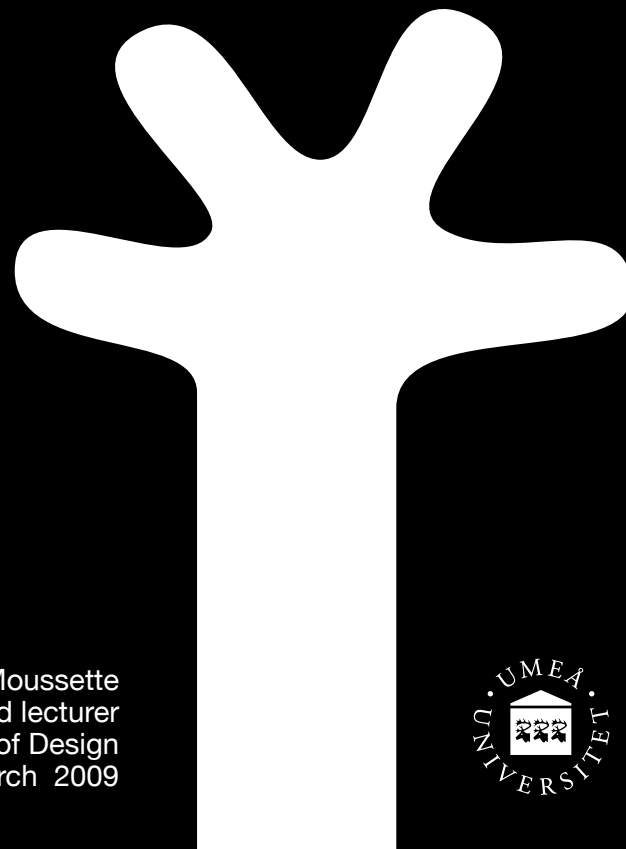


# Sketching haptic and multimodal interaction

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# Sketching haptic interaction

Is it possible to sketch haptic and multimodal interaction and can (interaction) designers do it?

What is haptic?

Sketching and prototyping

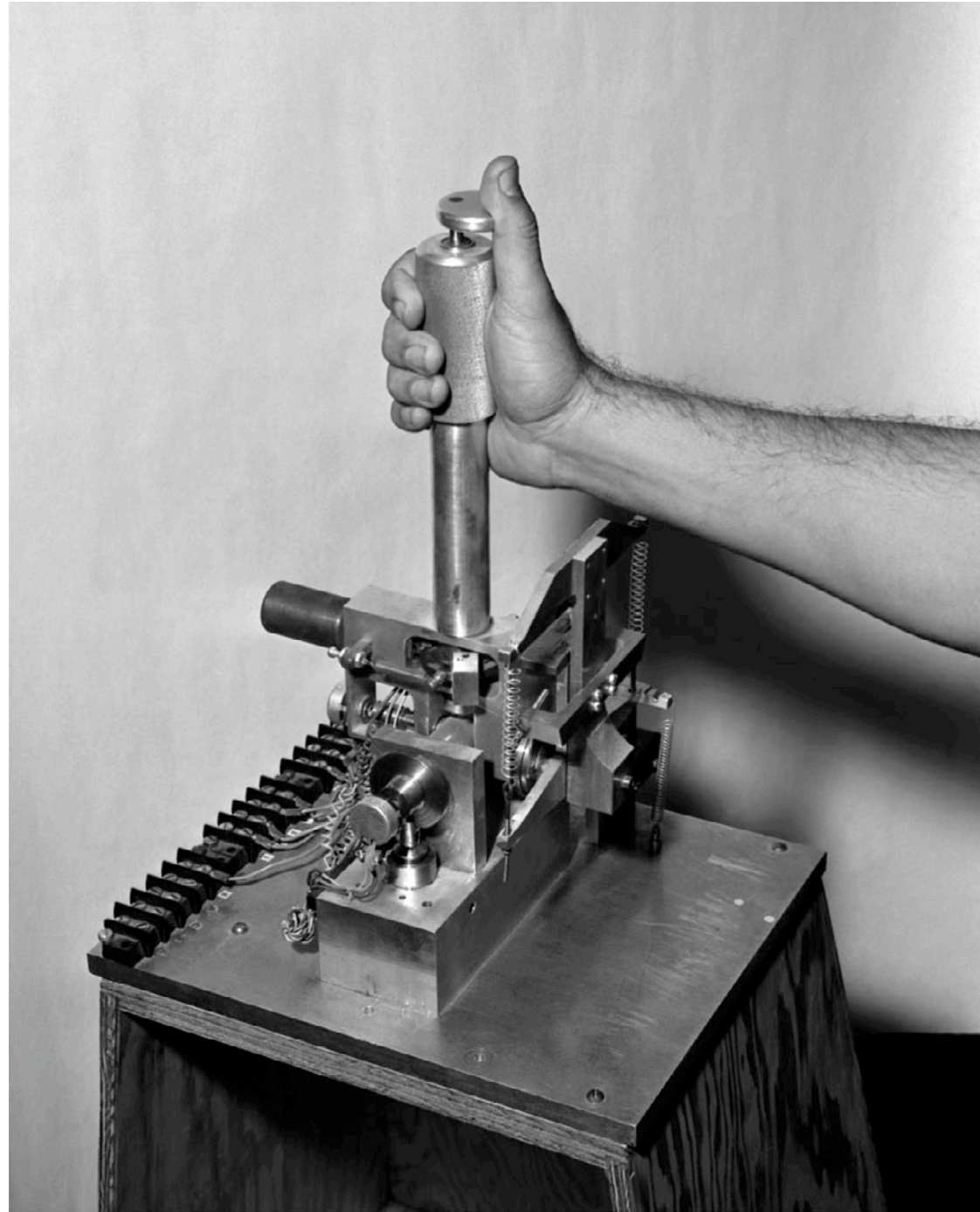
Examples

Challenges and difficulties

Suggestions and guidelines

Multimodality

# Haptic interface



NASA Dryden Flight Research Center Photo Collection  
<http://www.dfrc.nasa.gov/gallery/photo/index.html>  
NASA Photo: E-2633 Date: 1956

Three axis control stick used on Iron Cross Attitude Simulator

# Haptic technology

*Haptic technology refers to technology which interfaces the user via the sense of touch by **applying** forces, vibrations and/or motions to the user.*

Wikipedia, 2007

A touchscreen is not a haptic interface  
The iPhone is a poor haptic device!

# Haptic perception

Combination of somatosensory perception on the skin and proprioception

First sense to develop in humans and may be the last to fade.

20x faster than vision, we can notice two stimuli just 5 ms apart.

Can sense displacements on our palm as low as 0.2 microns in length.

Highly sensitive to vibration up to 1000 Hz, with the peak sensitivity around 250 Hz



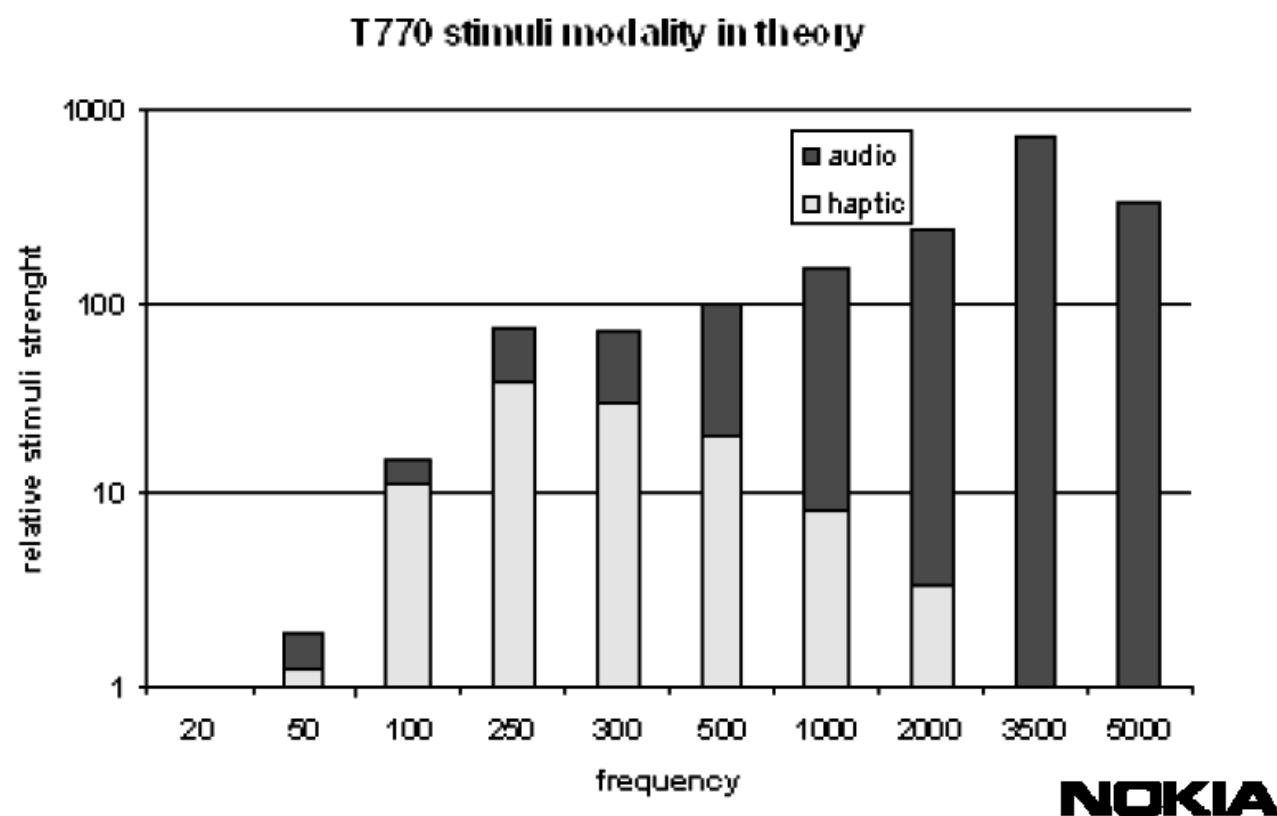
# Haptic perception

**Active** vs passive touch

Haptic interaction is very often **multimodal**

Visual or audio cues can augment haptic perception

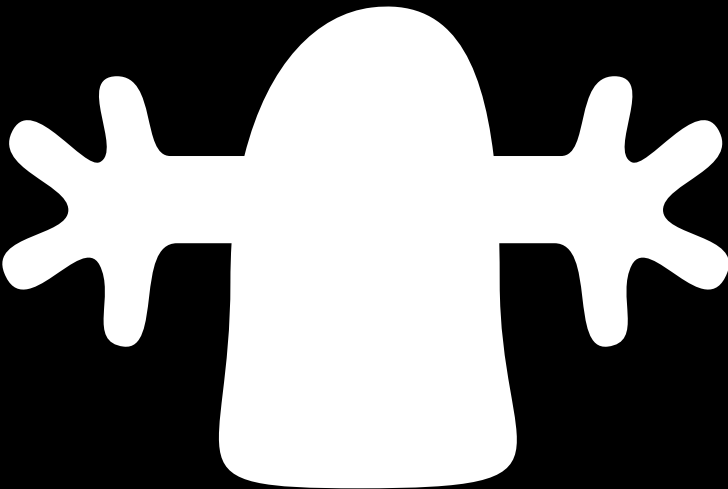
No clear boundary between sound and vibration, natural overlap



