NEFF Design Workshop

WELCOME!

Ludwig Maximilians Universität München

LMU

HOCHSCHULE FÜR ANGEWANDTE WISSENSCHAFTEN · FH MÜNCHEN

Lehr- und Forschungseinheit Medieninformatik

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LFE Medieninformatik

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LMU

Studium Medieninformatik

- angewandte Informatik
- digitale Informationsverarbeitung in den Medien
- Informatikkonzepte/ digitale Kommunikationstechnik/ Multimedia
- Mensch Maschine Interaktion
- Variante des Informatikstudiums

Studenten gesamt: 545

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LFE Forschungsthemen

HCI

Human Computer Interaction

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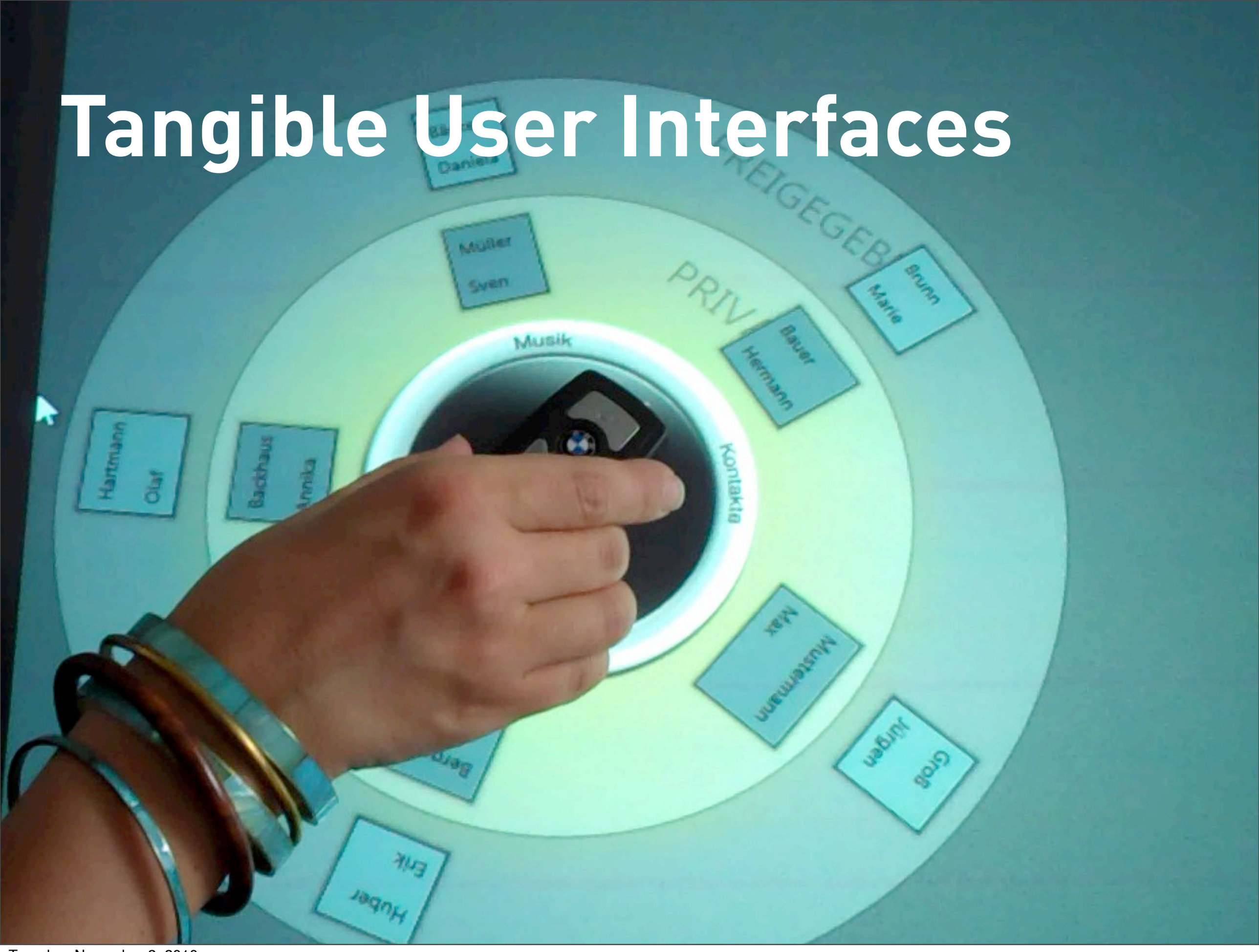
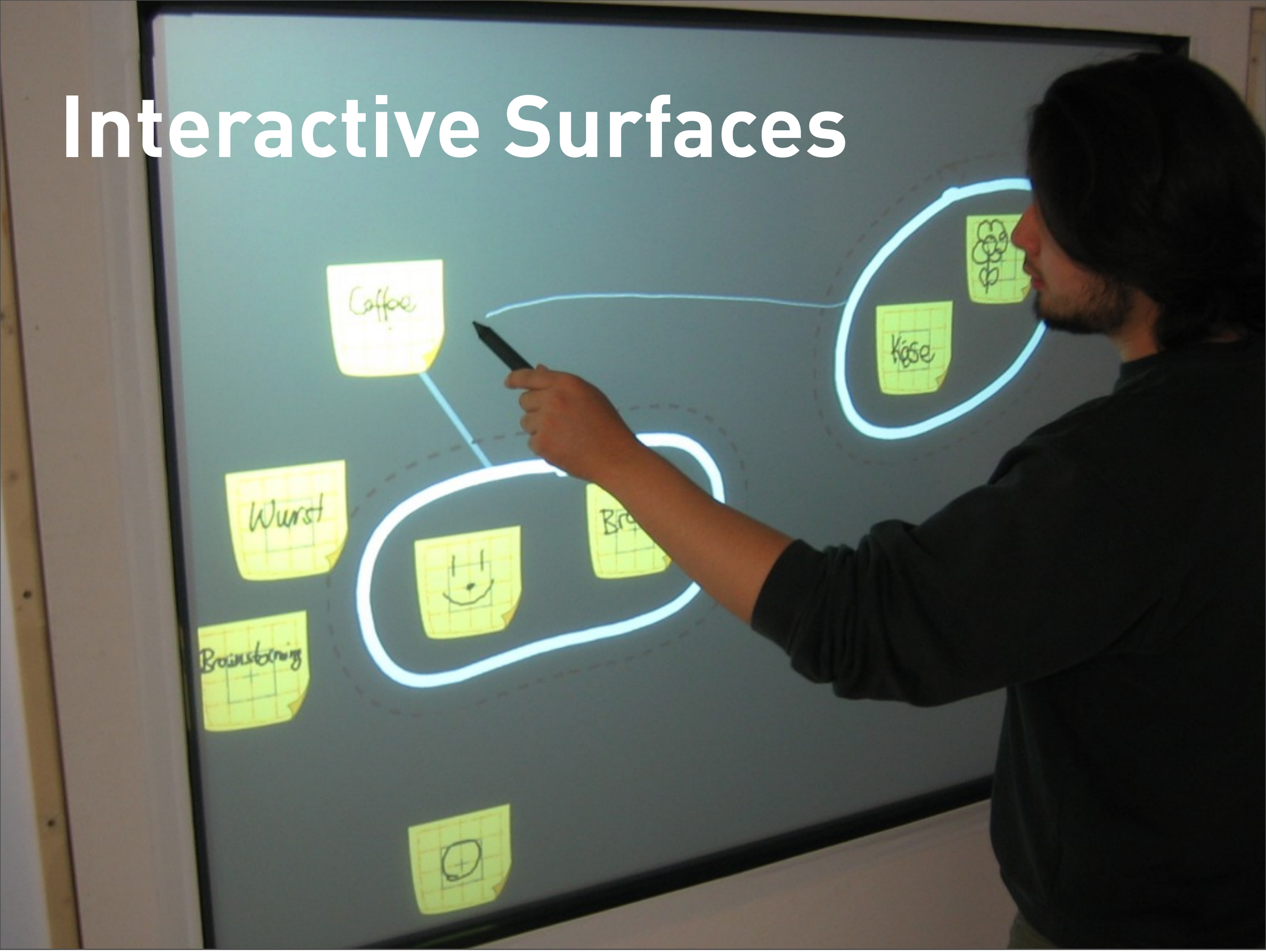
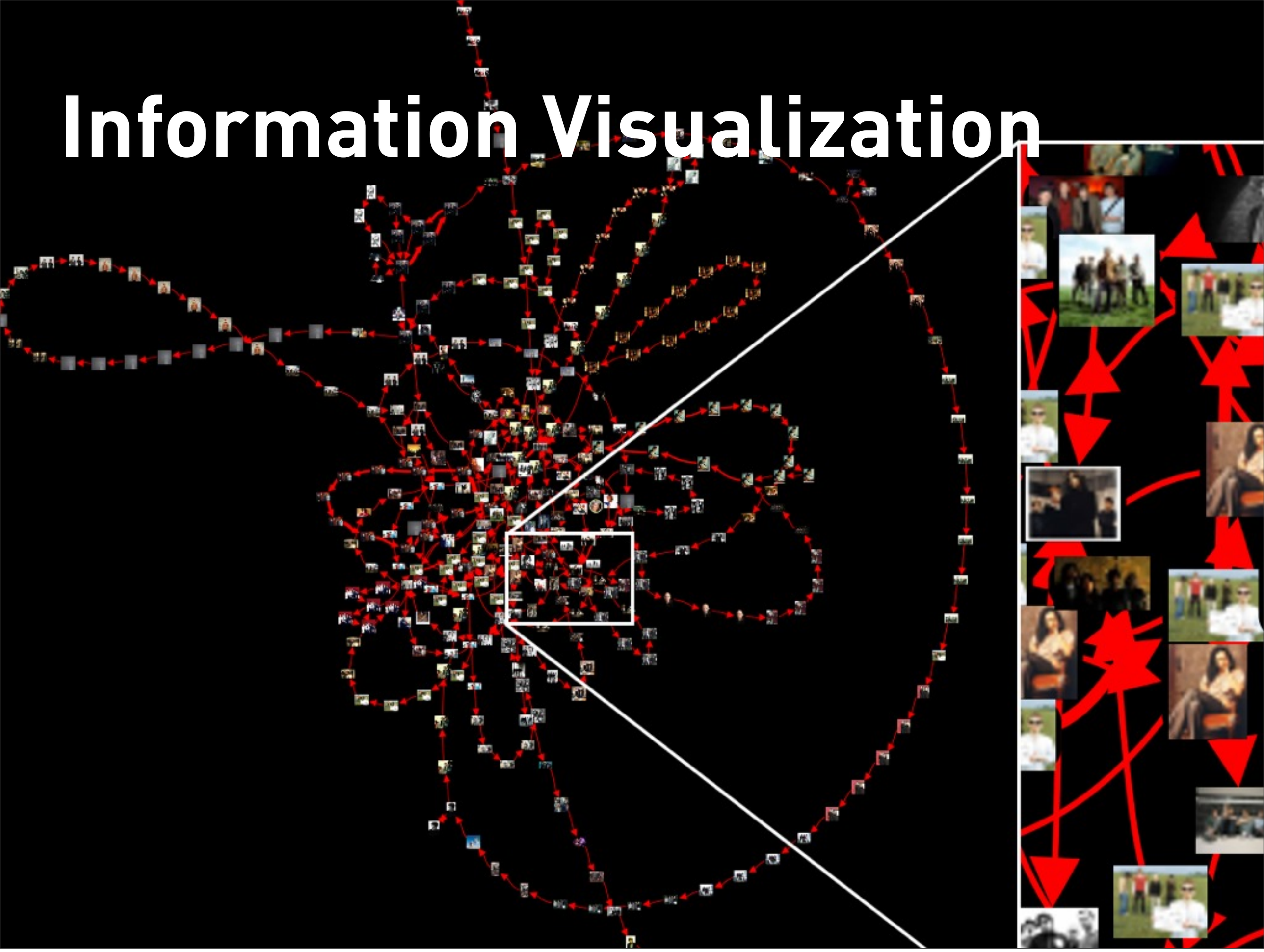
Tangible User Interfaces



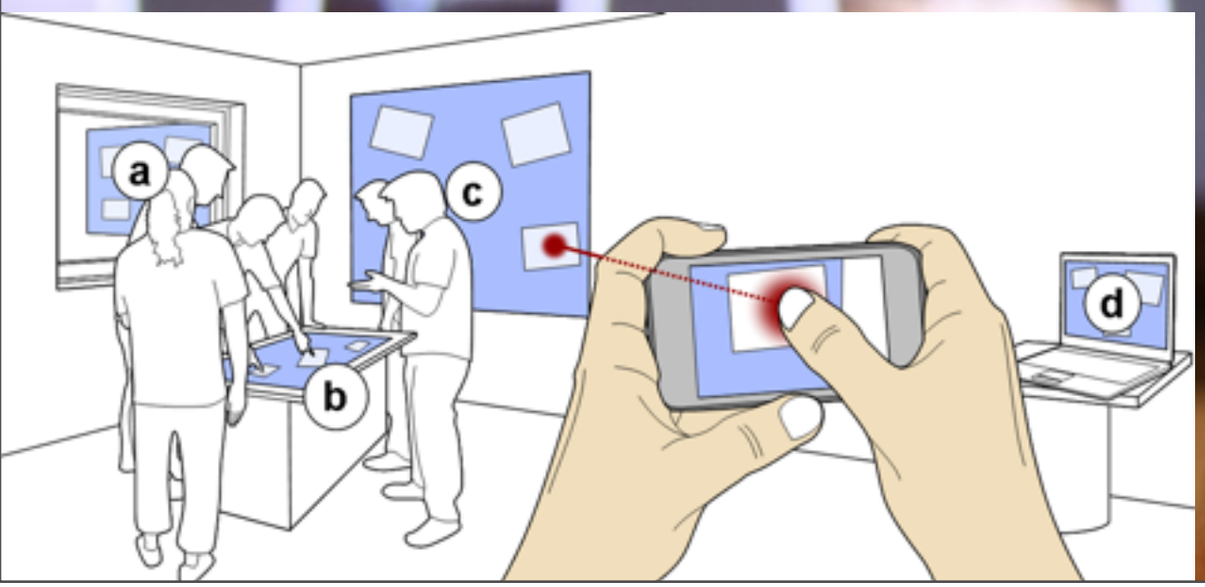
Interactive Surfaces



Information Visualization



Mobile Applications



Tuesday, November 2, 2010

www.medien.ifi.lmu.de

OVERVIEW

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HOCHSCHULE FÜR ANGEWANDTE WISSENSCHAFTEN · FH MÜNCHEN

Fundamentals & Keyboard Hacking

Thursday | Friday | Monday | Tuesday | Wednesday | Thursday | Friday

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Arduino Intro and Sensors

Thursday | Friday | Monday | Tuesday | Wednesday | Thursday | Friday

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Day 1:
Morning Session:

1.) 10:00 Introduction Lecture & Fundamentals

2.) 11:00 Practical Exercise

Afternoon Session

3.) 13:00 Keyboard Hacks

4.) 16:30 Mini Presentation

Day 2:
Morning Session:

