physical computing .2

NCTU Taiwan
playaround workshop
microplayground

2008

kiilo ||| dusjagr

Where to go and why

Search it | find it | share it

Who are we?

Tobias Hoffmann aka “kiilo”

Background: physics, special education, fine art

Interests: neo-dadaist, physical computing

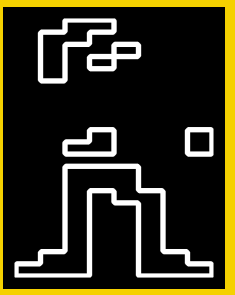
Director of mediastudio Institute for mediaart HGK FHNW Switzerland

http://kiilo.org

http://sage.medienkunst.ch

http://dorkbotswiss.org

Who are we?



Marc R. Dusseiller aka “dusjagr”

marc@dusseiller.ch

Background: Material Science, Biointerfaces, Nanosystems

Interests: Noise, DIY, experimental musical instruments

Lecturer for Micro- and Nanosystems for Life Sciences, FHNW

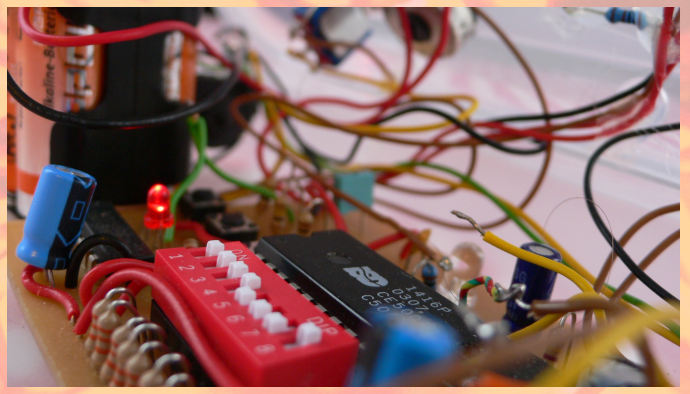
President of the Swiss Mechatronic Art Society, SGMK

www.dusseiller.ch/labs

www.mechatronicart.ch

SMAS Swiss Mechatronic Art Society
SSAM Société Suisse d'Art Méchatronique
SGMK Schweizerische Gesellschaft für Mechatronische Kunst
www.mechatronicart.ch

Mobile Electronic Lab



Variety of Workshops

www.mechatronicart.ch

www.mechatronicart.ch/wiki
under construction

www.diyfestival.ch

5-7 December 2008 Zürich

Contact:
SGMK
Dr. Marc R. Dusseiller
Langstrasse 122 - Postfach 2161
CH-8031 Zürich
info@mechatronicart.ch
+41 (0)78 645 82 59

Schweizerische Gesellschaft für Mechatronische Kunst
SGMK

diy*
festival

*do it together

Yearly Art & Technology Festival

overview

Overview – Day 1

physical computing .2

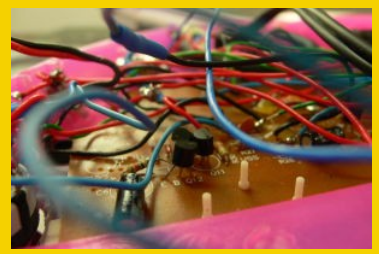
let's start !

FLOSS art | free-libre-open

- open source software
  (pd, ubuntu, open office...)

- open hardware
  (e-puck, arduino)

- open up your hardware
  (circuit bending, hardware hacking)

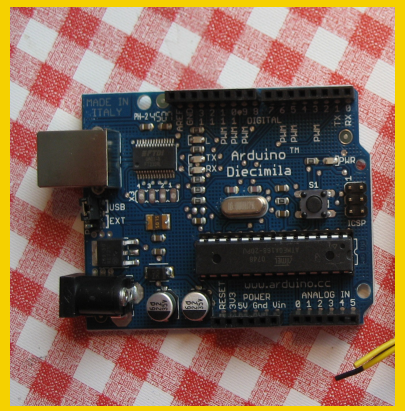


- Share it ! Discuss it ! Improve it !

physical computing & DIY sounder

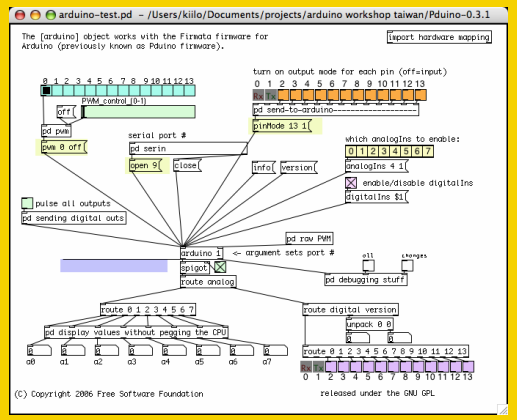
What is physical computing and arduino?

- How to get real world data in the computer?
- How to control outside objects?



What is DIY Sound?

- How to create simple electronic sounds without a PC?



How to get creative with that?

- Everything is interconnectable!

