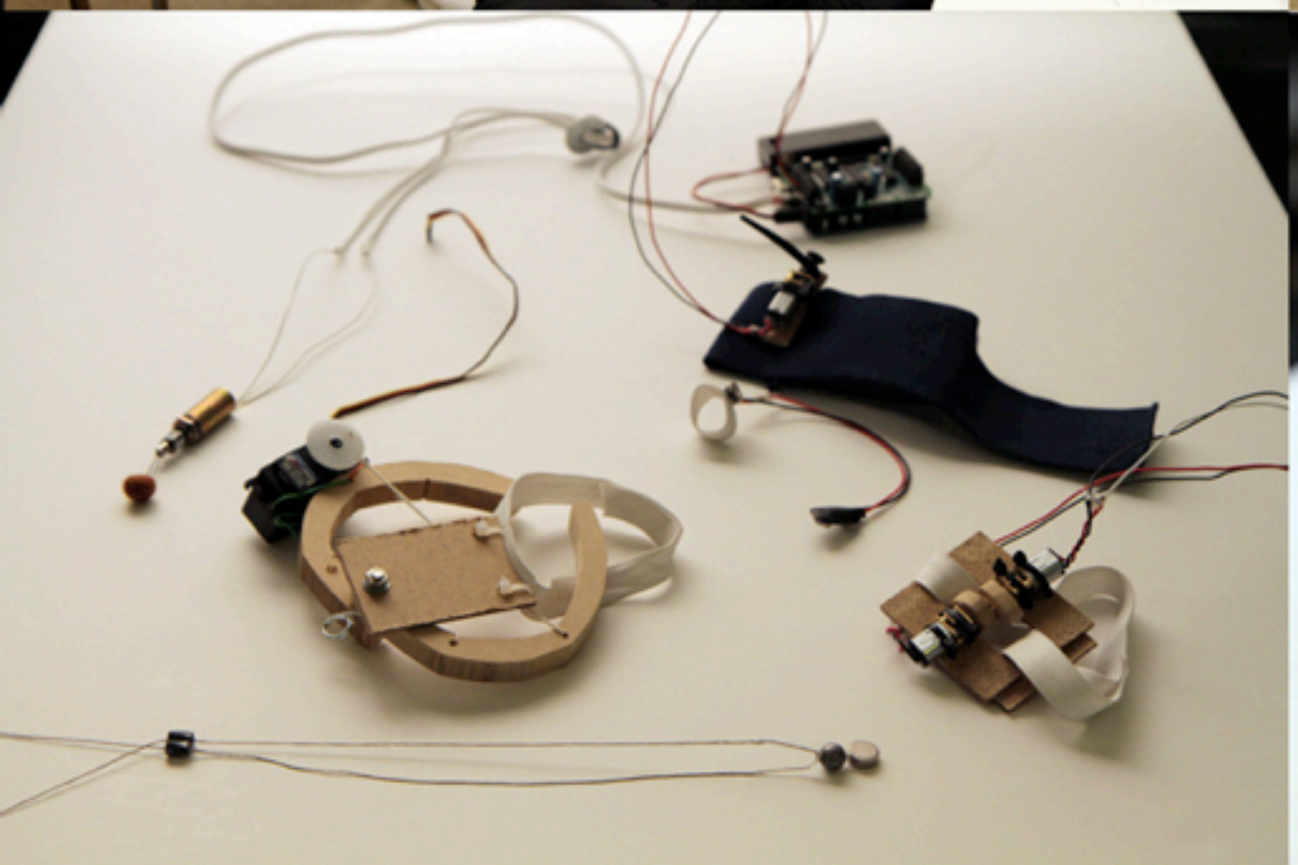