1.) 10:00 Arduino Introduction

2.) 12:00 Practical Exercise & Arduino

Afternoon Session

4.) 14:00 Arduino and Sensors

5.) 17:00 Wrap Up

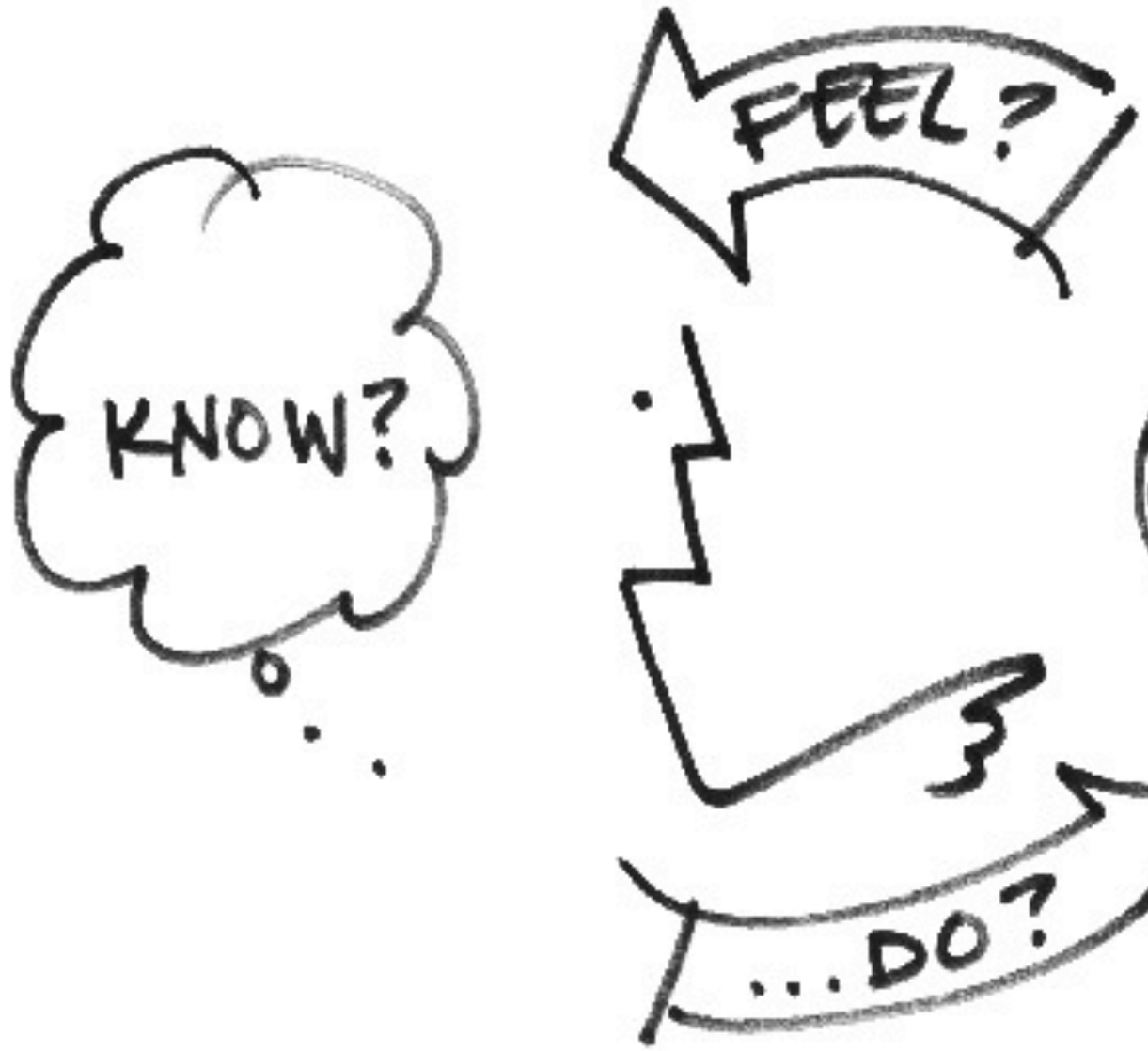
What are we doing here ?

a bit of **Interaction Design**

Bill Verplank / worked at Xerox 78-1986

INTERACTION DESIGN

INTERACTION DESIGN



Mental model (tutorial, signs)

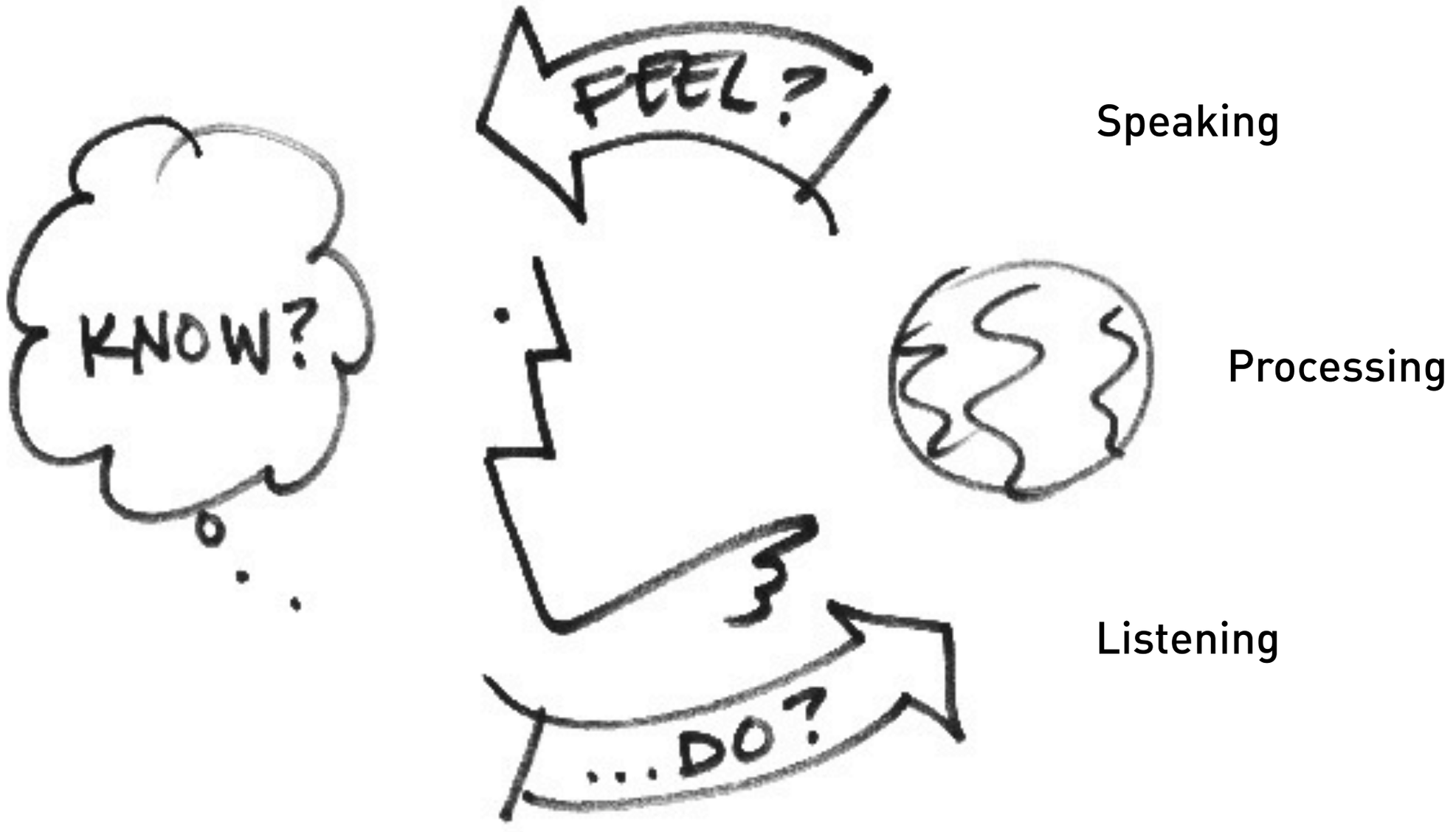
Transducers (output: hi/lo resolution)

Computer Microcontroller

Transducers (input: analog/digital)

photo credits © bill verplank

INTERACTION DESIGN



Speaking

Processing

Listening

photo credits © bill verplank

Interaction: Input,Output and Processing

Figure I.4
The parts of a physical computing system.

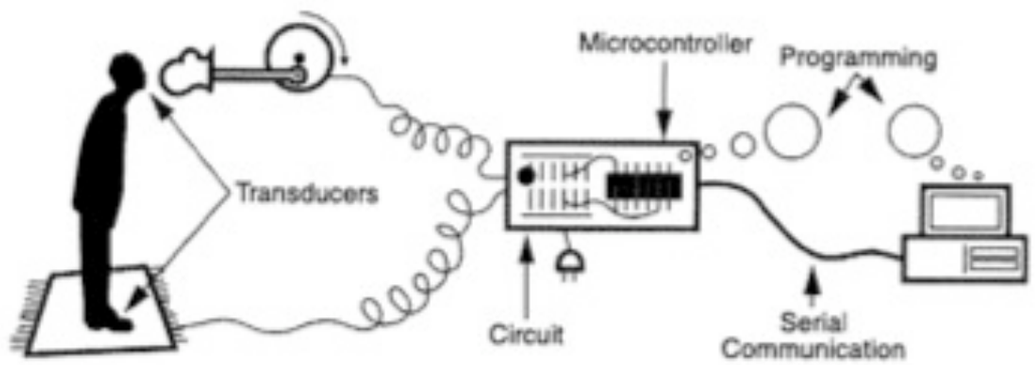


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photo credits © *Physical Computing* by O'sullivan, D., & Igoe, T.

a bit of **Physical Computing**

by Tom Igoe

Is an approach to learning how humans communicate through computers that starts by considering how humans express themselves physically.

Status Cube

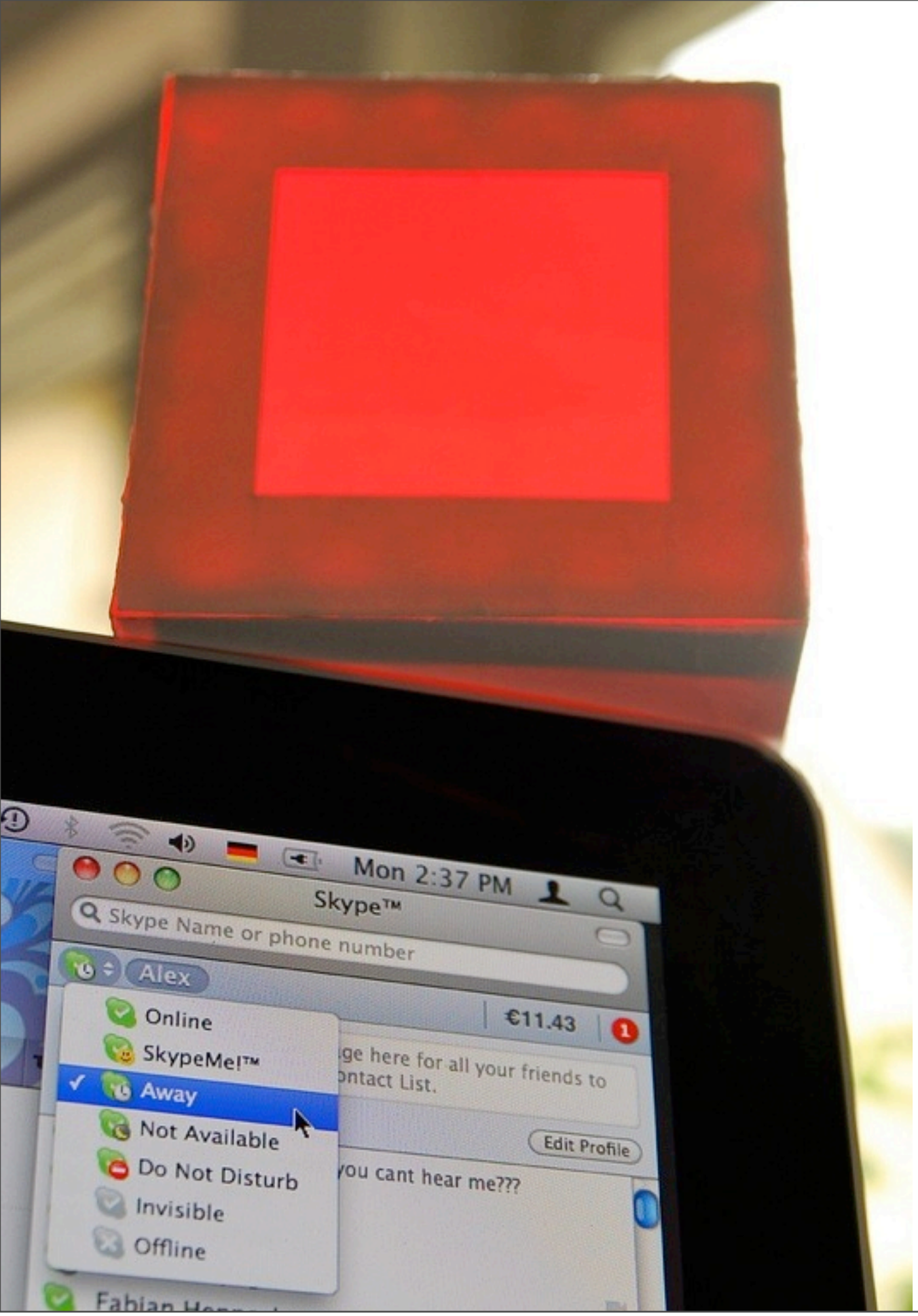

photo credits © alexander wiethoff

Think Sketch not Product !

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a bit of **ELECTRONICS**

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electricity is like **water**.....

(SOMEHOW)

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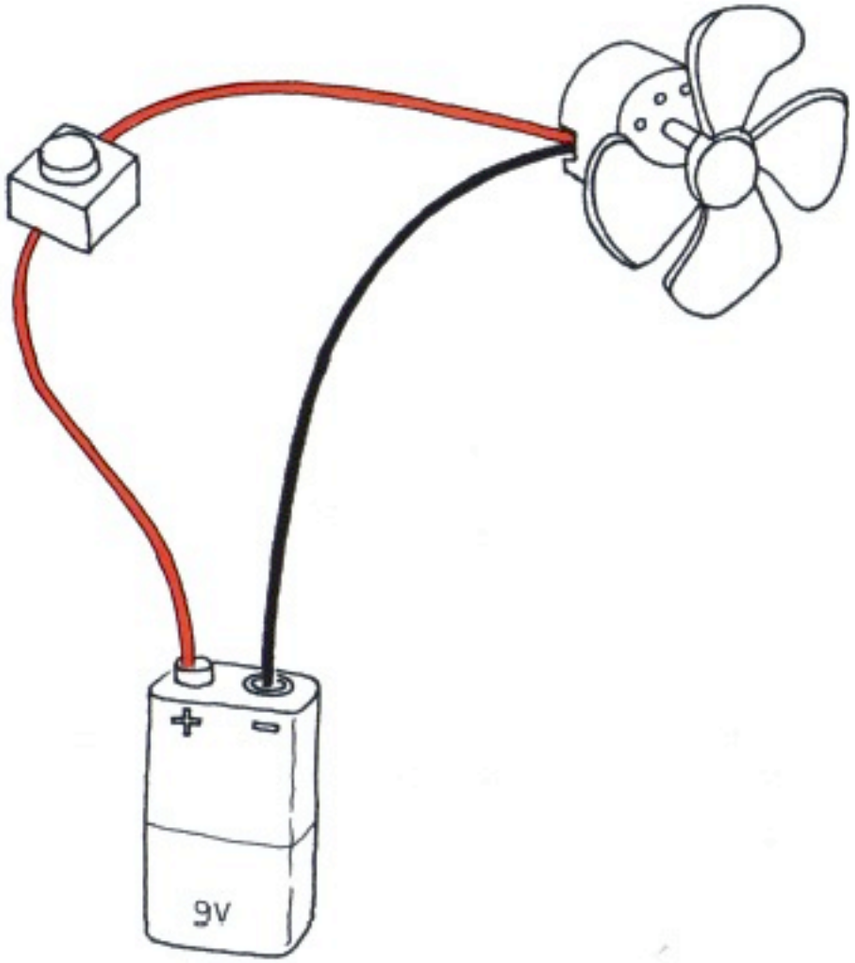

