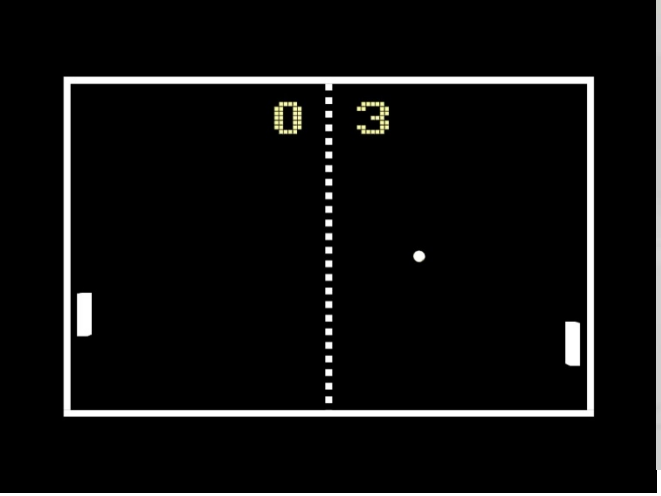
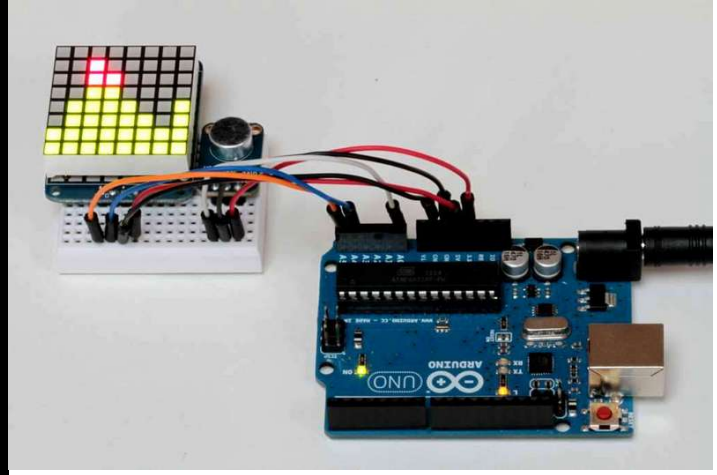
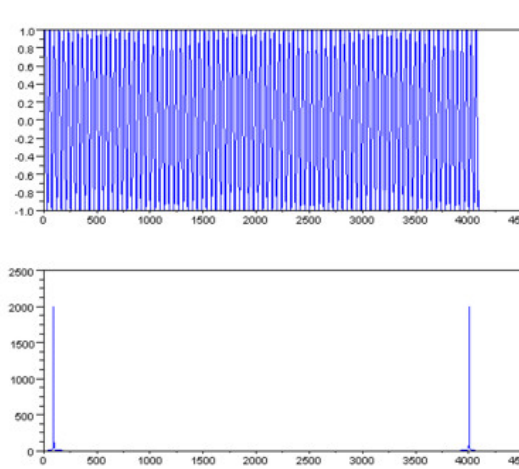
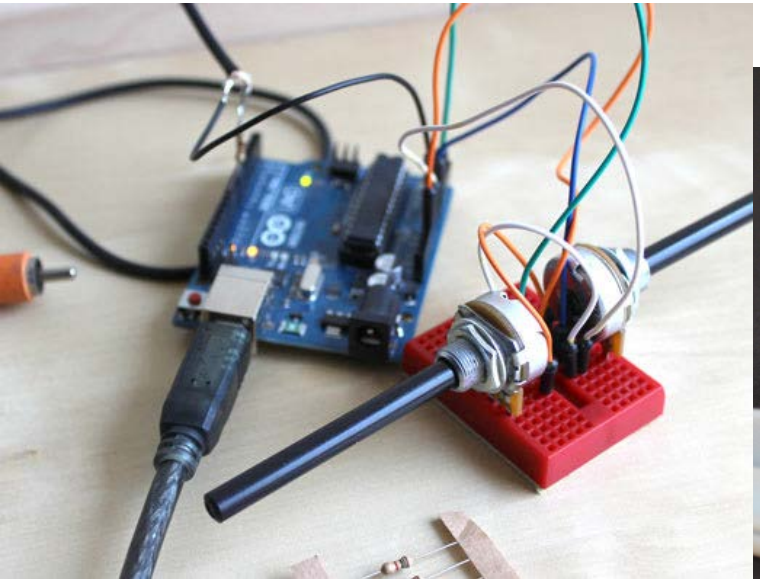
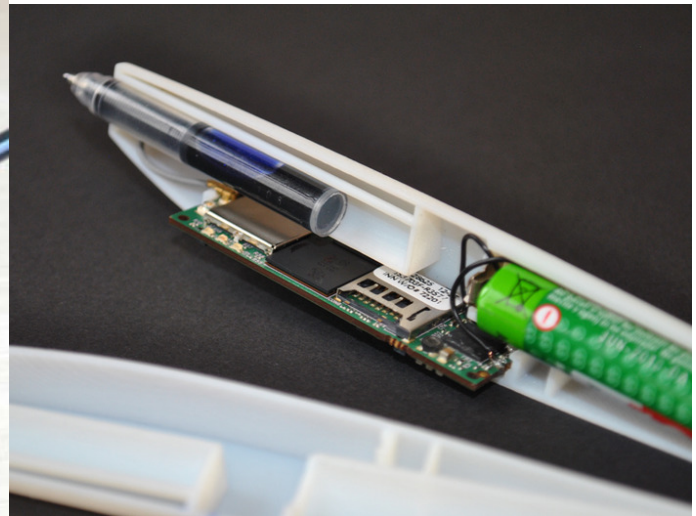


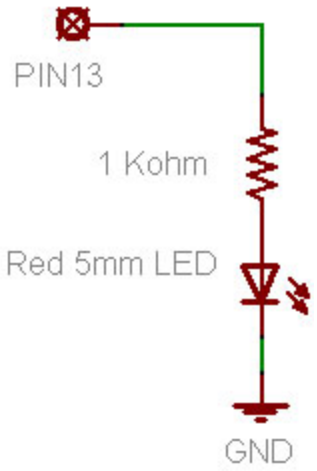




Semaine interdisciplinaire Jour 2-3: arduino et electronique (analogique)







Programme Jour 2

- Comprendre les bases de la programmation arduino (blink)

- Savoir lire un schéma éléctronique

- Savoir lire une datasheet

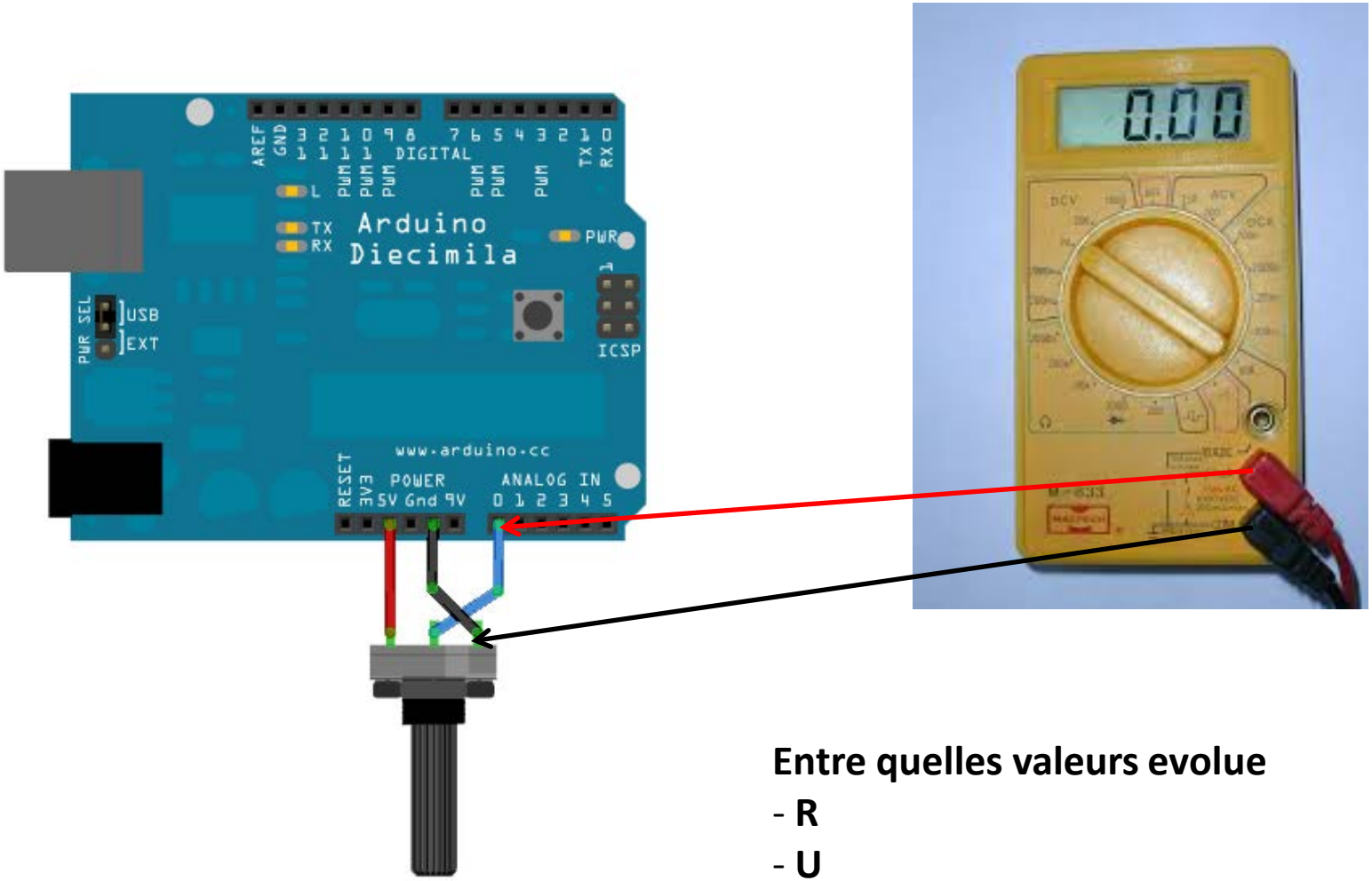
- Savoir comment debugger un circuit /programme

- Comprendre les bases de l'électronique (Différence courant /tension)

- Fabrication du device micro / carte sd / et test !