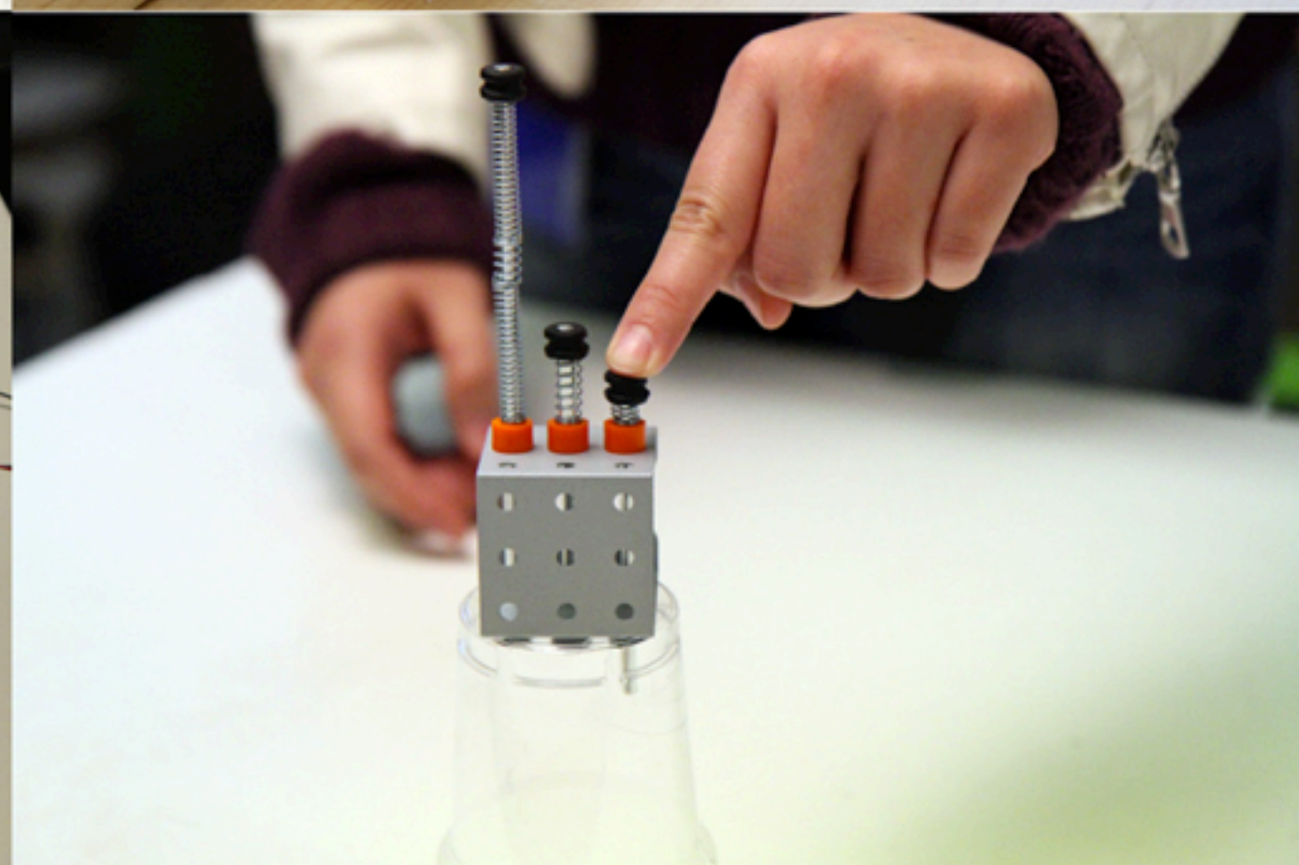