# Haptic interface

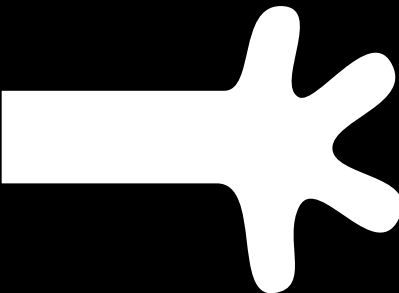
**Body**

1-3 m



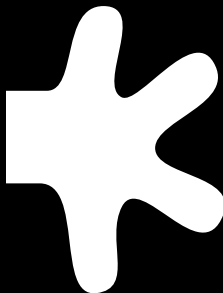
**Arm**

20-100 cm



**Hand**

1-20 cm



**Fingertip**

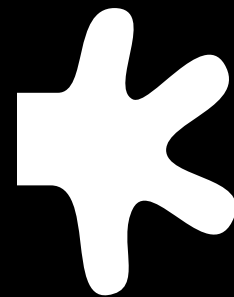
under 1 cm



# Haptic interface

**Hand**

1-20 cm



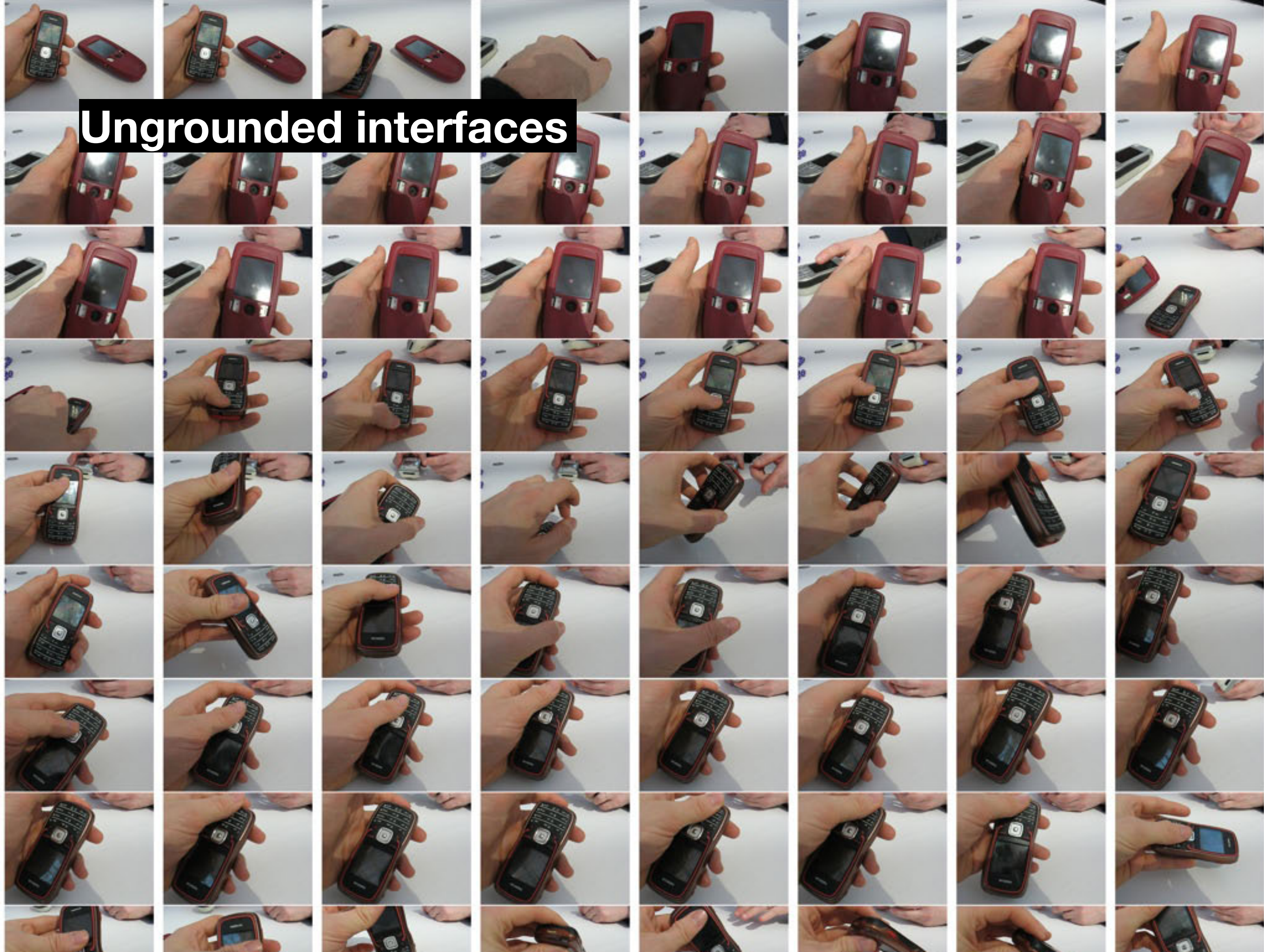


# Grounded interfaces





# Ungrounded interfaces





# Sketching and prototyping haptics?



