

ELECTRONICS 1

ELECTRONICS FOR INTERACTIVE MEDIA DESIGN

EMMA PARESCHI

ABOUT ME

Emma Pareschi

- 34, from Italy, in Amsterdam
- bachelor: Physics
- master: Electronics (Physics)
- I worked for Infineon
 - IC analog design engineer
- I work for Waag Society:
 - hardware developer
 - instructor and teacher



Waag Society

- Institute for Art, Science & Technology
- Since 1994, 63 Staff, based in Amsterdam
- Exploring emergent technologies & opening them up
- Three labs:
 - Fablab Amsterdam
 - WetLab
 - TextileLab Amsterdam



Fablab Amsterdam



WOO-Jungle

Multi-sensor wooden toy for everyone

Erinna Parasci
FabLab Amsterdam



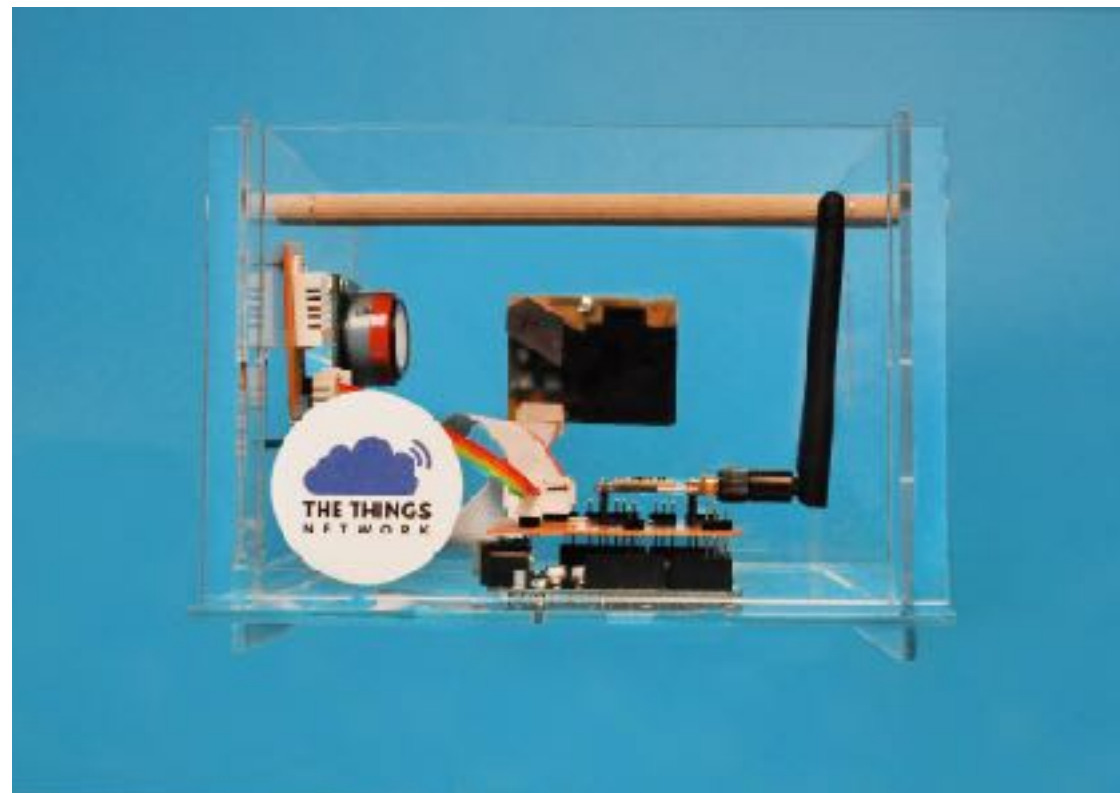
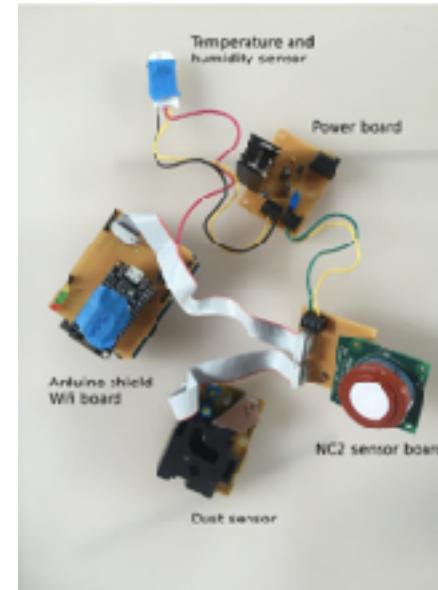
- The WOO Jungles toy and:
- is made of:
- responds with an LED and infrared light
- is sensitive to motion and responds to sound



The identification of the animal happens through the reaction inside the display with the motion sensor. It is supported by a motion sensor.



- The body is made out of wood
- is made of:
- The body is made out of wood
- is made of:
- The body is made out of wood
- is made of:
- The body is made out of wood
- is made of:



THE MOST NATURAL INTERACTIVE SYSTEM

Human Body



INTERACTIVE MEDIA PROJECT

Three Elements

Input

Sensors

Devices that detect and respond to some type of input from the physical environment.

Electronic Brain

Computer

A programmed system that manages input and output.