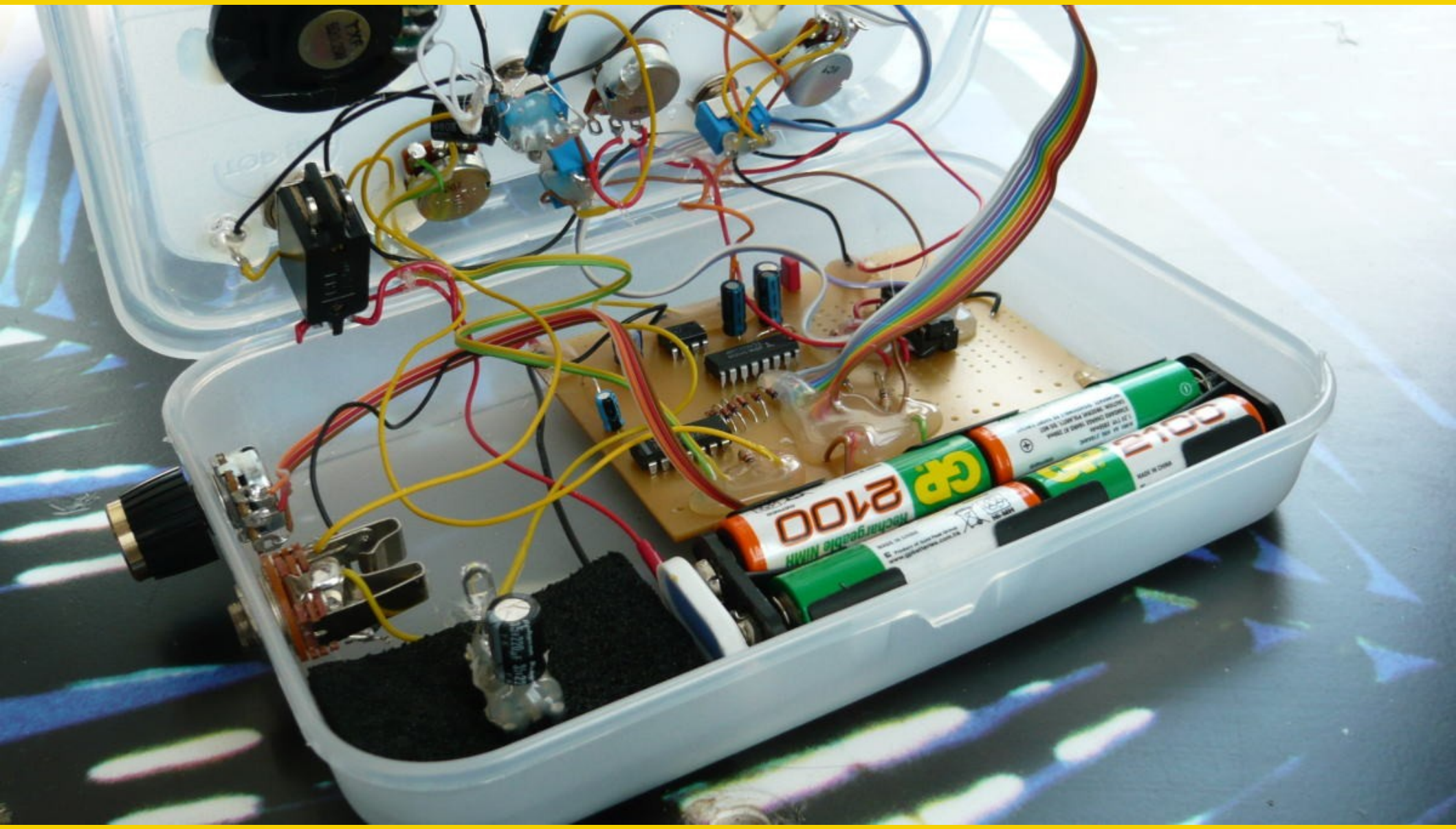
physical computing

show video

DIY sounder

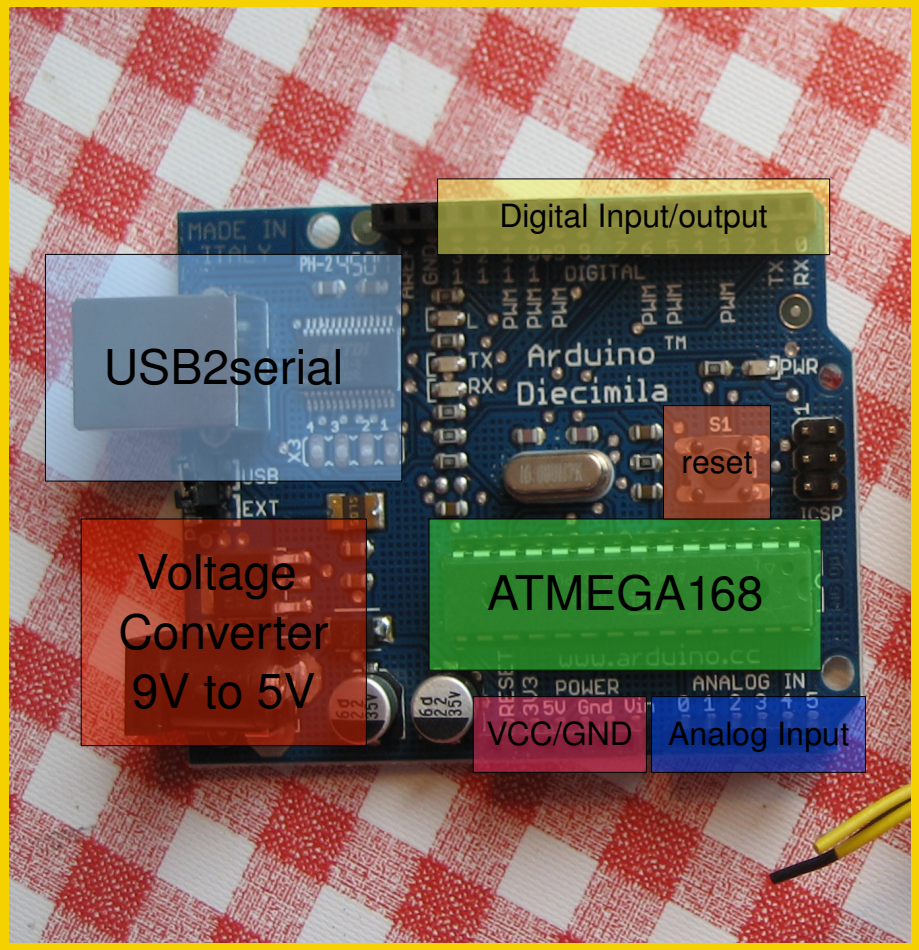
show examples

Noise Circuits // NAND gates // Sequencer



arduino

The Arduino board – open hardware

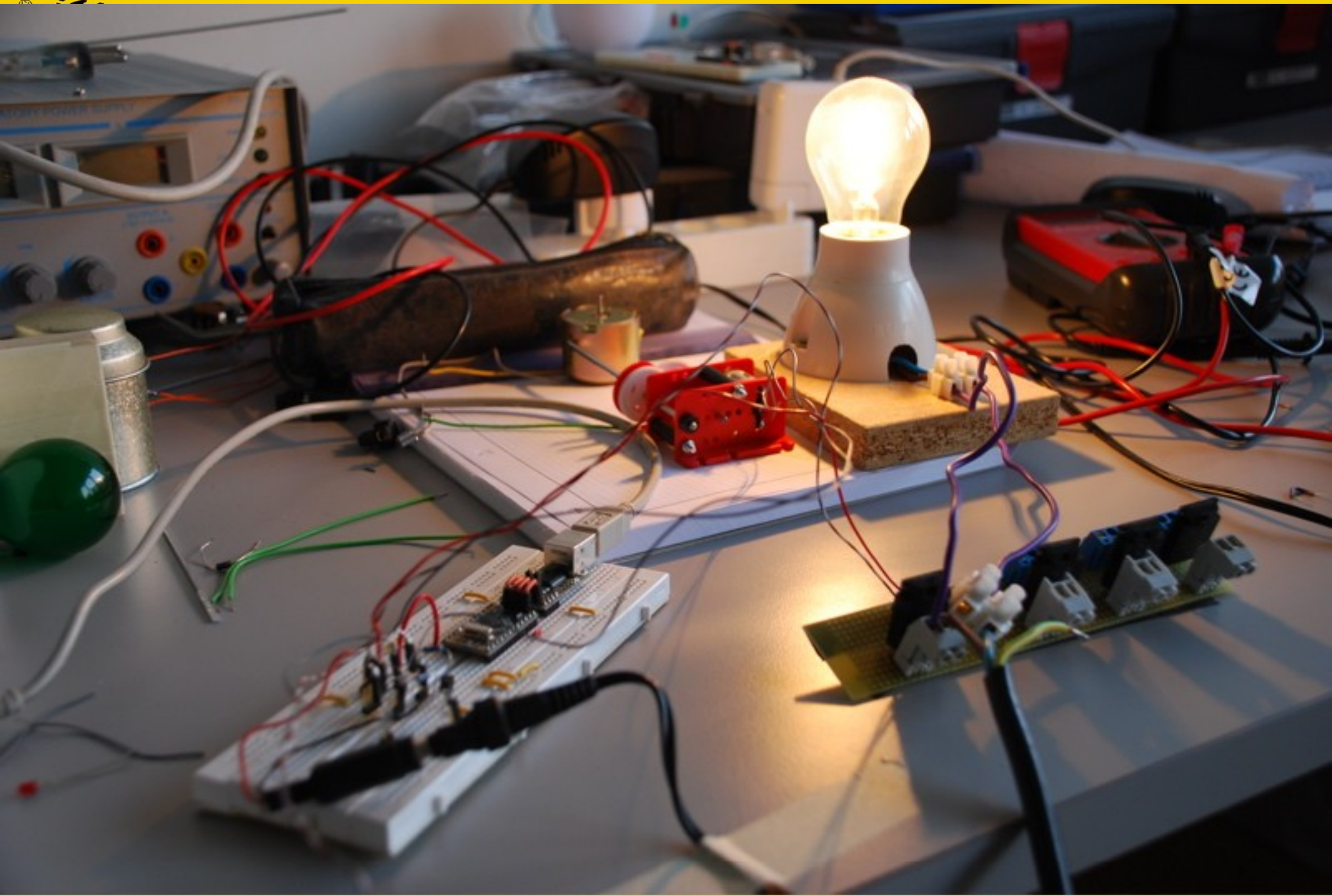


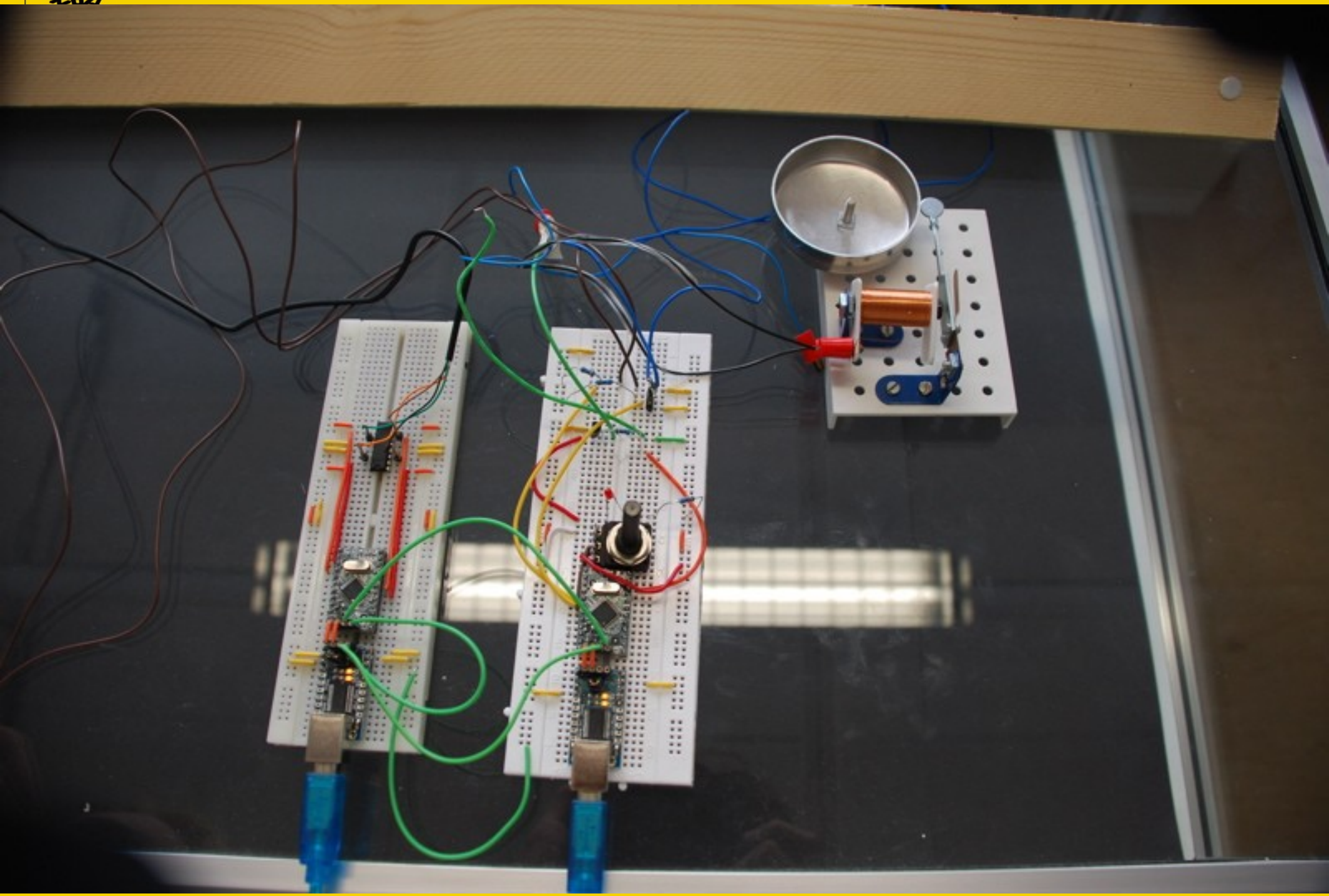
Arduino is an open hardware platform:

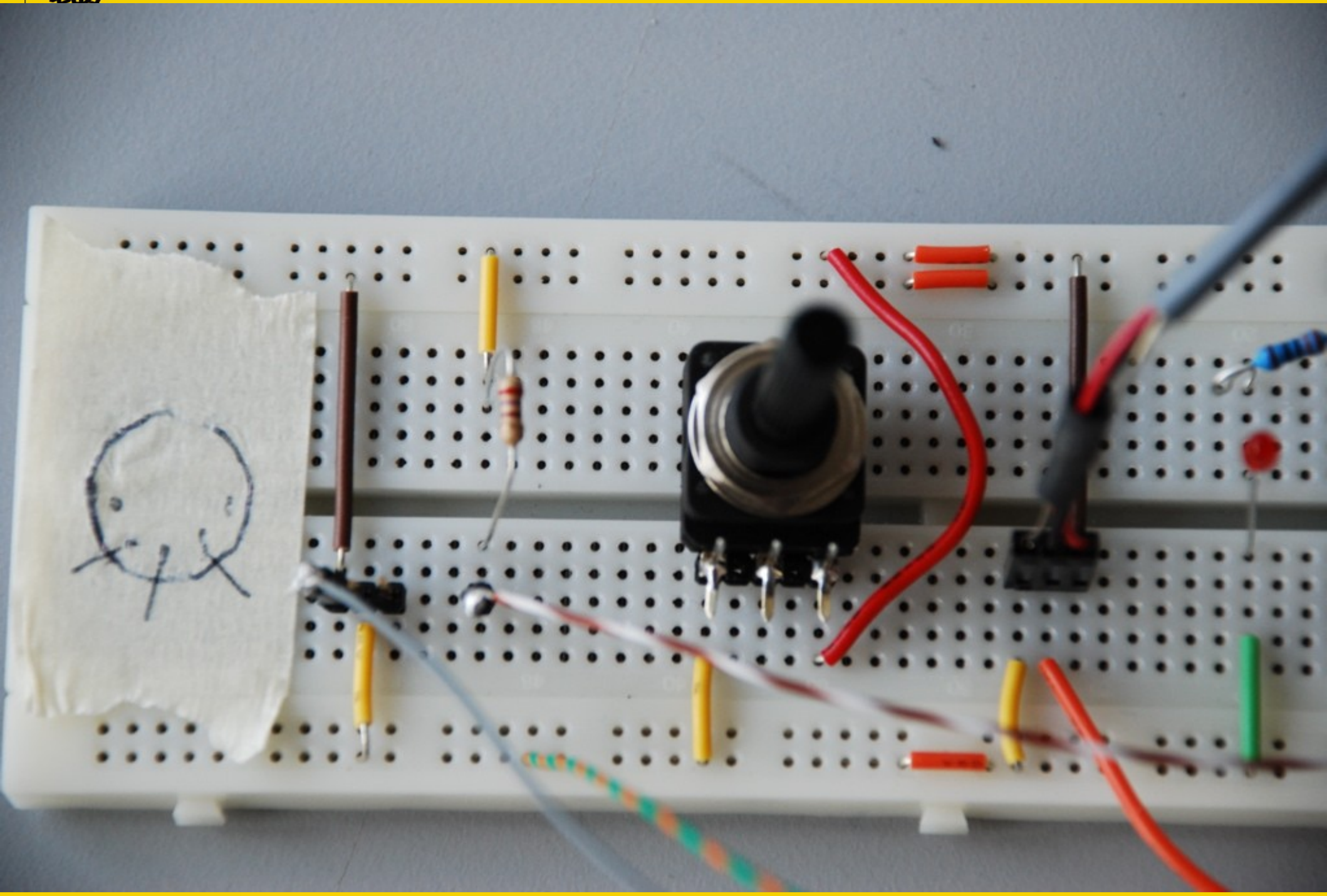
- programmable microcontroller
- USB connection
- 13 digital input/output ports
- 6 analog input ports
- external power

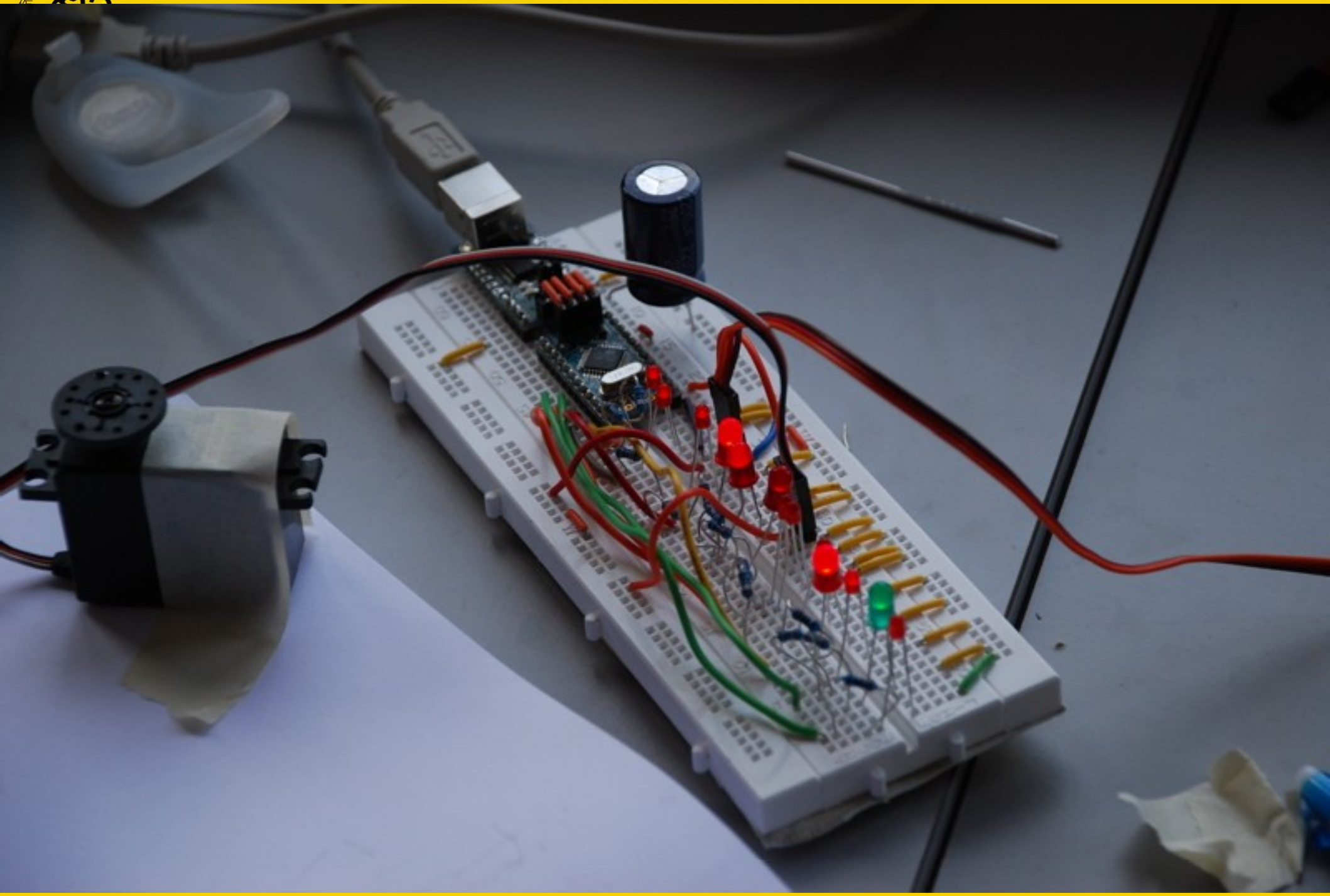
- mini version / nano version
- open community web platform