Part 1- Electronics 101

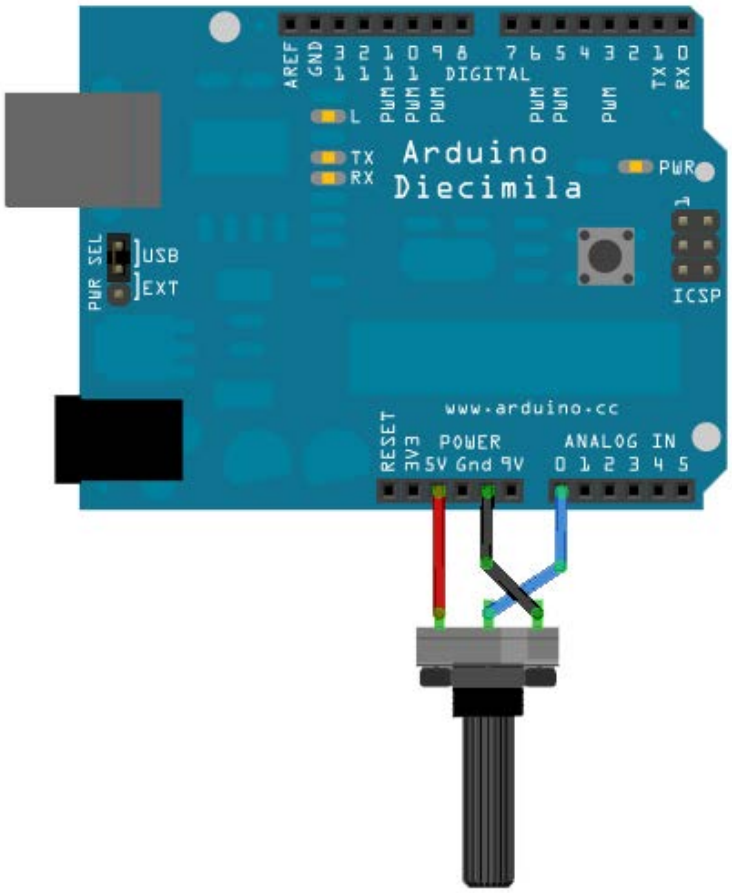
Arduino Potentiometer – Ex 1 mesurer tension et R

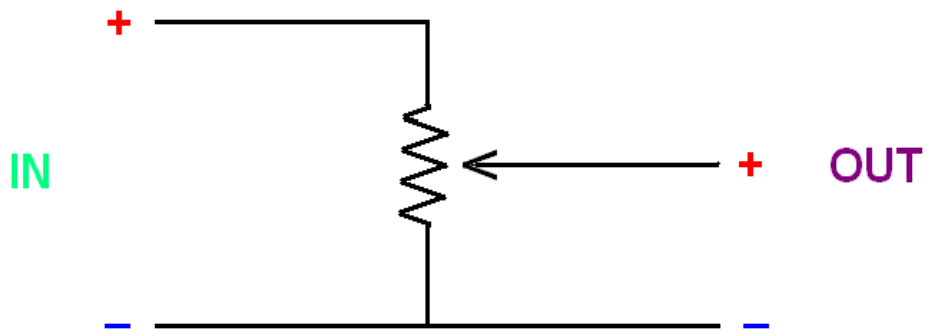


Entre quelles valeurs evolue

- **R**
- **U**
- **valeur A0**

Arduino Ex 1 Potentiometer correction

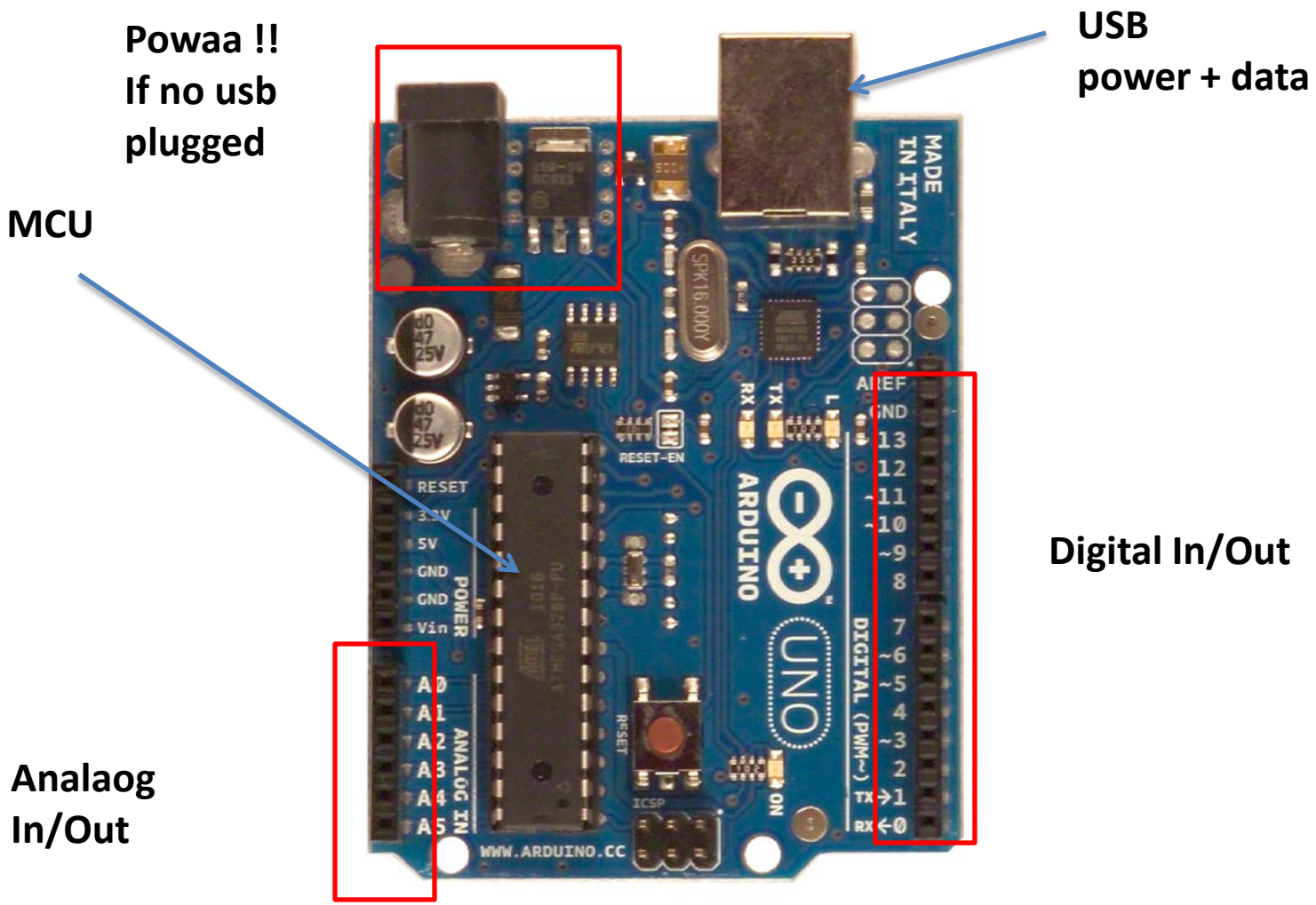




Entre quelles valeurs evolue

- **R : 0-10kohms**
- **U: 0-5V**
- **valeur A0 : 0-1024**

What is the Arduino ?



Analog vs Digital

Digital Signal

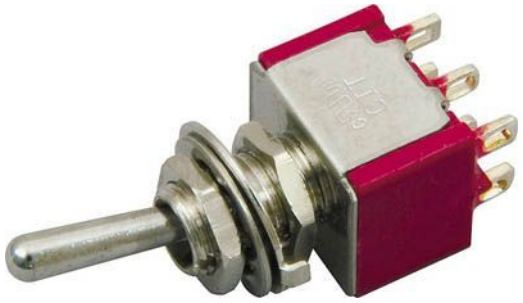
Analog Signal

Output has been digitalized

Output directly linked to the signal

Ex 2 : Analog or digital

GPS chip



Ex2 correction

GPS chip

Analog vs Digital

Digital Signal

Analog Signal

ADC

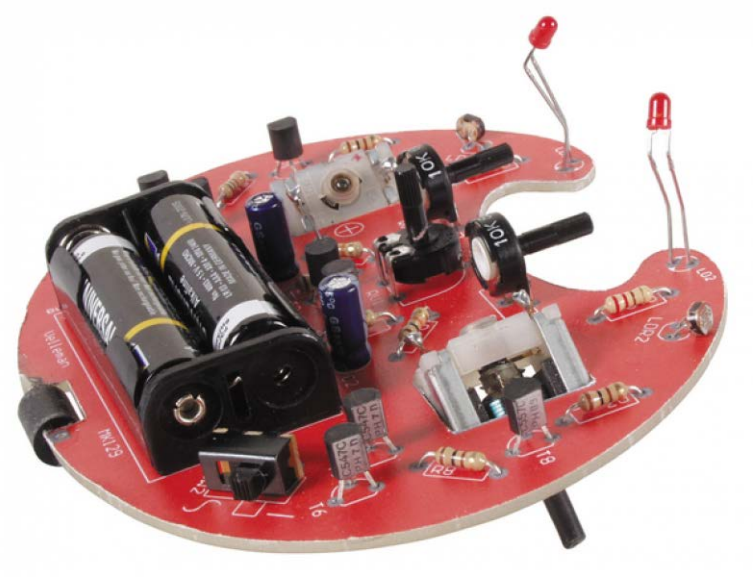
DAC (PWM)

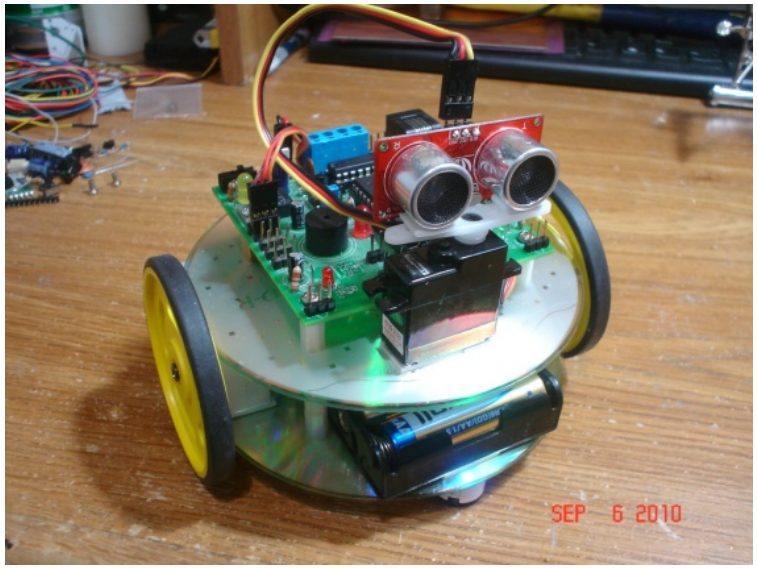
Output has been digitalized

Si encodage : microprocesseur

Output directly linked to the signal

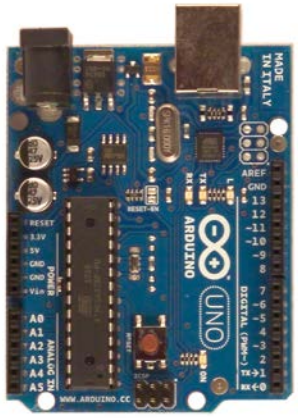
Analog vs Digital
ex robots





Analog => Digital

=>



0V-5V

0-1023

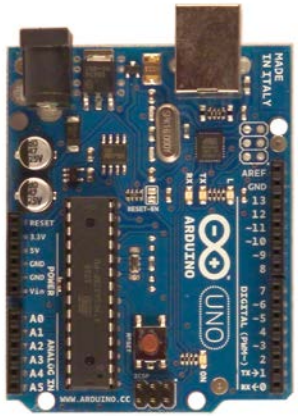
Why 1023 et pas 53 ,158, 256, 42 ???