Output

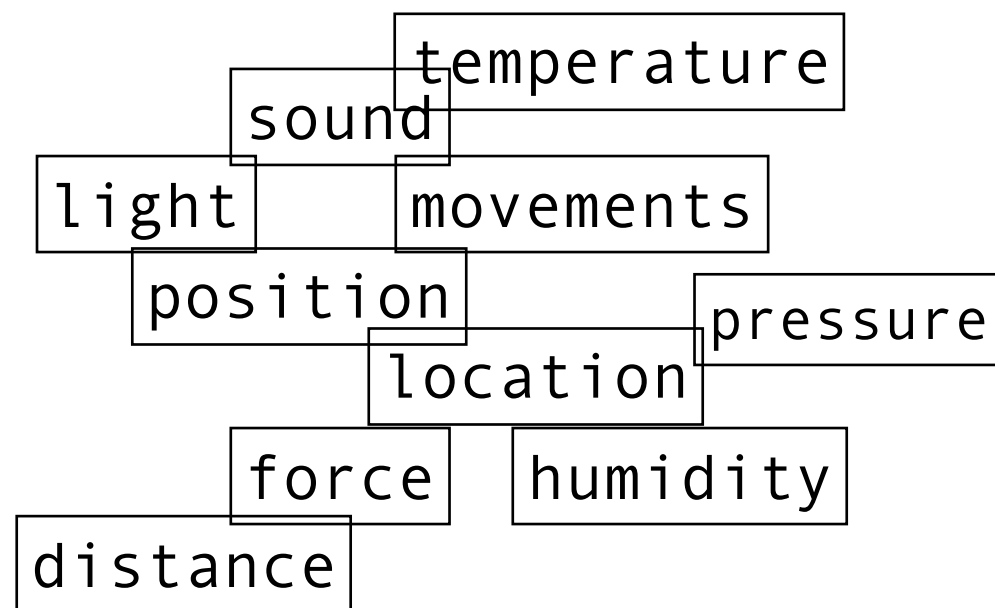
Actuators

Devices that are responsible for moving or controlling a mechanism or system.

INPUT DEVICE

It is a device able to detect and measure physical or chemical magnitudes and transform it into electrical signal.

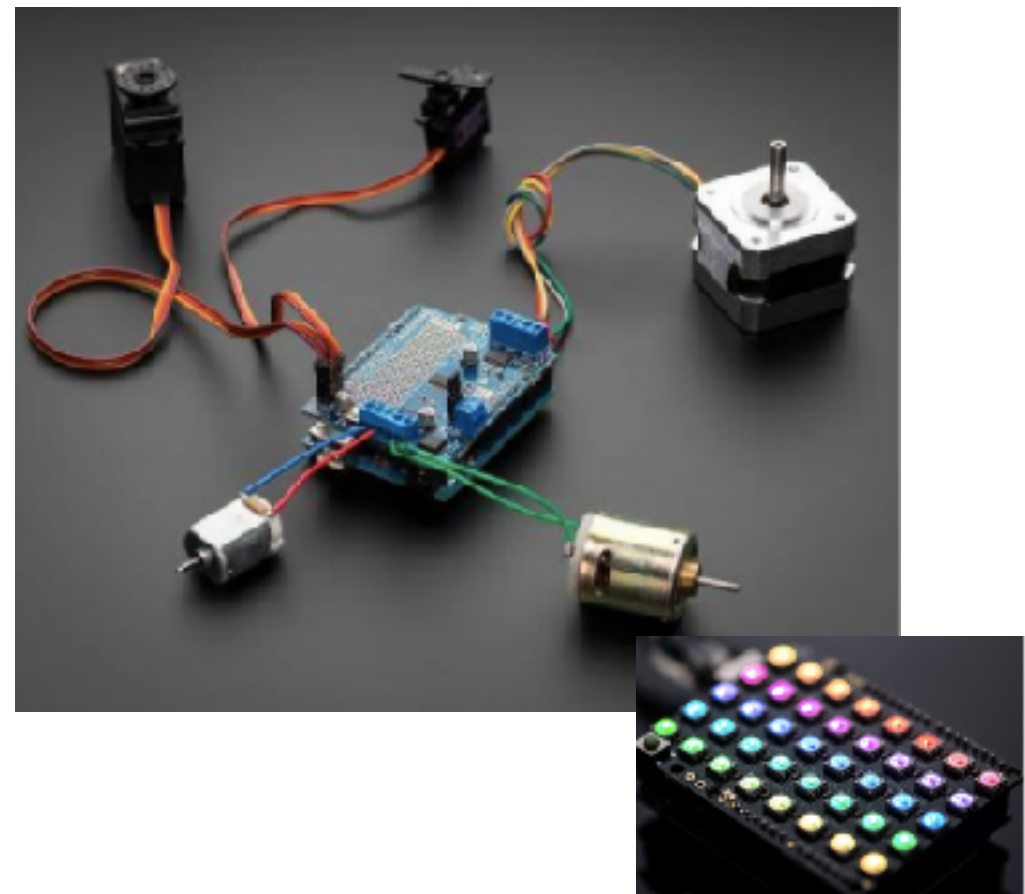
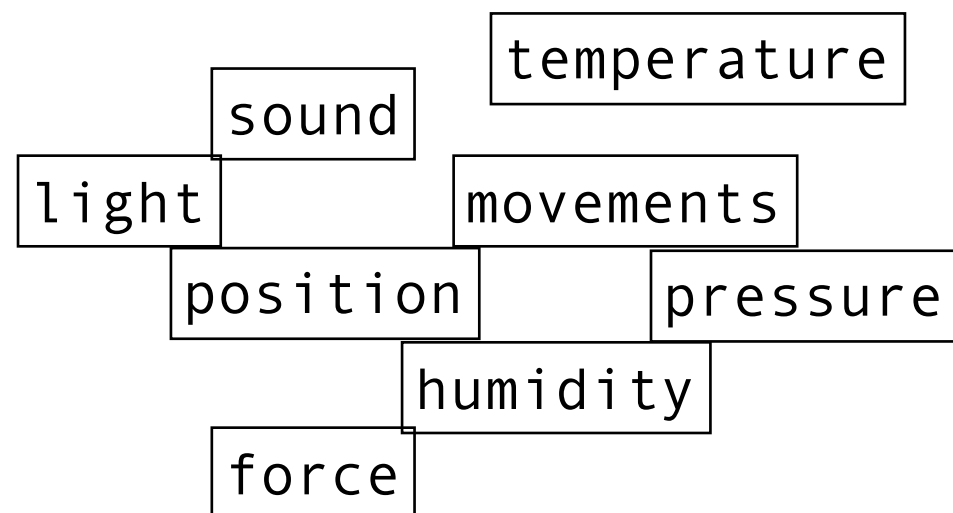
it collects information from the environment where it is included.