# SKETCHING HAPTICS

# **DESIGN CONSTRAINTS** @ MICROSOFT RESEARCH

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

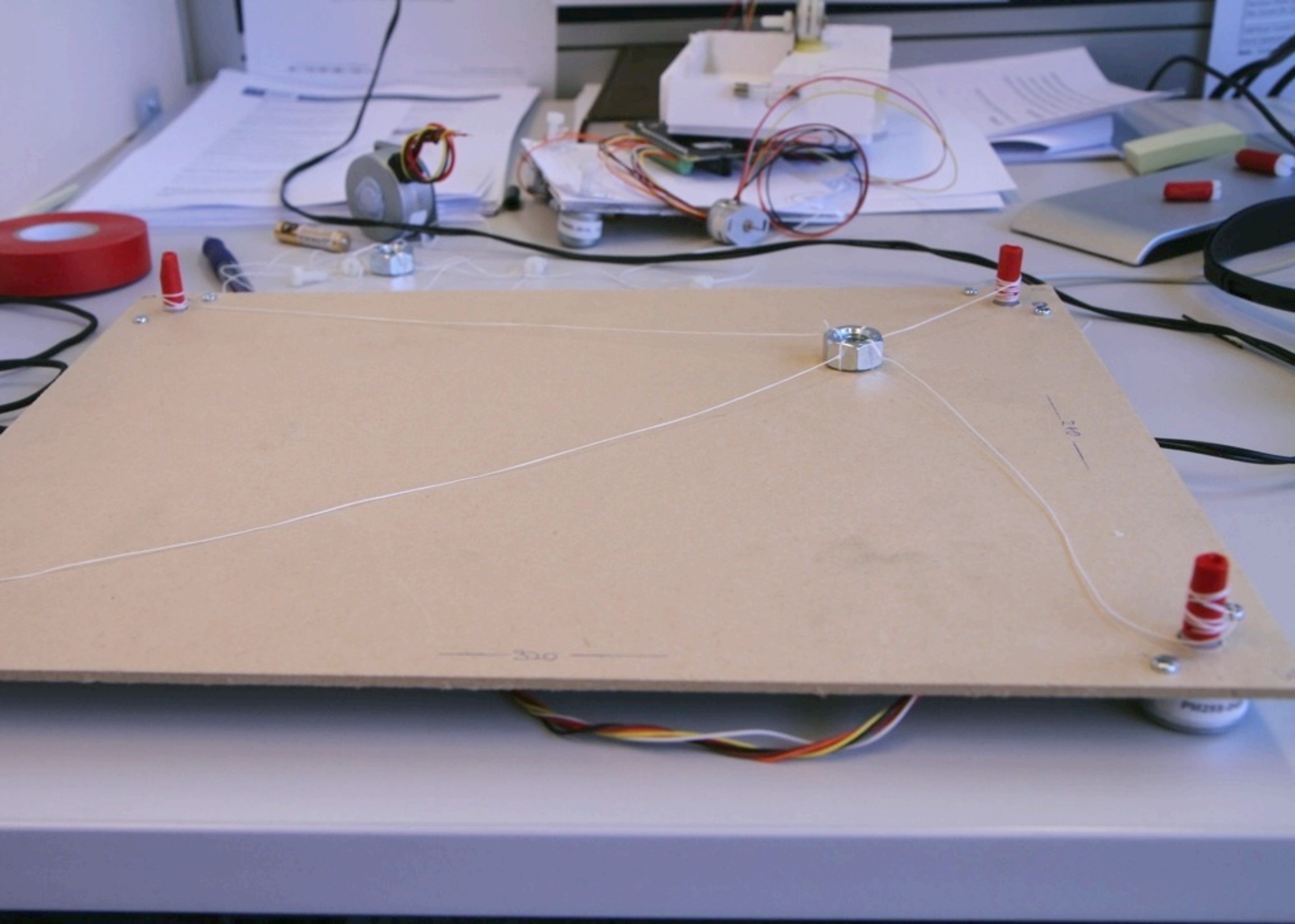
Handheld, ungrounded, fixed shell & size, one material (MDF)

Linked with UI, if appropriate

Simple components and parts (no high-end solutions)