There are 10 types
of people in the world:

Those who understand binary
and those who don't.

Analog => Digital

=>

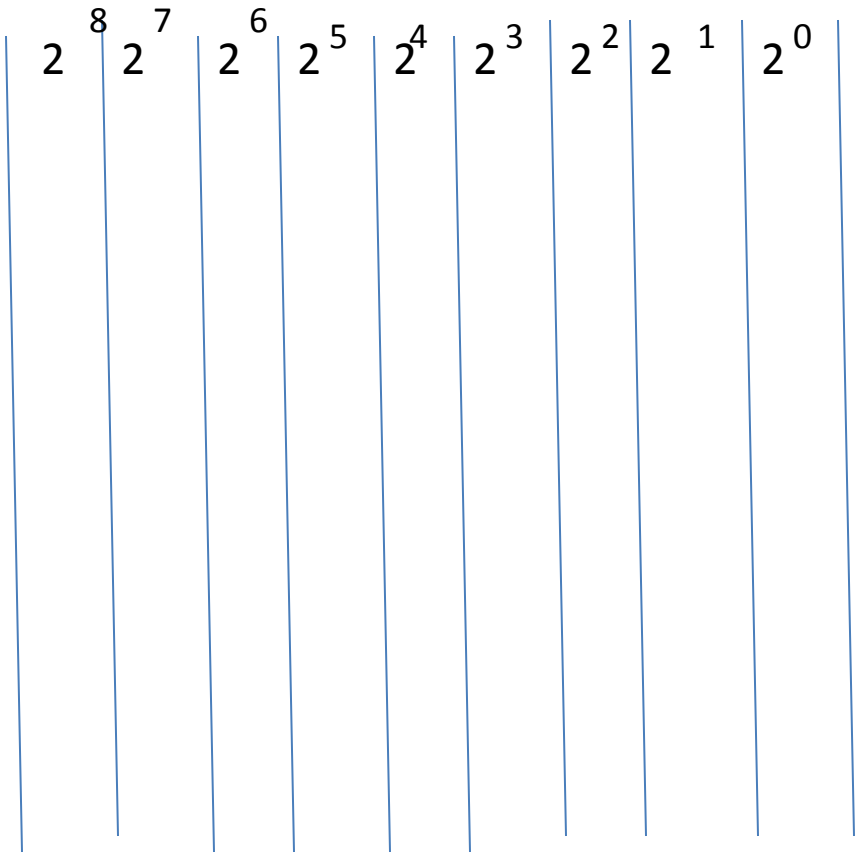


0V-5V

0-1023

$$1023 = 2^{10}$$

Ex 3 ecrire en binaire

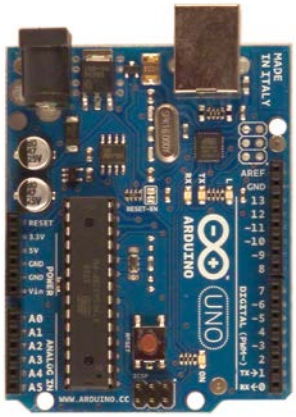


bits Vs bytes

MSB vs LSB

Ecrire : 256, 64,17,23,42,58 en binaire

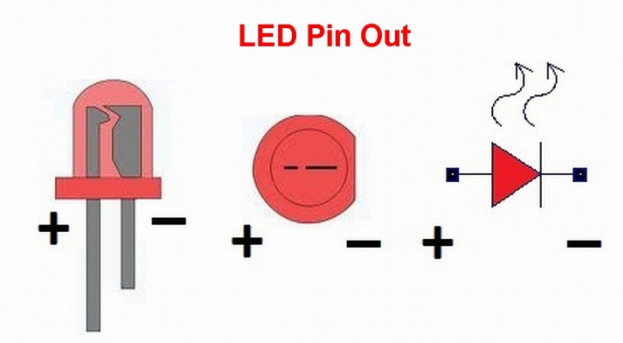
ADC precision

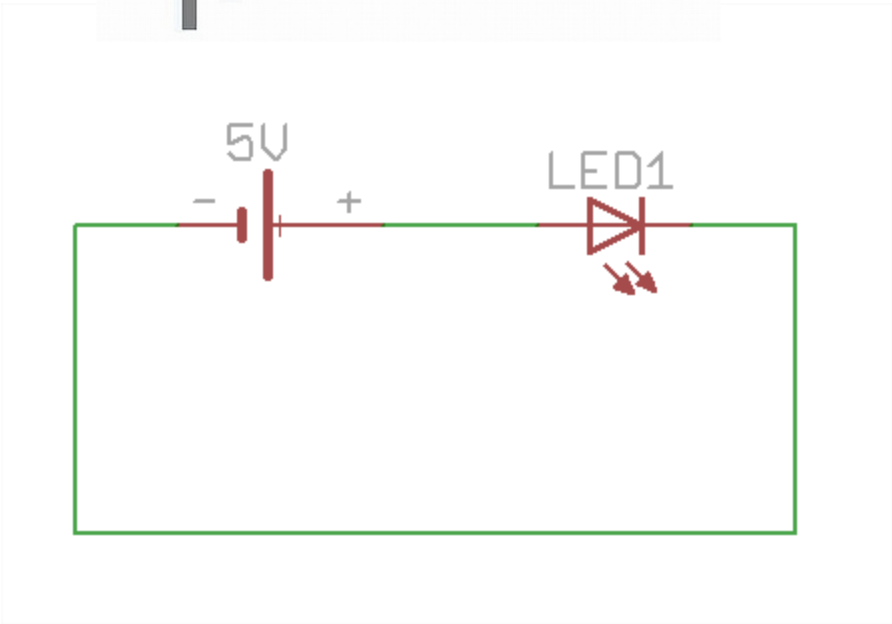


0-1023 - 10 bit

Quel est le plus petit voltage que l'on peut mesurer ??

LEDs

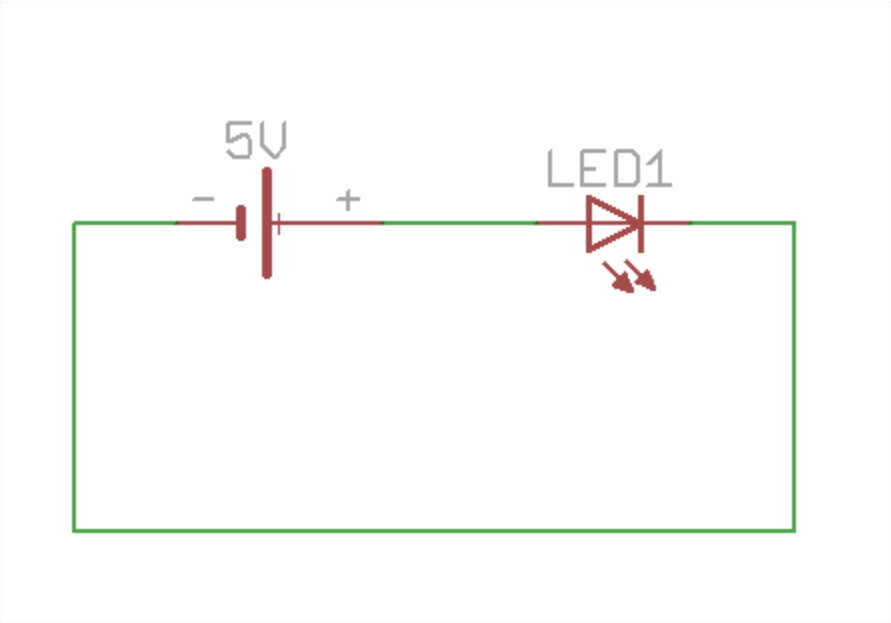




Loi d’ohms

U=RI

LEDs



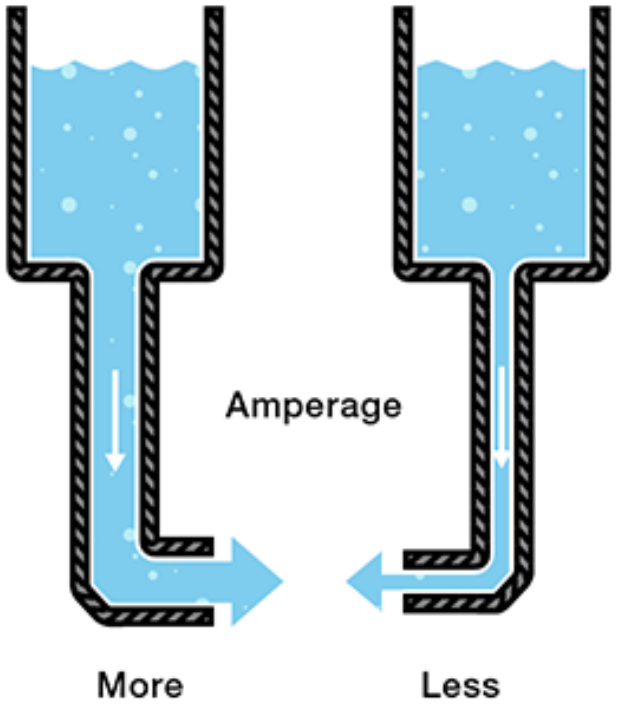
Loi d'ohms

U=RI

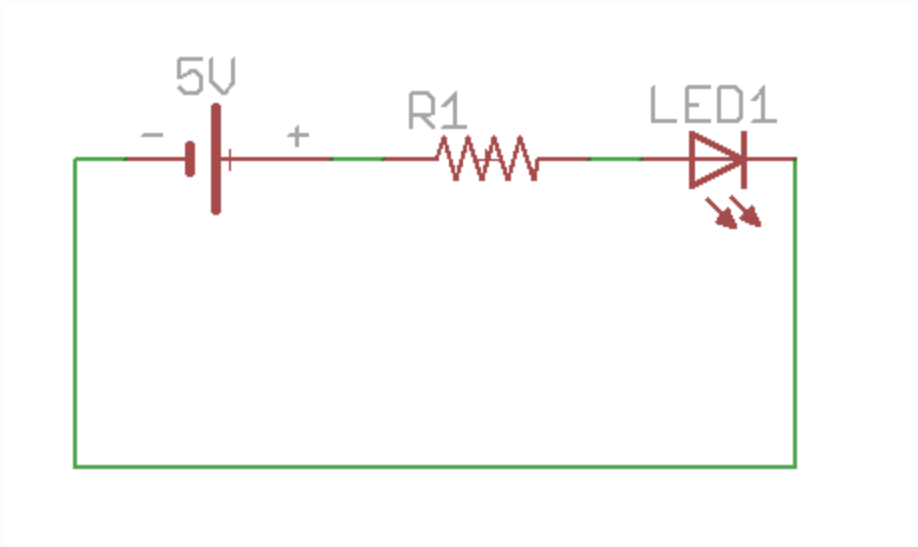
I = U/R

Si R~0 => I enorme => magic smoke

Differences tension/courant



Ex 4 : LEDs - how to choose R

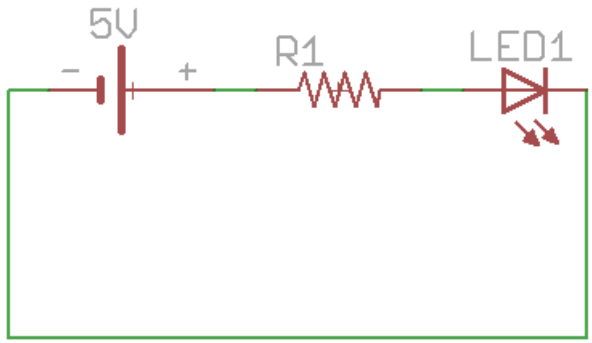


Loi d'ohms

U=RI

Voir la datasheet fournie !