OUTPUT DEVICE

It is a device able to convert electrical, hydraulic or mechanical energy to generate an effect, an action.

It changes physically the surrounding space.



ELECTRONIC BRAIN

What it does:

- collect data from the input
- analyse data
- send the control command to the output

The most popular hardware platform are:



Microprocessor
(Raspberry Pi)

It's a real computer, you can connect keyboard, screen, mouse, install an operating system (Linux).



Microcontroller
(Arduino)

It is used to read sensors, analyse data and send command to an output device.

INTERACTIVE



<http://vtol.cc/filter/works/motorgan>

INTERACTIVE



<https://www.youtube.com/watch?v=3vAqv2la84w>

INTERACTIVE



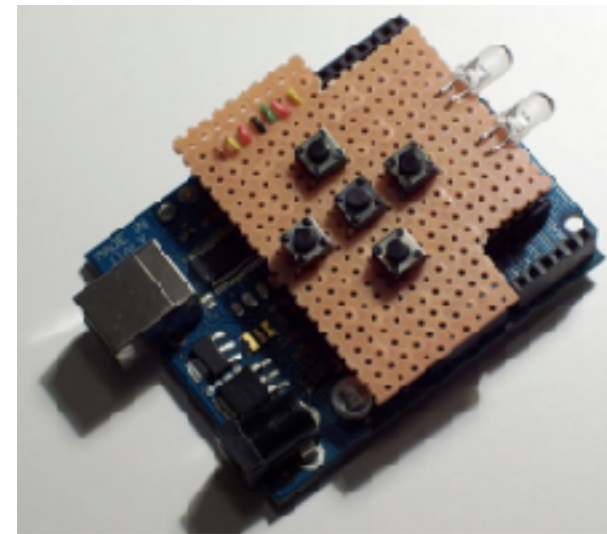
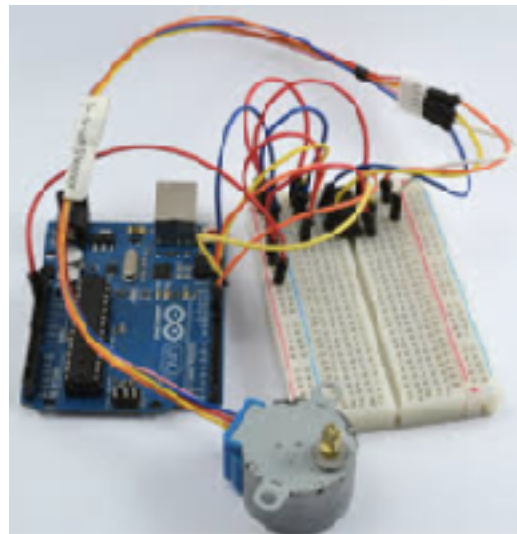
<http://treewifi.org/>

INTERACTIVE MEDIA PROJECT

Input

Electronic Brain

Output



WEEKLY ASSIGNMENTS

- Open a blog
 - A post where you introduce yourself (picture)
 - example of interactive systems and explain how it works
 - for second year class: a post to describe interactive media projects of your first year
- Send to me (emma@waag.org) your blog address

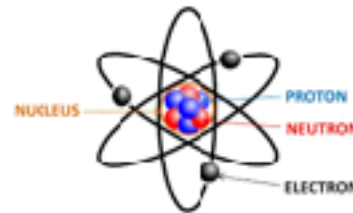
Blog

- Tumblr
- Wordpress

CIRCUIT

What is a circuit?