## Sketching and prototyping haptics

# *The Art of Nonrealistic Usefulness and Realism Through Shortcuts*

Hayward & MacLean, 2007

# How do you start?







**Technocentric ↔ Human Centric**

# Sketching and prototyping levels

Minutes and hours

Hours, one day

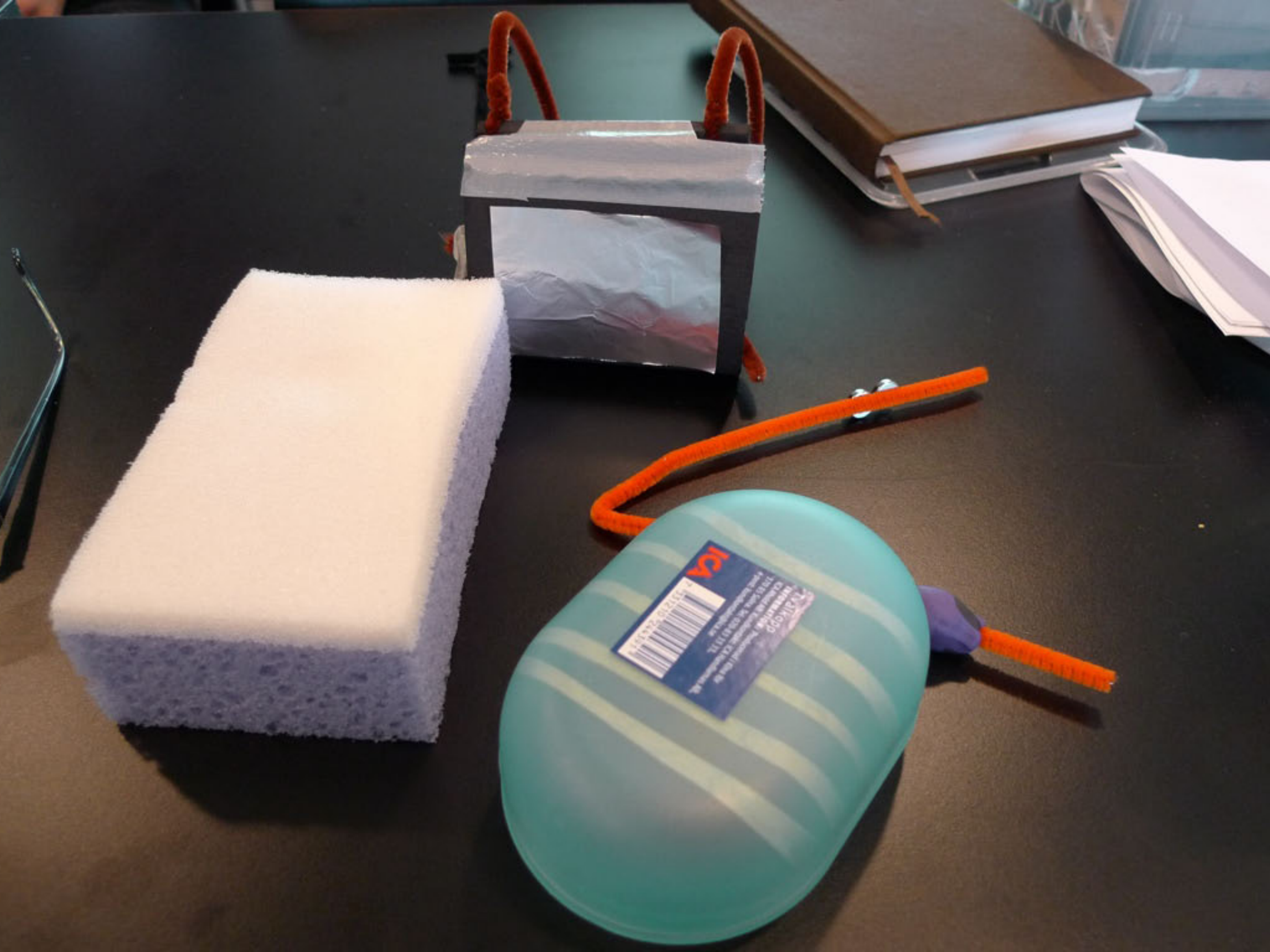
Multiple days

Week