Stimulation first, more abstract than feasible

Self-control (no experimenter intervention)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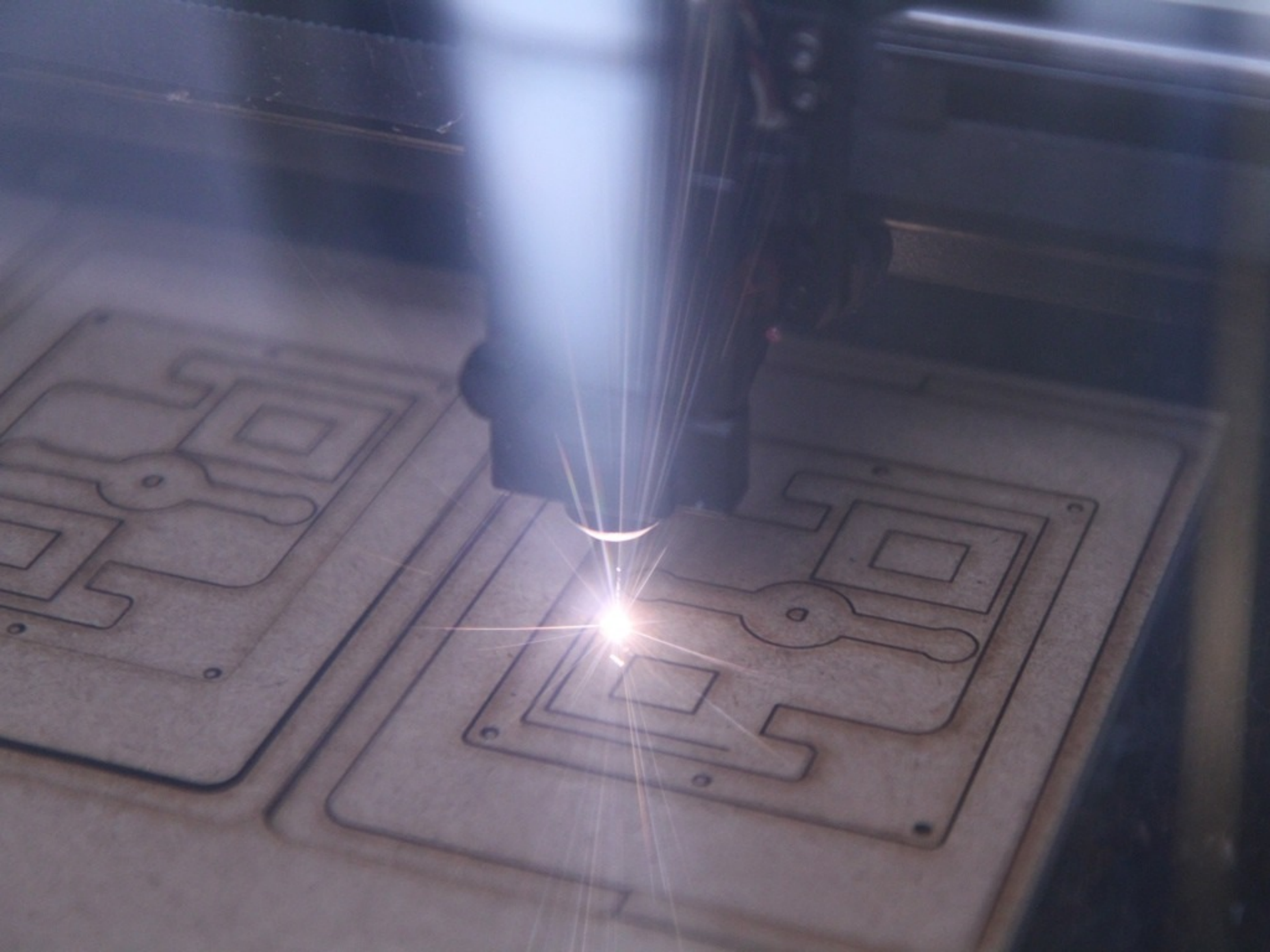