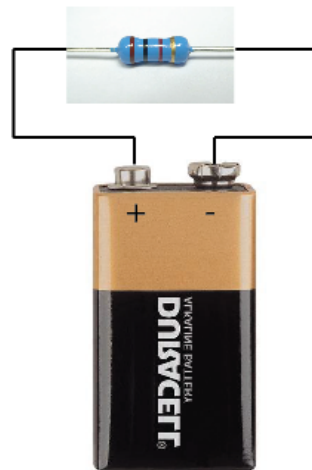
It's a CLOSE LOOP that electrons can travel in.



Electrons flow = Current

How can I generate a current?

The simplest circuit is
POWER SUPPLY + RESISTOR



POWER SUPPLY

The Power Supply is the device that generates the electric field that allows the flow of the electrons .

It always has two sides:

-> plus: VCC, V+, +V

-> minus: GND

Unit of measure: Volt (V).

VOLTAGE: IT'S THE
DIFFERENCE
BETWEEN TWO POINTS



POWER SUPPLY

Low Voltage - Low Current

Alkaline



Lithium Ion Polymer
(Rechargeable)



High Voltage - High Current

Adapter



Switching
Power Supply



Desktop Power Supply
(laboratory)

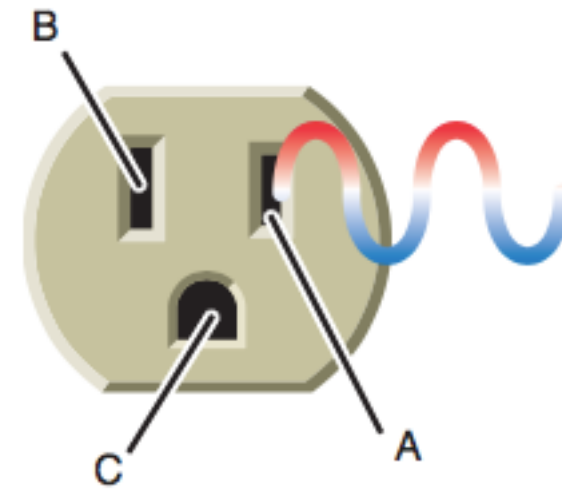


POWER SUPPLY - DC vs AC

Direct Current



Alternating Current



HOW TO MEASURE VOLTAGE

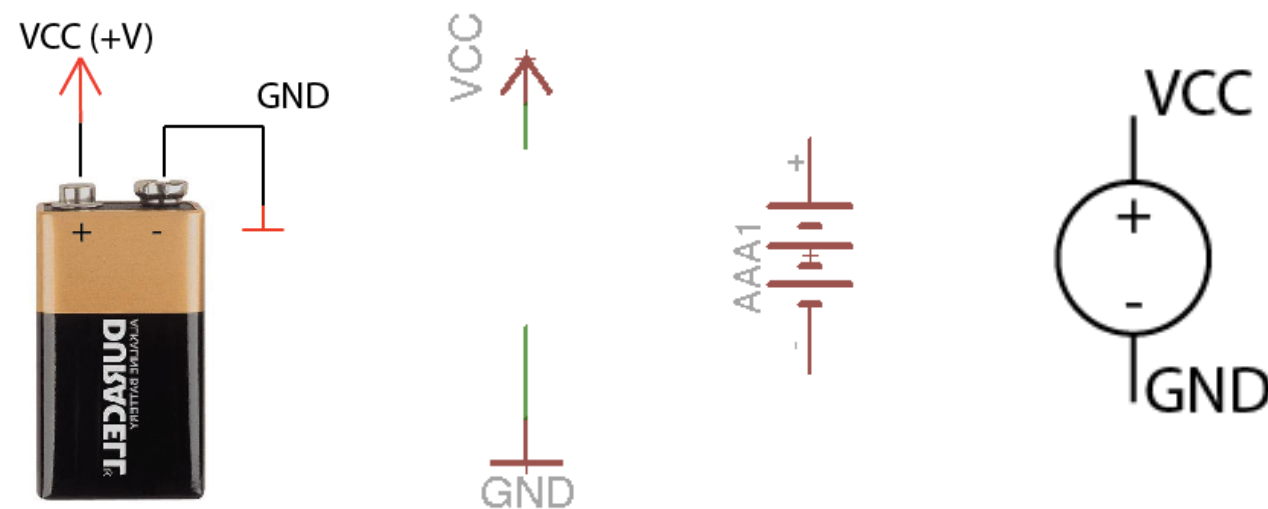
Your best friend in the electronic lab is
THE MULTIMETER



Let measure the voltage of your battery and adapters.