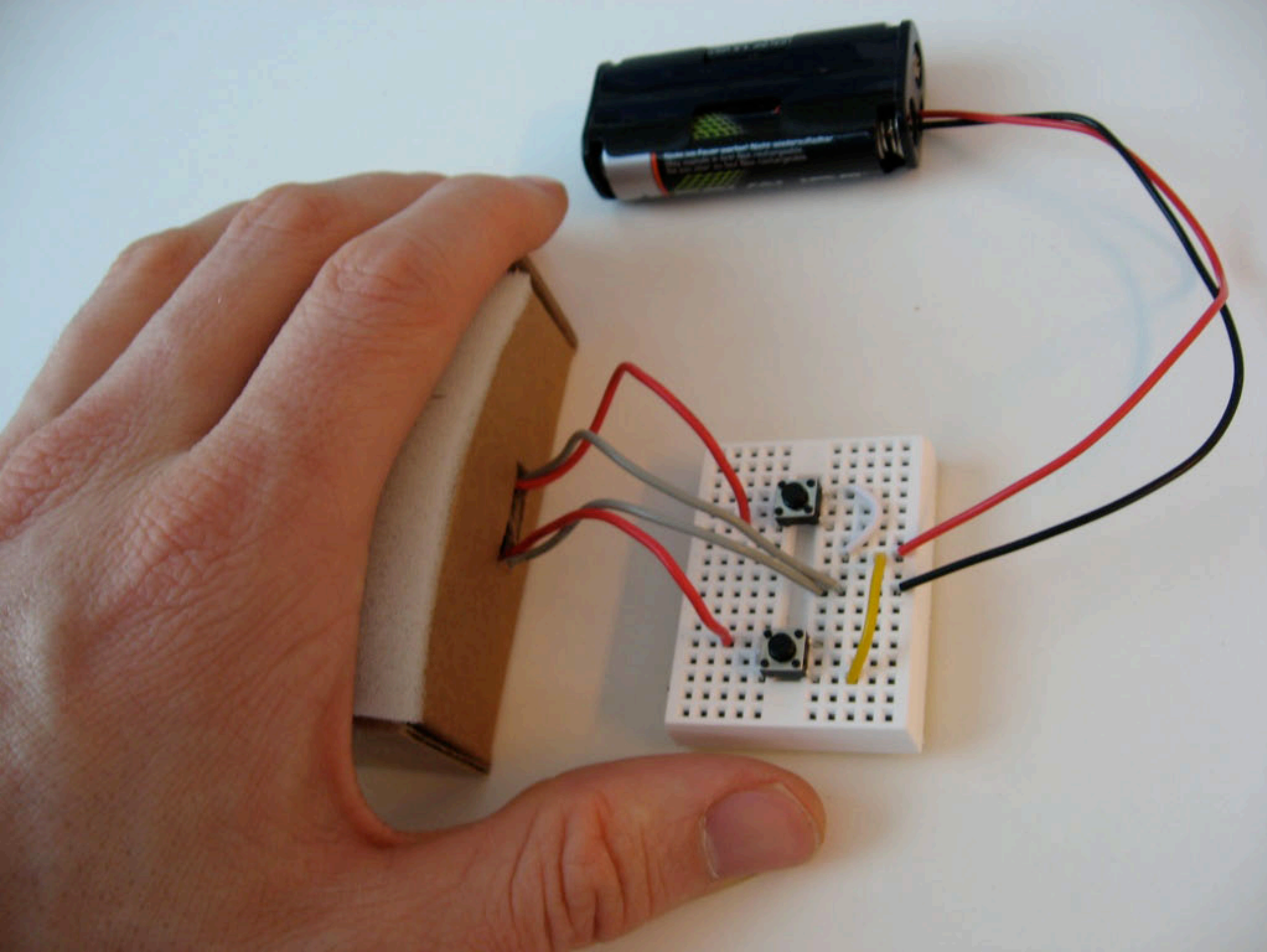




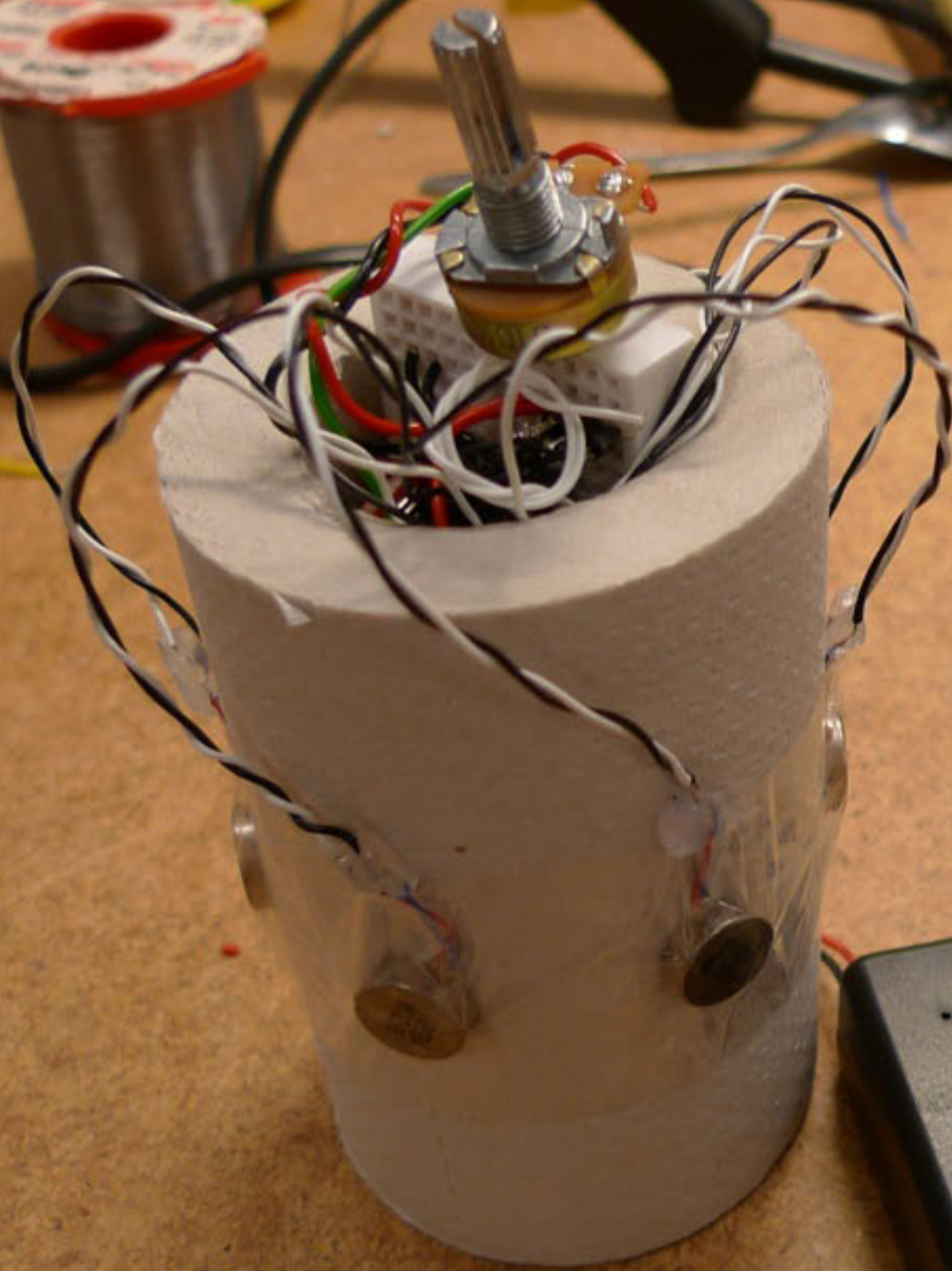








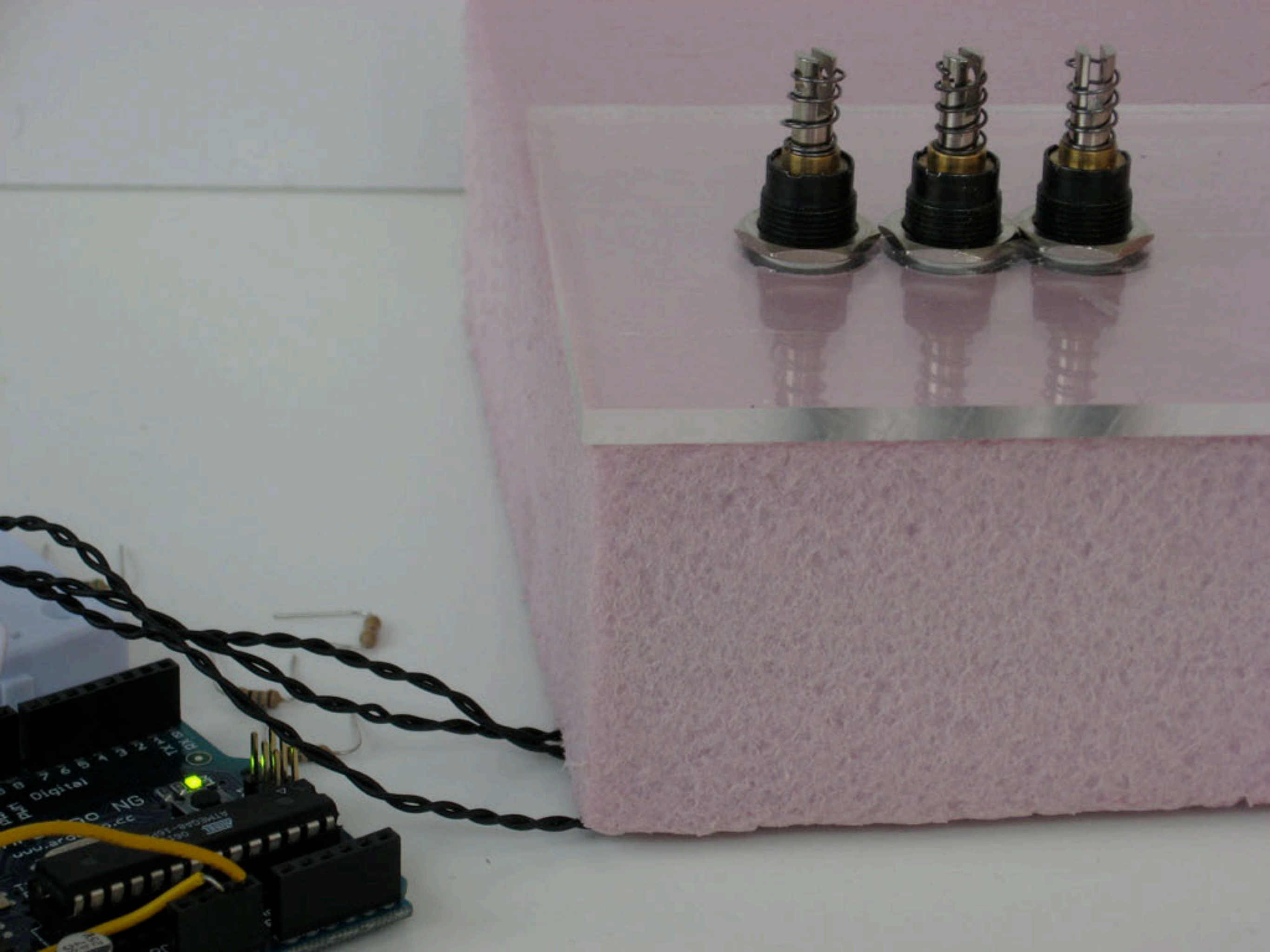






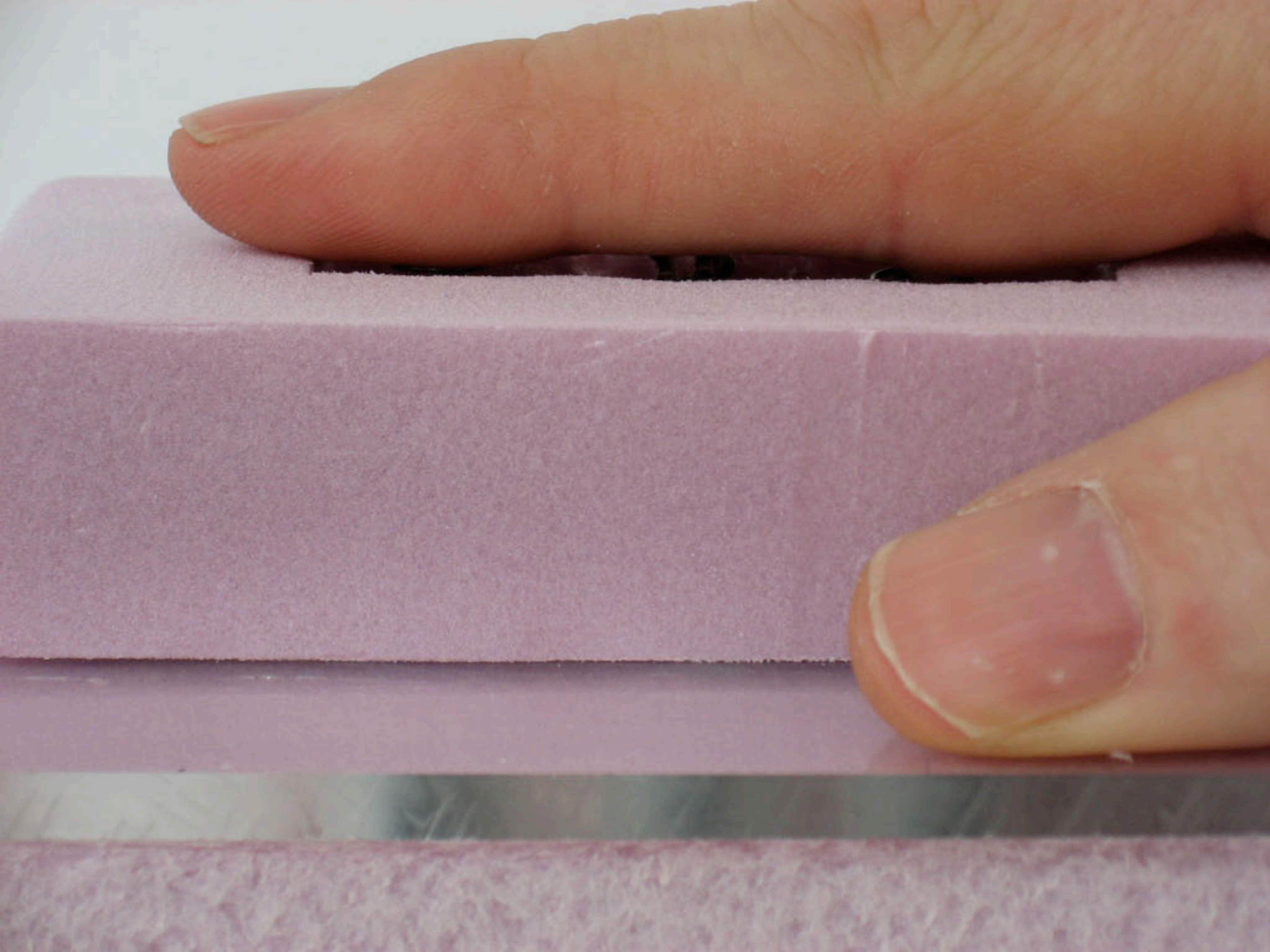




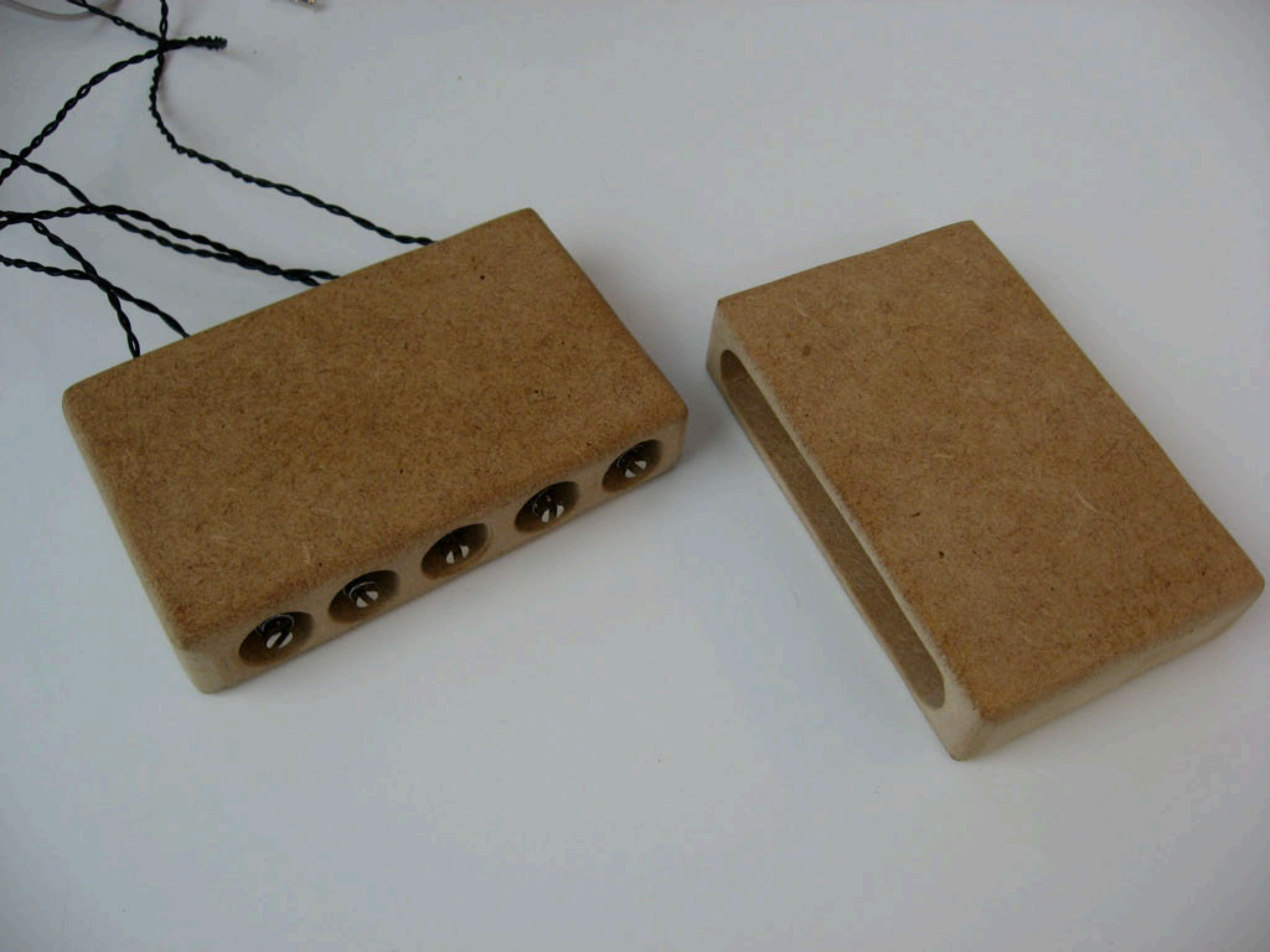




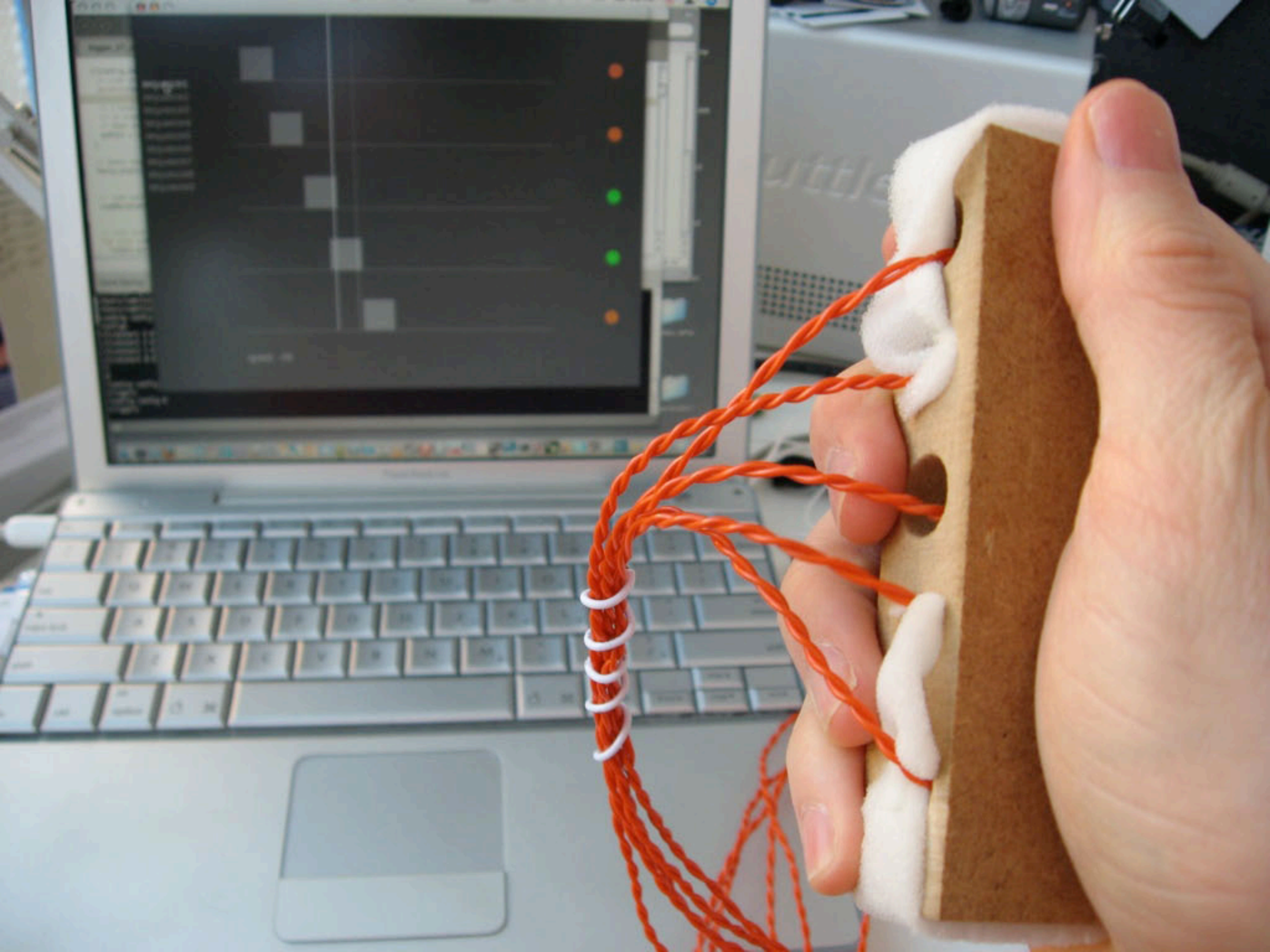




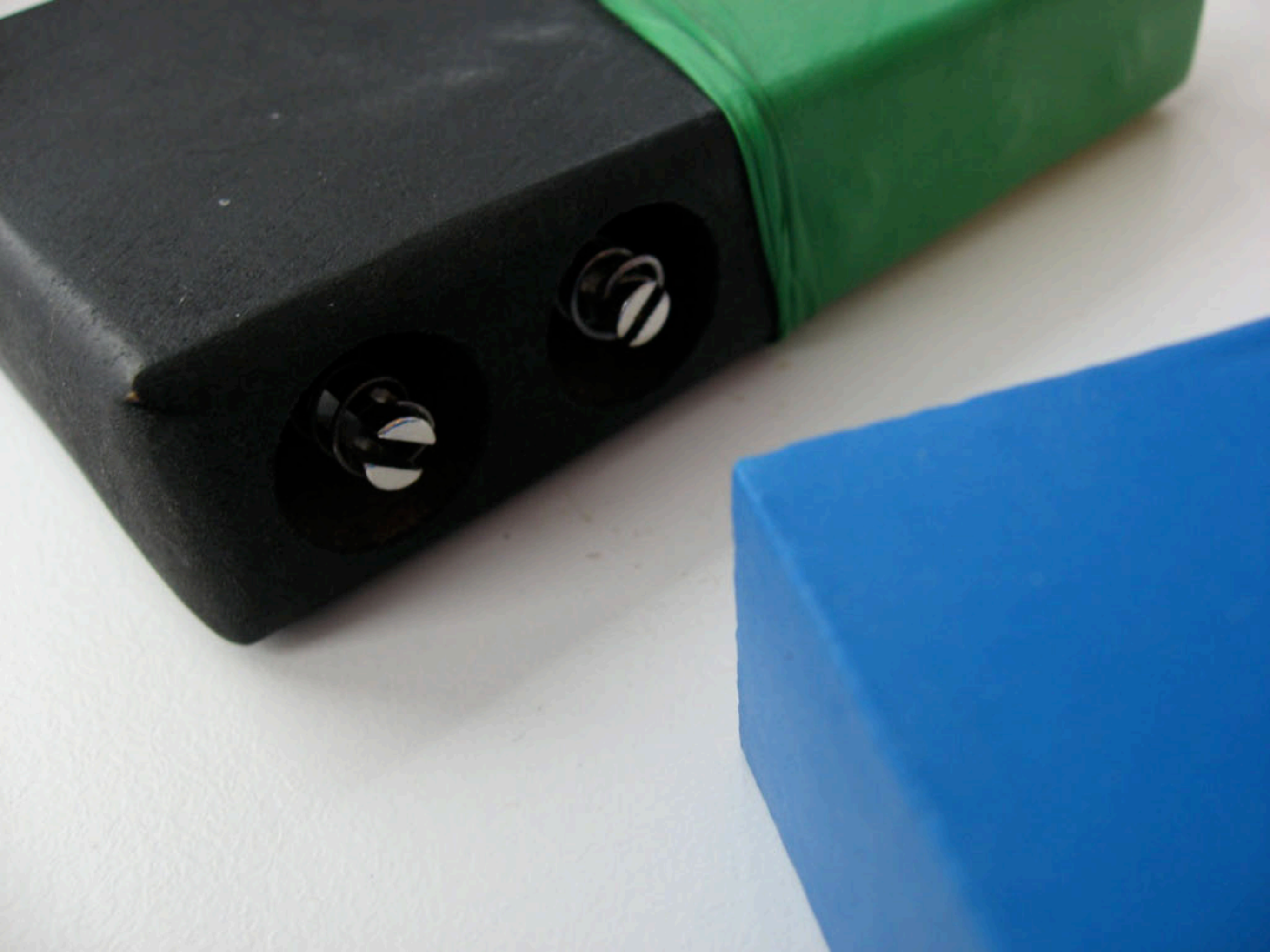






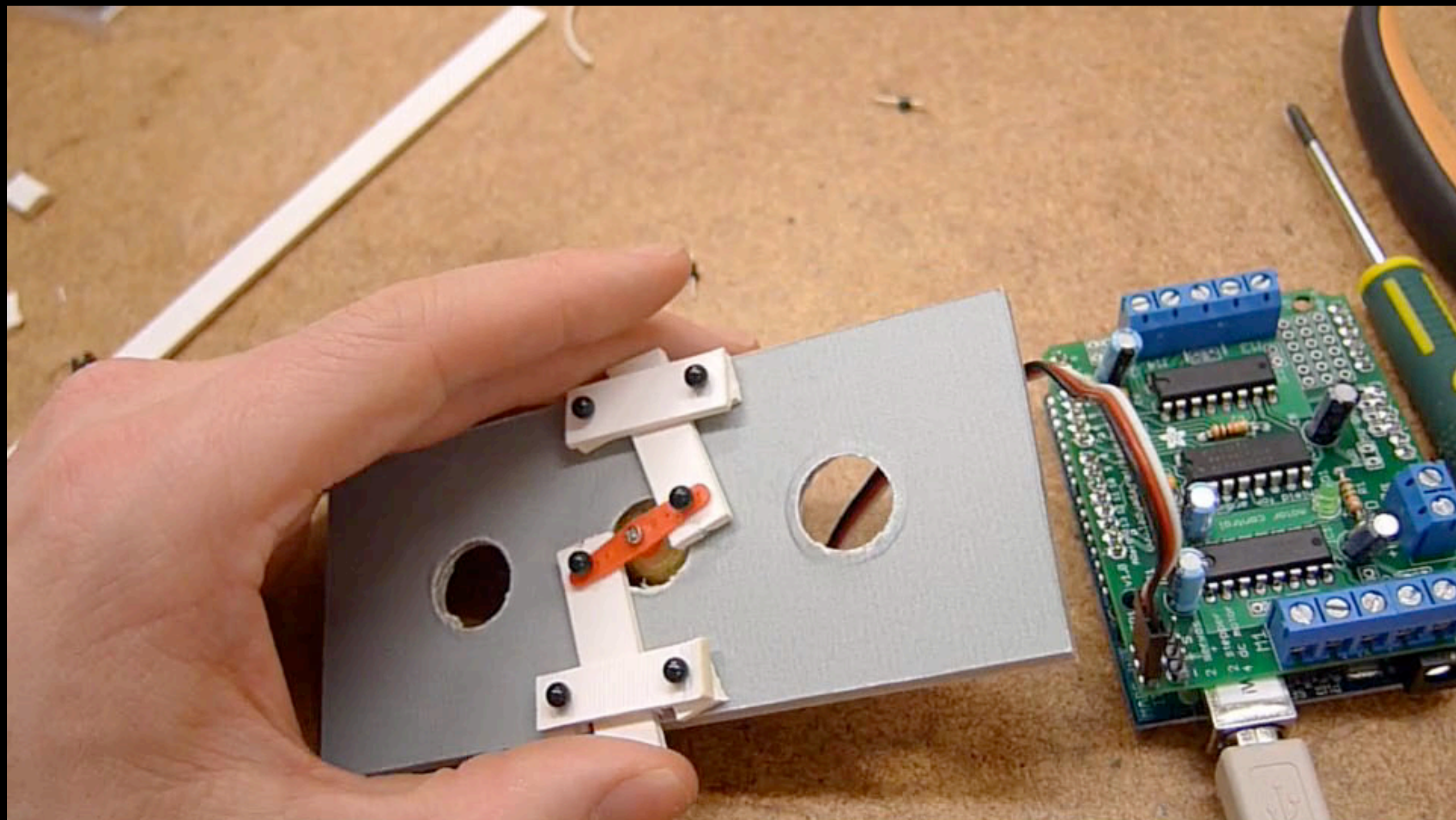




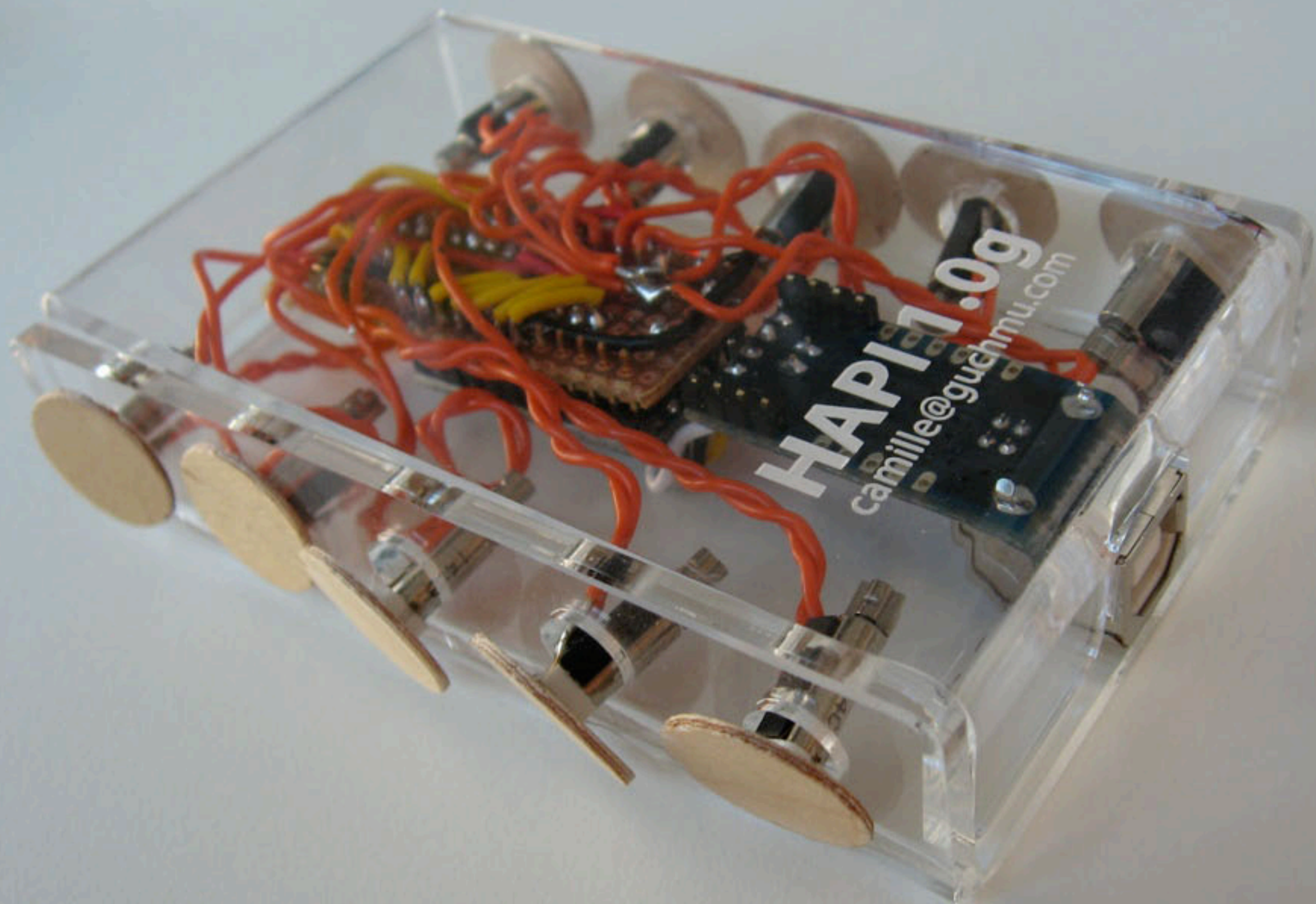