Ex4 : correction



Absolute Maximum Ratings: (Ta=25℃) .

ITEMS	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	20	mA
Peak Forward Current	I_{FP}	30	mA
Suggestion Using Current	I_{su}	16-18	mA
Reverse Voltage (V_R=5V)	I_R	10	uA
Power Dissipation	P_D	105	mW
Operation Temperature	T_{OPR}	-40 ~ 85	℃
Storage Temperature	T_{STG}	-40 ~ 100	℃
Lead Soldering Temperature	T_{SOL}	Max. 260℃ for 3 Sec. Max. (3mm from the base of the expoxy bulb)	

Absolute Maximum Ratings: (Ta=25℃)

ITEMS	Symbol	Test condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	I_F=20mA	1.8	---	2.2	V
Wavelenength (nm) or TC(k)	$\Delta\lambda$	I_F=20mA	620	---	625	nm
*Luminous intensity	I_V	I_F=20mA	150	---	200	mcd
50% Viewing Angle	$2\theta 1/2$	I_F=20mA	40	---	60	deg

Loi d'ohms

U=RI

I=20ma

U=5-2.2=2.8

R=U/I =140

Resistance + proche

150

Ex 4 : triche

http://led.linear1.org/

LED center

LED basics | LED lighting | LED science | Practical LEDs | LED products

LED calculator

This is the new version of the single LED series resistance calculator, good for when you have a single LED and need to know "**what resistor should I use with my LED?**" This calculator determines that for you.

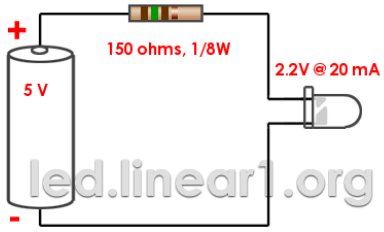
The **LED series/parallel array wizard** is available for those of you who need to do calculations involving more than one LED. The wizard will help you pick the resistors make the connections for **any number of LEDs**.

LED calculator: current limiting resistor value

5 Source voltage
2.2 diode forward voltage
20 diode forward current (mA)

Find R

The wizard recommends a 1/8W or greater 150 ohm resistor. The color code for 150 ohms is brown green brown.

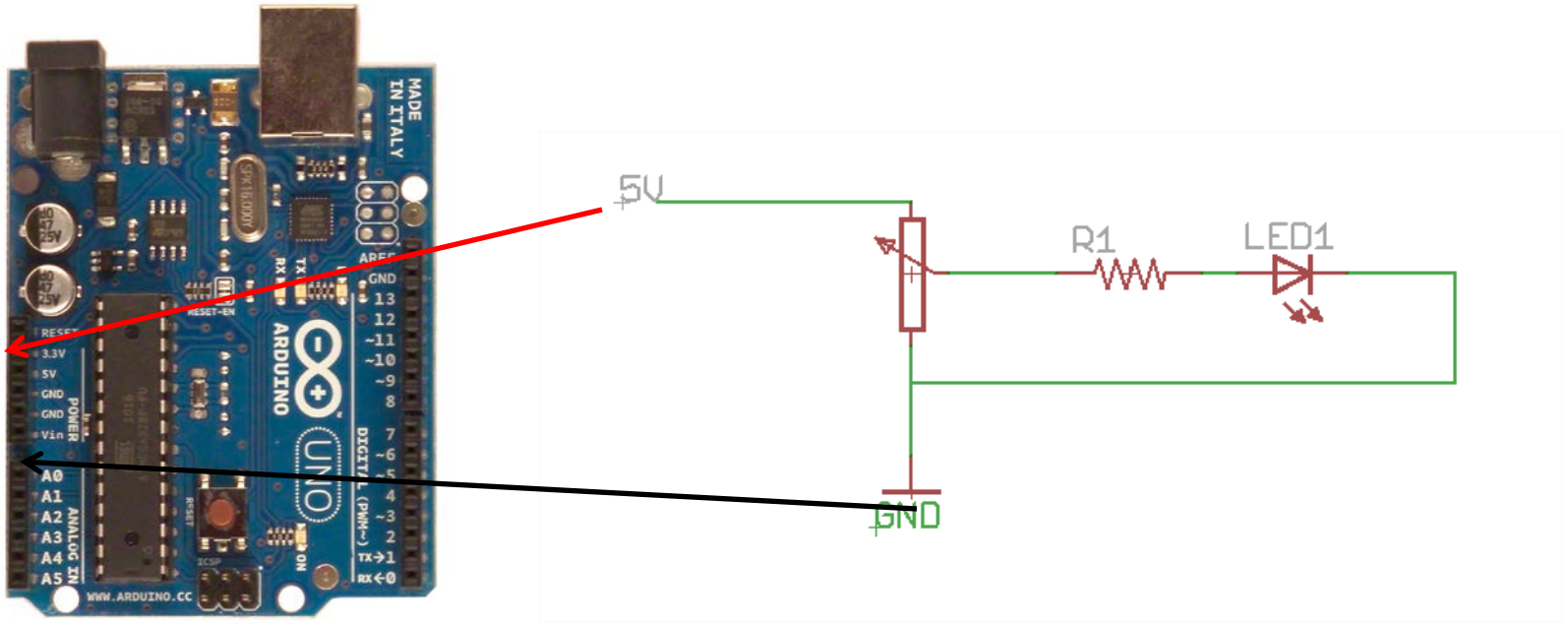


Link to this solution: **http://led.linear1.org/1led.wiz?VS=5;VF=2.2;ID=20**

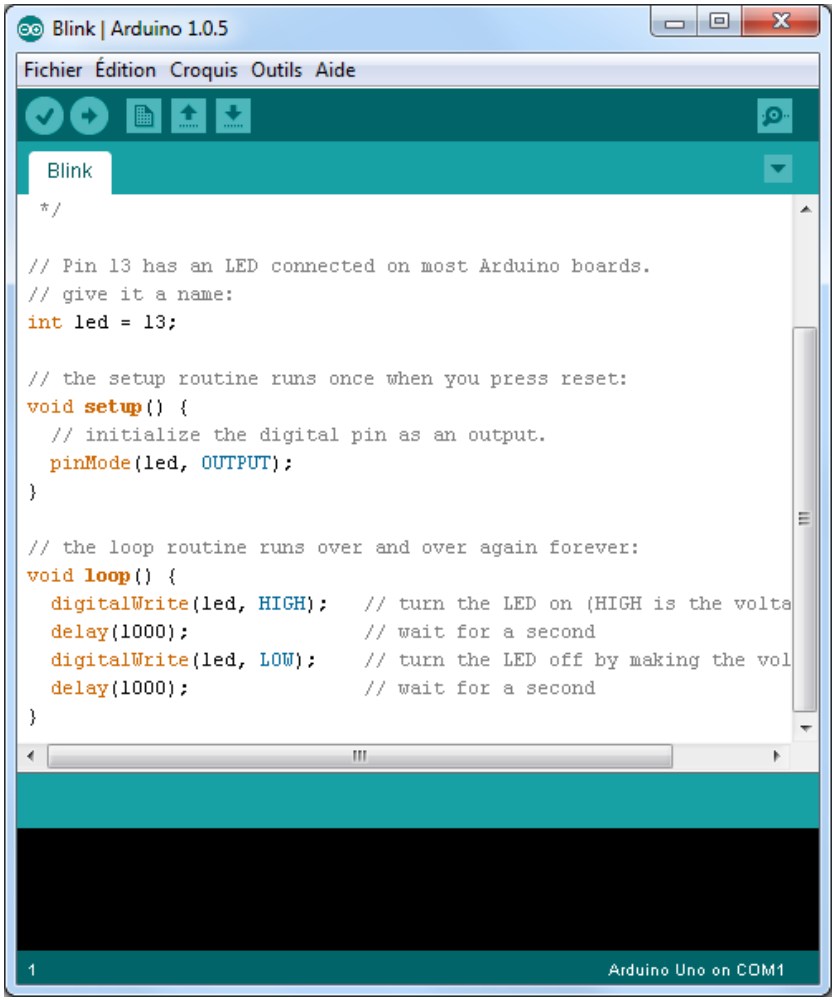
* **This calculator rounds the resistance up to the next standard resistor value. You should actually be able to buy a 5% resistor with the value returned by the calculator.**

** **Power calculations assume use of the standard value current-limiting resistor shown above. Resistor power ratings are chosen based on operating within 60% of the rated value.**

Ex 5 : potentiometer led dim

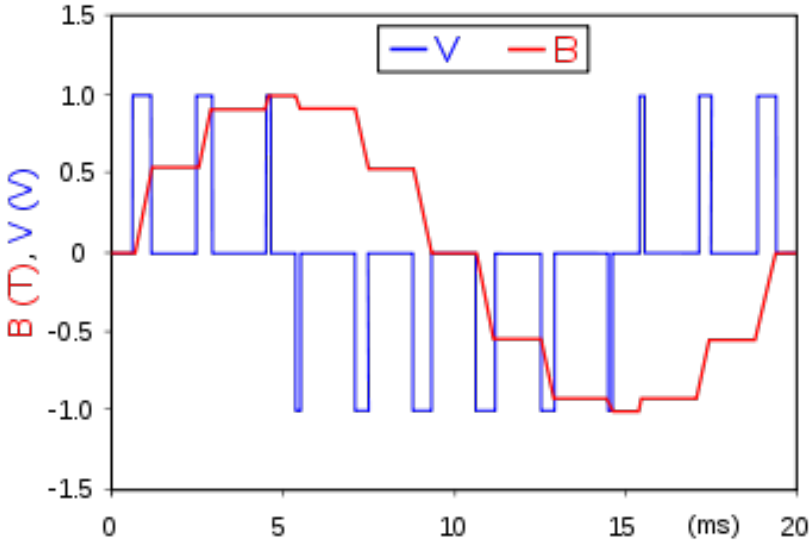


Ex 6 : Blink commande des led numérique



Changer le delay et voir le résultat !