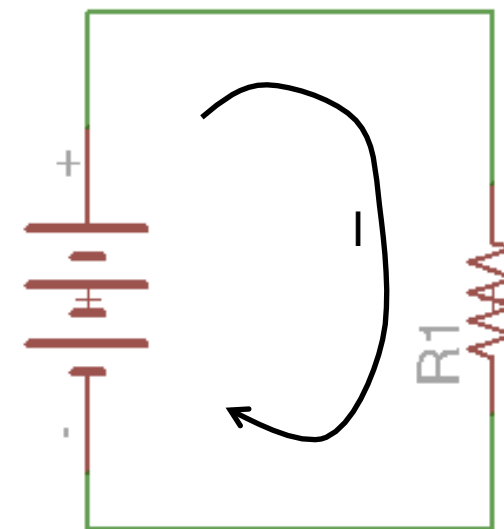
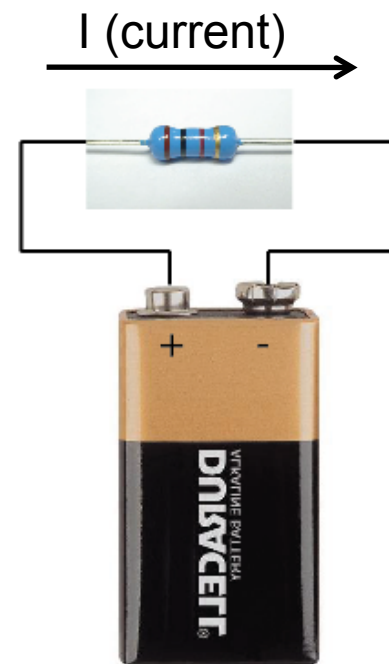
POWER SUPPLY - SCHEMATIC

A schematic, or schematic diagram, is a representation of the elements of a system using abstract, graphic symbols rather than realistic pictures.



Schematic representation

THE SIMPLEST CIRCUIT - SCHEMATIC



Voltage: is the difference in charge between two points.

Current: is the rate at which charge is flowing.

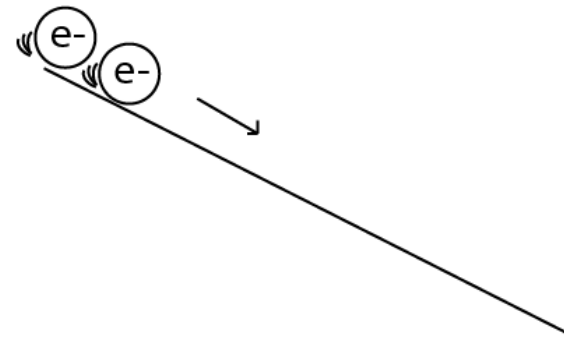
Resistance: is a material's tendency to resist the flow of charge (current).

CURRENT

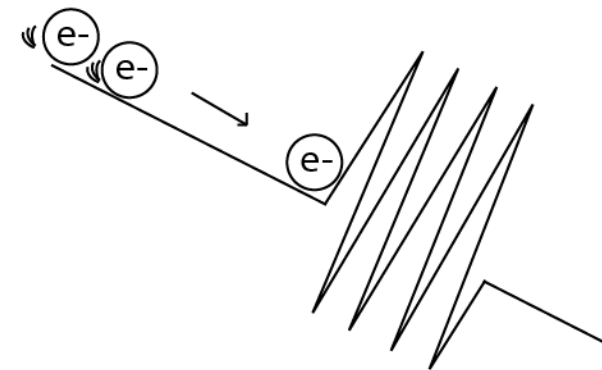
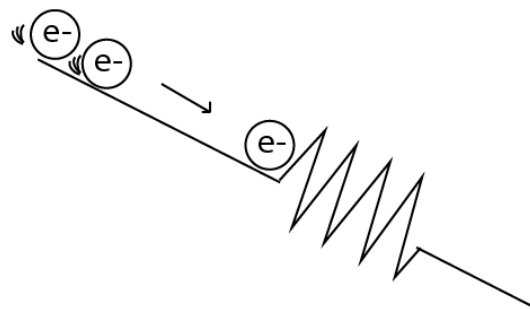
1) NO SLOPE = NO MOTION