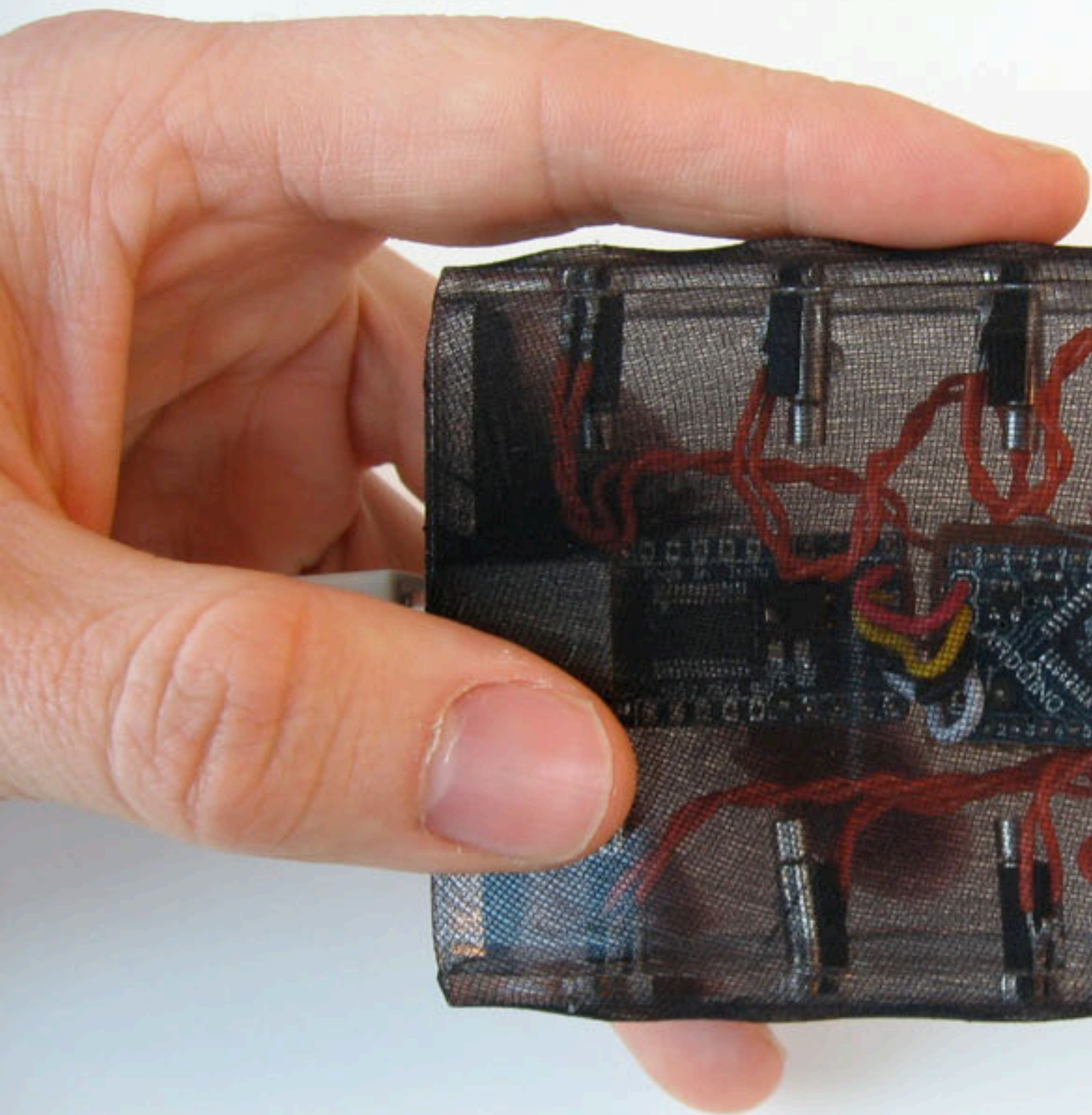




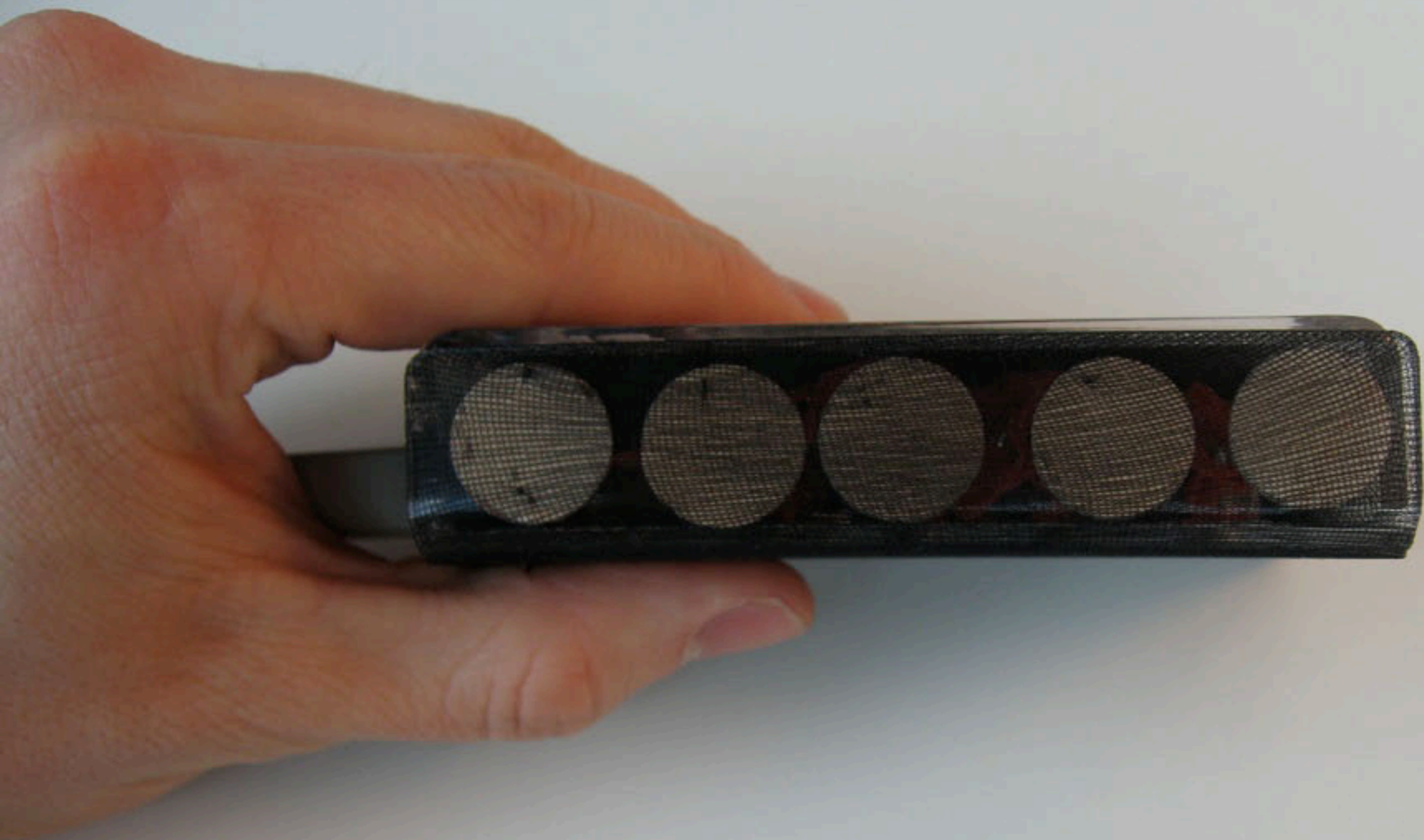














# Challenges and difficulties

Describing/designing haptic stimuli: vocabulary, representations, lexicon

Problems verbalizing and communicating sensations

Synthesizing movement and haptic feedback is not trivial

Often technical problems/issues completely kill the interaction