www.arduino.cc



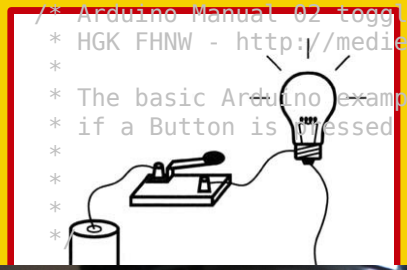




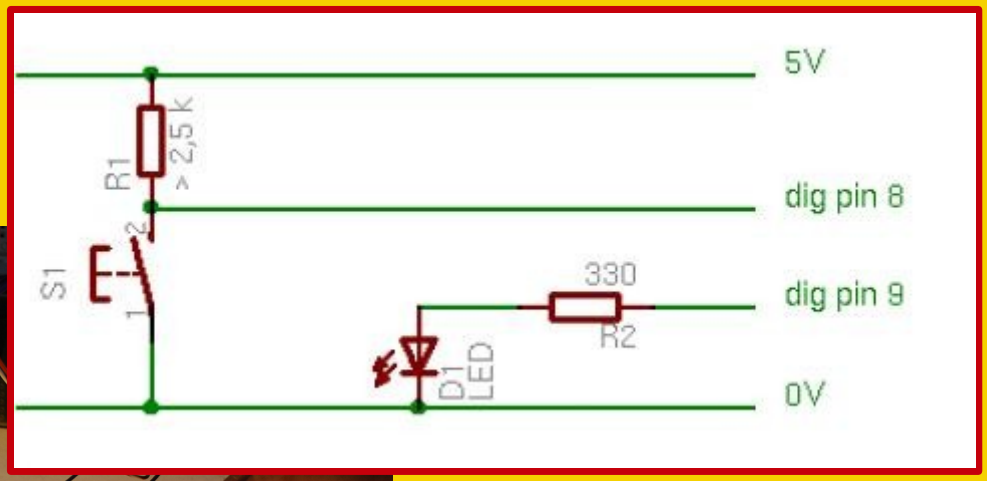


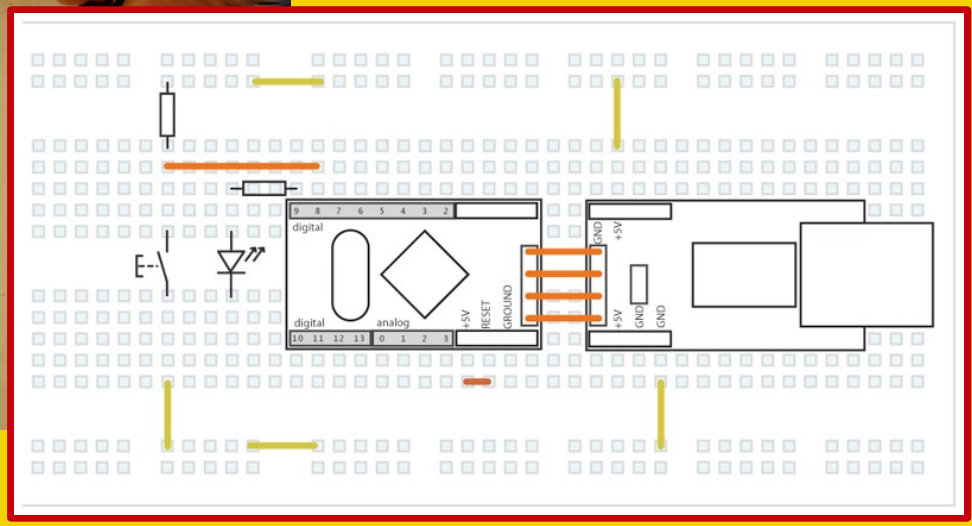

Servo pushes spray can!
YES its arduino!

Physical creativity



```
/* Arduino Manual 02 toggle
 * HGK FHNW - http://medienkunst.ch
 *
 * The basic Arduino example.
 * if a Button is pressed the LED is turned on
 *
 *
 *
 */

int ledPin = 9;                // LED connected to digital pin 9
int ledOnOff = 0;              // LED on off status
int buttonPin = 8;             // BUTTON connected to digital pin 8
int buttonOnOff = 0;           // BUTTON on off status



void setup()                   // run once, when the sketch starts
{
  pinMode(ledPin, OUTPUT);     // sets the digital pin as output
  pinMode(buttonPin, INPUT);   // sets the digital pin as input
}

void loop()                    // run over and over again
{
  if ((digitalRead(buttonPin) == LOW) && (buttonOnOff == 0))  // when pressed button gets LOW!
  {
    buttonOnOff = 1;
    if (ledOnOff == 0)
    {
      digitalWrite(ledPin, HIGH); // sets the LED on
      ledOnOff = 1;
    }
    else
    {
      digitalWrite(ledPin, LOW);  // sets the LED off
      ledOnOff = 0;
    }
  }

  if ((digitalRead(buttonPin) == HIGH) && (buttonOnOff == 1))
  {
    buttonOnOff = 0;
  }

}
```



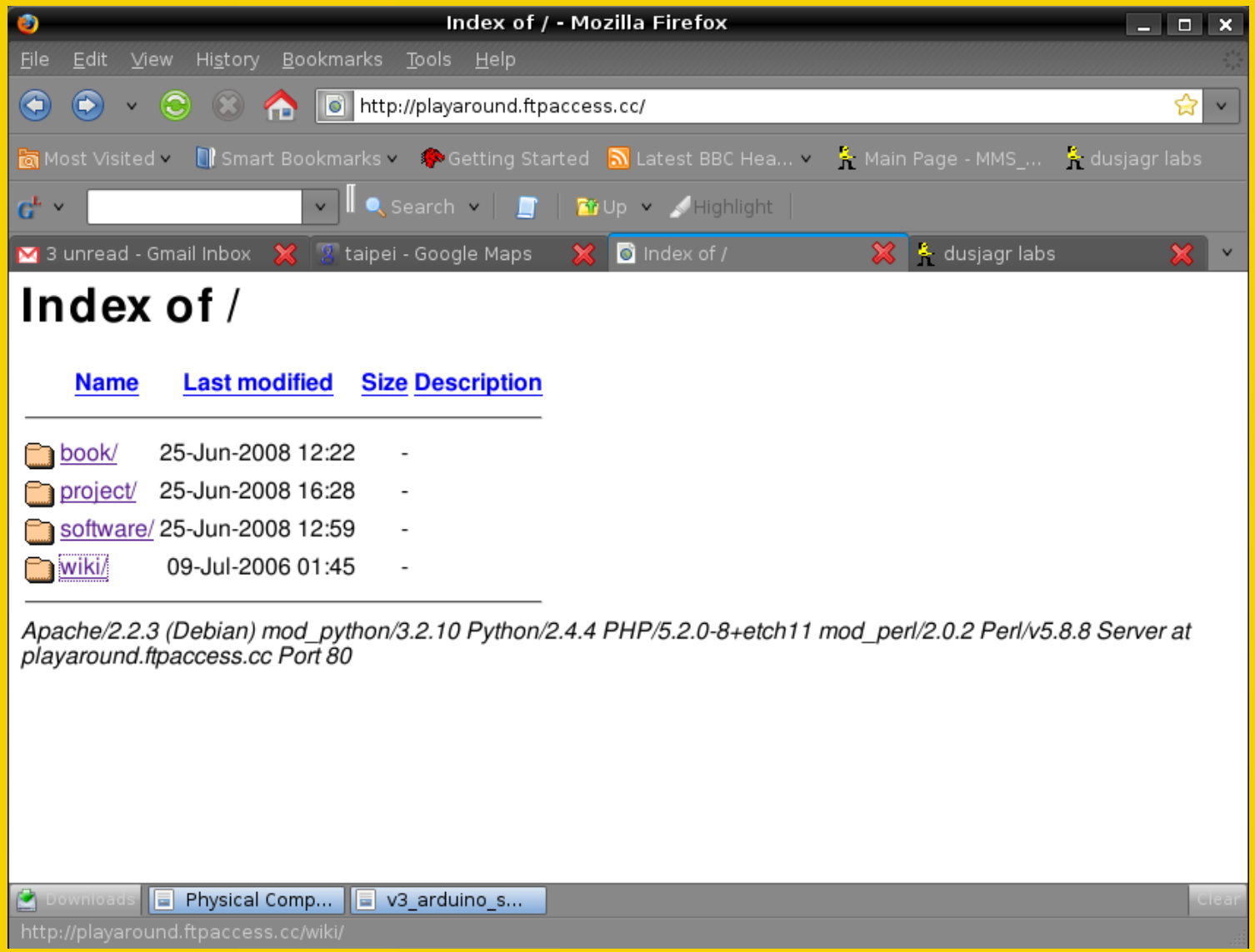


Let's get it running!