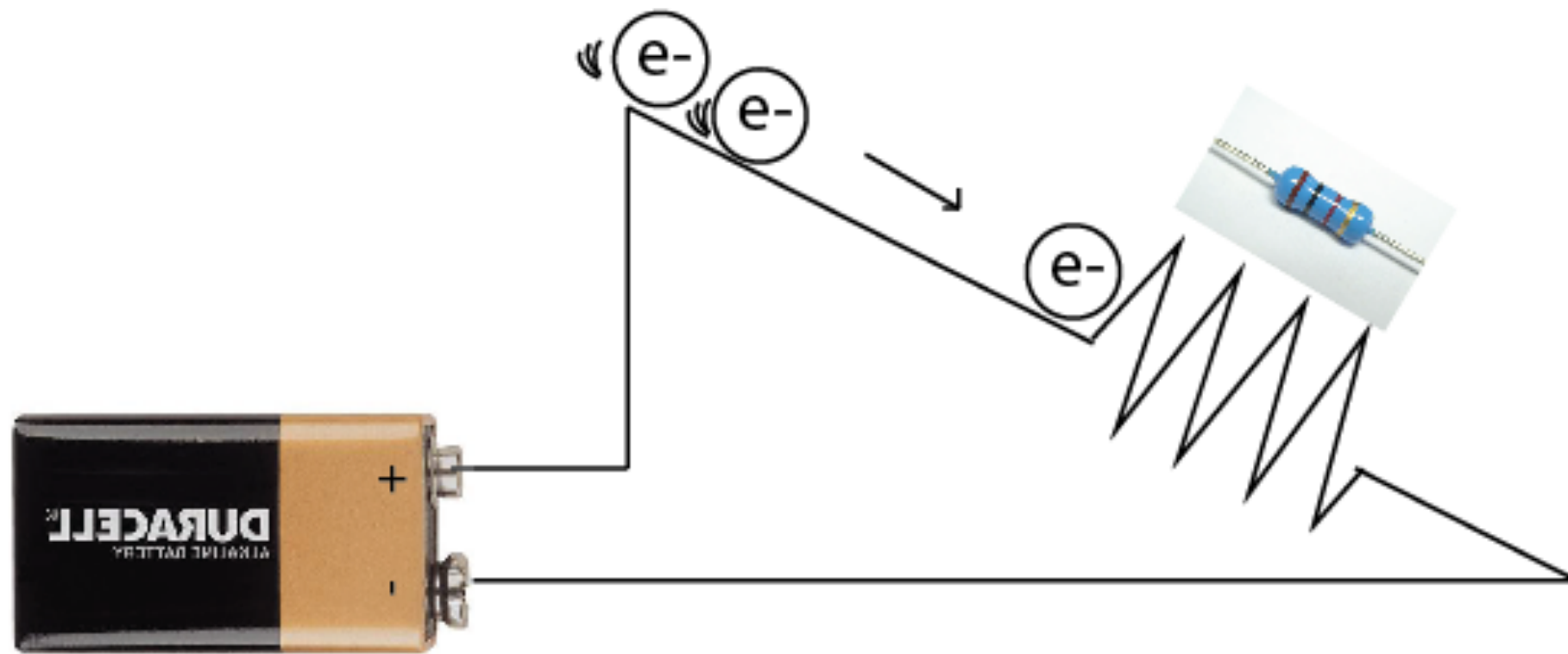
2) SLOPE = MOTION WITHOUT CONTROL



3) SLOPE + OBSTACLE = MOTION WITH CONTROL



THE SIMPLEST CIRCUIT



RESISTOR

It has two sides, it doesn't matter the orientation.
Unit of measure: Ohm (Ω).



Through Hole
Technology
(THT)



Surface
Mounted
Technology
(SMT or SMD)



US symbol



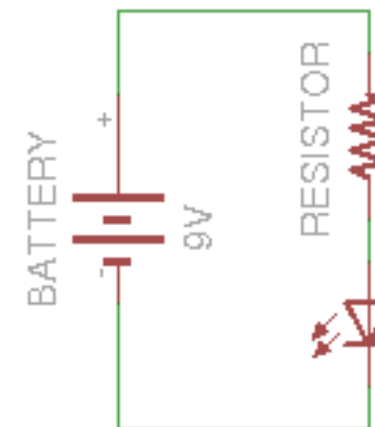
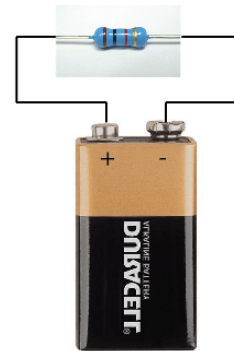
EU symbol

How To measure the resistance? With the multimeter

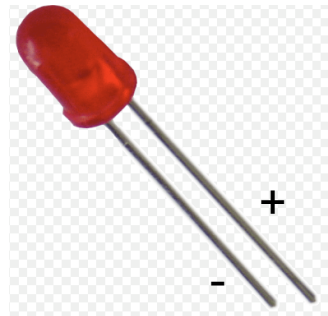


TURN ON A LED

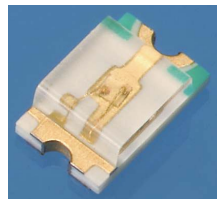
THE SIMPLEST AND
USELESS CIRCUIT



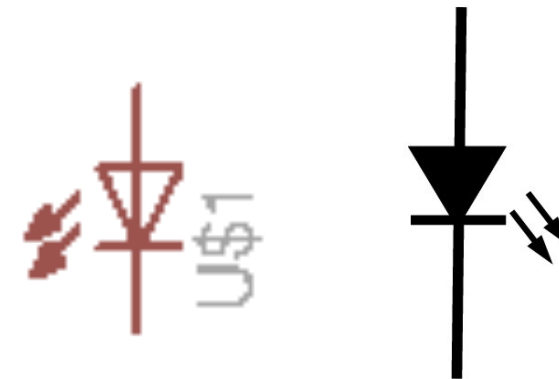
LED



Through Hole
Technology
(THT)



Surface
Mounted
Technology
(SMT or SMD)



Anode (+)



Cathode (-)