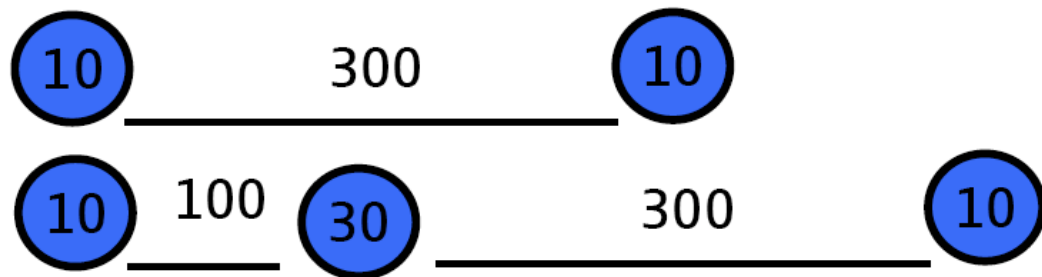
Formal evaluation and comparison is impossible

Have to build stuff to inform/grasp/evaluate/discuss

# How do you describe and design haptic I/O?

Lexicon?

Notation system for I/O? Music, sequencer, etc.



Measurement unit for haptic? Audio => dB

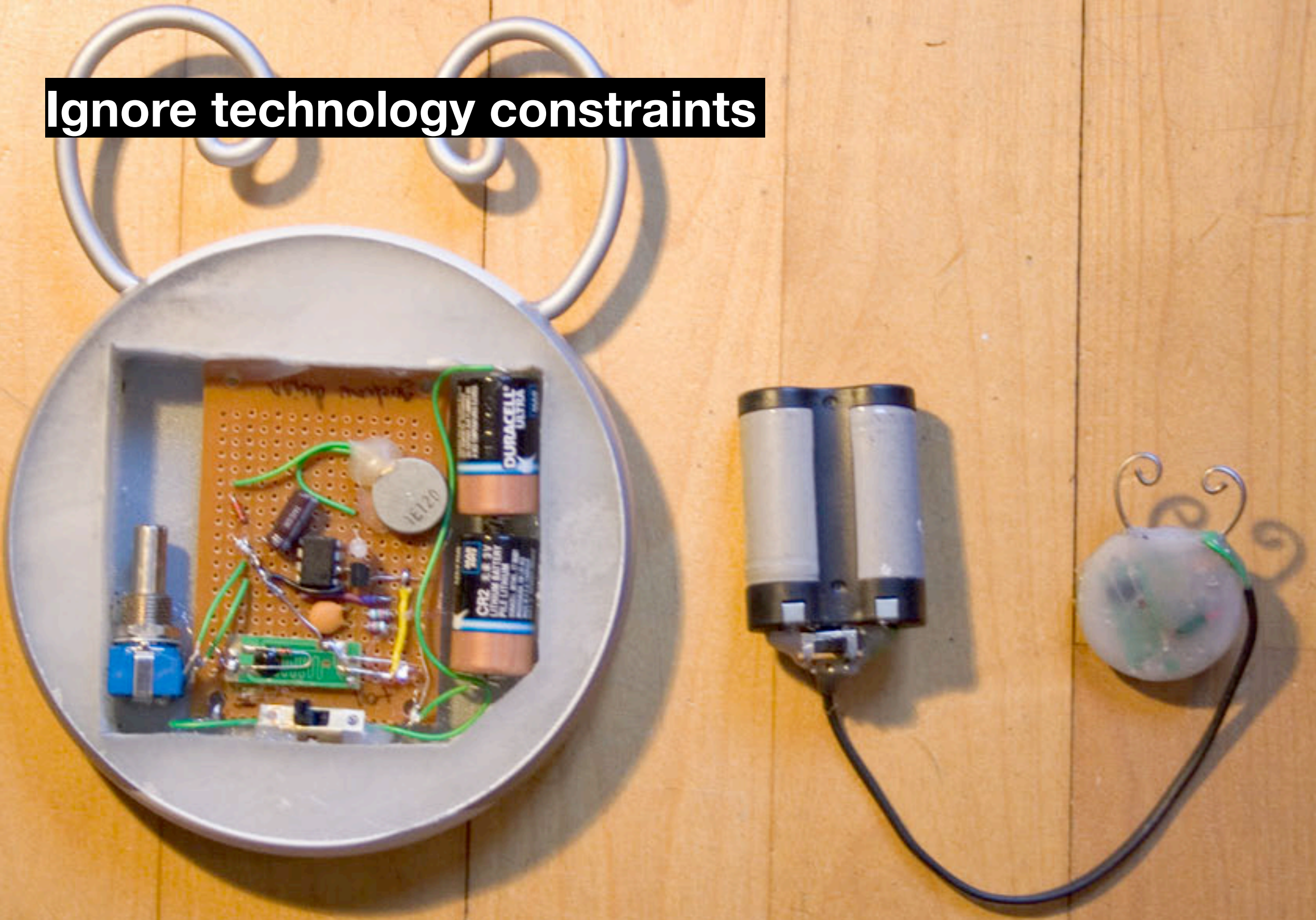
Hardware based or perception based?