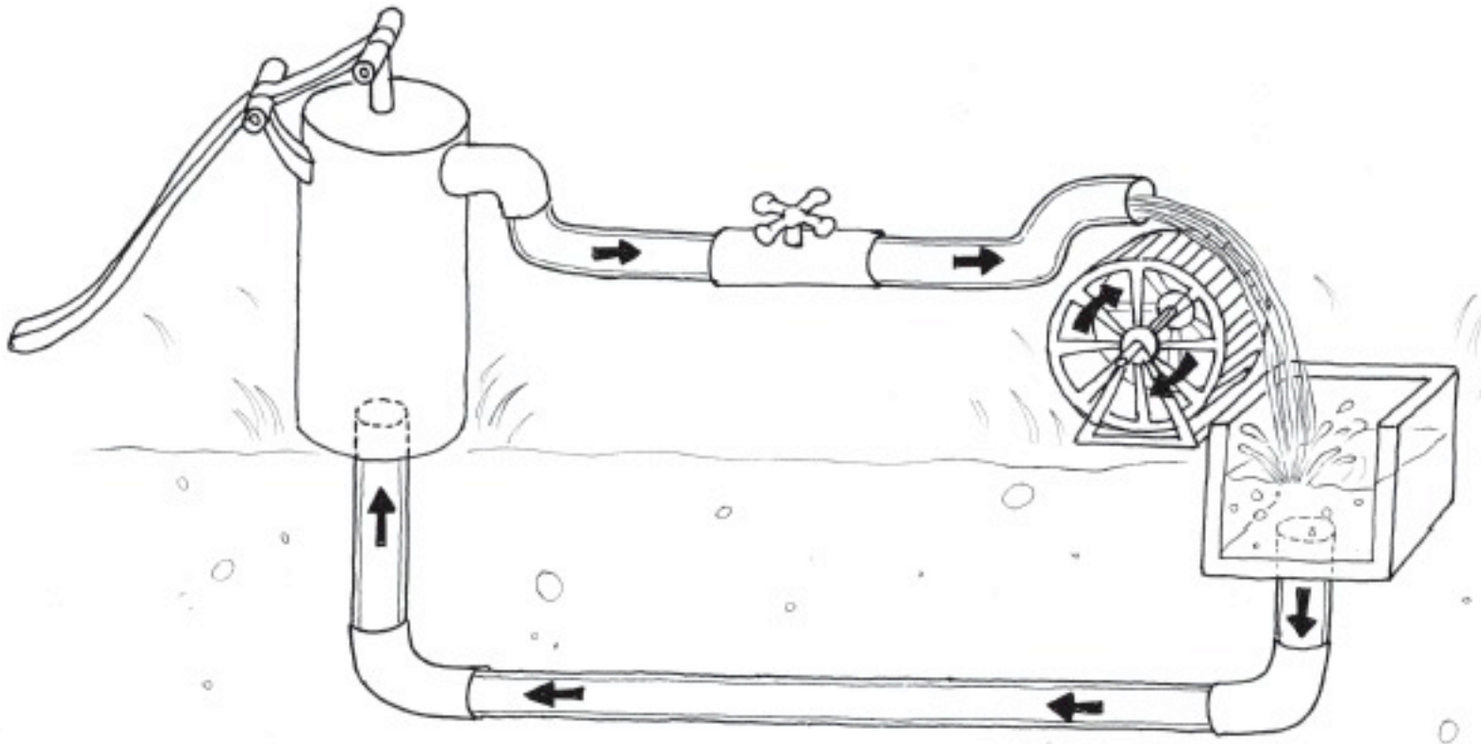

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Fundamentals: **Resistors**
(Video Tutorial)

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watch resistor video tutorial :

http://www.youtube.com/watch?v=VPVoY1QROMg

video credits © makeshed.com

looking back.....

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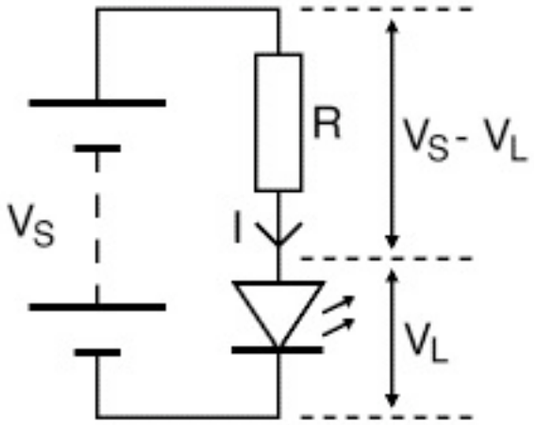
OHMs LAW

$$V = I \times R \quad \text{or} \quad I = \frac{V}{R} \quad \text{or} \quad R = \frac{V}{I}$$

where: V = voltage in volts (V)
I = current in amps (A)
R = resistance in ohms (Ω)

or: V = voltage in volts (V)
I = current in milliamps (mA)
R = resistance in kilohms (kΩ)

$$R = (V_S - V_L) / I$$



V_S = supply voltage
V_L = LED voltage (usually 2V, but 4V for blue and white LEDs)
I = LED current (e.g. 20mA), this must be less than the maximum permitted

For example

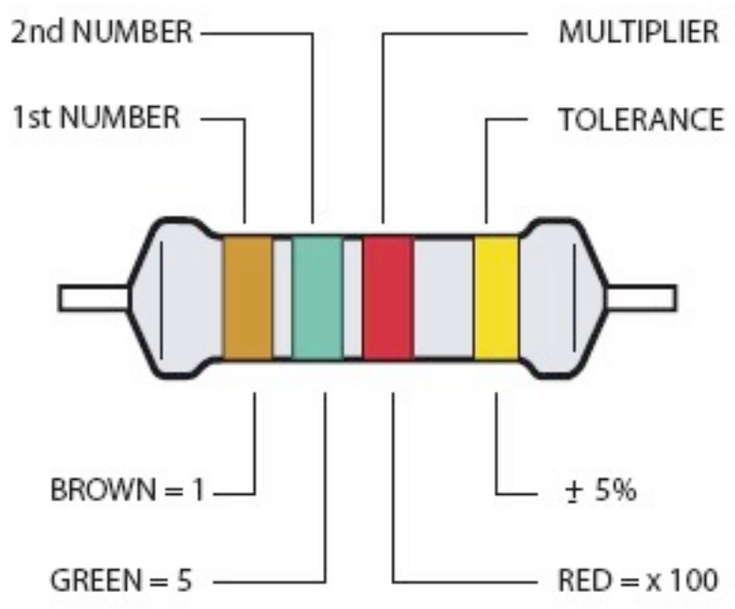
If the supply voltage V_S = 9V, and you have a red LED (V_L = 2V), requiring a current
I = 20mA = 0.020A,
R = (9V - 2V) / 0.02A = 350, so choose 390 (the nearest standard value which is greater).

Working out the LED resistor formula using Ohm's law

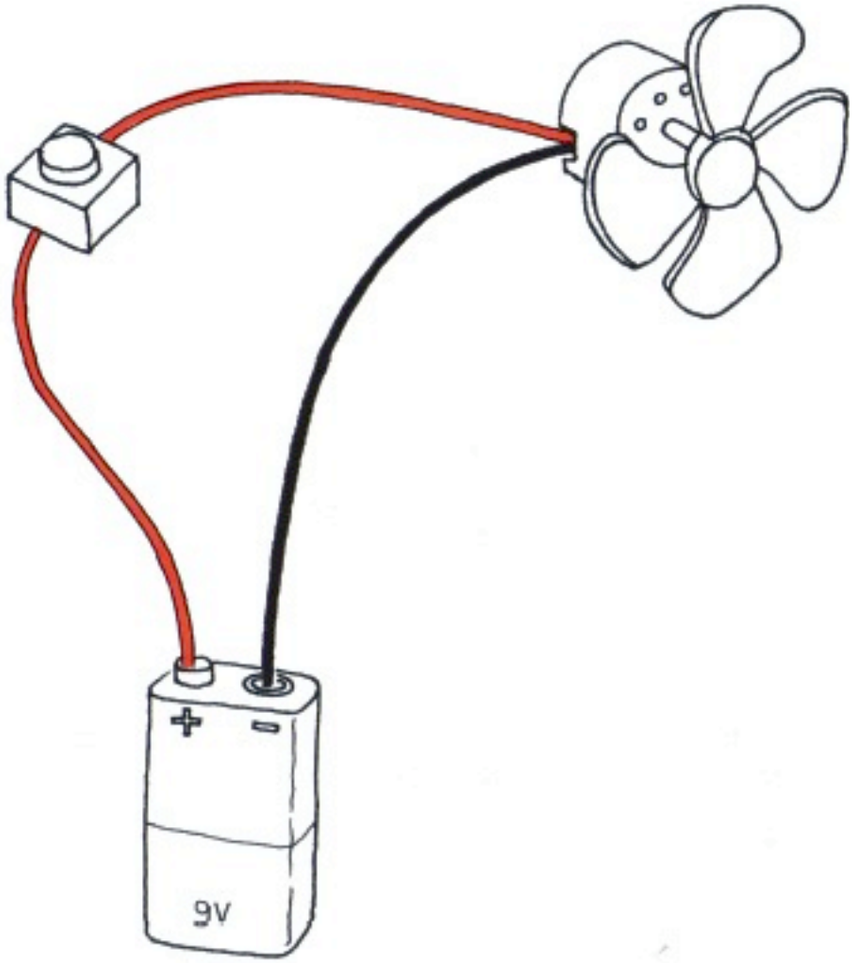
Ohm's law says that the resistance of the resistor, R = V/I, where:
V = voltage across the resistor (= V_S - V_L in this case)
I = the current through the resistor
So R = (V_S - V_L) / I

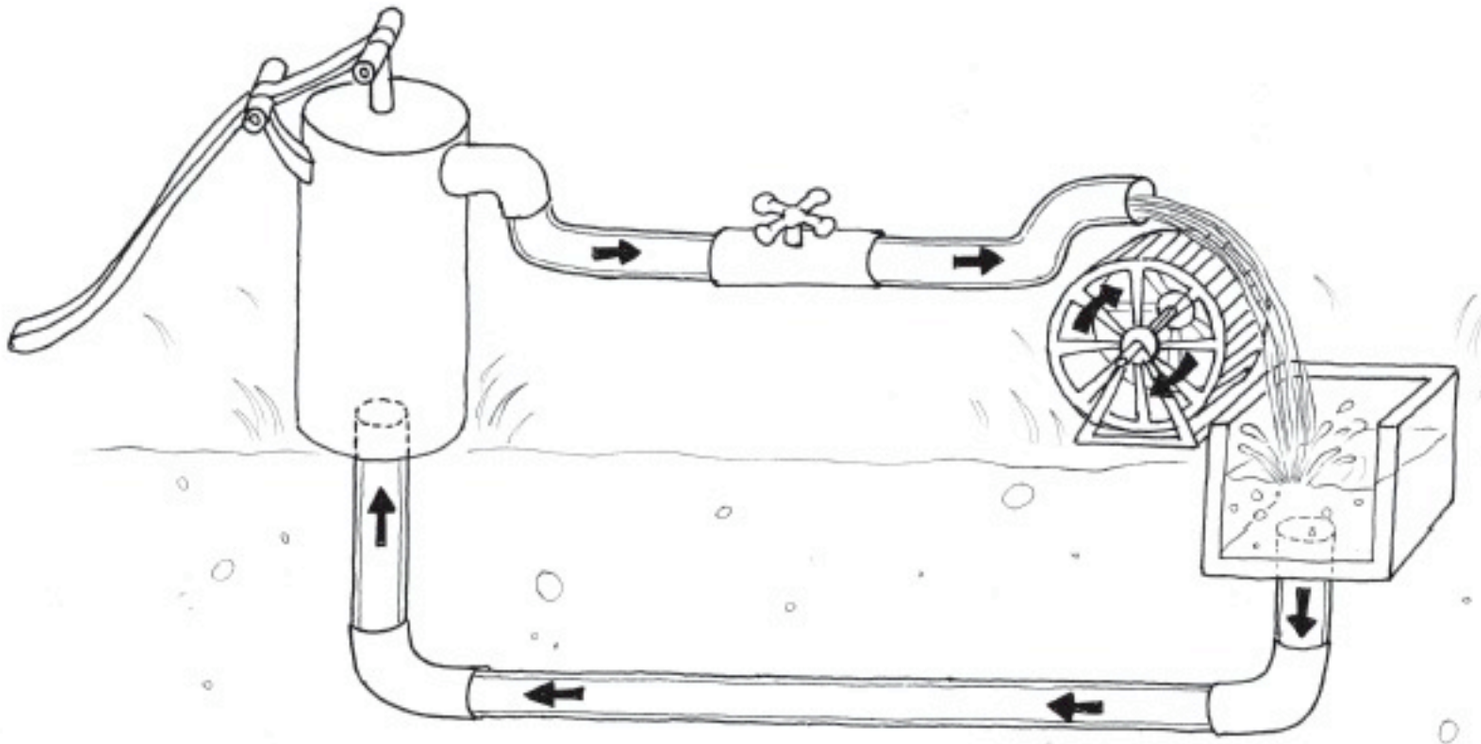
http://www.kpsec.freeuk.com/ohmslaw.htm

	1st NUMBER	2nd NUMBER	MULTIPLIER	TOLERANCE
BLACK	====	0	x 1	10 % SILVER
BROWN	1	1	x 10	5 % GOLD
RED	2	2	x 100	
ORANGE	3	3	x 1.000	
YELLOW	4	4	x 10.000	
GREEN	5	5	x 100.000	
BLUE	6	6	x 1.000.000	
PURPLE	7	7	GOLD : 10	
GREY	8	8		
WHITE	9	9		



1 5 00 = 1 500 Ohms ± 5%





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Fundamentals: **Capacitors**
(Video Tutorial)

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watch video tutorial capacitor:
http://www.youtube.com/watch?v=ZYH9dGI4gUE

video credits © makeshed.com

looking back.....