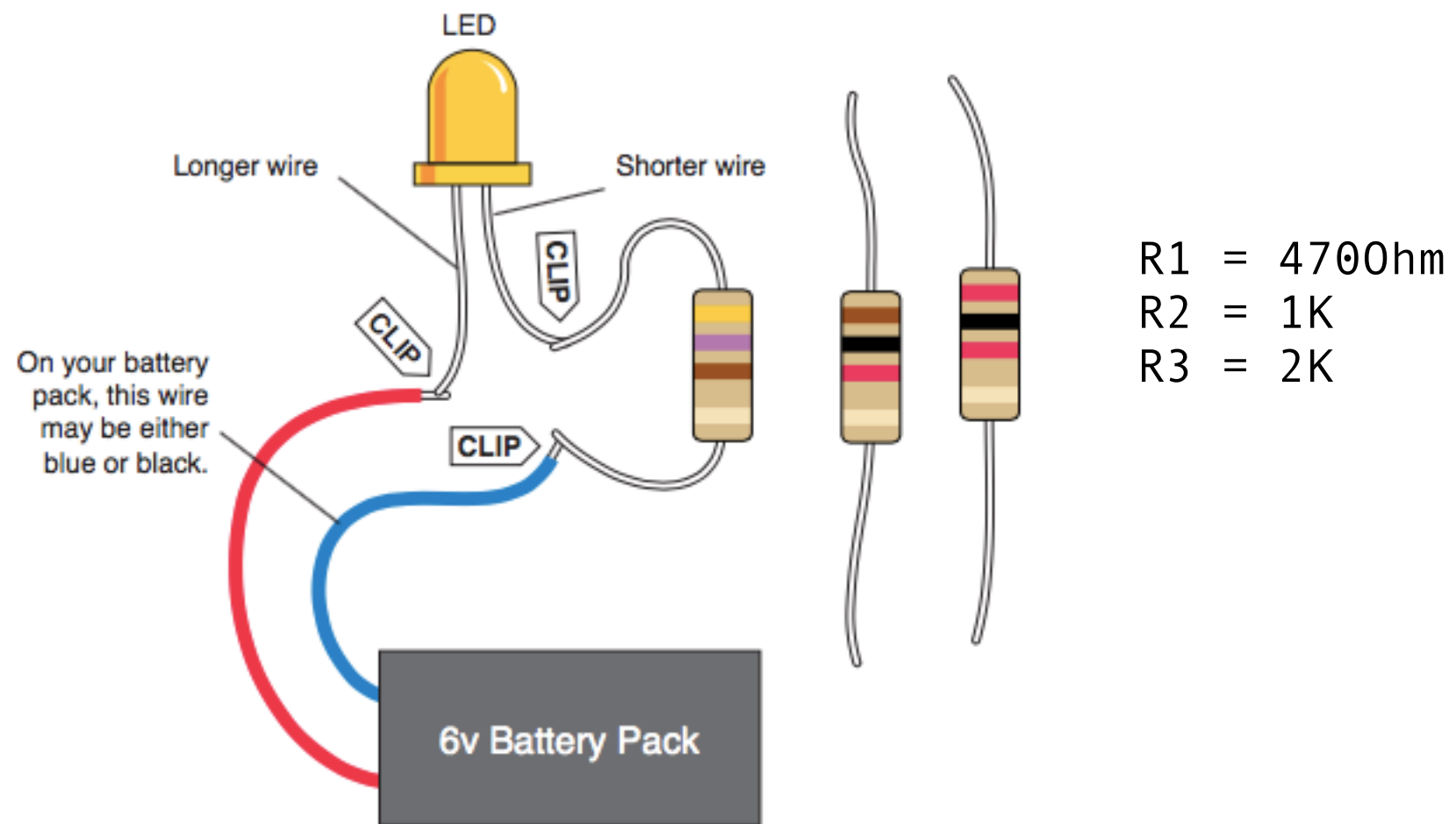
Forward Voltage (V_f)

It's the voltage at the sides of the LED when there is current through it.

Forward Current (I_f)

It's the maximum current that you fix.

TURN ON A LED

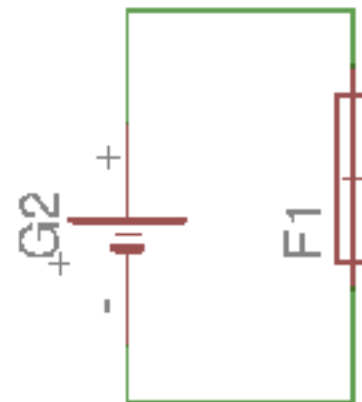


SHORT CIRCUIT

A short circuit is a direct connection between the two sides of a power source.