Commande des leds par PWM



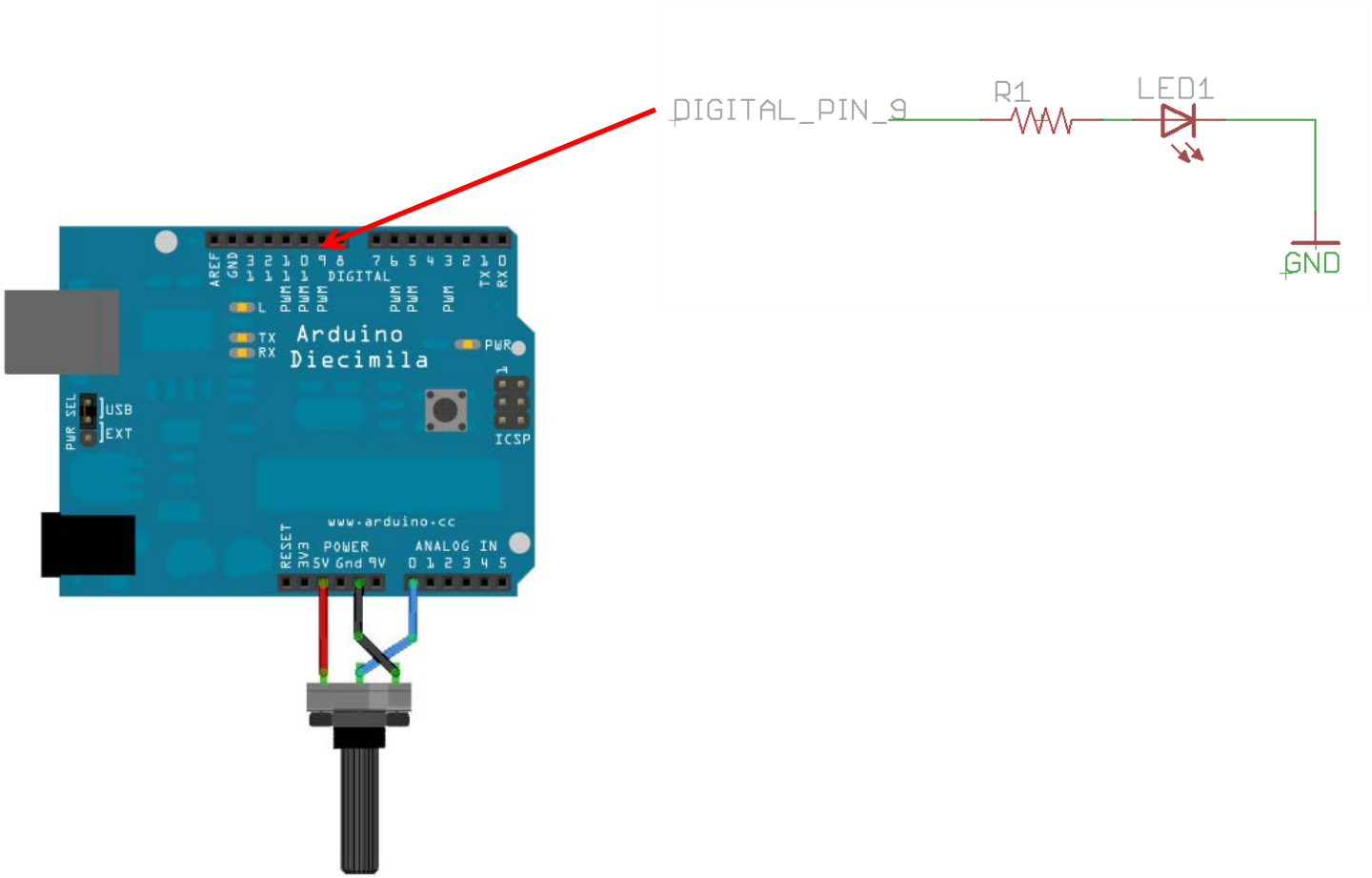
Ex 7: Commande des leds par PWM

Dans le code du blink changer le digitalwrite par :

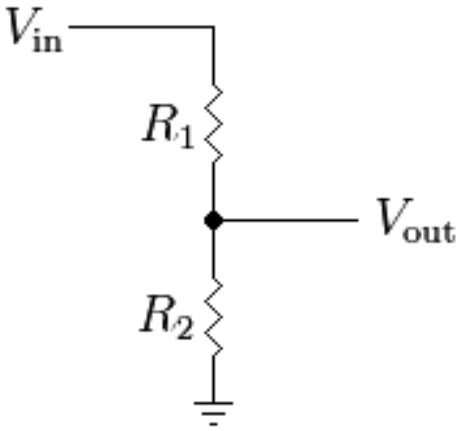
analogWrite(led, brightness);

Et comprendre comment cela peut marcher

Ex 8: Commande des leds par PWM et potentiometre



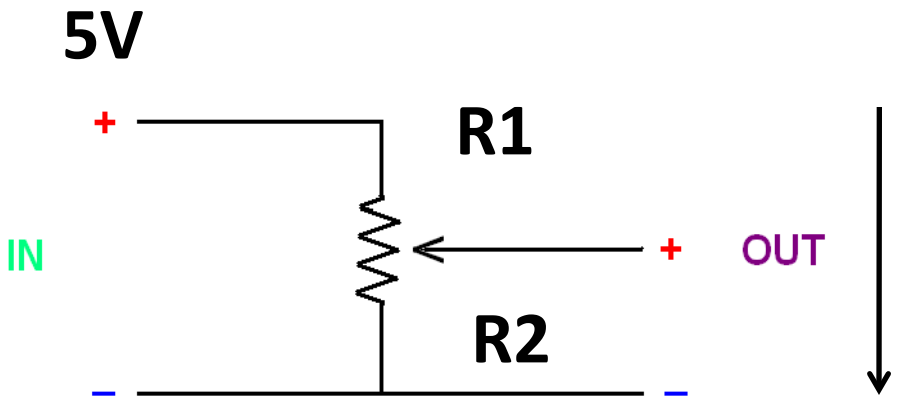
Pont diviseur de tension



$$V_{out} = \frac{R_2}{R_1 + R_2} \cdot V_{in}$$

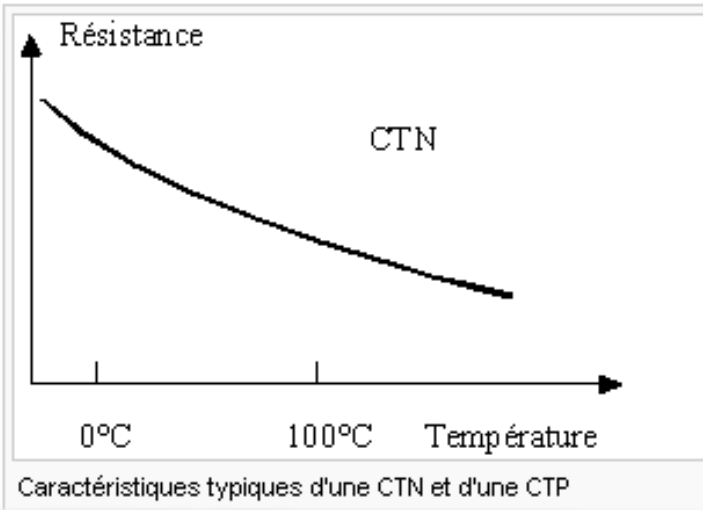
Ex R1=R2 = 5k = 5000

Vout= (5000/10000) * 5 = 2.5



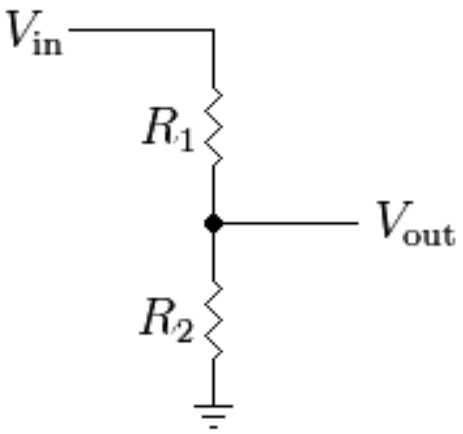
0-10k

Ex 9 : Application thermistor



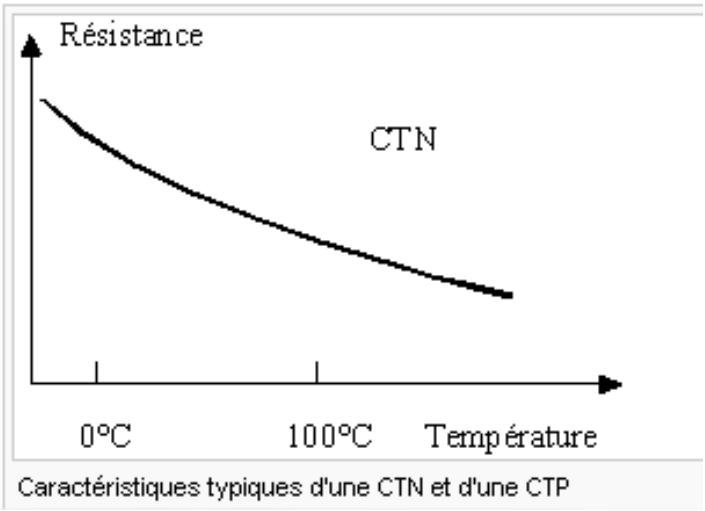
Caractéristiques typiques d'une CTN et d'une CTP

Rt= 100k @25°C



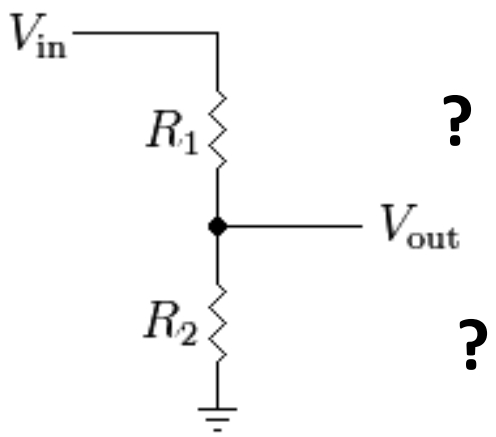
Coefficient thermique = -4.57%/°C

Ex 9 : Application thermistor



Caractéristiques typiques d'une CTN et d'une CTP

Rt= 100k @25°C



?