Values of **capacitors** are usually specified in ranges of Farads (F), microfarads (**μ**F or MFD), nanofarads (nF), or picofarads (pF)

1F = 1000 mF = 1,000,000 **μ**F = 1,000,000,000 nF = 1,000,000,000,000 pF

1**μ**F = 1,000 nF = 1,000,000 pF

source © wikipedia.com

Fundamentals: **Transistors**
(Video Tutorial)

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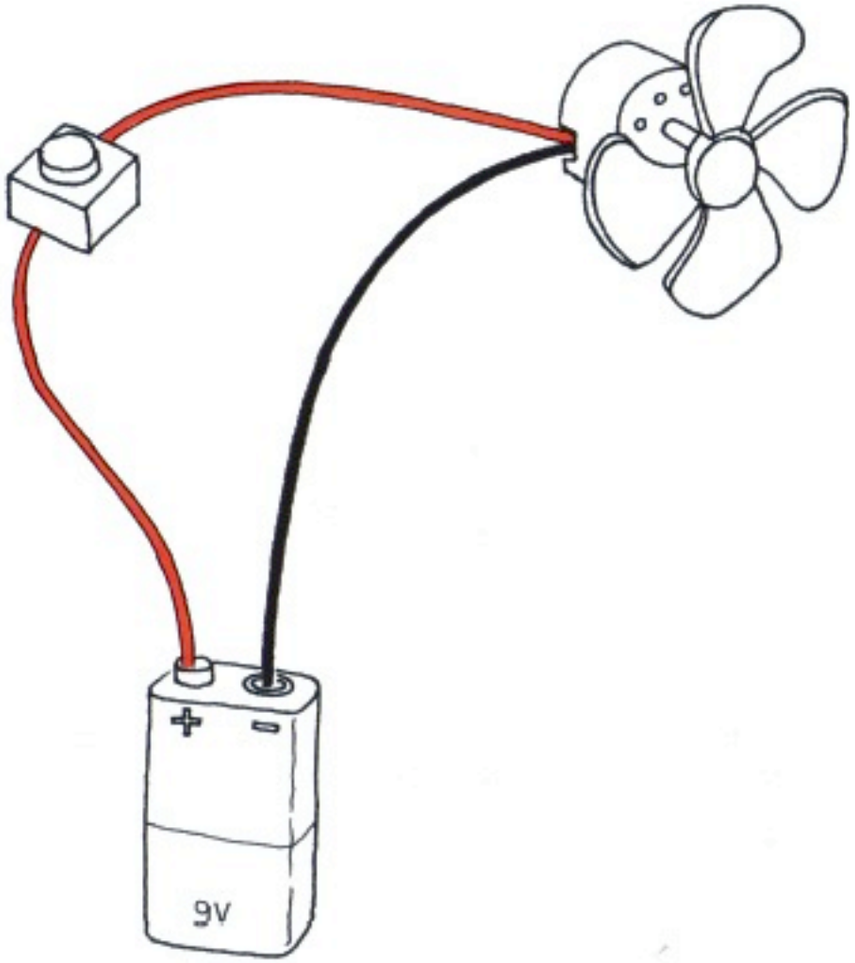
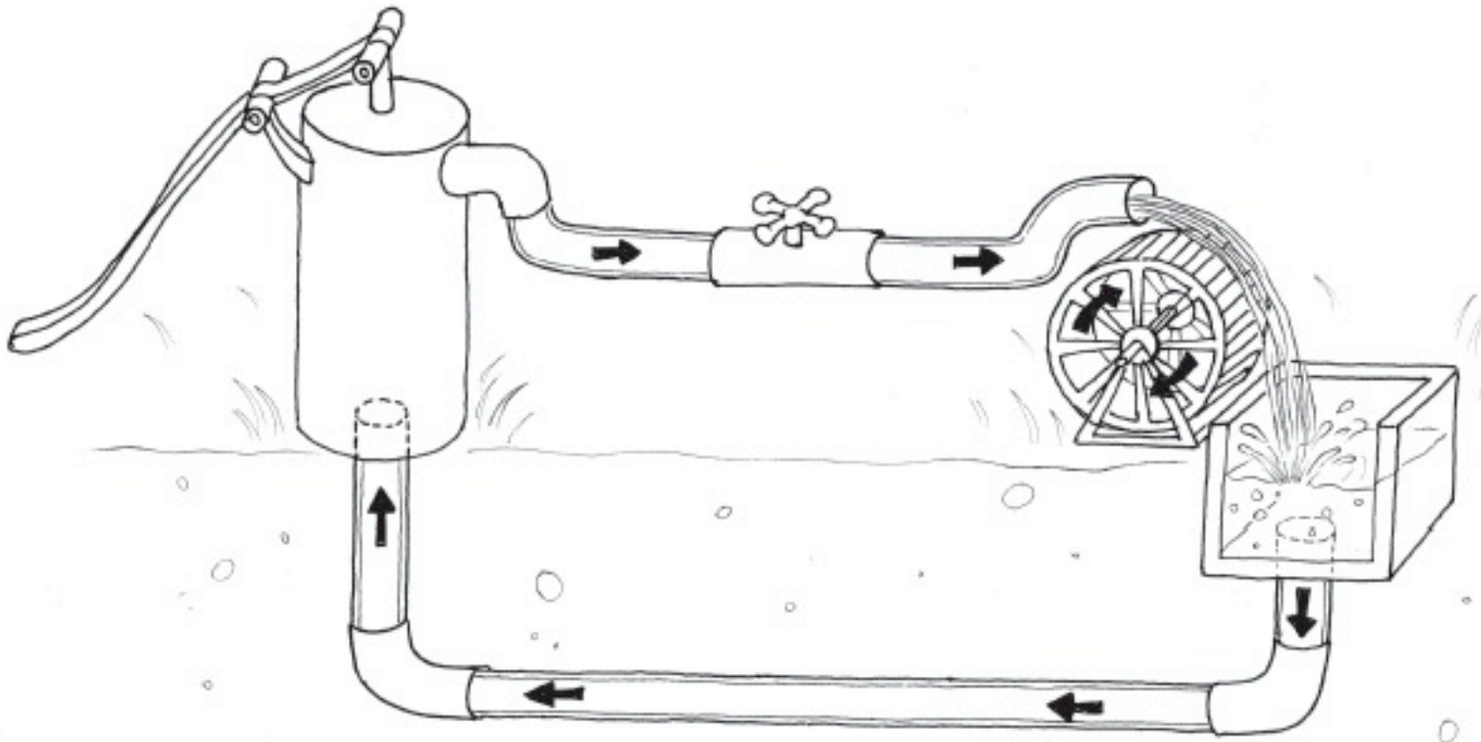
watch video tutorial transistors:

http://www.youtube.com/watch?v=Te5YYVZiOKs

looking back.....





Symbols and schematics

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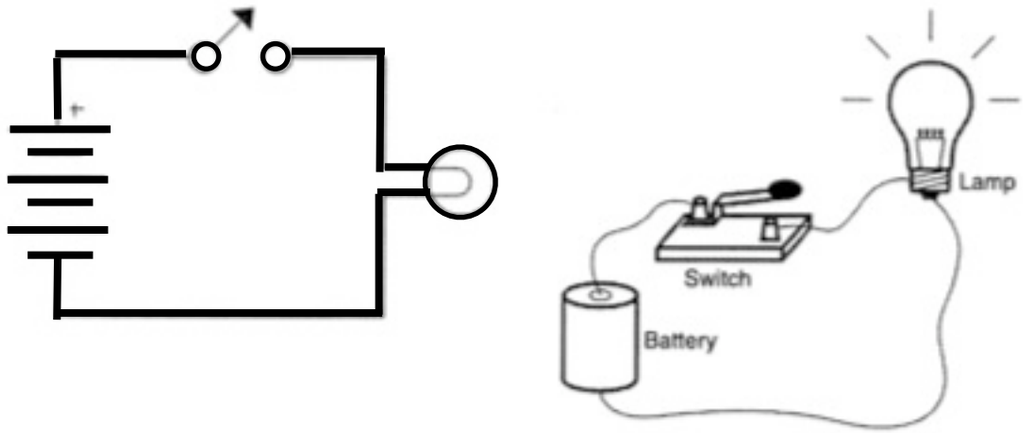


schematic vs. sketch

Switches

Figure 2.1
Schematic symbol for a switch and a variety of switches.

Resistors

Figure 2.2
Schematic symbol for a resistor and a pile of resistors.

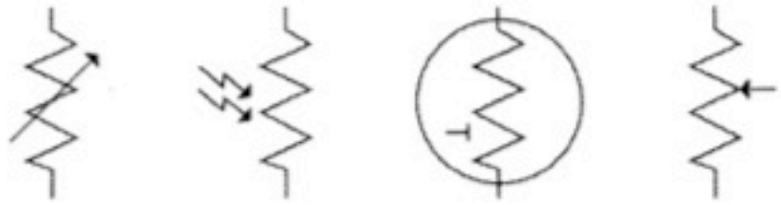


Figure 2.3
Variable Resistors. Schematics from left to right: generic variable resistor, photocell, thermistor, potentiometer. Images from left to right: photocell, thermistor, potentiometer, flex sensor, force-sensitive resistor (FSR).

Figure 2.4
Capacitors in schematic (unpolarized and polarized) and actual capacitors (left to right: ceramic, tanatlum, electrolytic capacitors).

Diodes

Figure 2.5
Diode schematic and general-purpose diodes.

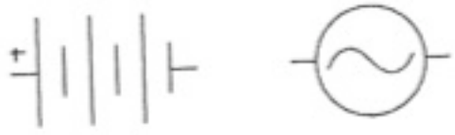
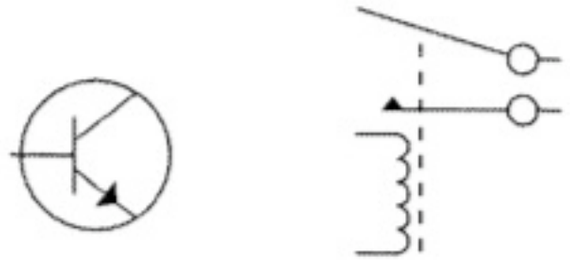


Figure 2.7
Transistor and relay schematics, and transistors.



The Breadboard

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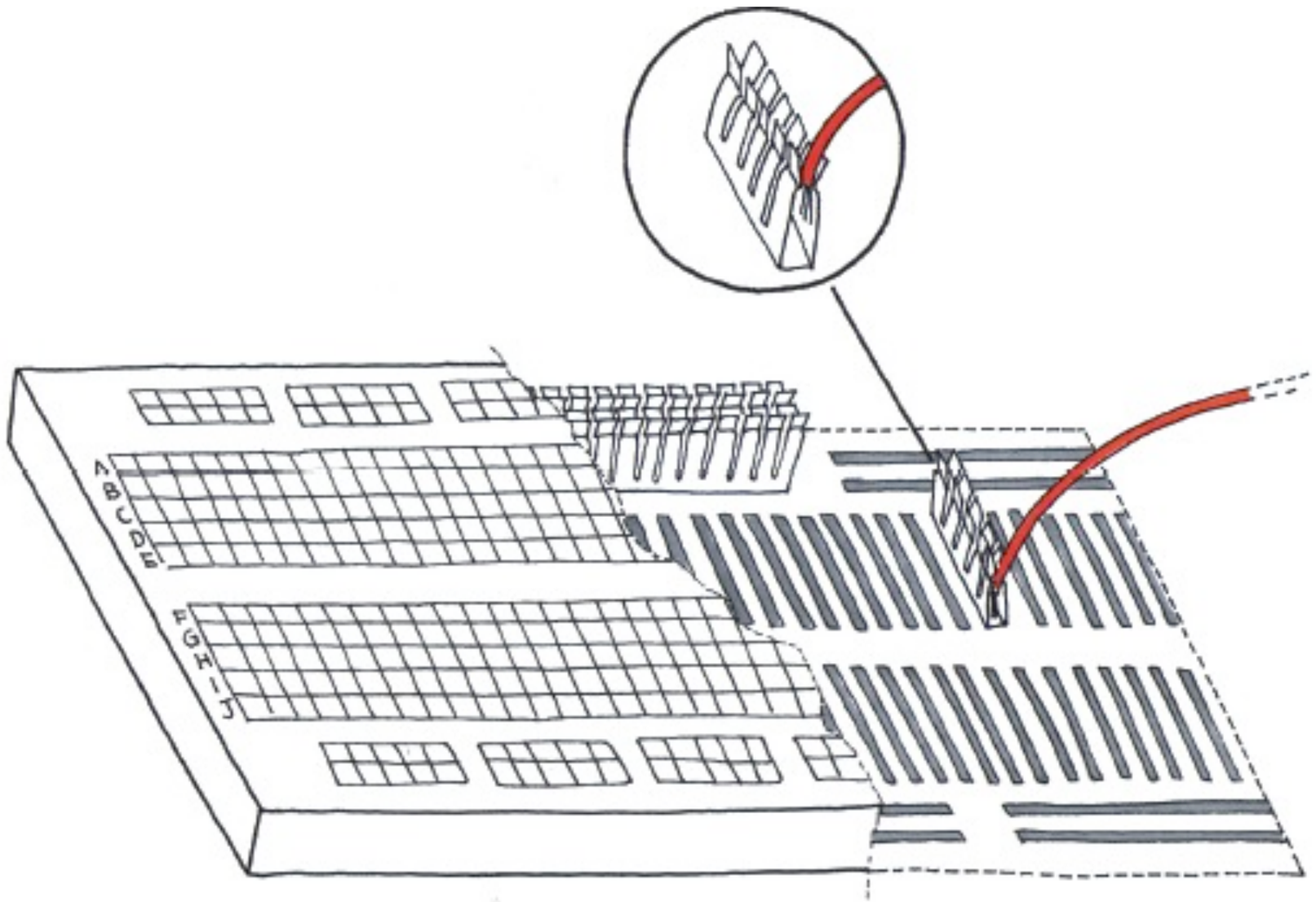
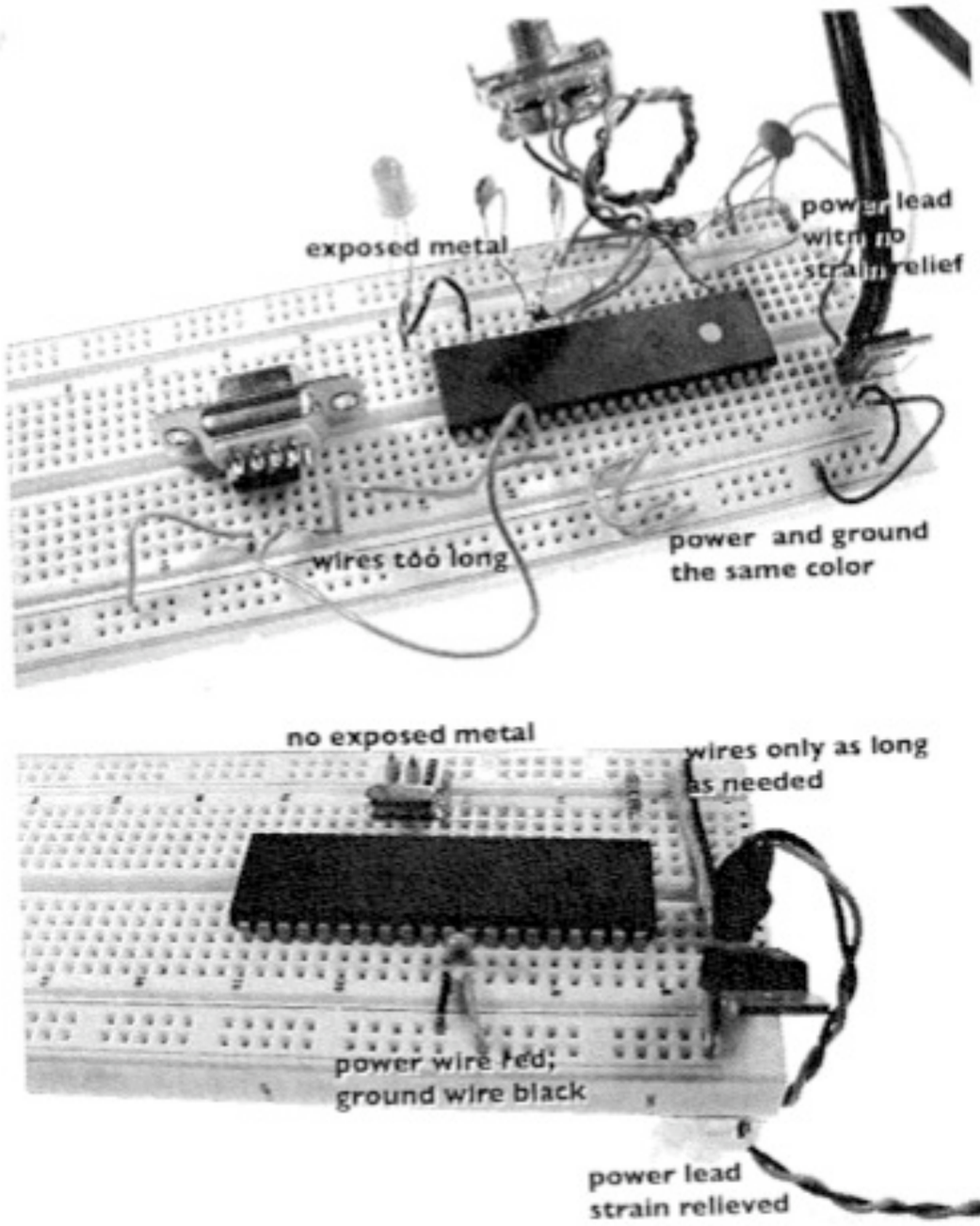


messy

vs.