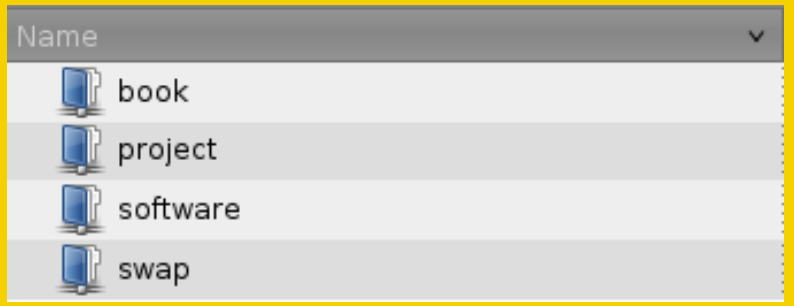
playaround fileserver

username: play
password: around

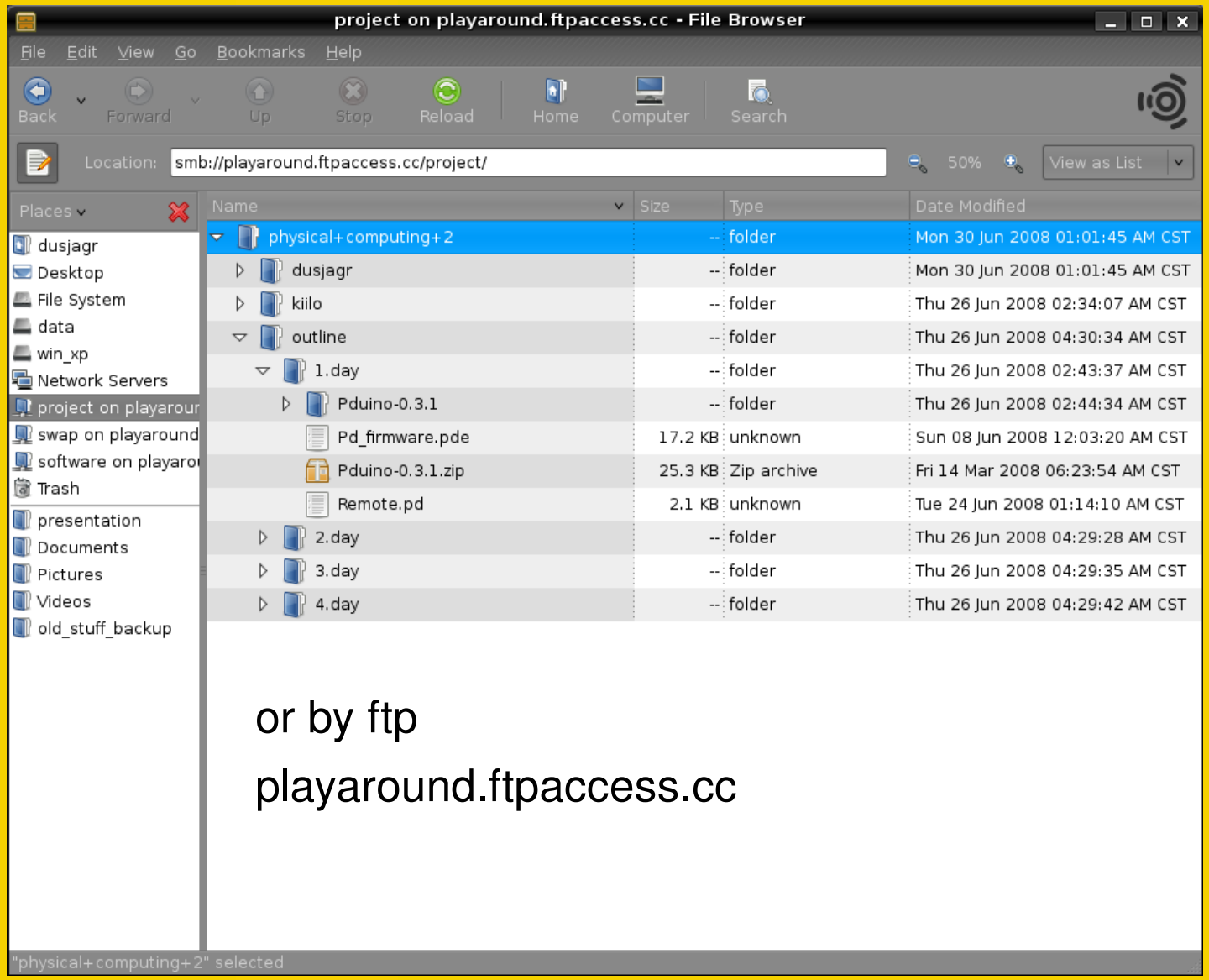
http://playaround.ftpaccess.cc/



playaround fileserver



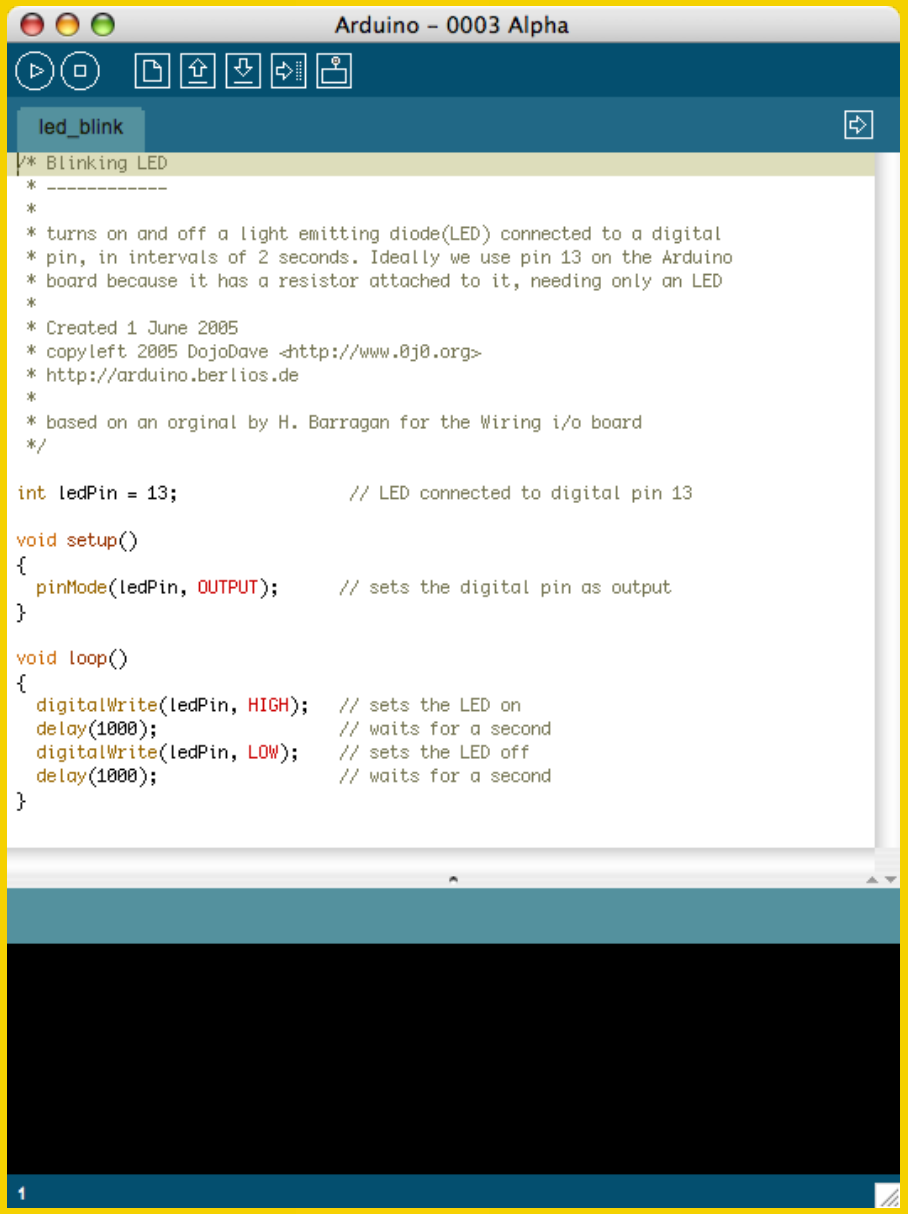
smb://playaround.ftpaccess.cc/



or by ftp

playaround.ftpaccess.cc

How to install the Arduino environment



Do not plug it in yet !

Install arduino IDE

Install driver

Plug in the Arduino

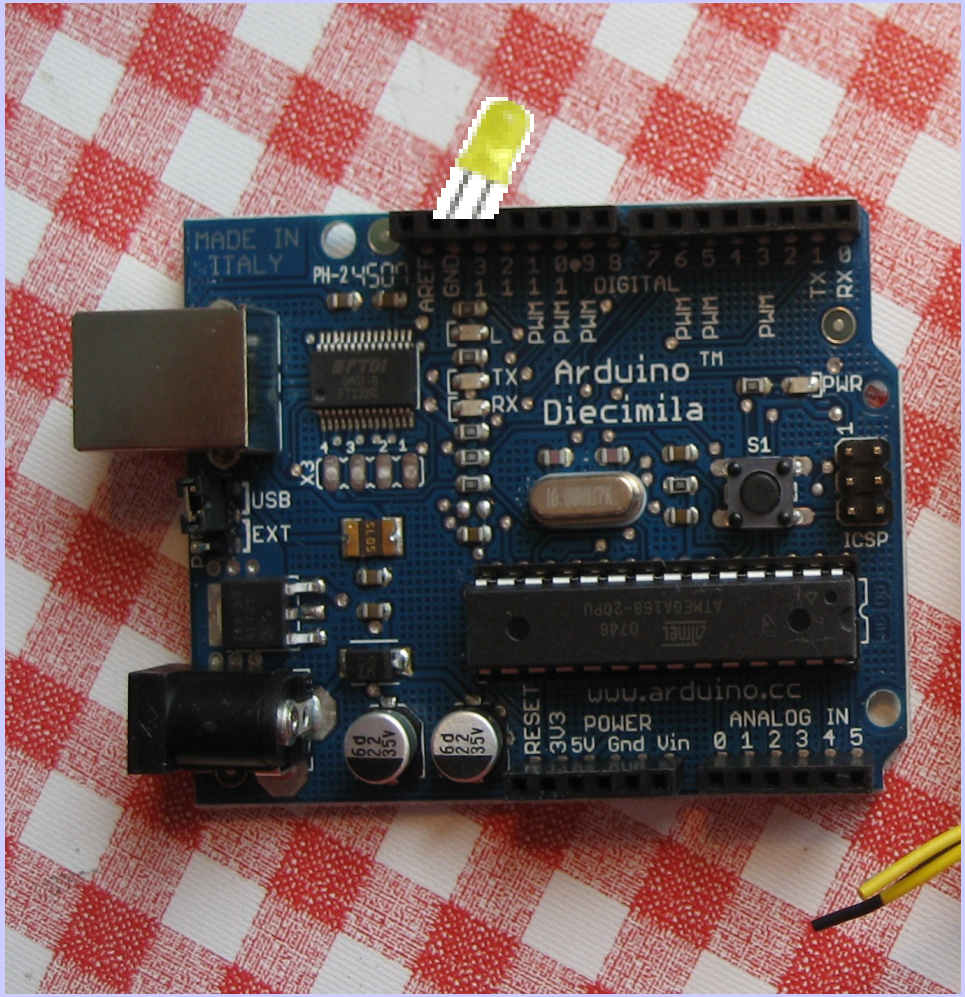
check port

upload to board

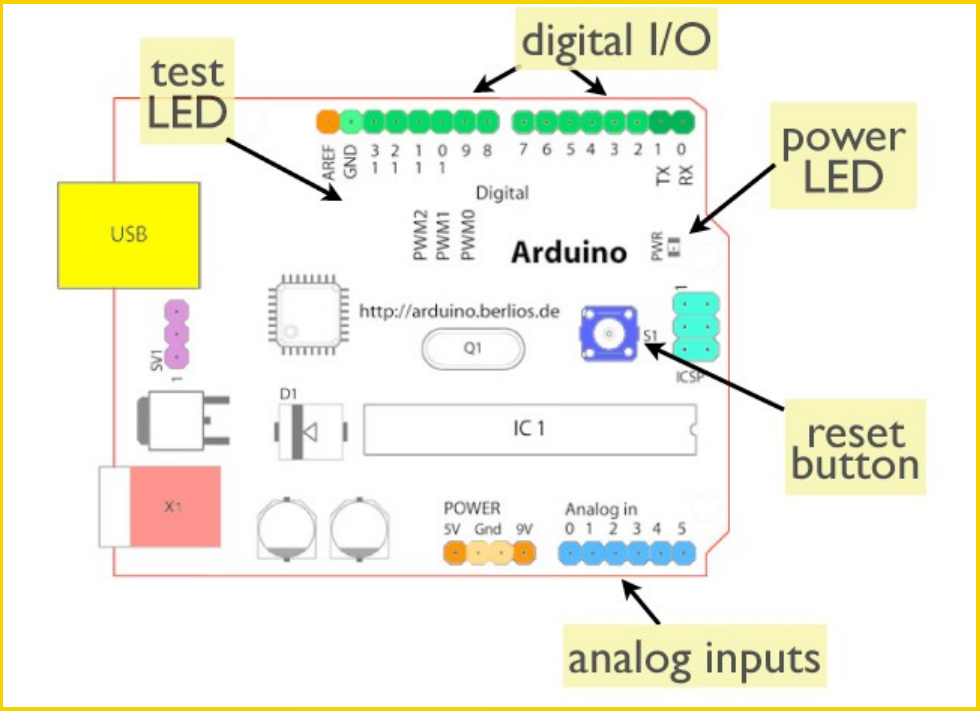
LED Hello World

Hello World // blinking LED // serial com

```
/*
 * Blink
 *
 * The basic Arduino example.  Turns on an LED on for one second,
 * then off for one second, and so on...  We use pin 13 because,
 * depending on your Arduino board, it has either a built-in LED
 * or a built-in resistor so that you need only an LED.
 *
 * http://www.arduino.cc/en/Tutorial/Blink
 */

int ledPin = 13;                // LED connected to digital pin 13

void setup()                    // run once, when the sketch starts
{
  pinMode(ledPin, OUTPUT);      // sets the digital pin as output
}

void loop()                     // run over and over again
{
  digitalWrite(ledPin, HIGH);   // sets the LED on
  delay(1000);                  // waits for a second
  digitalWrite(ledPin, LOW);    // sets the LED off
  delay(1000);                  // waits for a second
}
```



physical computing



It is all about connection

HowTo connect to breadboard

HowTo communicate with Computer

HowTo connect your creativity

HowTo not getting confused?

physical programming

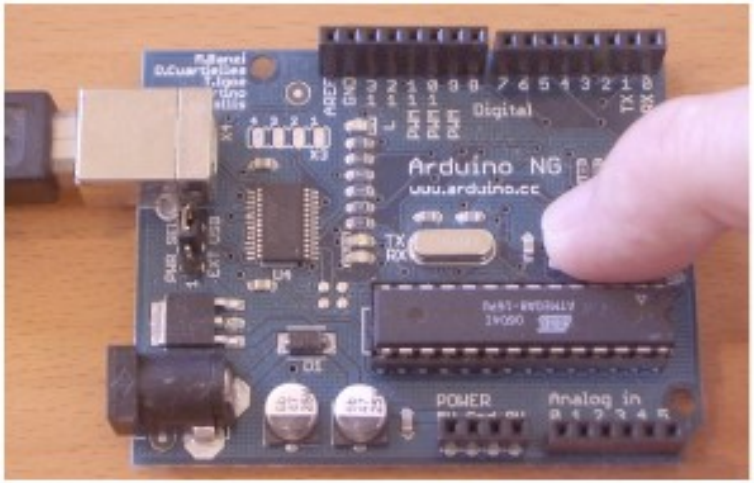
Edit

```
int ledPin = 13;                  // LED connected to digital pin 13

void setup()
{
  pinMode(ledPin, OUTPUT);        // sets the digital pin as output
}

void loop()
{
  digitalWrite(ledPin, HIGH);     // sets the LED on
  delay(1000);                    // waits for a second
  digitalWrite(ledPin, LOW);      // sets the LED off
  delay(1000);                    // waits for a second
}
```