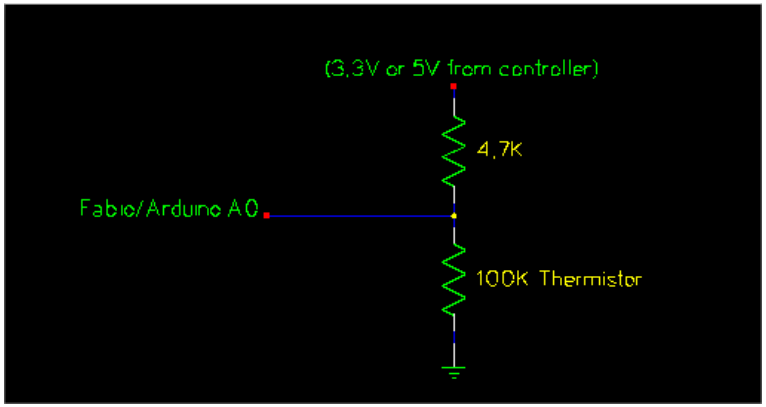
?

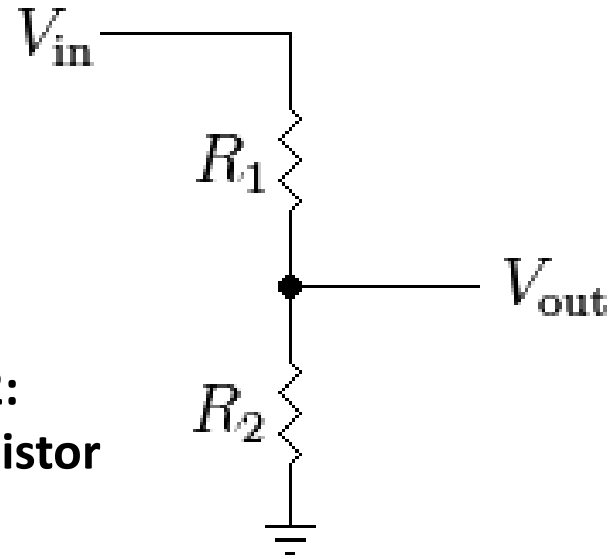
Q1 : Rt R1 ou R2 ?

Q2 : valeur approximative autre résistance ?

Q3: deviner la temperature actuelle/sensibilité ?

Ex 10 : Application thermistor correction





R2: thermistor

$$V_{out} = \frac{R_2}{R_1 + R_2} \cdot V_{in}$$

Thermistor 100K = 100Kohm@25°C

Vout= (100k/104.7k)5= 4.75V= 989@25°C

Arduino ADC: 5V=1024 -> 0.0488 V/step

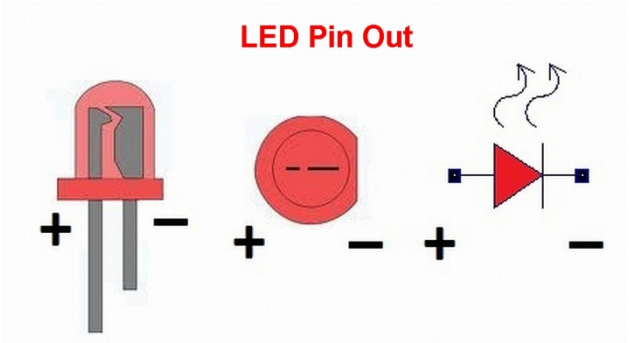
Value A0 *0.0048 =voltage
-4.57% de 100kohm/°C=-4.57k Ohm/°C

26°C = 100k – 4.57k = 95.43 = (95430/100 130)*5=4.76V= 992

Ex 11 : Application 2 IR phototransistor + IR emitter

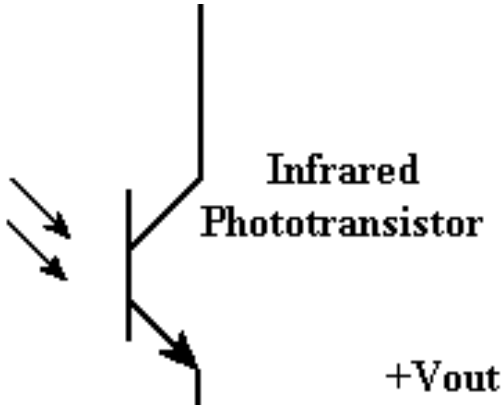
Point jaune : IR led
Point rouge : IR phototransistor

Polarité comme les leds



IR led : comme led (voir datasheet fournie)

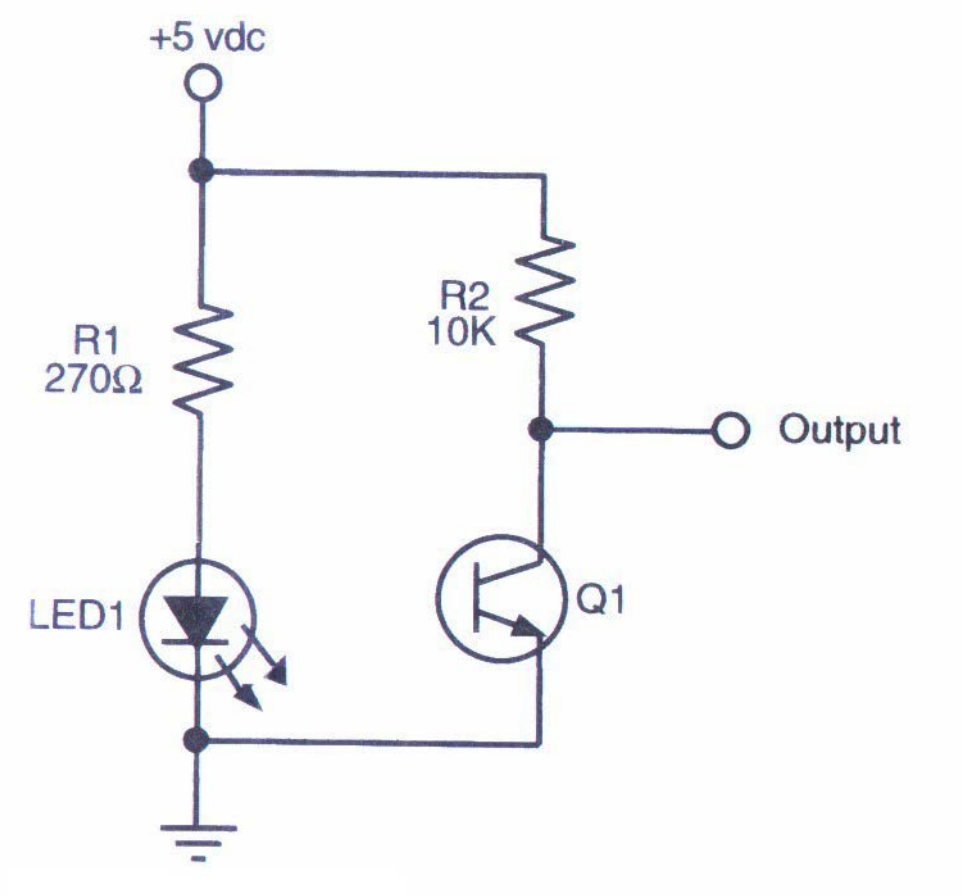
IR phototransitor

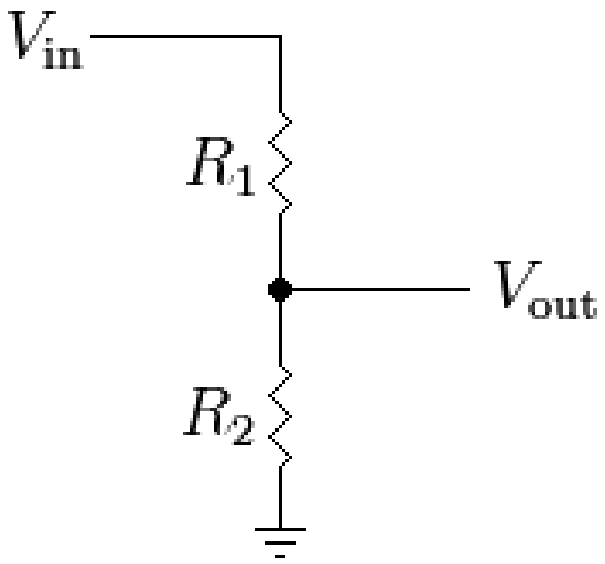


Q1 : schéma phototransistor

Q2 : resistance pour ir led ?

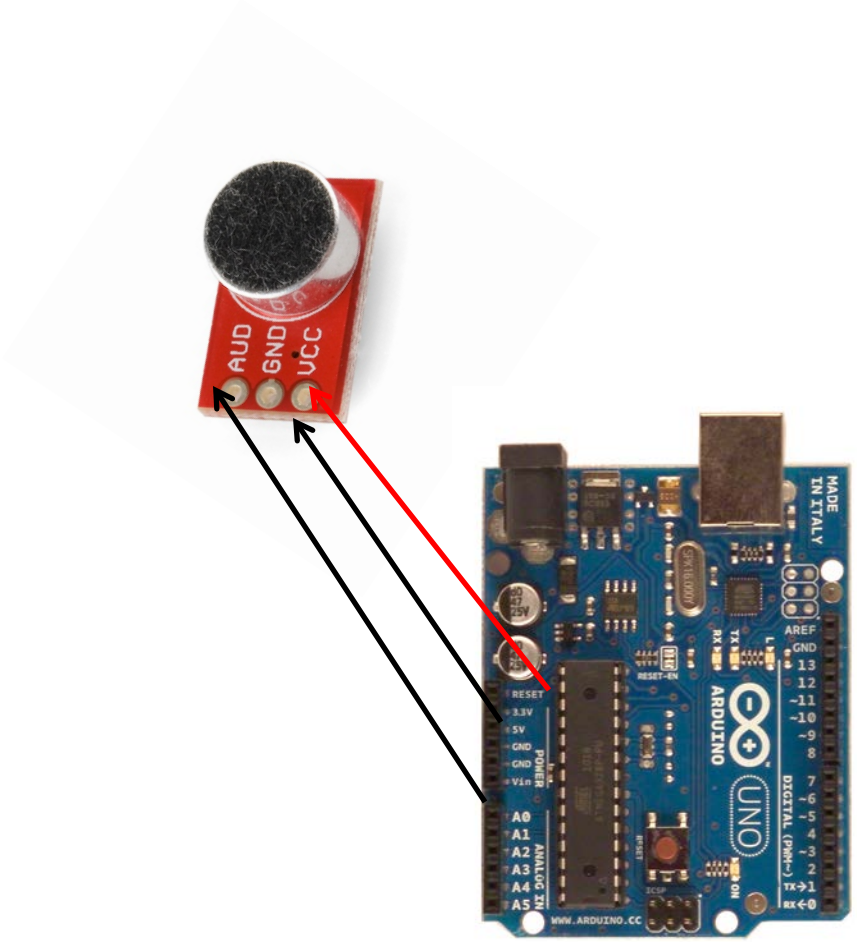
Ex 11 : Application 2 IR phototransistor + IR emitter - correction