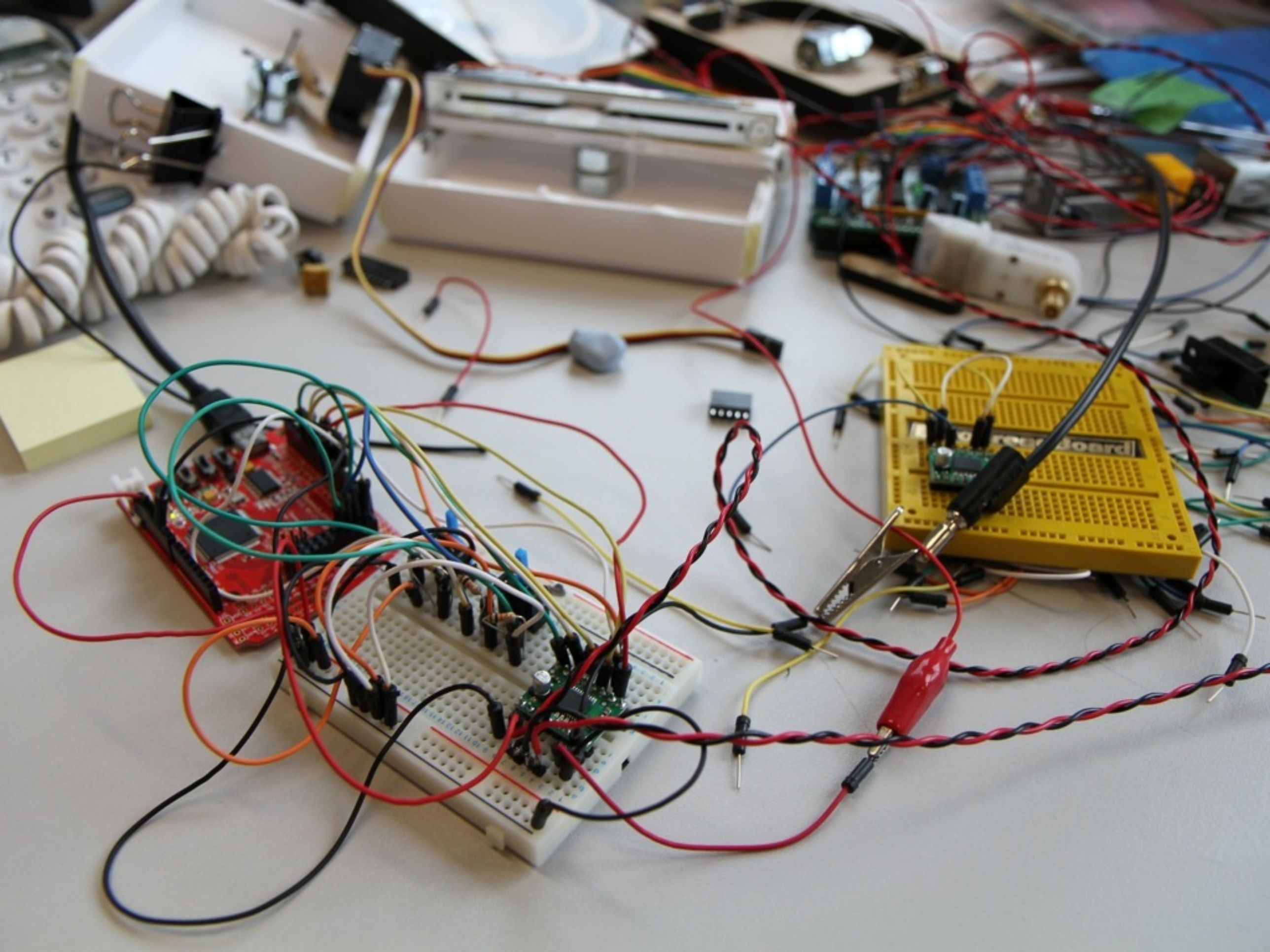
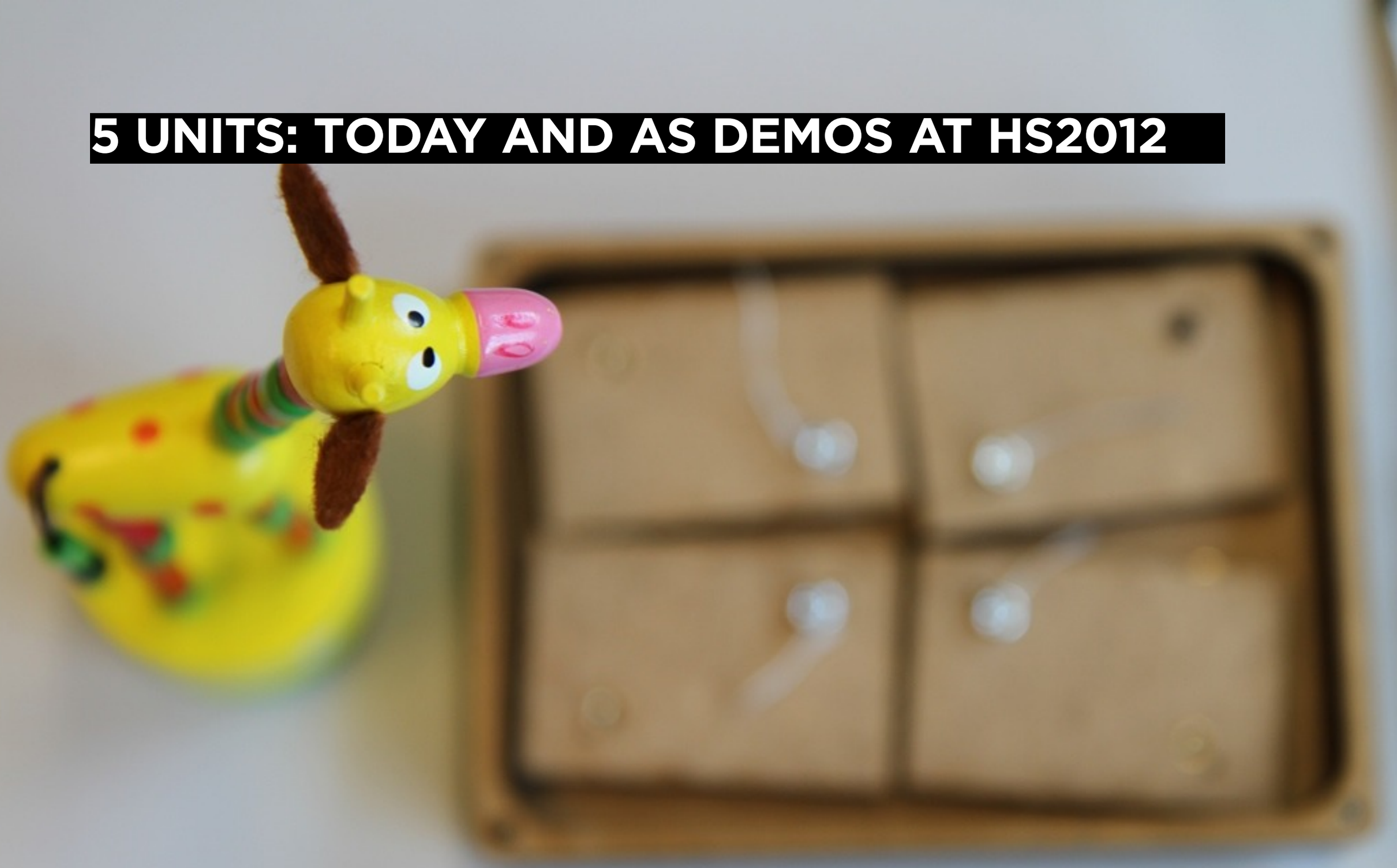




# 5 UNITS: TODAY AND AS DEMOS AT HS2012



# 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 | $n^x$ |
| 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/$I^2C$ |
| 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”

camille.moussette@dh.umu.se - www.partly-cloudy.com

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