clean



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Fundamentals: Multimeter (Video Tutorial)

watch video tutorial multimeter:

http://www.youtube.com/watch?v=KzjMIcER4EU

Fundamentals: Soldering (Video Tutorial)

watch video tutorial soldering:
http://www.youtube.com/watch?v=I_NU2ruzyc4

A Word on **Safety**

- Electronics are toxic to **you**
- Lead in some of the parts
- Wash up afterwards
- Don´t eat and drink
- Don´t inhale the fumes
- Iron get´s really hot

- **You** are toxic to electronics
- Static-sensitive: don't shuffle your feet
- Heat and force can kill circuits

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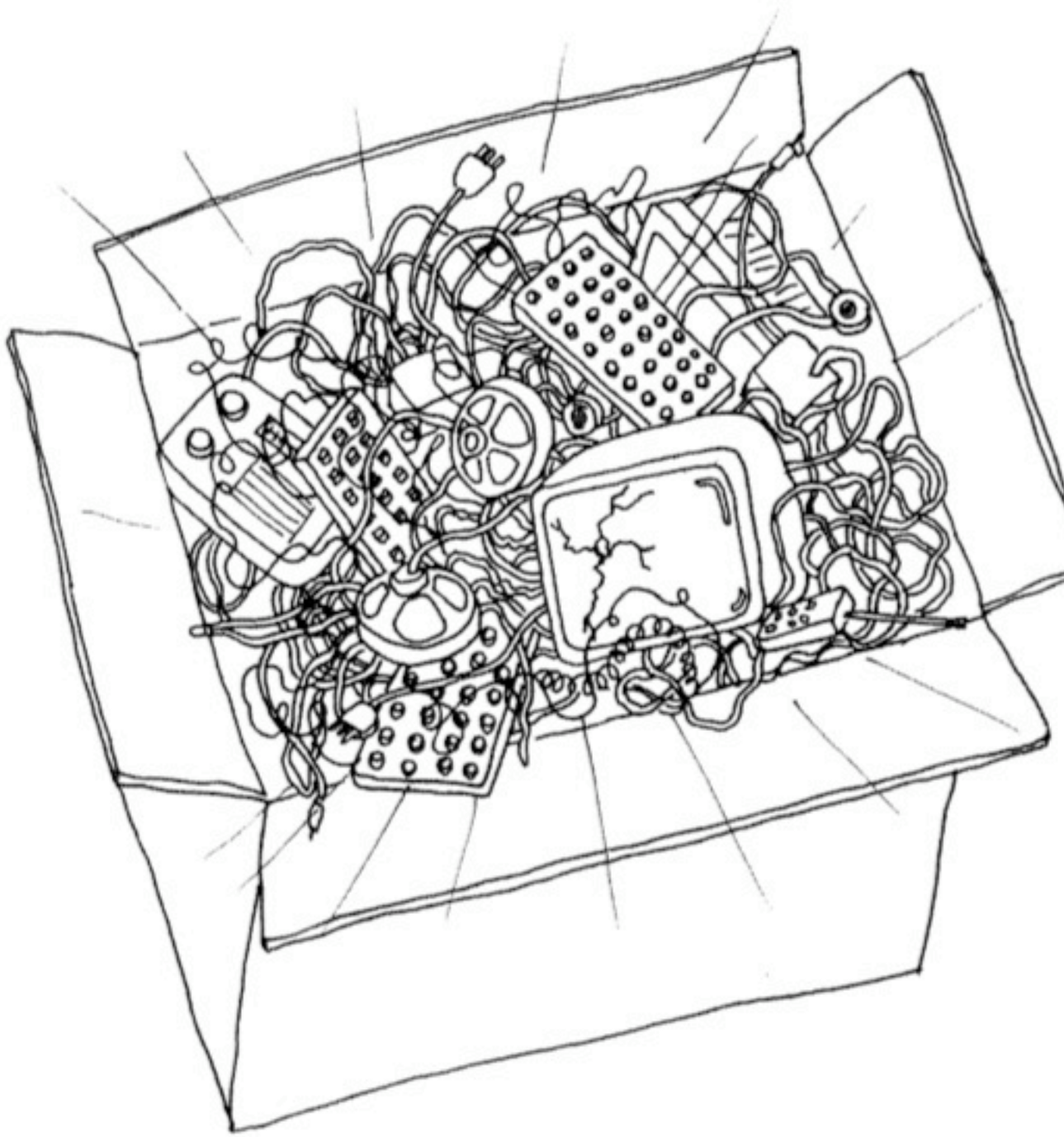
Producing Input.....

Junk as a resource.....



sketch credits © elisa canducci

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Hacking Toys.....
(or how to produce input for 10€)

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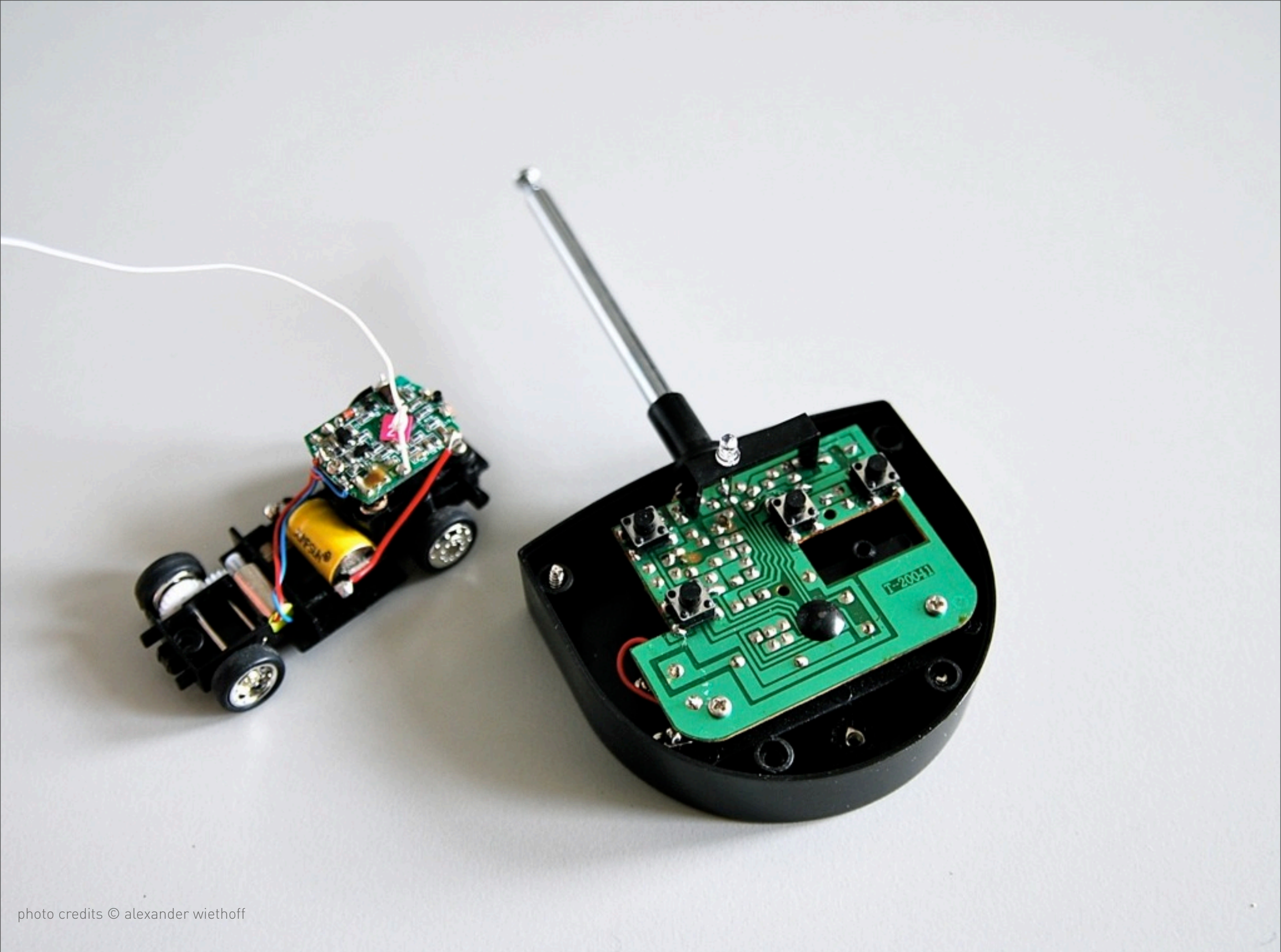

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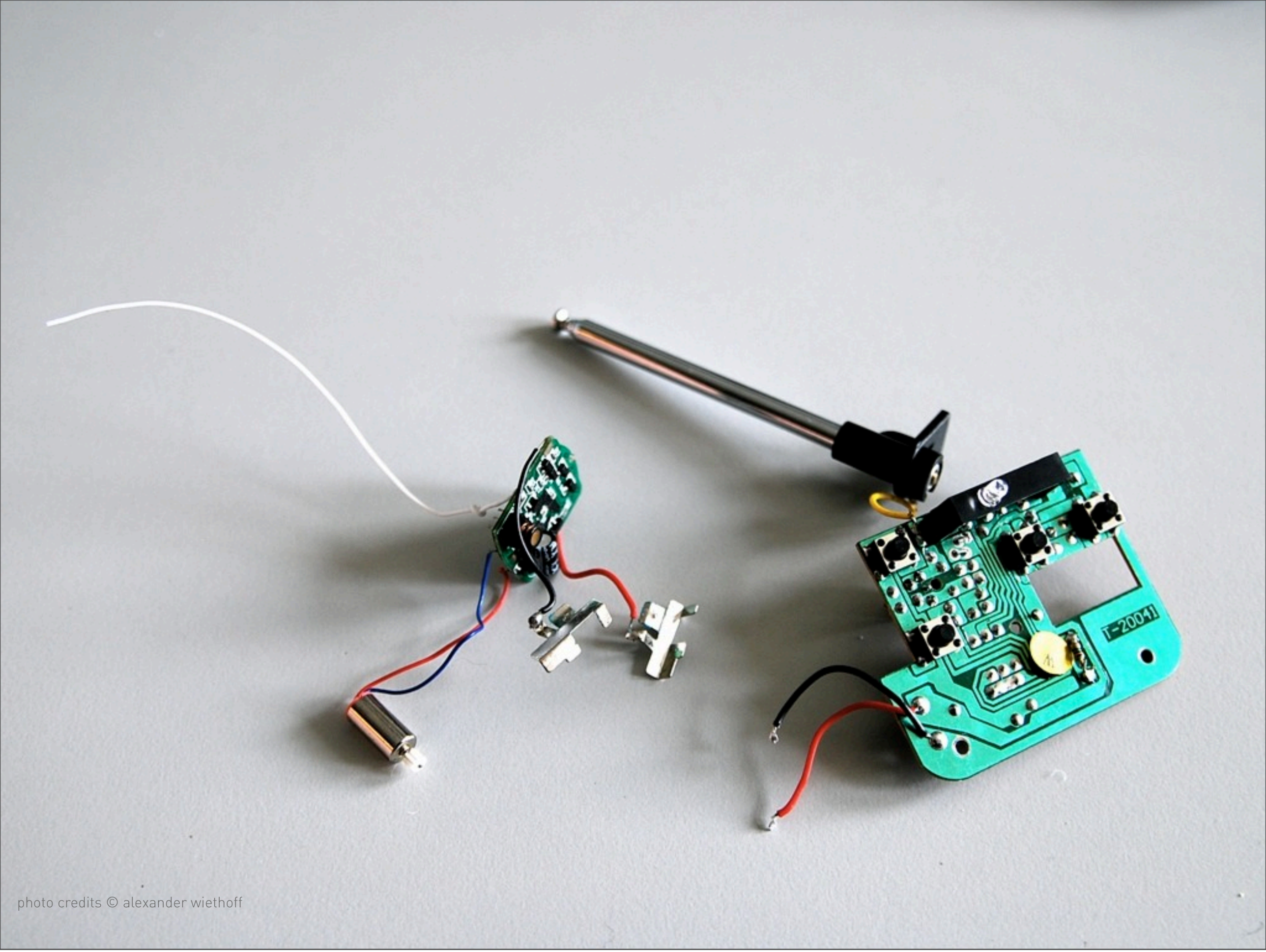

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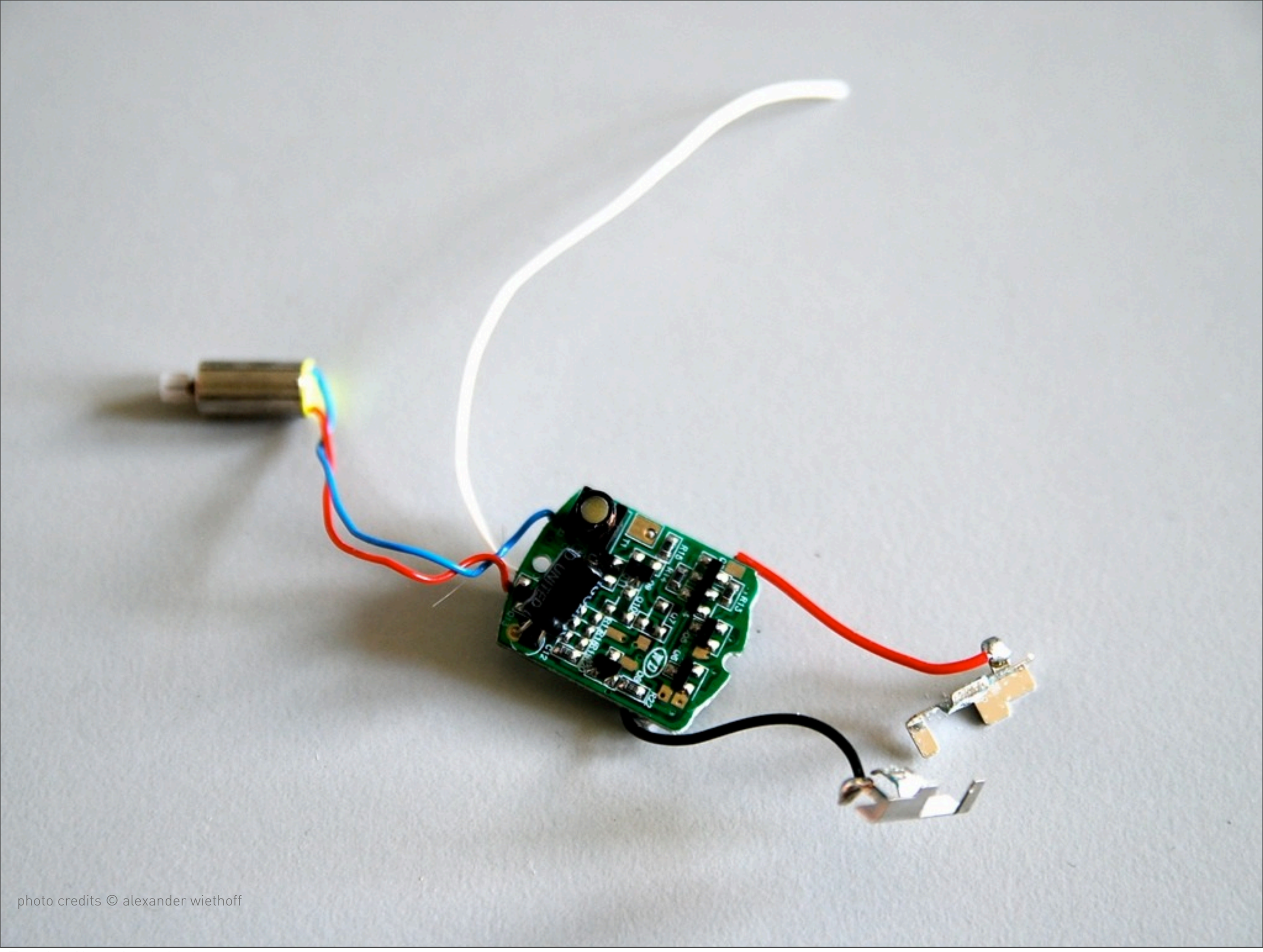