Does it work across devices, humans, contexts, brands?

# Suggestions and guidelines for sketching



**Ignore technology constraints**





**Fake as much as possible**



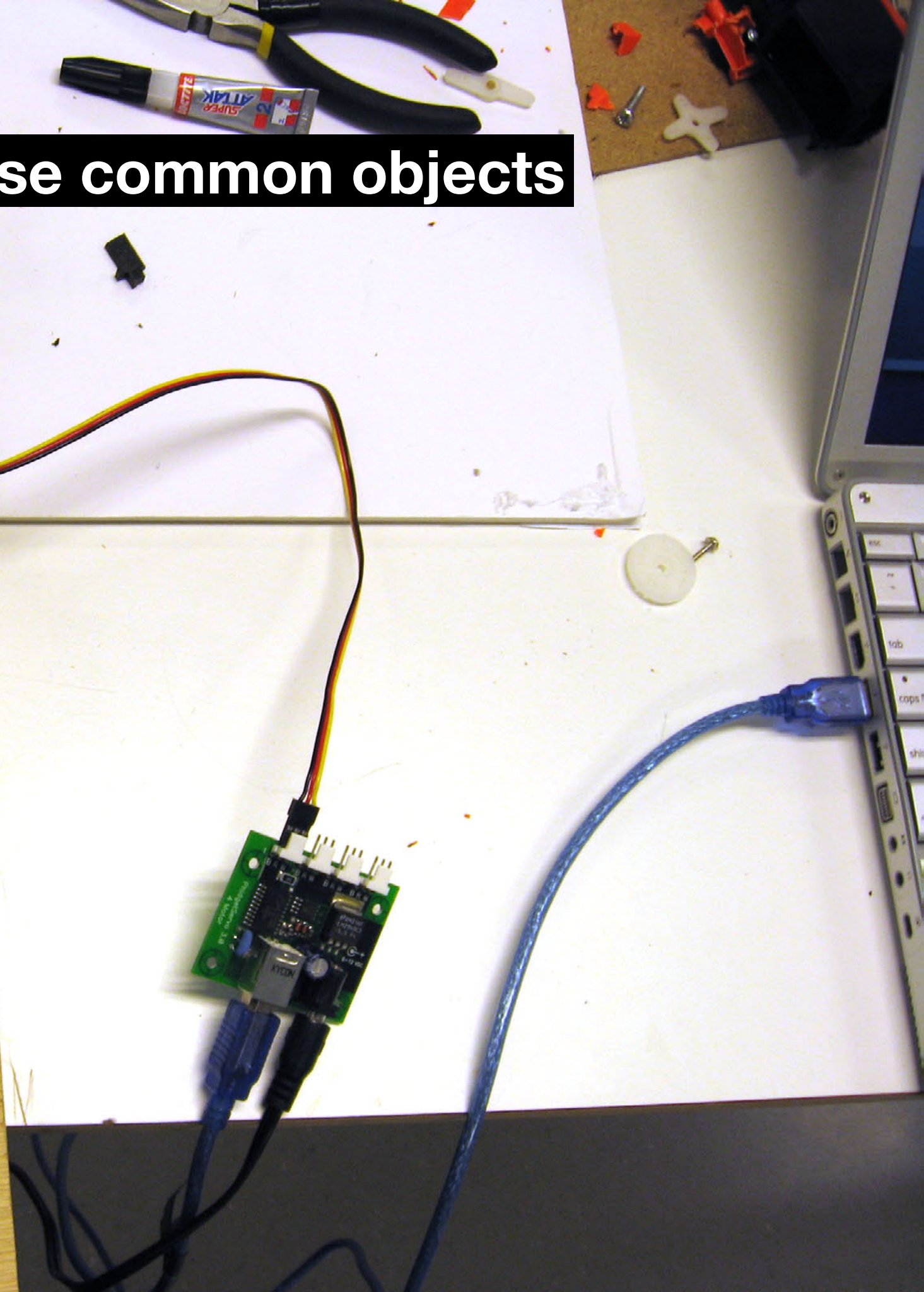
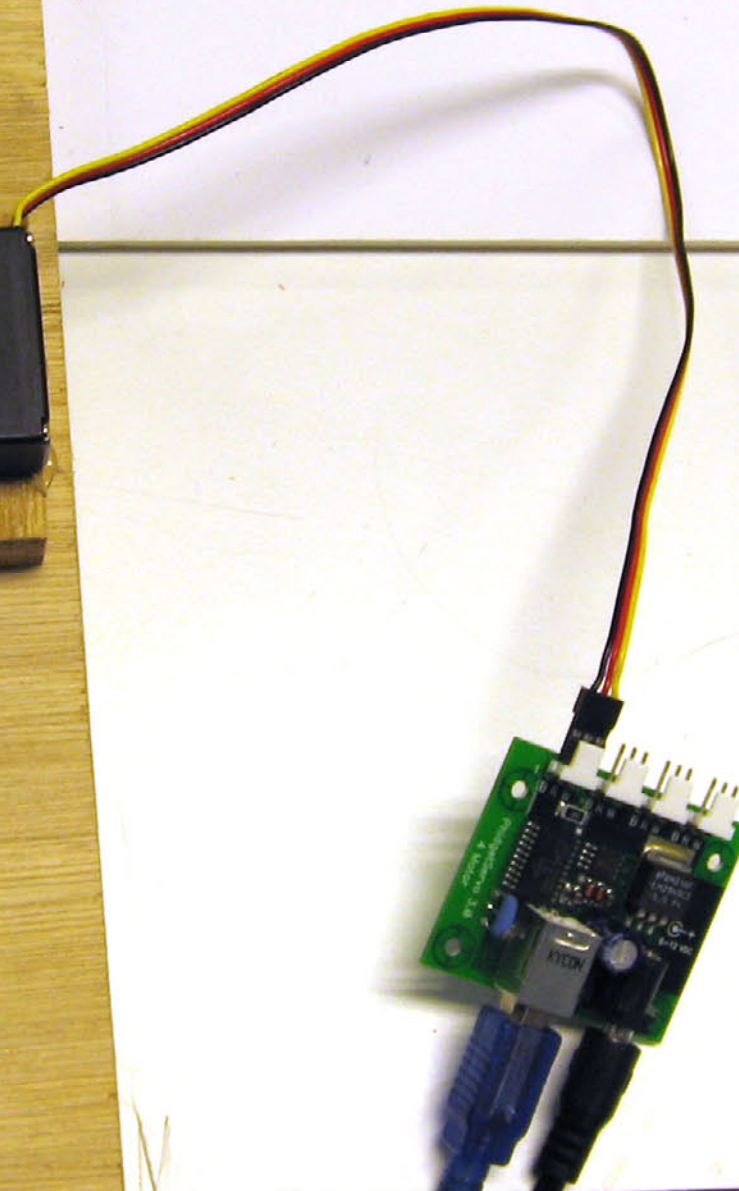
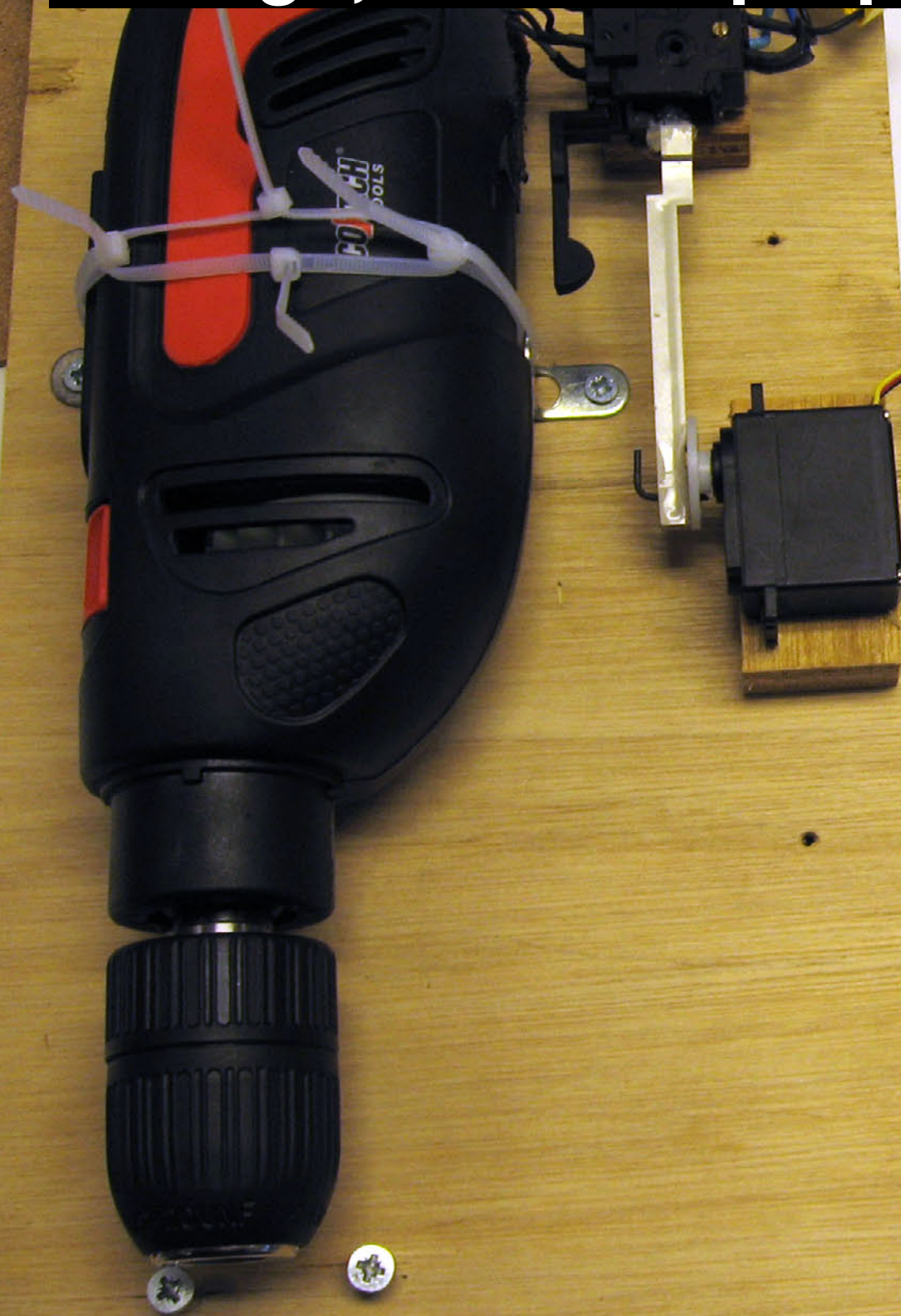