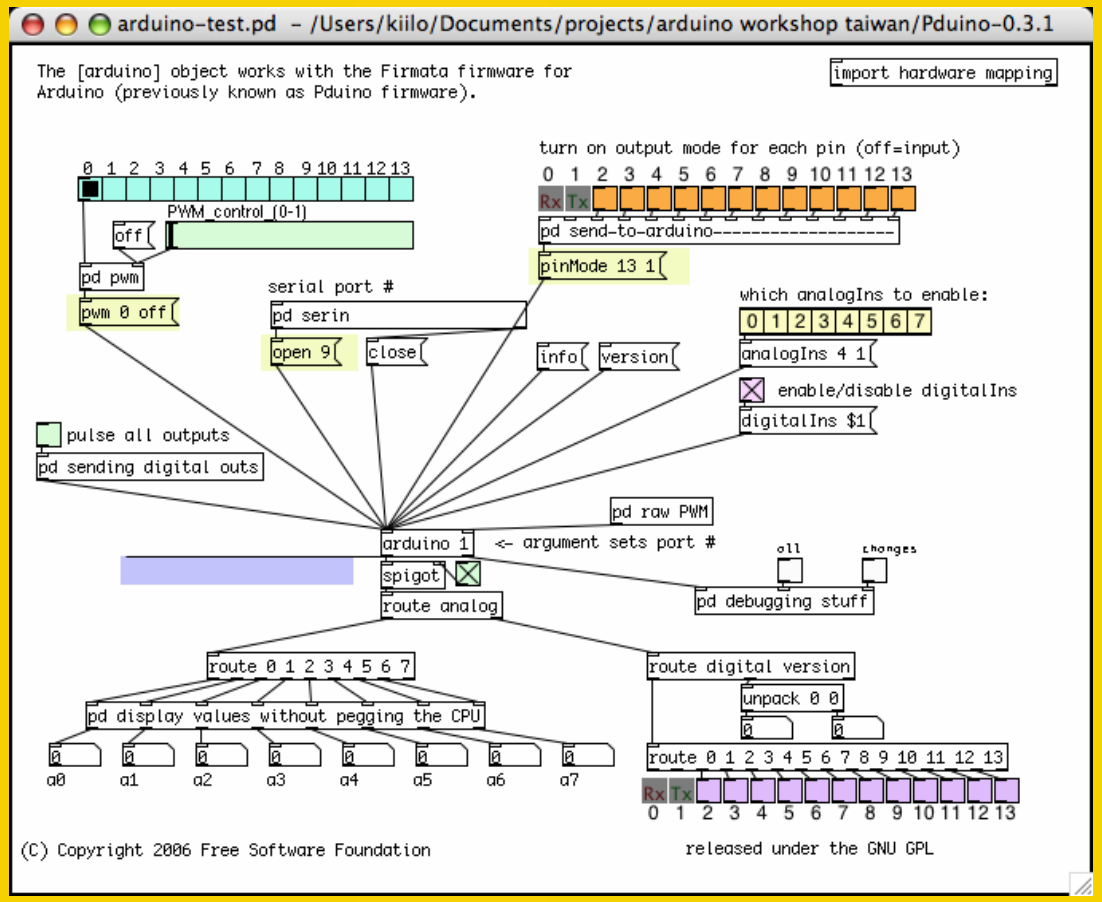
Compile

Upload

Reset



patch computing



Data is flowing through objects and circuits

How install pure data / pduino

Download Pure data software

http://playaround.ftpaccess.cc/software/

open remote.pd

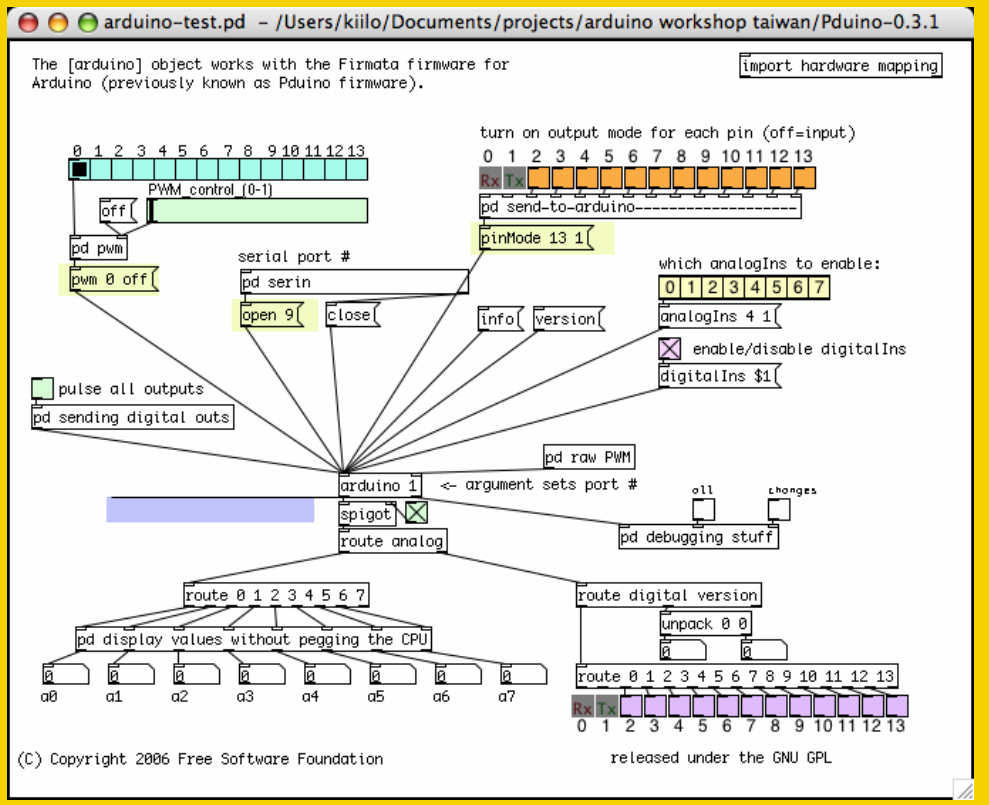
upload pduino onto the arduino board

Pd_firmware.pde

run arduino-test.pd in Pure data

pduino + blinking LED

http://playaround.ftpaccess.cc/project/physical+computing+2/outline/1.day/ Pduino-0.3.1.zip



electronics introduction

physical computing

all works with this tiny niffty eletrons

LED

switch

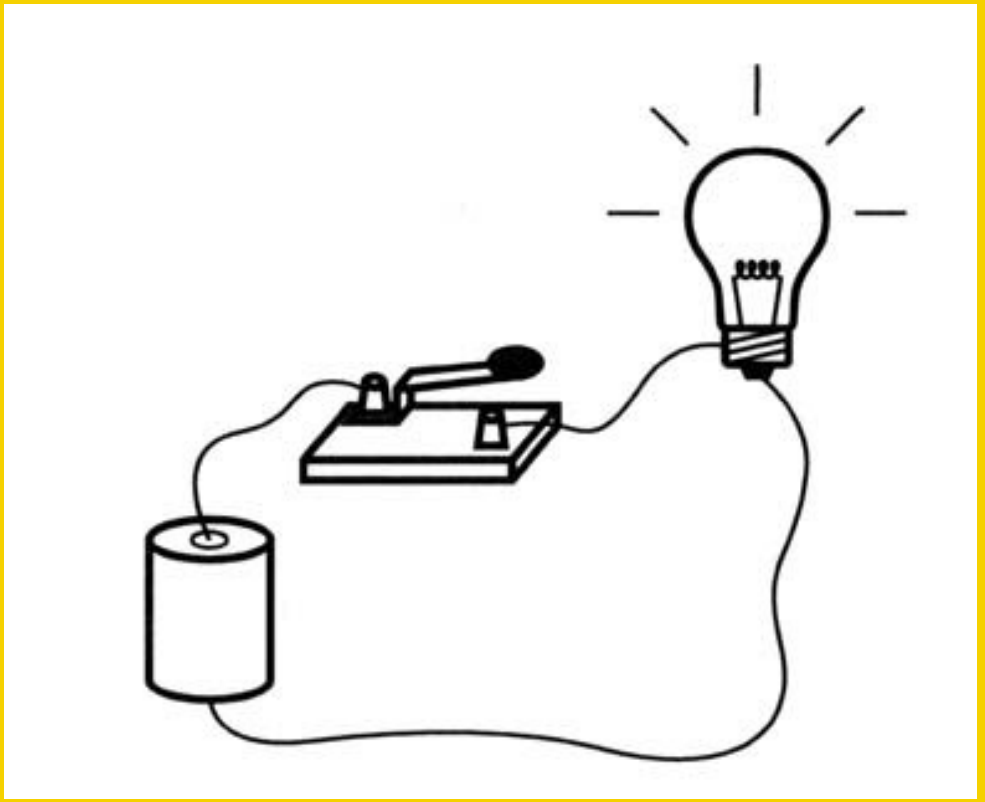
potentiometer

LDR (voltage divider)

Oscillators (Sound)