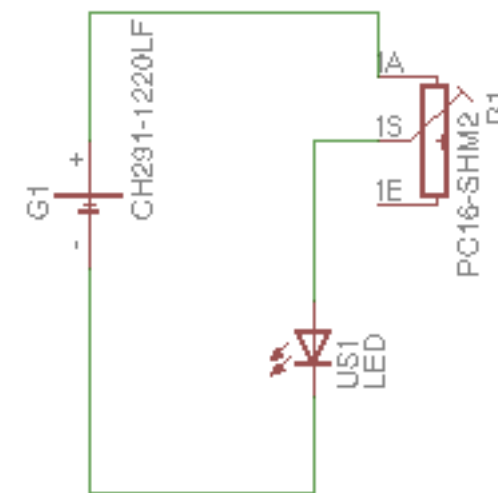
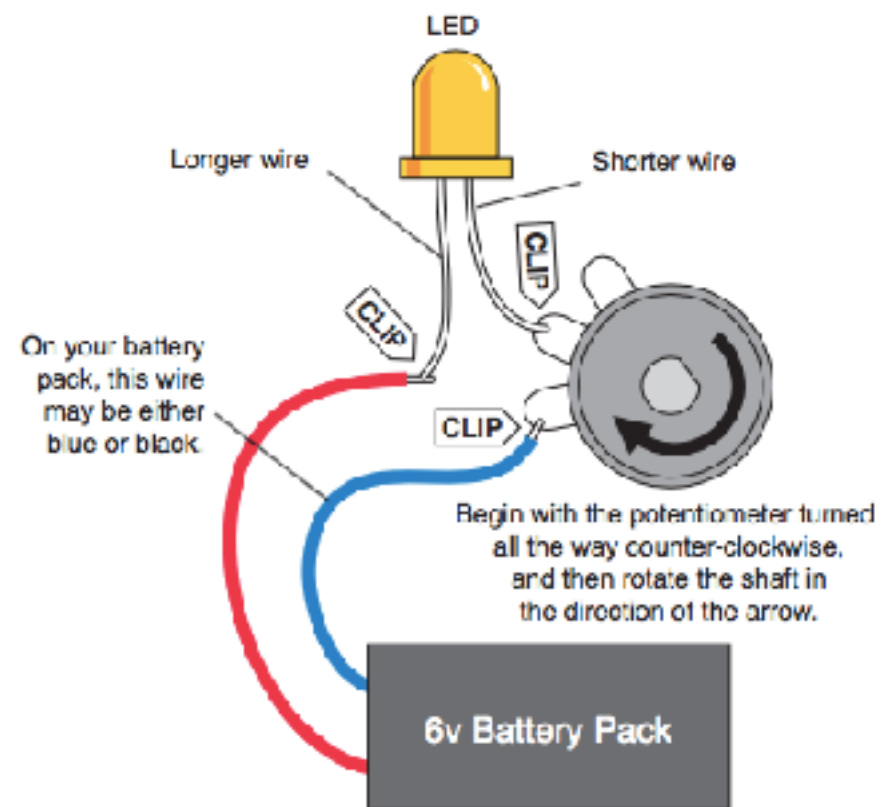
The Resistor is used to limit the amount of current, but what happens if I you create a “short circuit”? How much current flows?



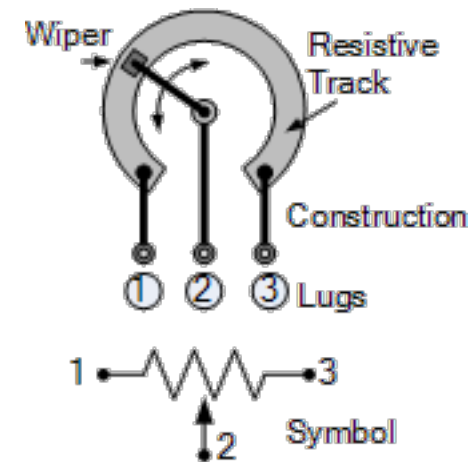
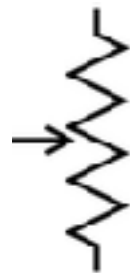
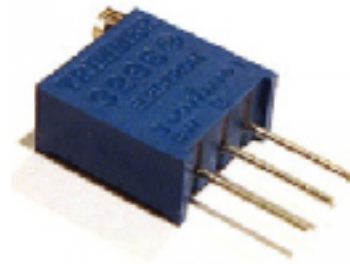
We use a 3Amp fuse to check what happens.

Shorting out an alkaline battery can be safe if you follow the directions precisely. Even so, the battery is liable to become too hot to touch comfortably. Don't try this with any type of recharge-able battery.

VARIABLE RESISTOR

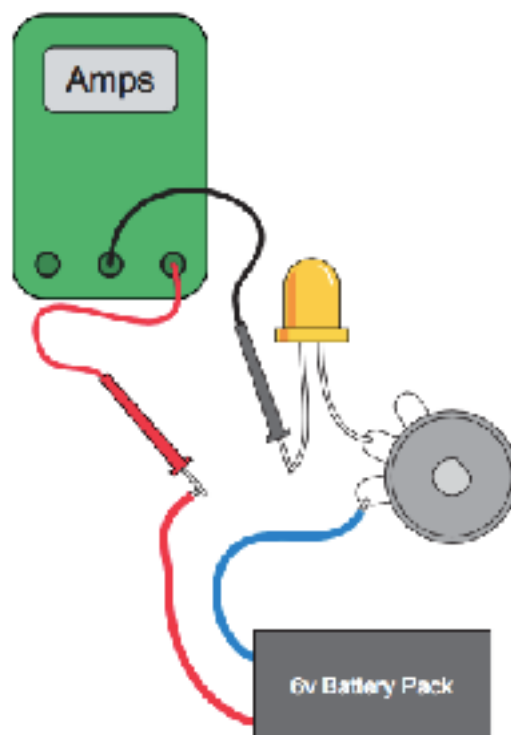


POTENTIOMETER (VARIABLE RESISTOR)



HOW TO MEASURE CURRENT

To measure amps the current has to pass through the meter. When you increase the resistance, you restrict the current flow, and the lower flow makes the LED glow less brightly.



SOURCES AND LICENCE

BOOKS

“MAKE ELECTRONICS - LEARNING THROUGH DISCOVERY”, CHARLES PLATT

ON-LINE TUTORIALS

[HTTPS://LEARN.SPARKFUN.COM/TUTORIALS/VOLTAGE-CURRENT-RESISTANCE-AND-OHMS-LAW](https://learn.sparkfun.com/tutorials/voltage-current-resistance-and-ohms-law)

LICENCE

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Prima parte (1.30h)

- Introduzione - 10min
- Interactive Media Design - 20min
- Assignment (10min)
- Blog (.30h)

Seconda parte (1.15h)

- Intro della batteria