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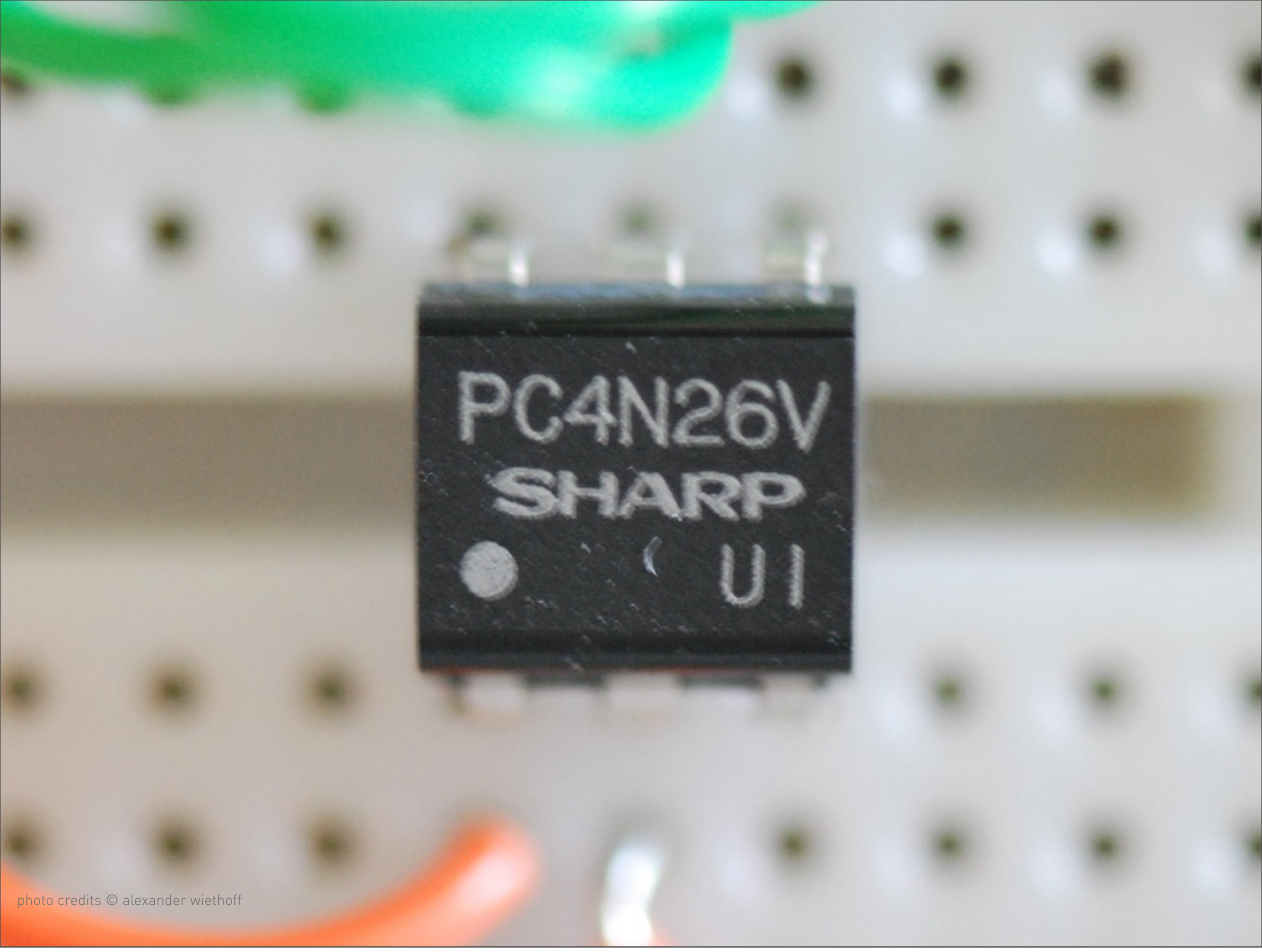
Now let´s bring in a keyboard hack.....



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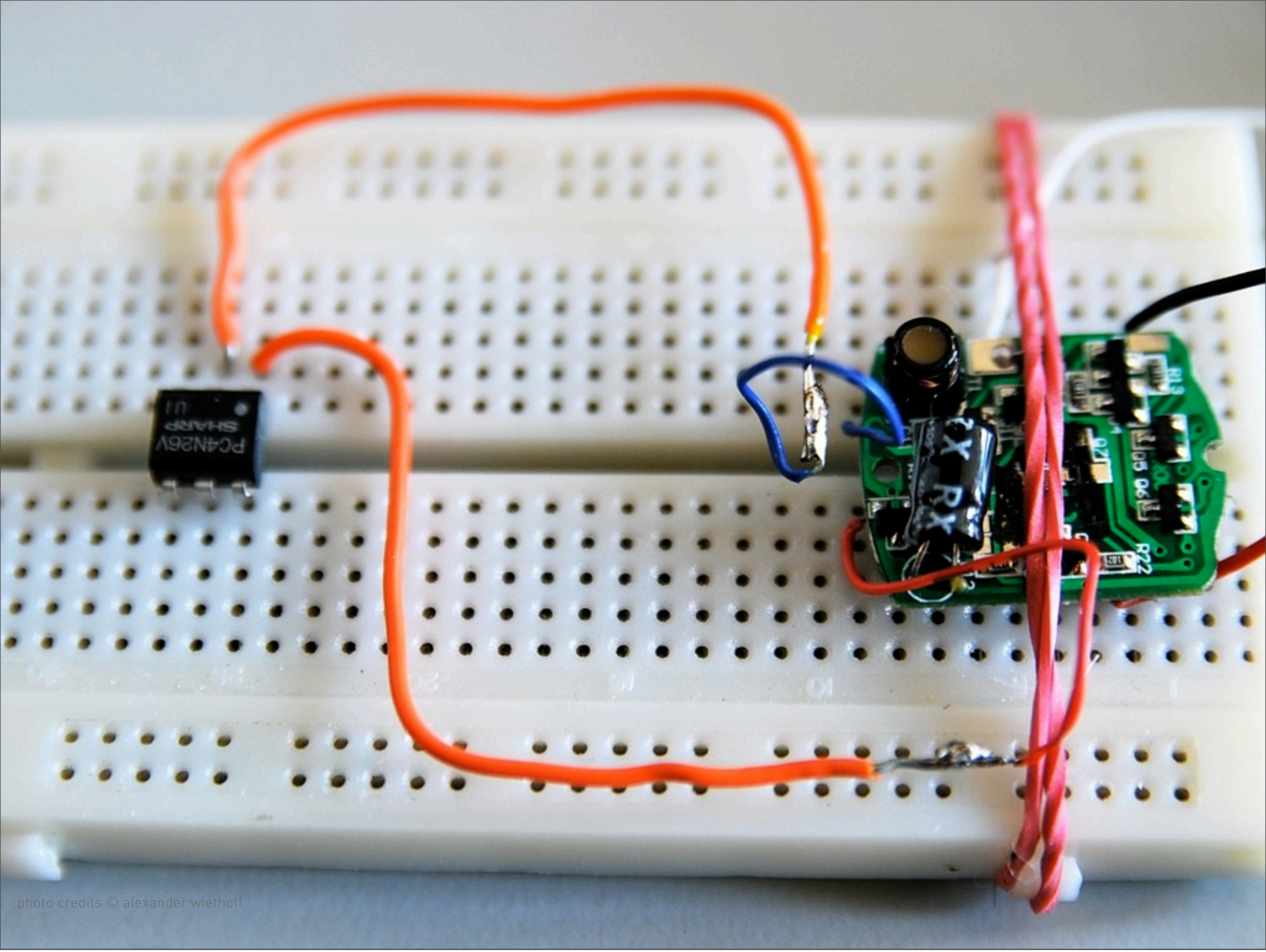

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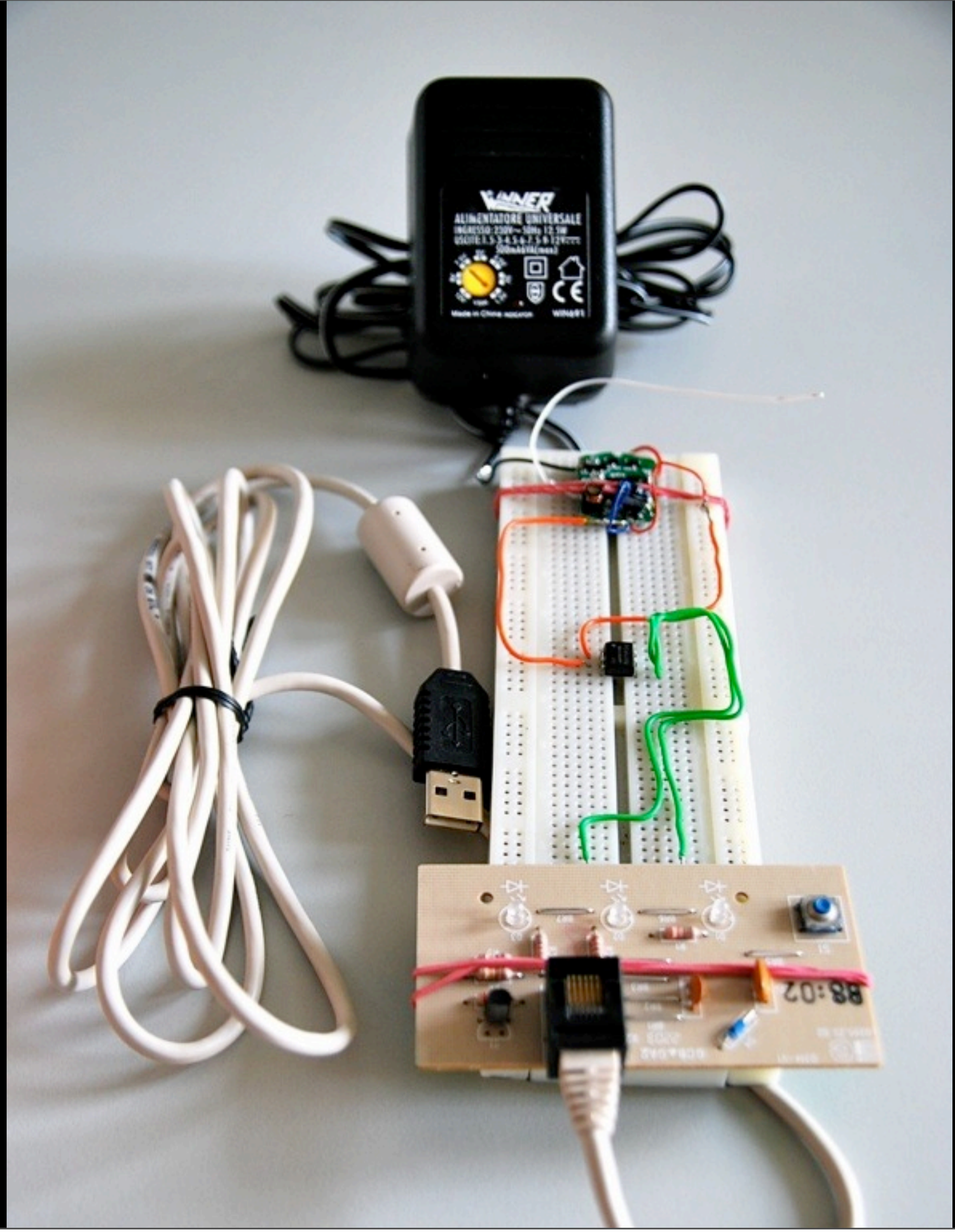

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Tilt Sensor

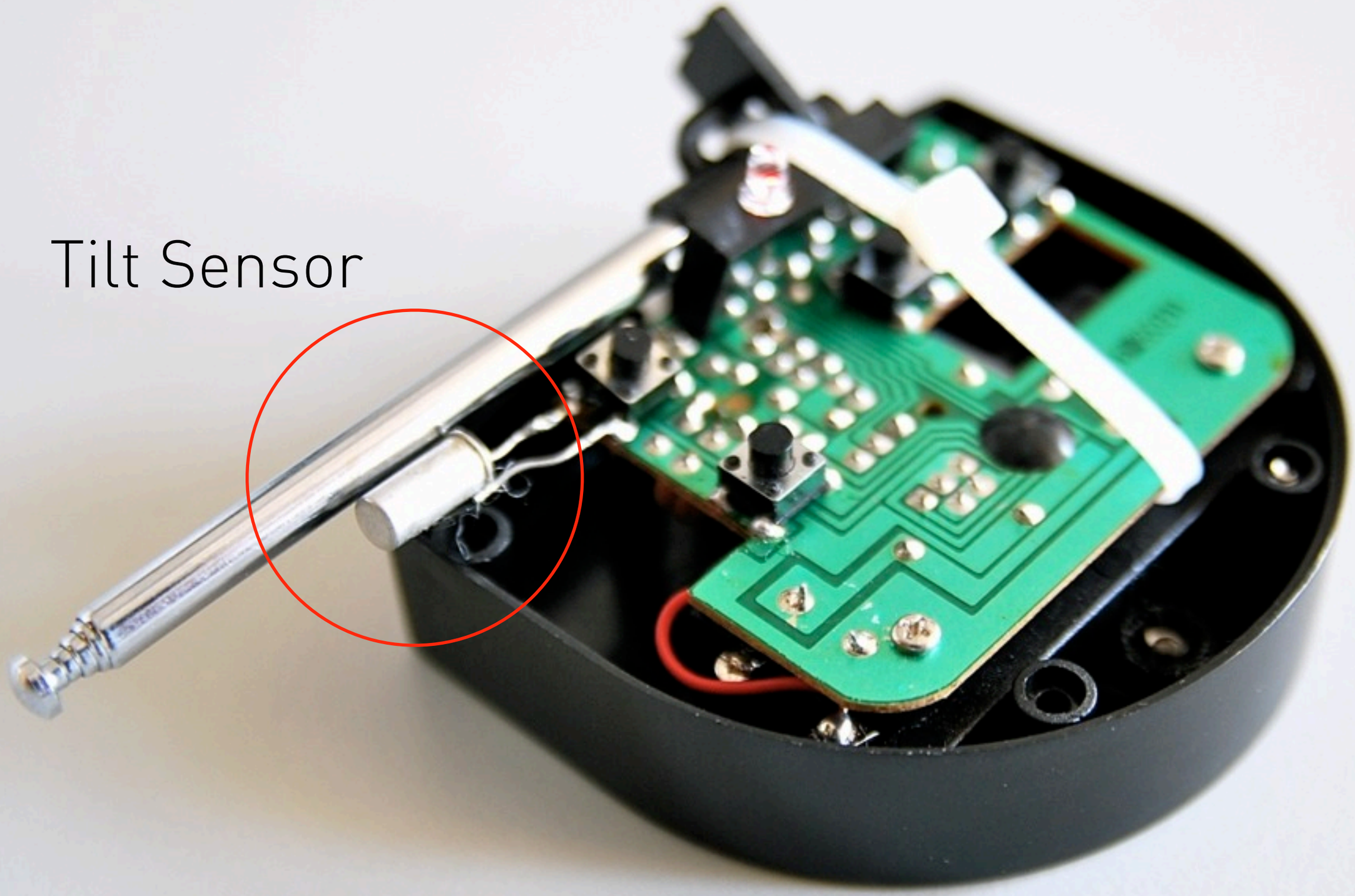


photo credits © alexander wiethoff

Tilt Sensor (aka Ball Switch)