Part 2- Montage du device

Microphone



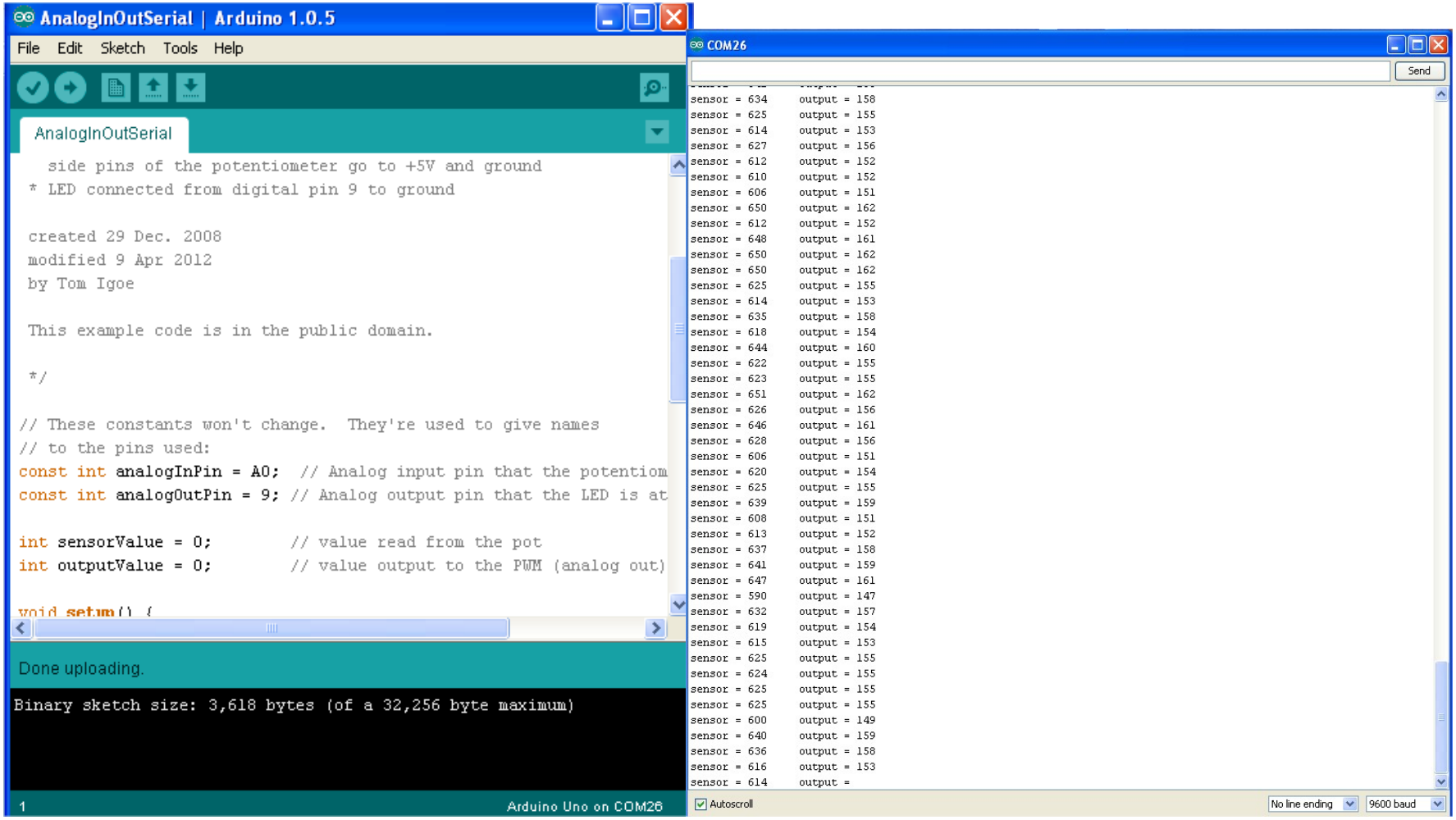
Vcc : arduino 5V

GND : GND

AUD : analog pin 0

Souder 3 fils !

Arduino code potentiometer

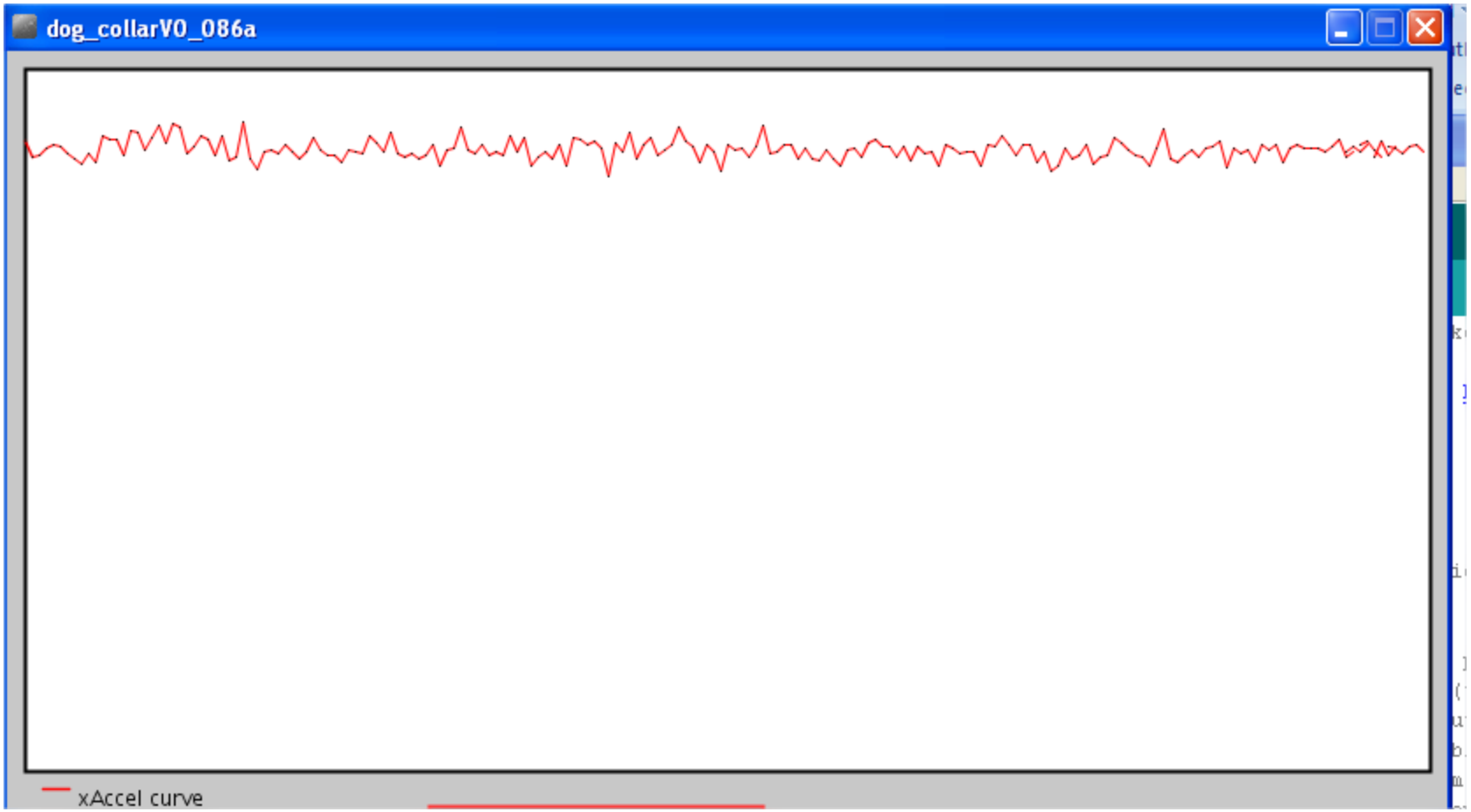


Reflechir au sampling rate et à la taille mémoire occupée

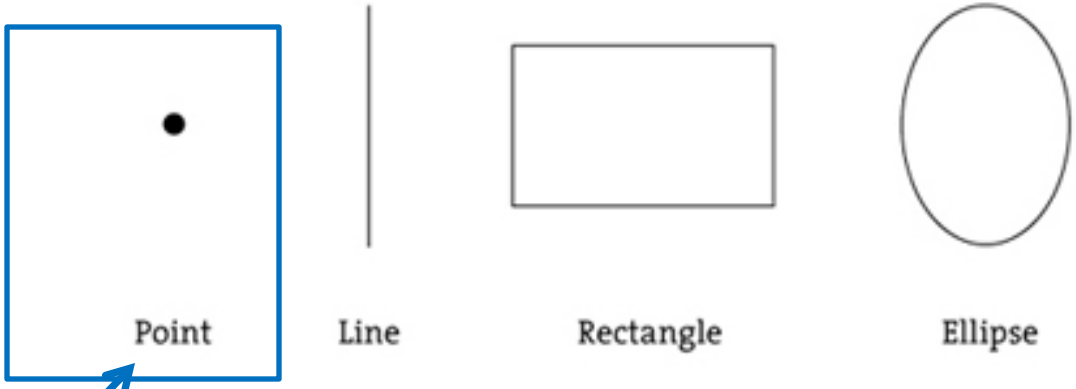
```
unsigned long time0 =0;
unsigned long time1 =0;

time0=time1;
time1=micros();
Serial.println(time1-time0);
```

Code processing oscillocope ?