**Use the world to control the world**



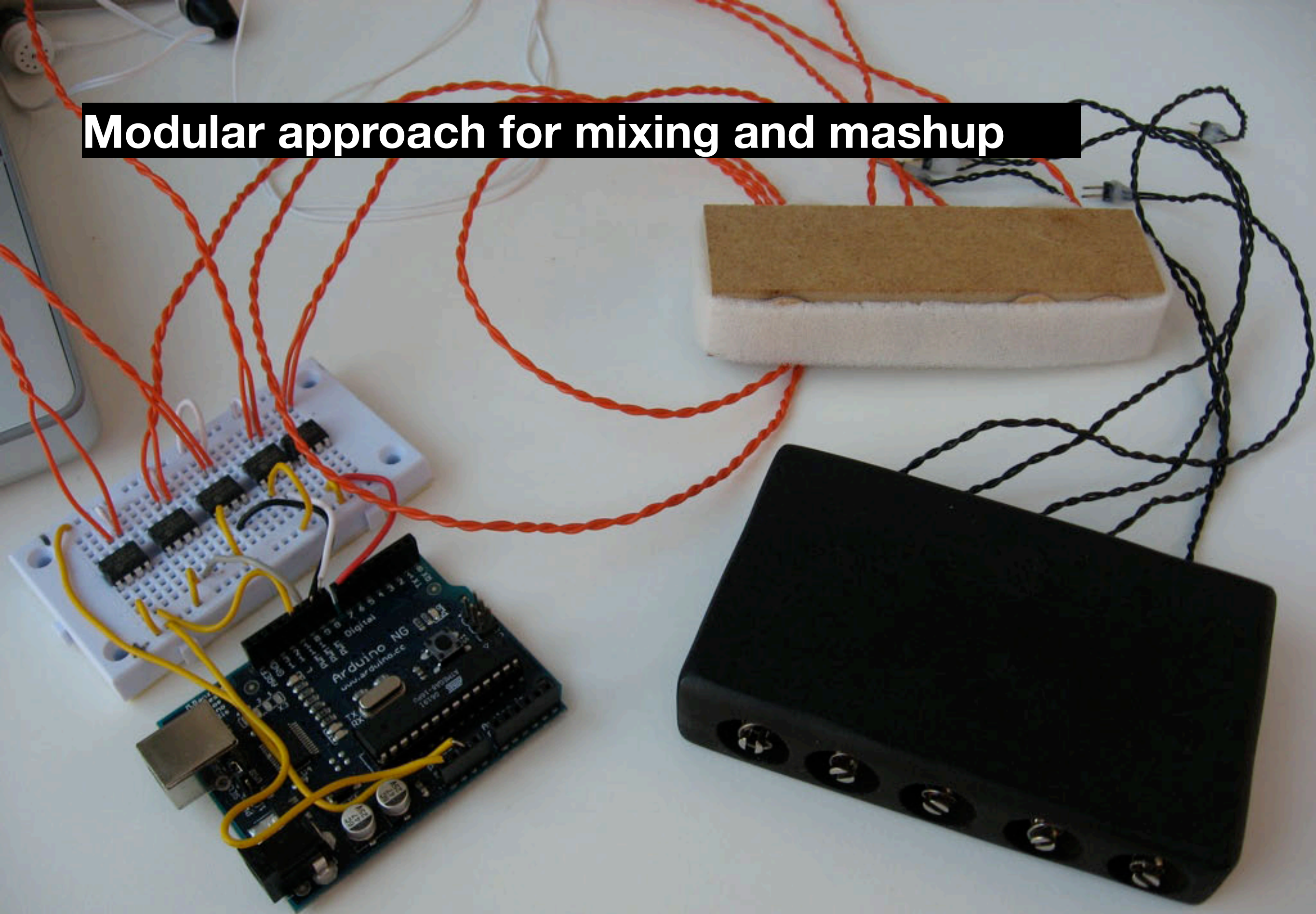


**Salvage, use or repurpose common objects**



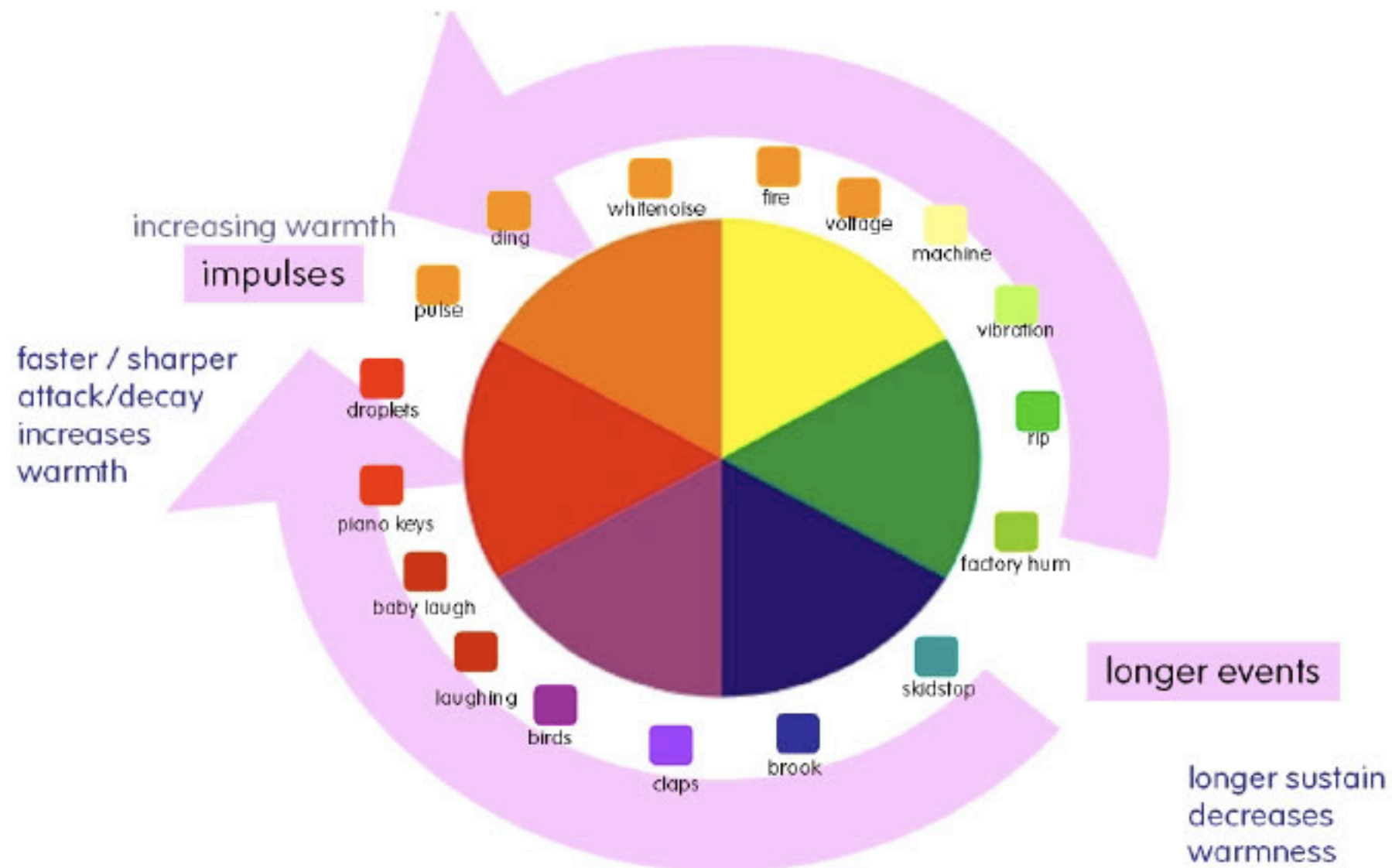


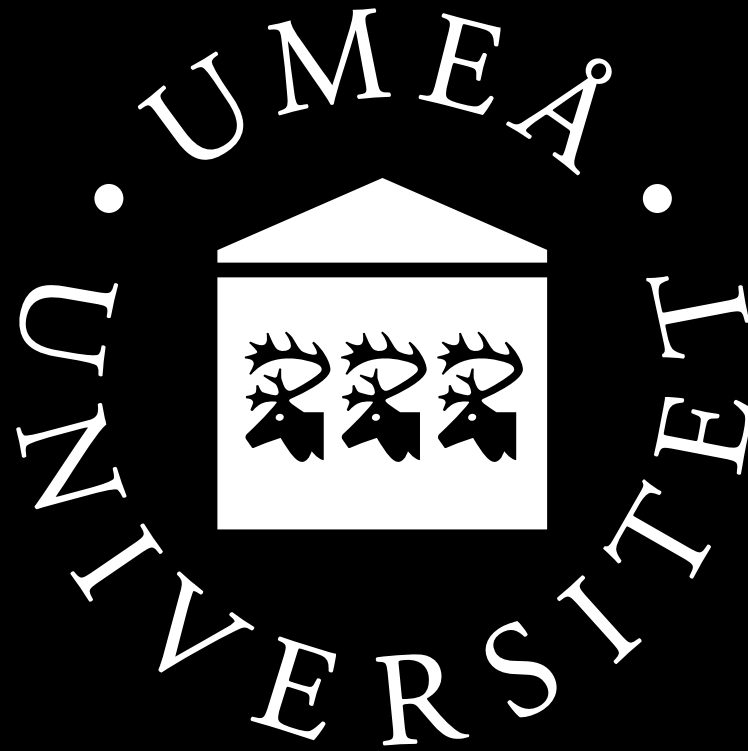
# Modular approach for mixing and mashup





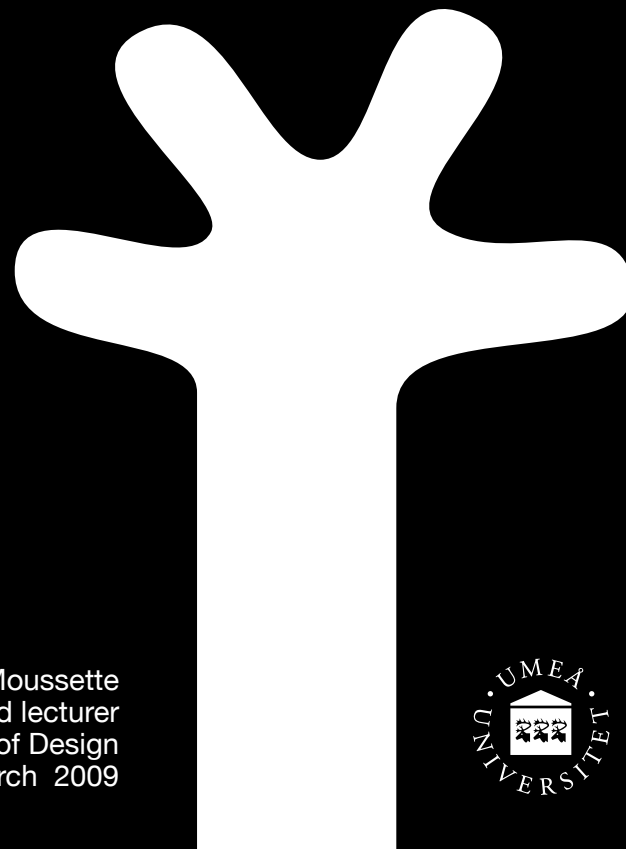
# Use of metaphor





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**<http://www.partly-cloudy.com>**



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