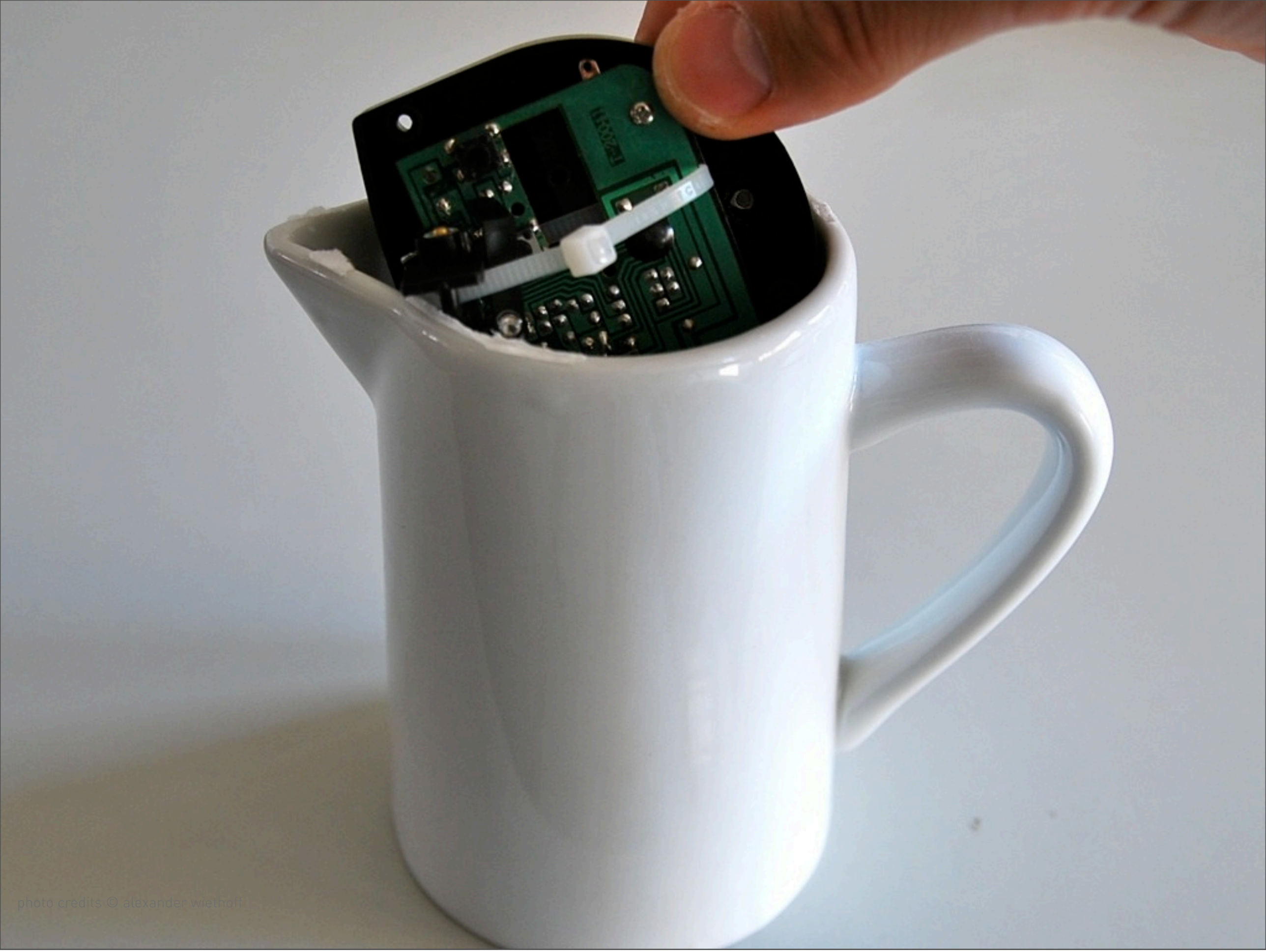
photo credits © wikimedia

colour_ellipses | Processing 1.0.3

File Edit Sketch Tools Help

colour_ellipses

```
int i = 0;
int diam = 0;
float r;
float g;
float b;

void setup () {
  size (800,800);
  smooth ();
   background (0);
}

void draw () {

  ellipseMode (CENTER);
  if (keyPressed == true) {
    diam = diam + 1;
    r = (random(0,255));
    g = (random(0,255));
    b = (random(0,255));
  }else{
    diam = 0;
  }

  fill (r,g,b);
  ellipse (height/2,width/2,diam,diam);

}
```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A Word on **Safety**

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- Don´t inhale the fumes
- Iron get´s really hot

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- Heat and force can kill circuits

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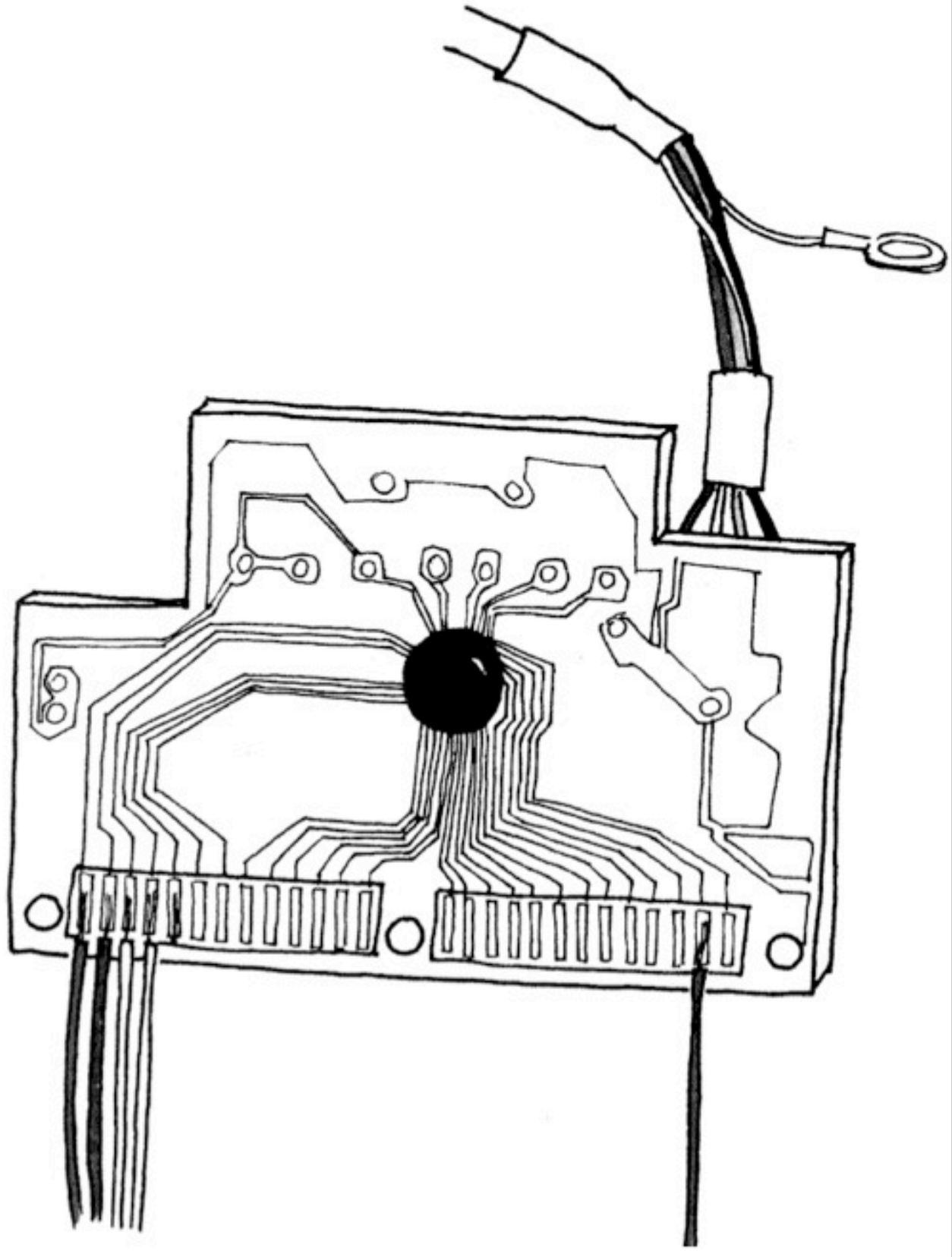
your turn.....
Keyboard Hacking



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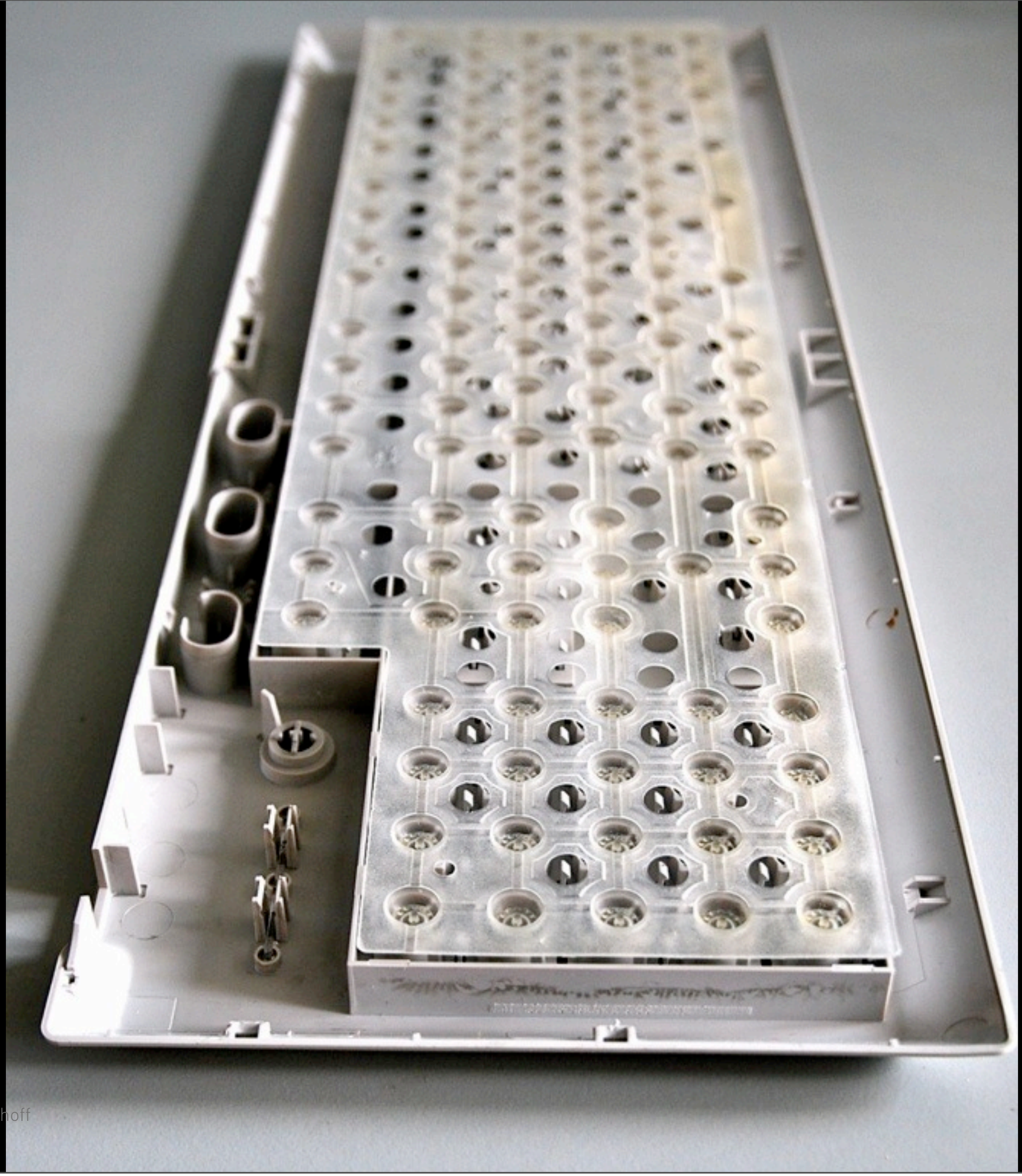

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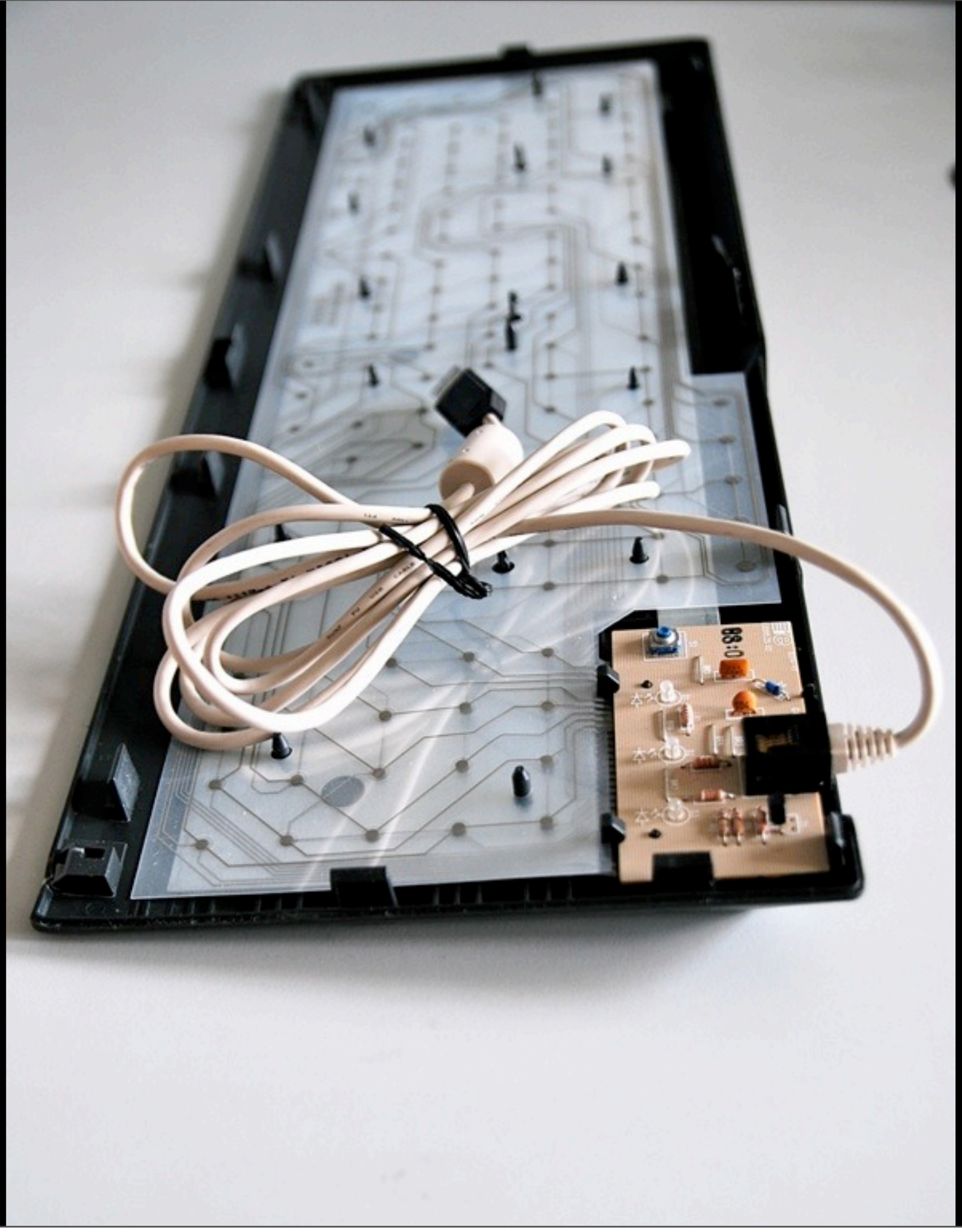