Transistor

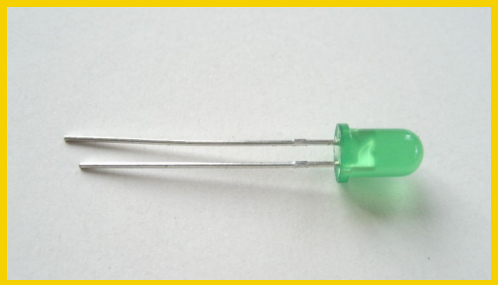
Sensors with serial protocol



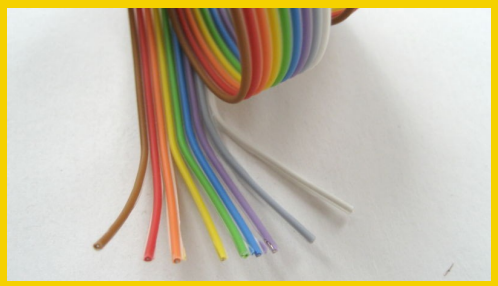
Electronic components

Resistors

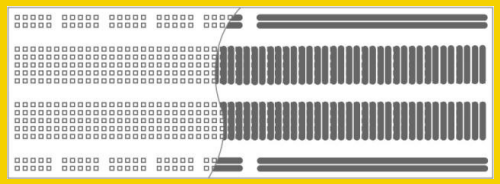
LEDs



Wire / Jumpers



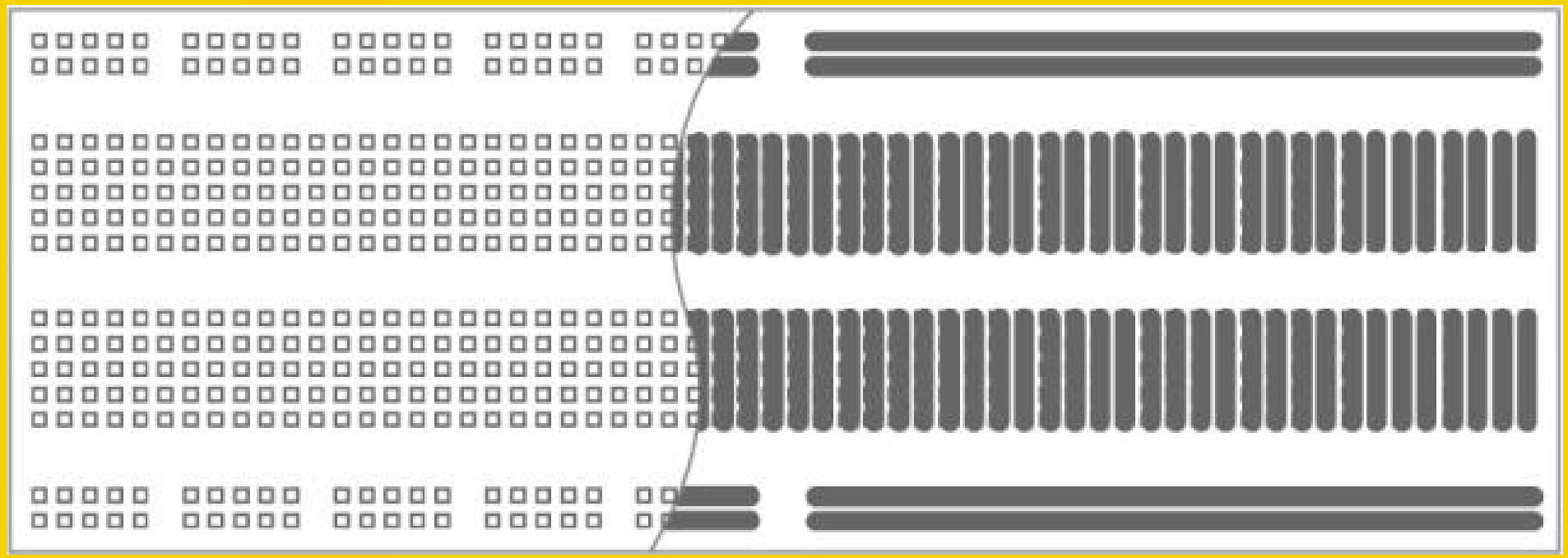
Breadboard



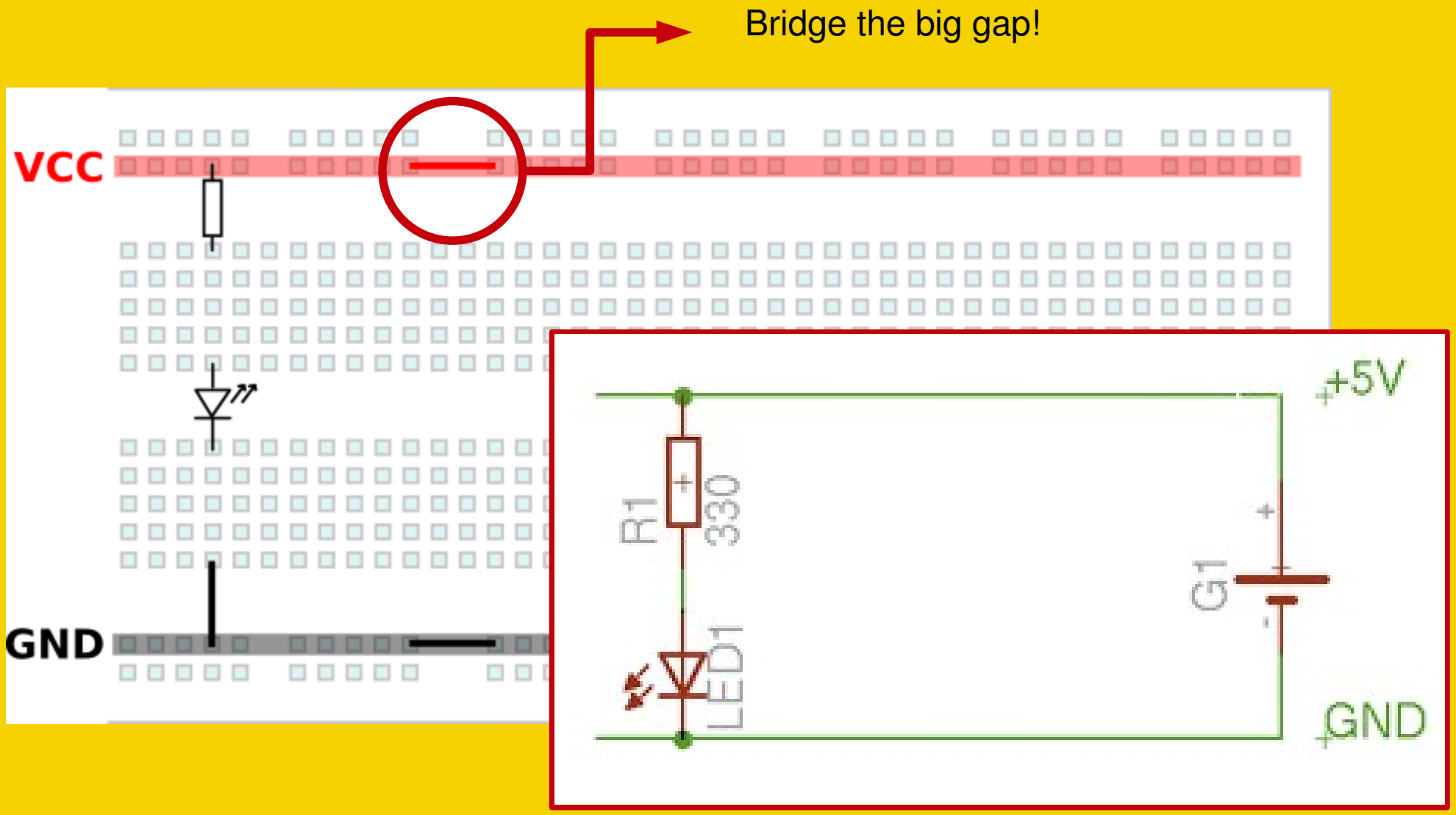
physical computing?

Dont solder!

Patch your circuit first!



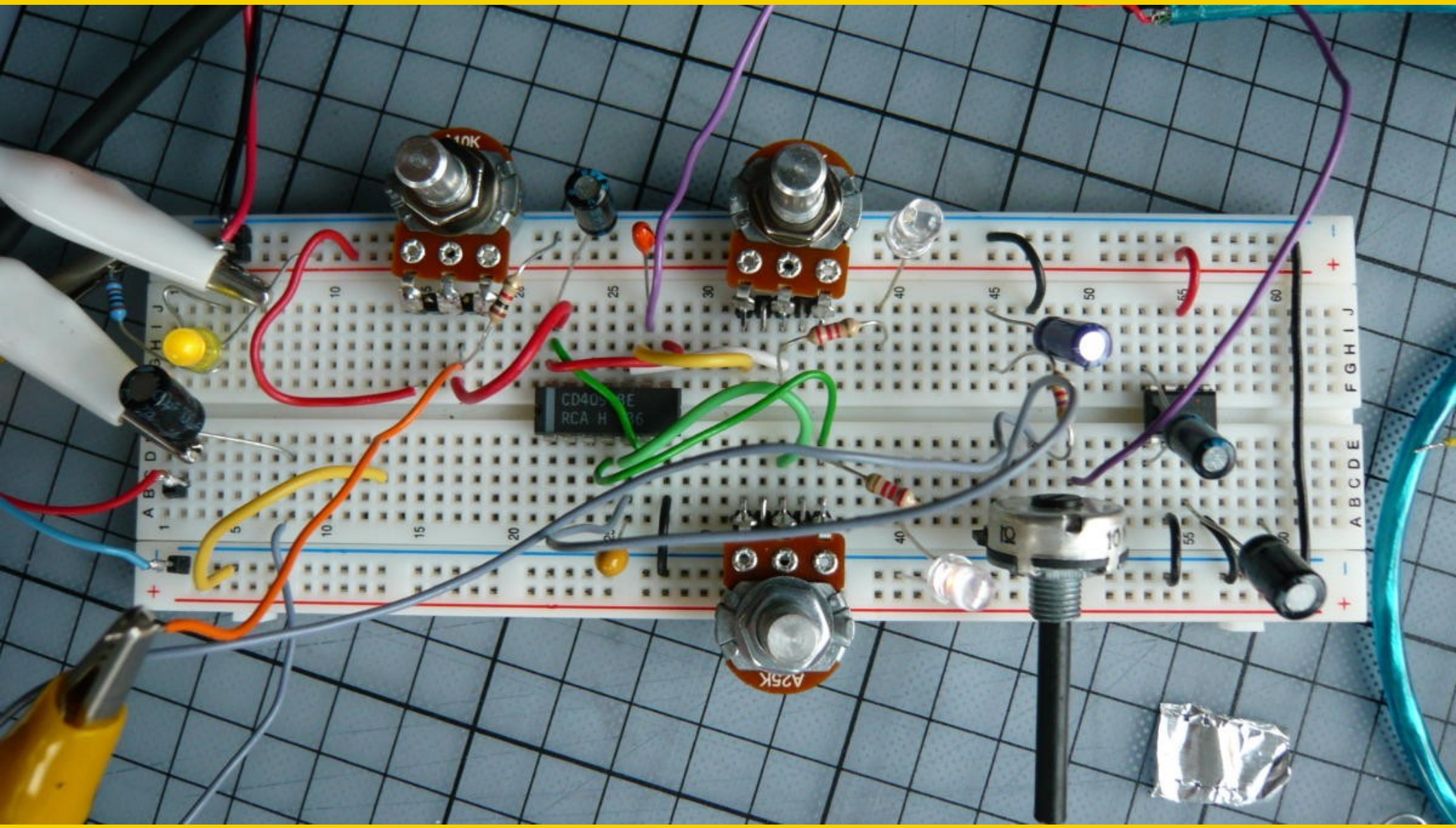
physical connecting



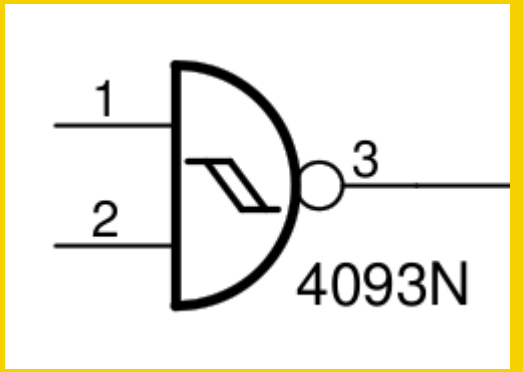
Switches, photoresistors (LDR) and pots

Let's make some noise!

Noise Circuits // NAND gates // Amps



The NAND Gate



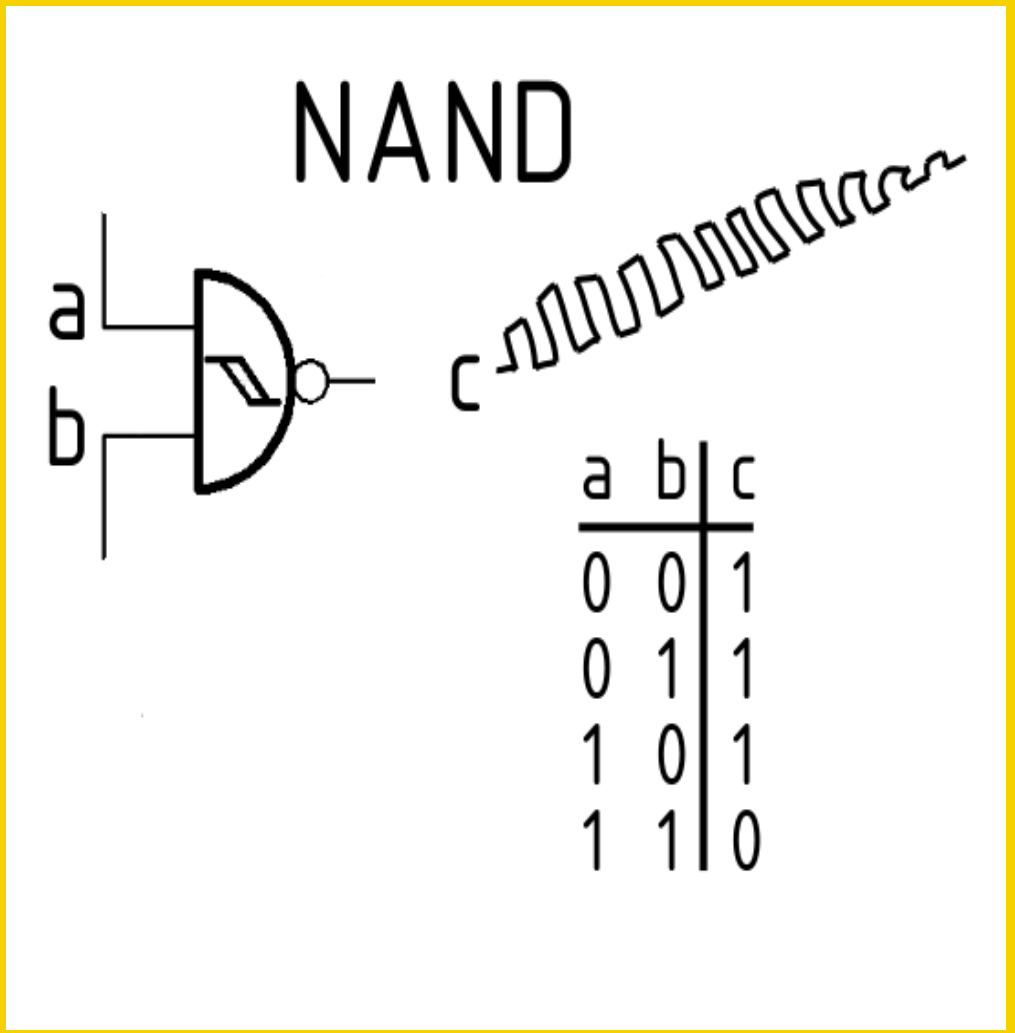
The most simple computer !

Compares 0's and 1's at two inputs

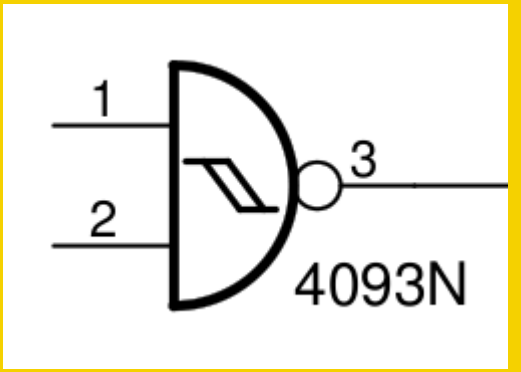
Boolean logic

Creates 0's and 1's at output

make it oscillate !