Int[] dataX;



Rappel processing : shapes

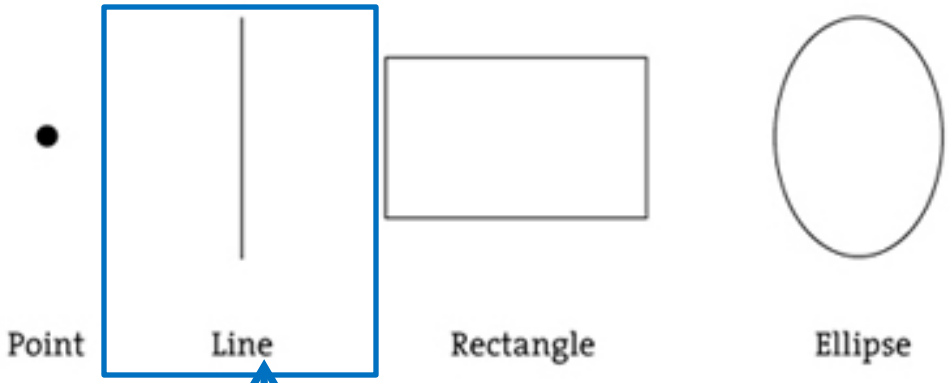


point(x,y) ;

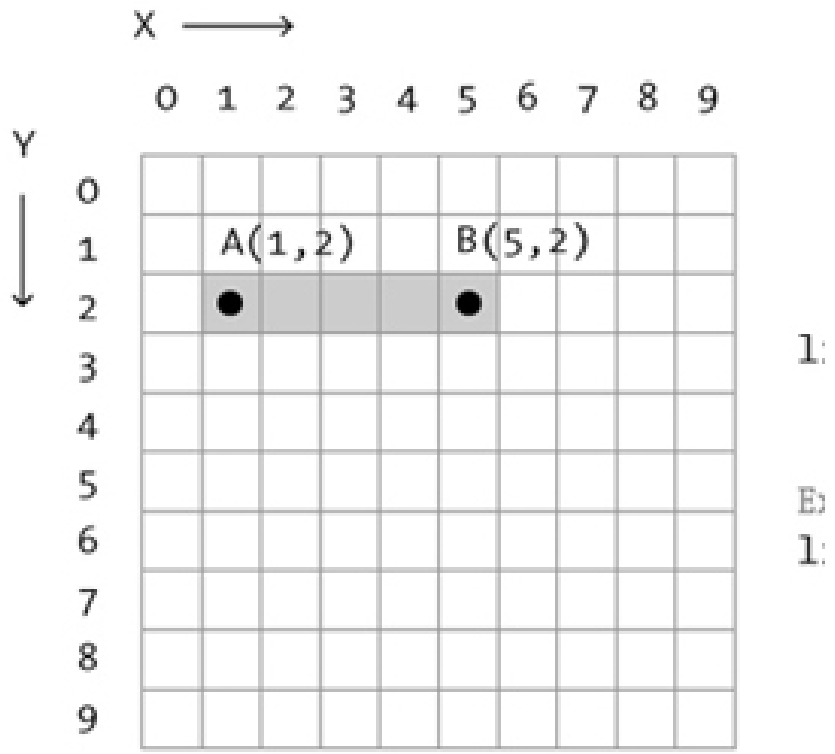
=> 1 point = 1 pixel =

très petit

Rappel processing : shapes



line(xa,ya,xb,yb) ;

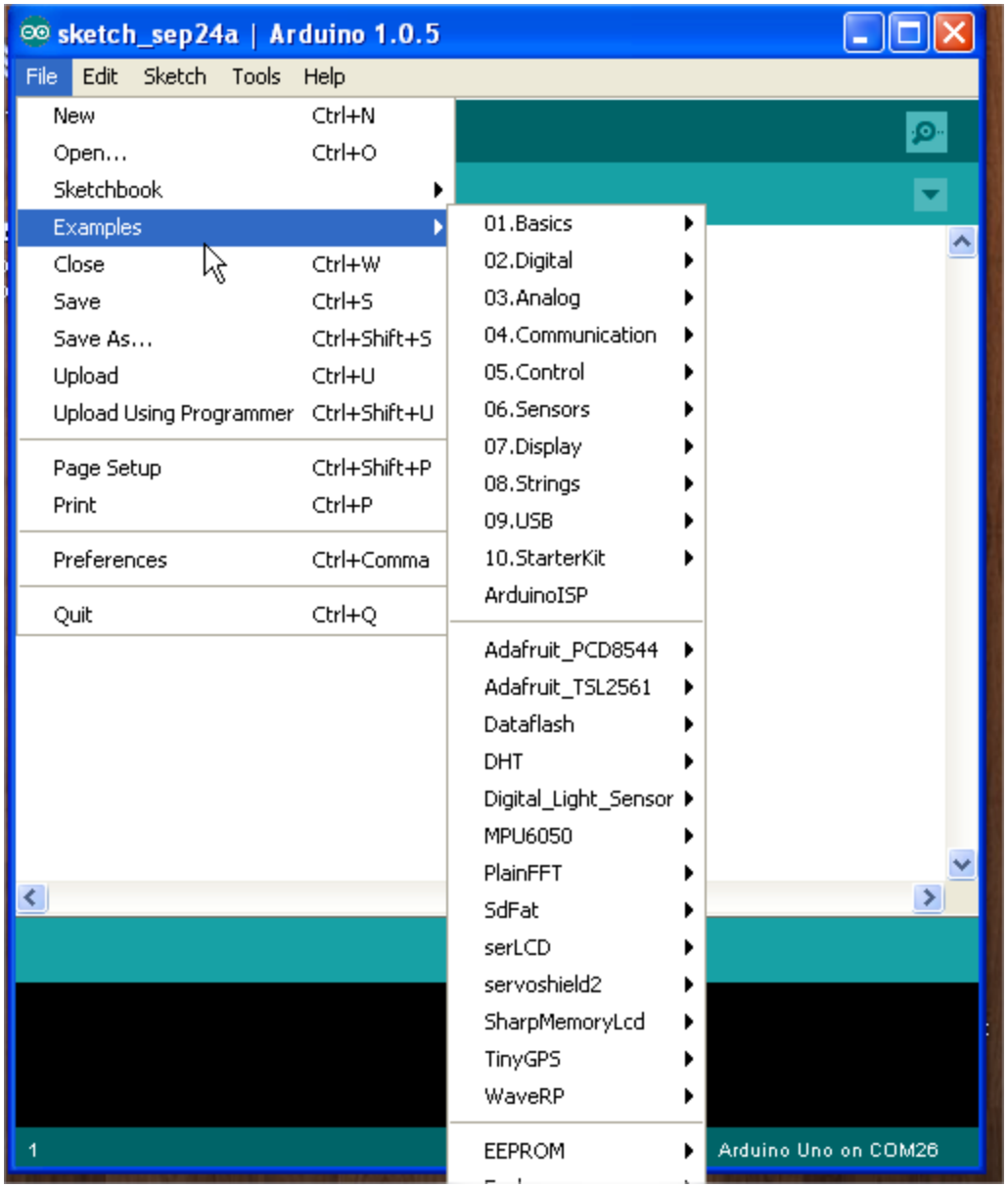


Installer le shield carte SD

Installer les librairies arduino pour enregistrer des wave

Copier le contenu de
day2->arduino_libraries
Dans
Arduino-> sketchbook -> libraries

Si bonne installation on devrait voir dans
la liste d'example Sdfat et waveRP


sketch_sep24a | Arduino 1.0.5
File
Edit
Sketch
Tools
Help
New Ctrl+N
Open... Ctrl+O
Sketchbook
Examples
Close Ctrl+W
Save Ctrl+S
Save As... Ctrl+Shift+S
Upload Ctrl+U
Upload Using Programmer Ctrl+Shift+U
Page Setup Ctrl+Shift+P
Print Ctrl+P
Preferences Ctrl+Comma
Quit Ctrl+Q
01.Basics
02.Digital
03.Analog
04.Communication
05.Control
06.Sensors
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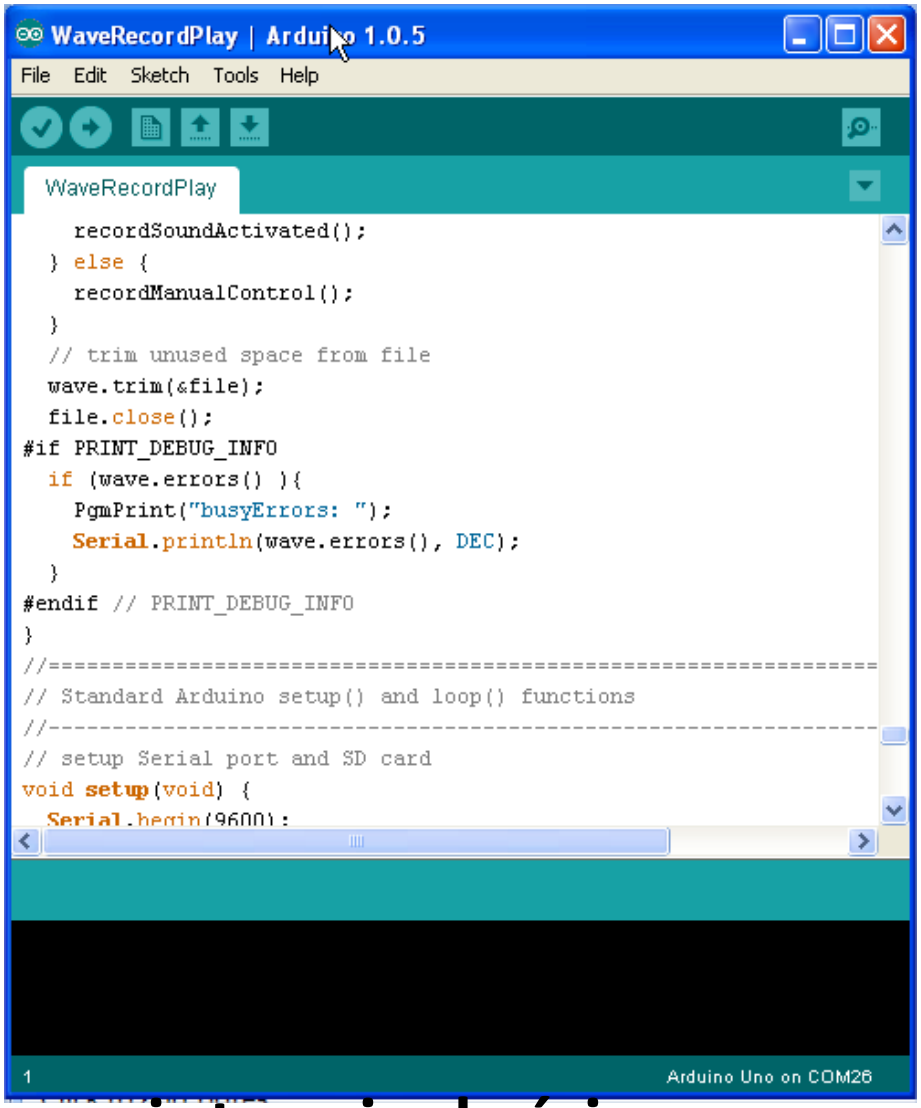
08.Strings
09.USB
10.StarterKit
ArduinoISP
Adafruit_PCD8544
Adafruit_TSL2561
Dataflash
DHT
Digital_Light_Sensor
MPU6050
PlainFFT
SdFat
serLCD
servoshield2
SharpMemoryLcd
TinyGPS
WaveRP
EEPROM
1
Arduino Uno on COM26

Arduino -> example -> waveRP -> waverecorPlay



Upload -> ouvrir terminal série

a : liste des commandes

r : record

p : play (mais ne marchera pas car il n'y a pas de spaeaker branché)