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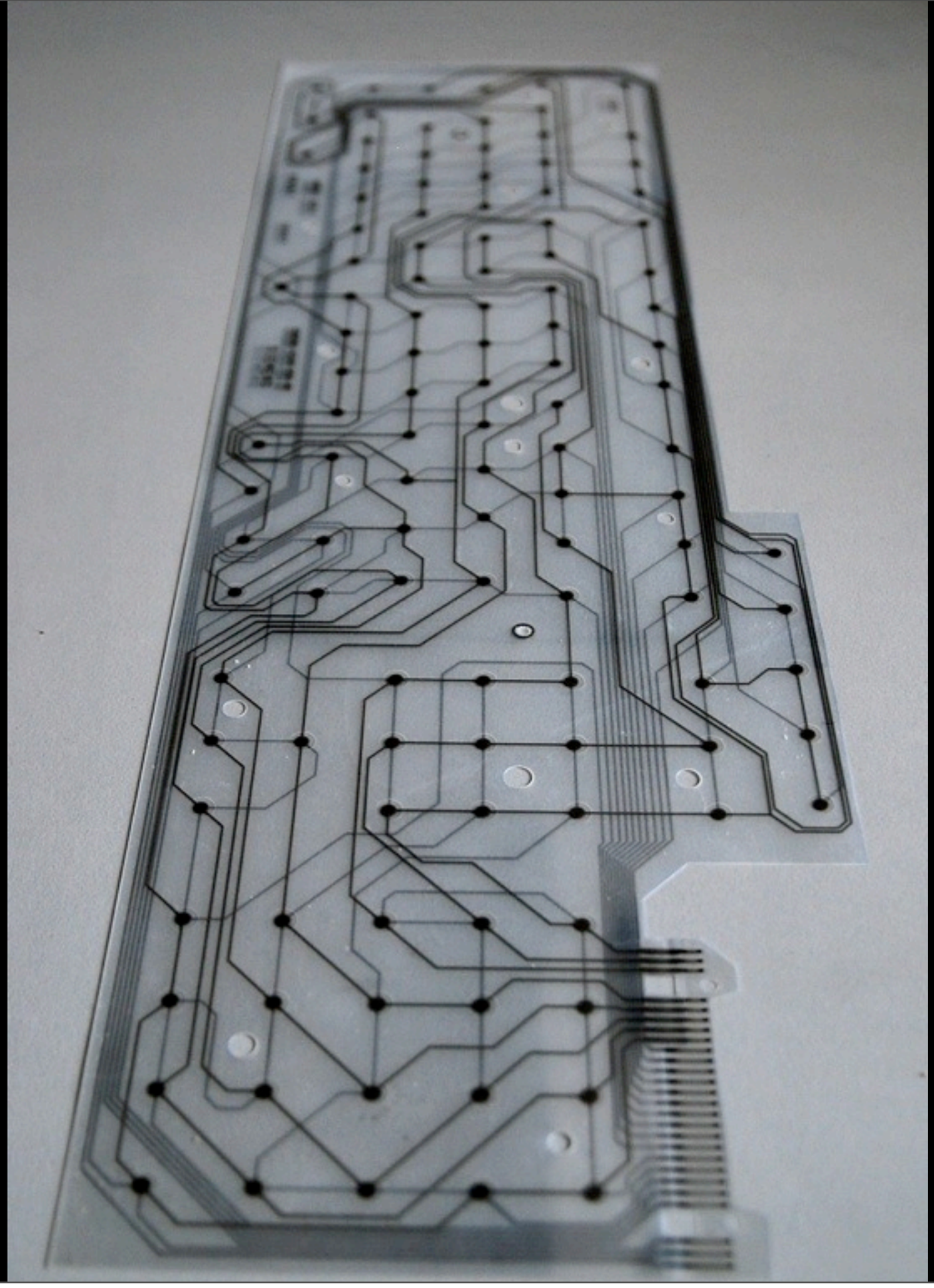

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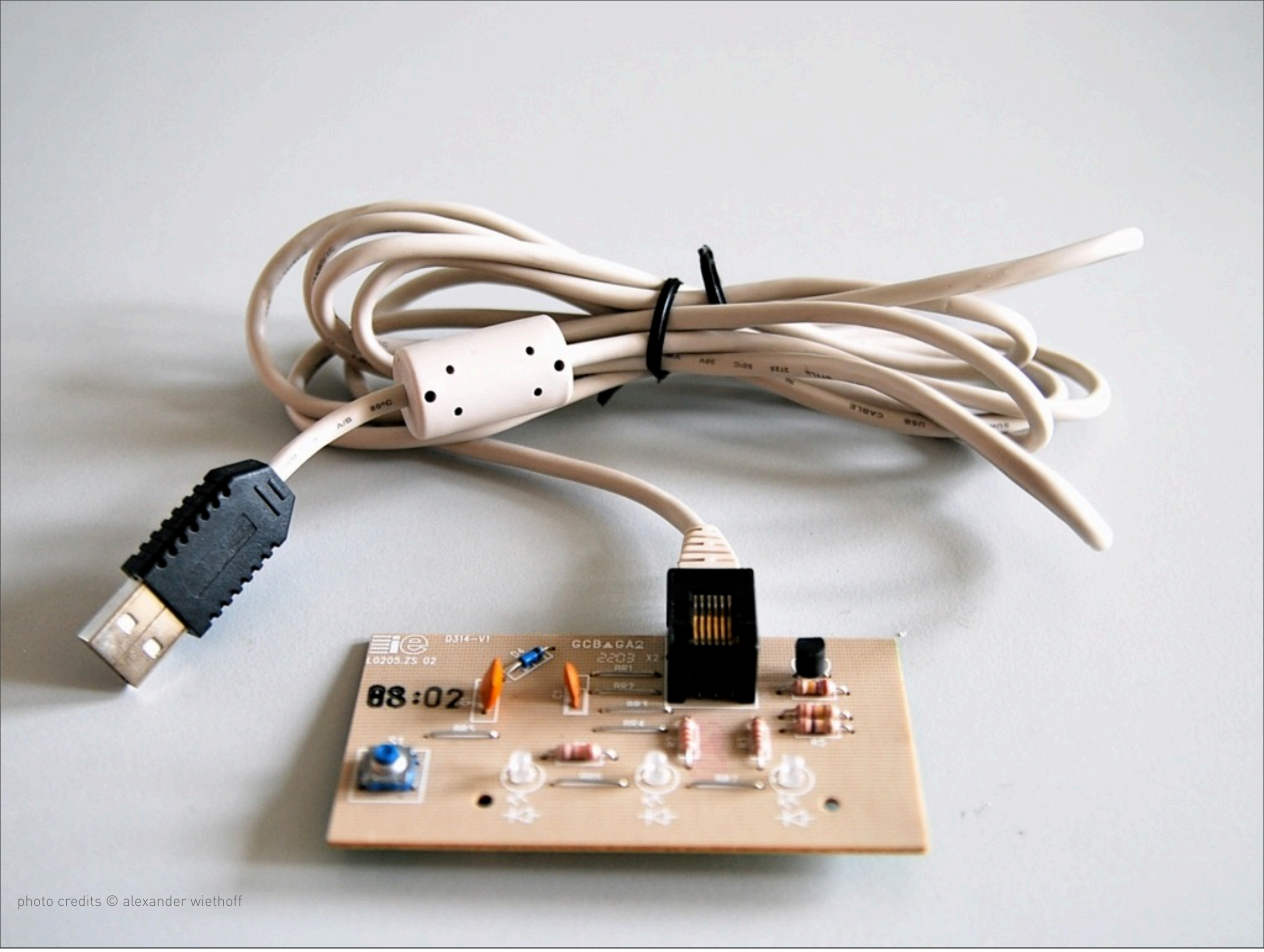

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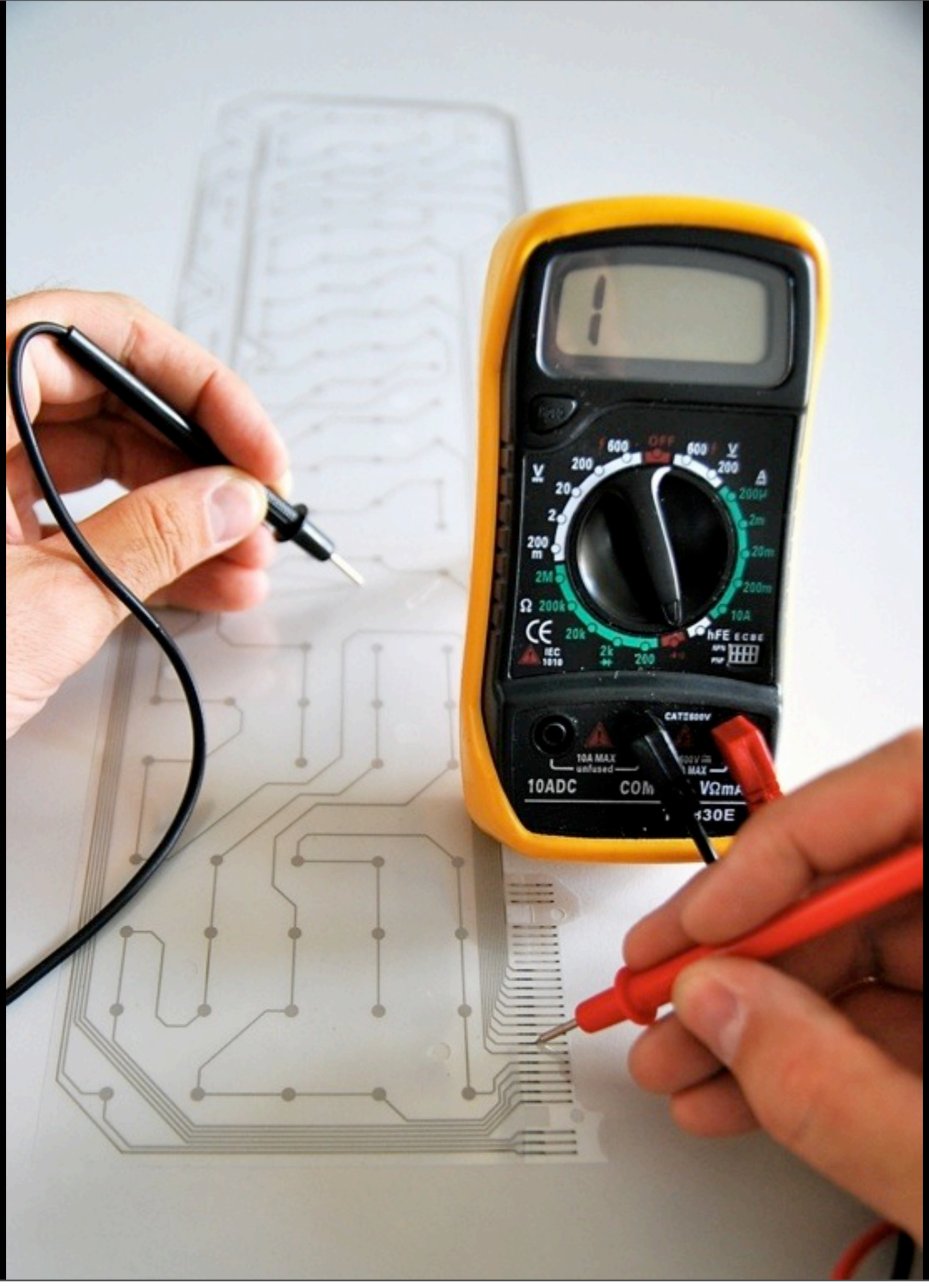

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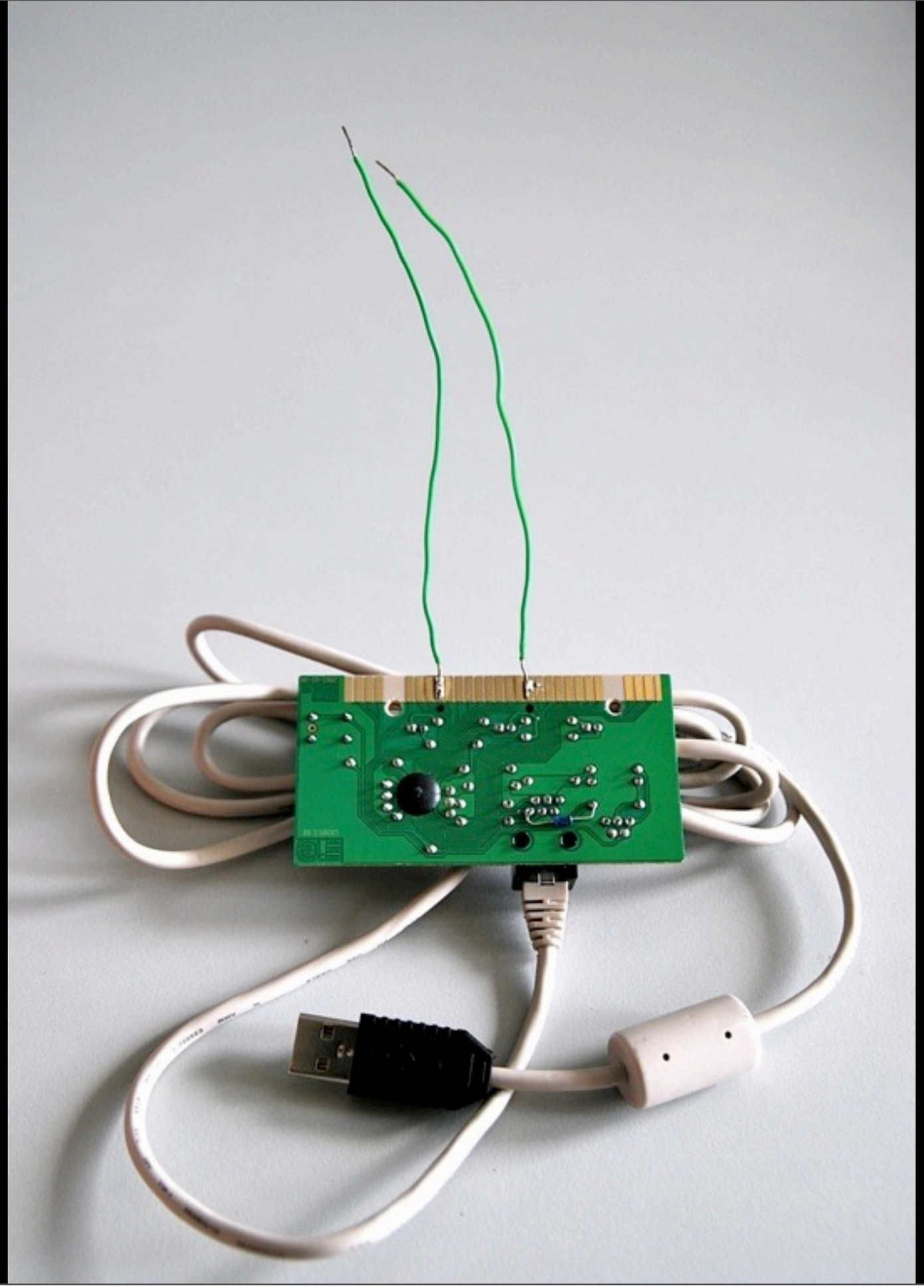
Tuesday, November 2, 2010



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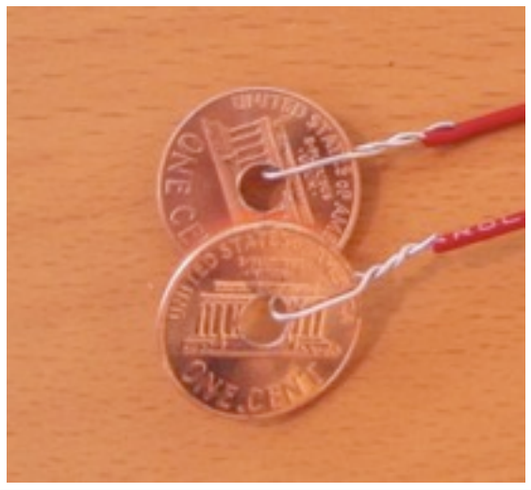
Task : Design a game controller
for an online game that works with the keyboard

Create a switch through: foil, tilt, coins etc.

finish 16:30



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Lecture: Alexander Wiethoff

Tutorials: Raphael Wimmer