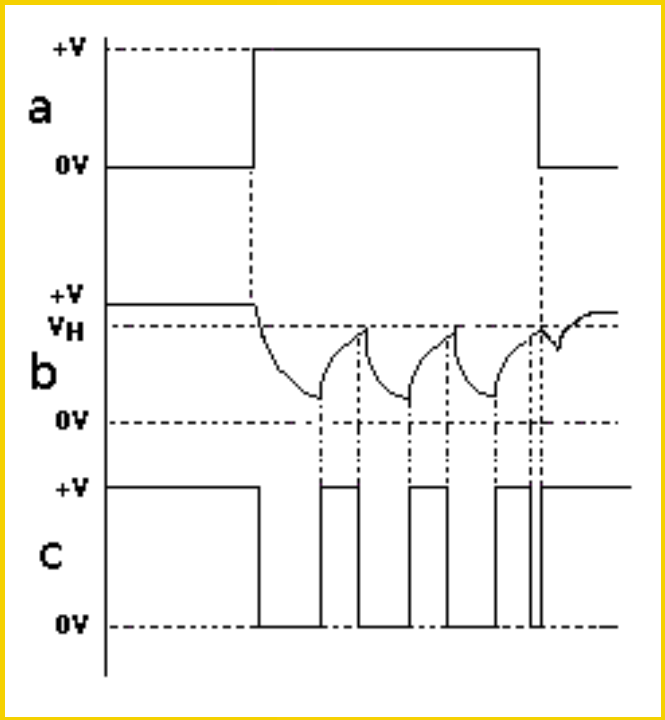
Simple NAND oscillator

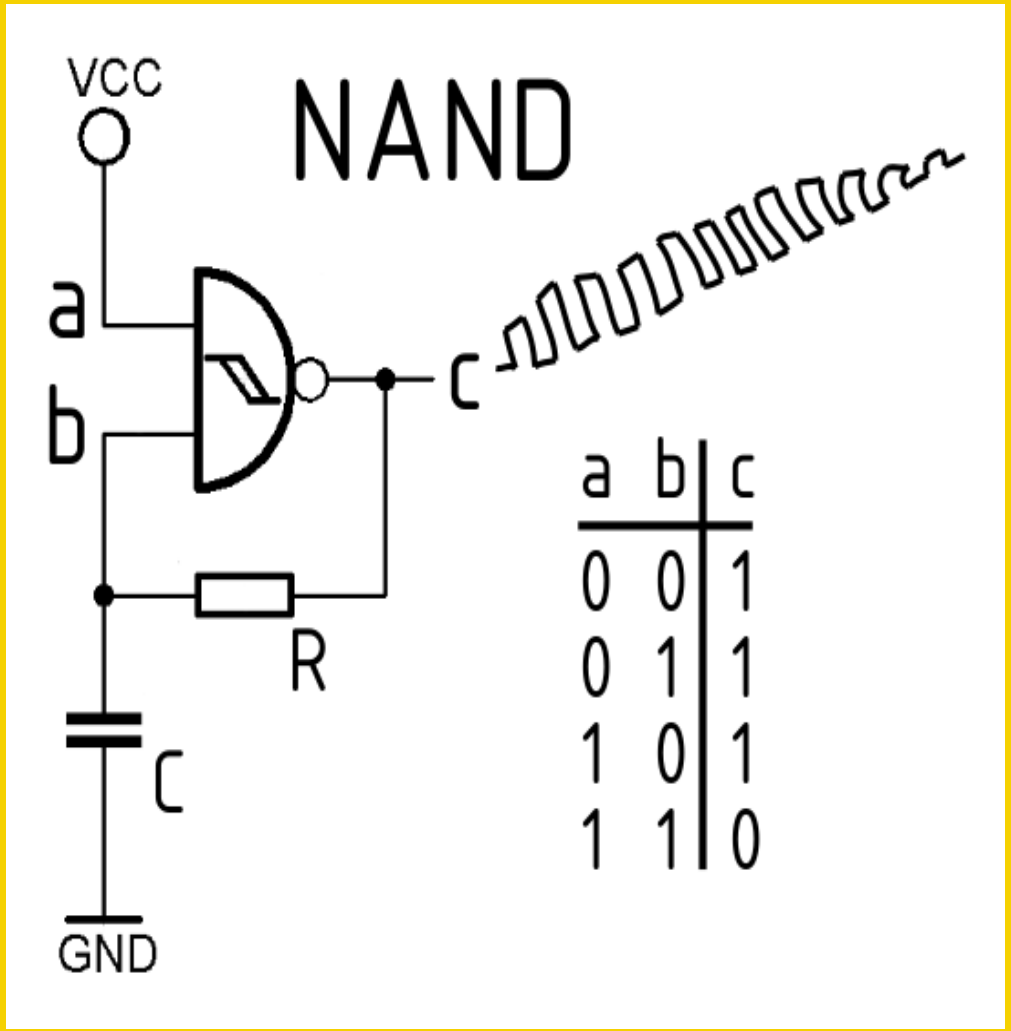


Abuse it !

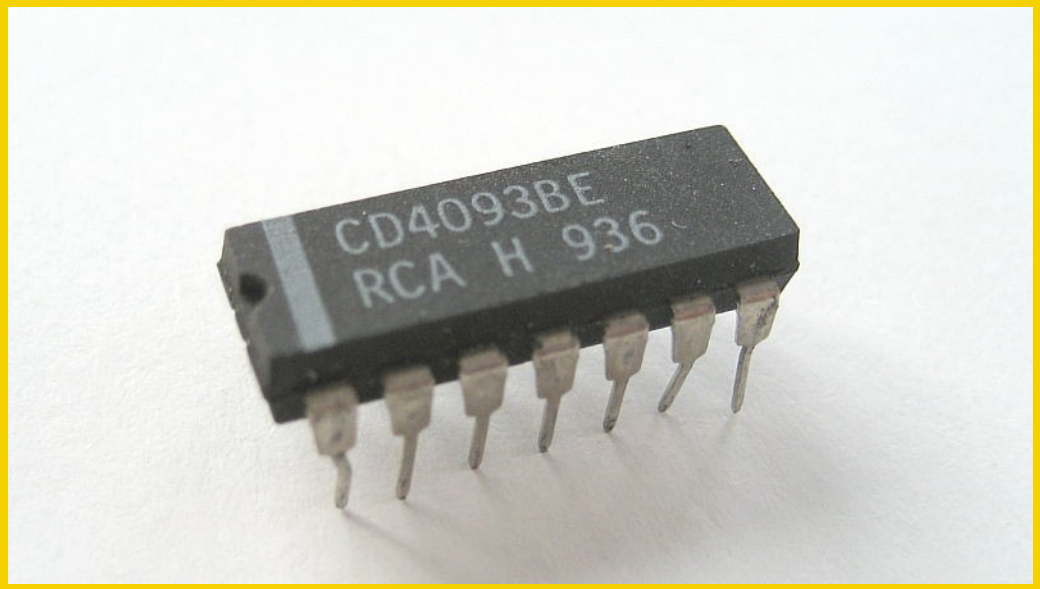
Make it to oscillate

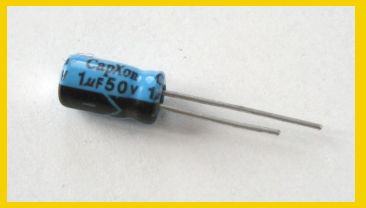
block the current to the chip

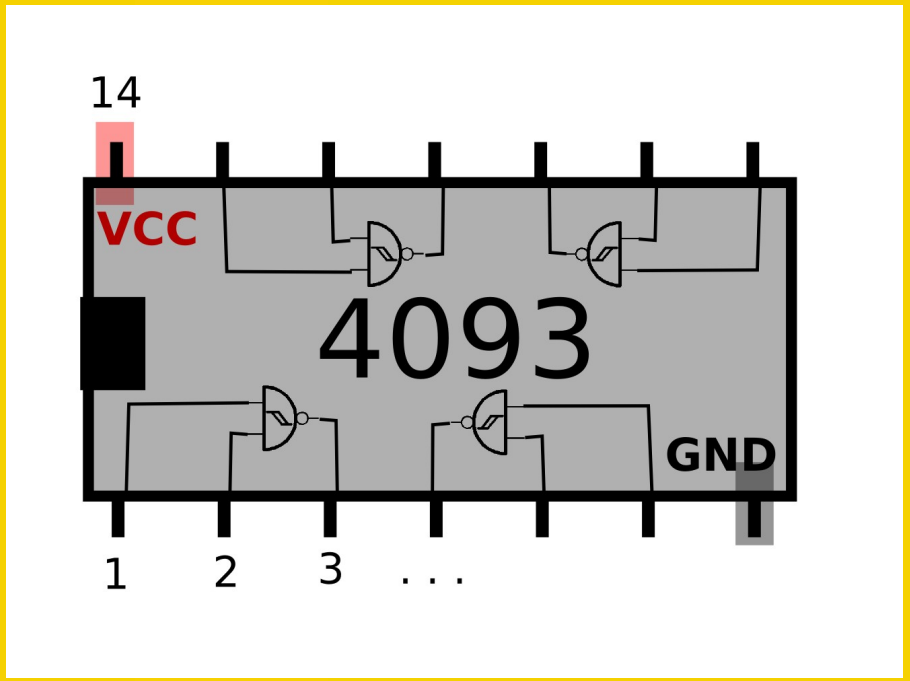


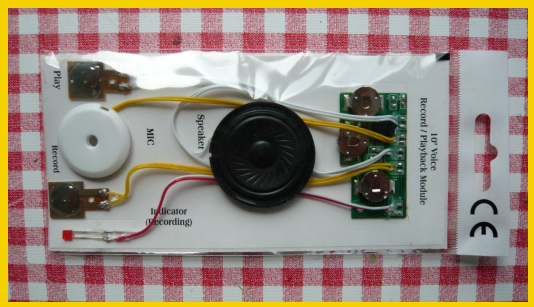


4093 – CMOS Quad NAND Schmitt Trigger

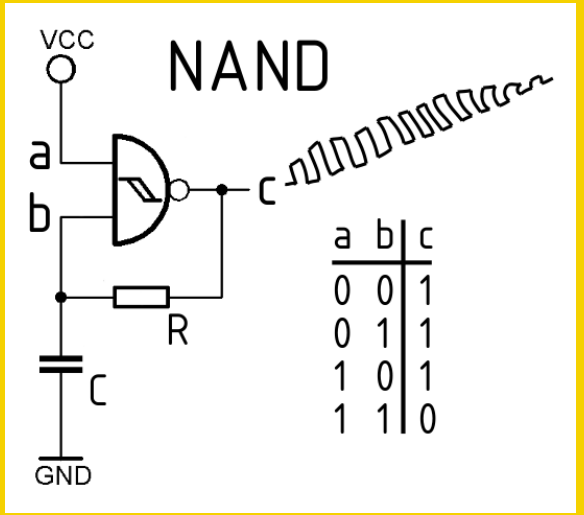




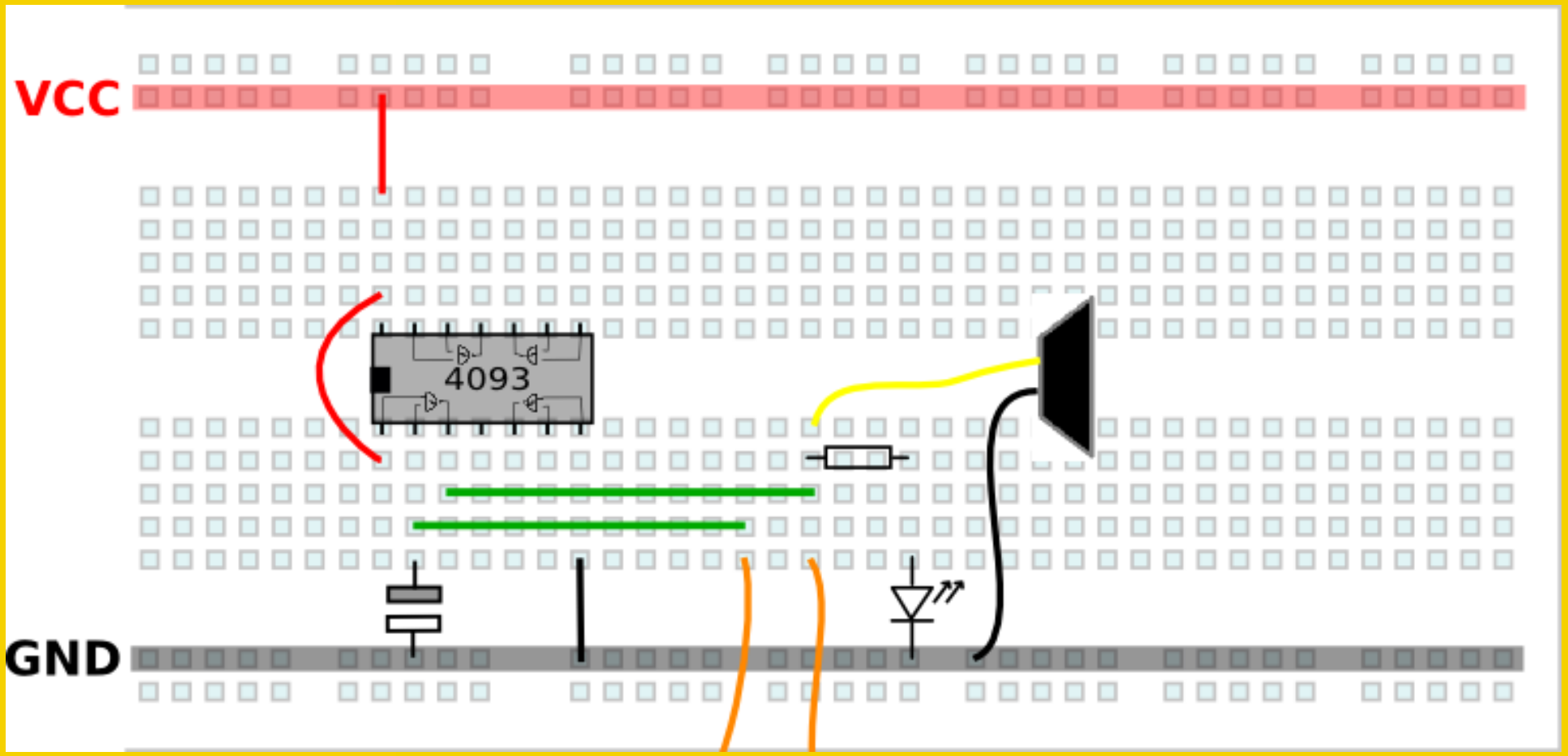




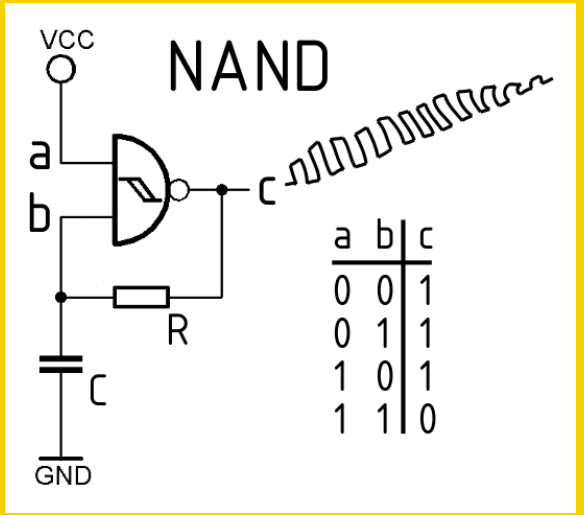
NAND Oscillator



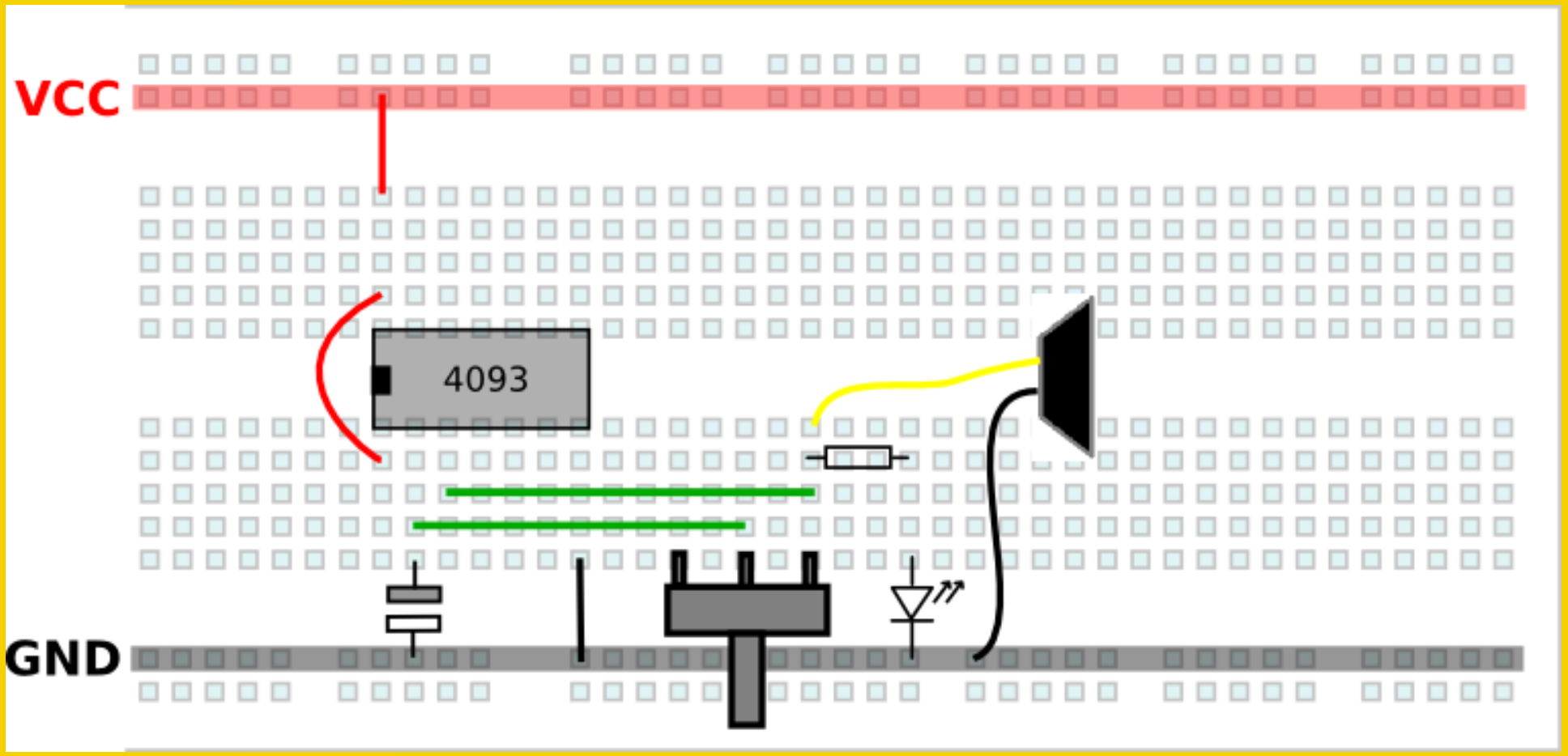
try different resistors and capacitors
are humans resistors?



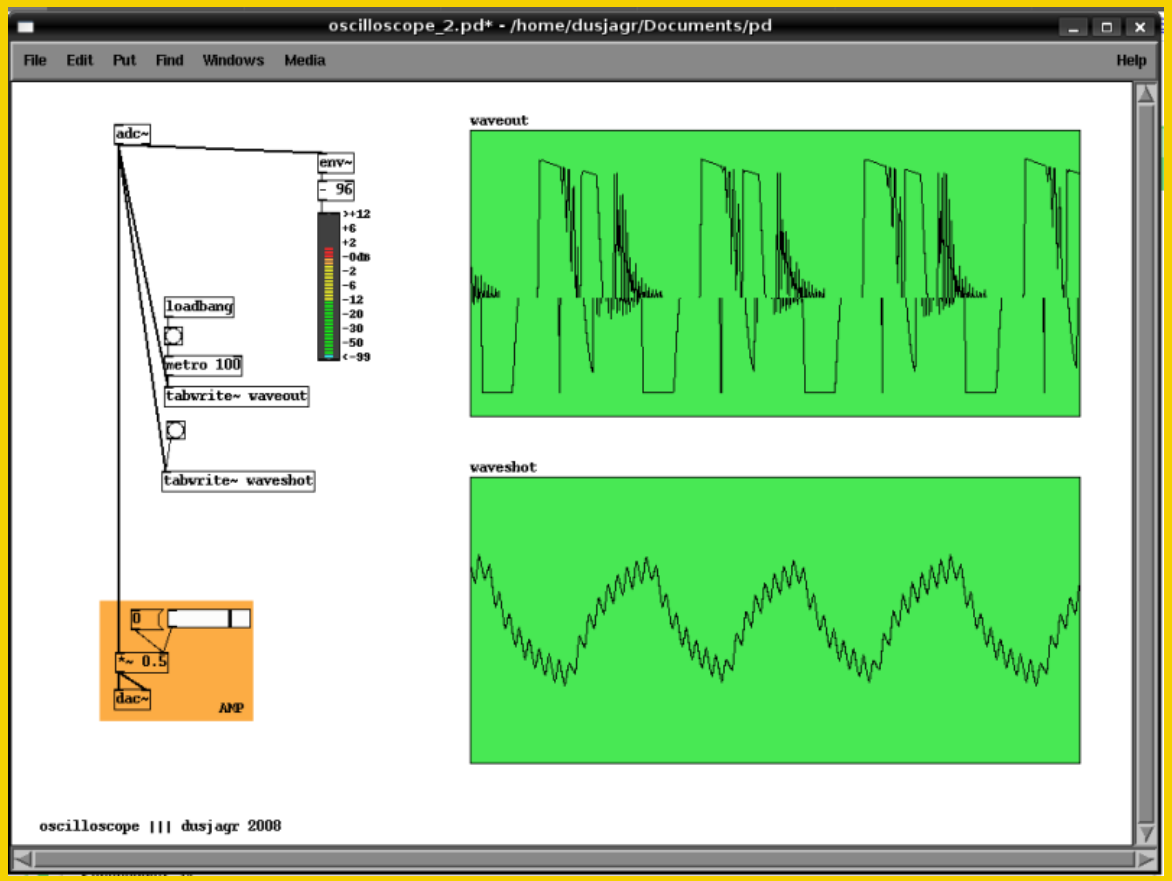
NAND Oscillator



try a pot or an LDR

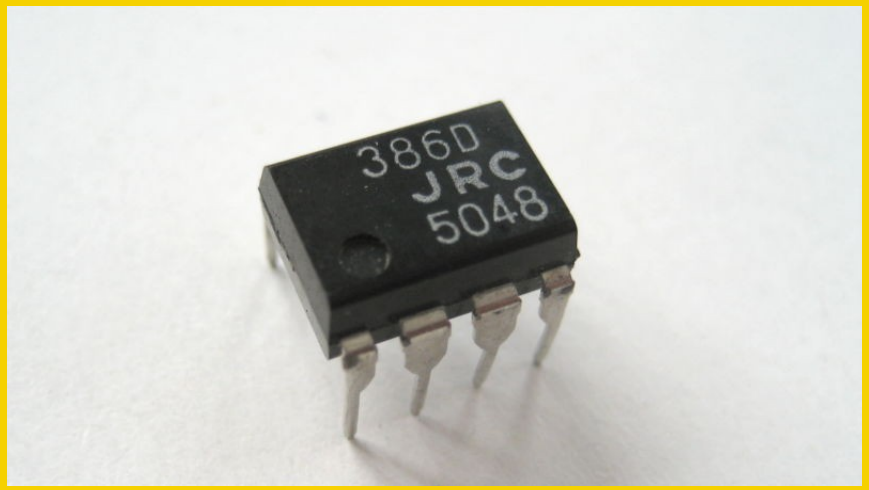


Use PureData as Oscilloscope

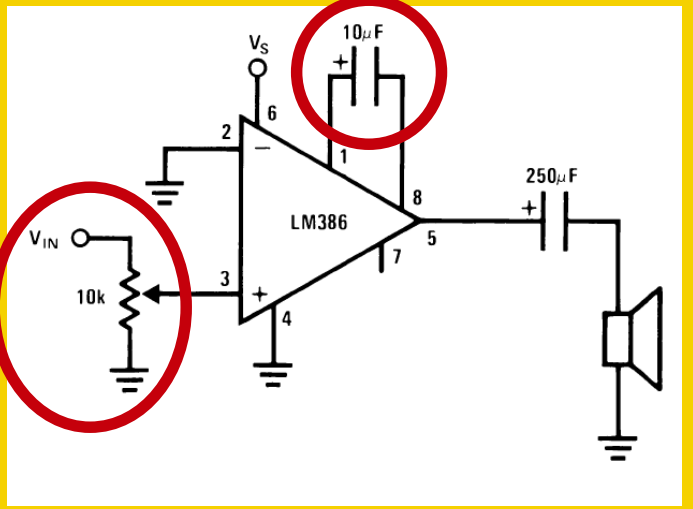


http://playaround.ftpaccess.cc/project/physical+computing+2/outline/1.day/ oscilloscope_2.pd

LM386 – Audio Amplifier Chip



Gain



Volume Control

Make it loud