



Having fun with a solar panel, camera and raspberry.
How with a few dollars you end making IoT!

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Agenda

- **Introduction.**
- **How it started...**
- **Next the zero + big panel in Neuchatel**
- **Looking for cheaper solution and solving problems**
- **Results the raspberry on the balcony**
- **Adding more RPI**
- **Making it objects other fun stuff**
- **Q & A**

Who I am

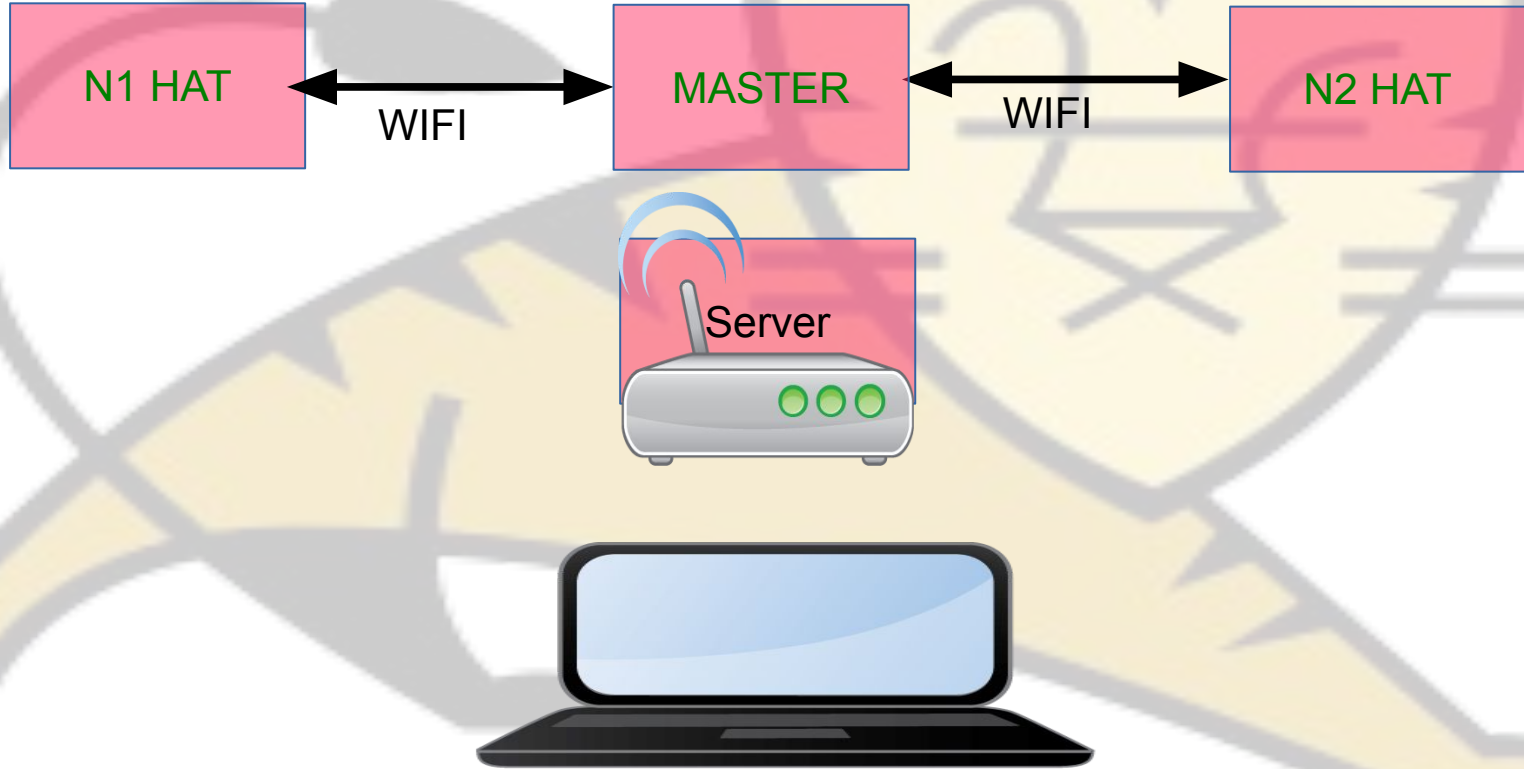
- Red Hat employee
 - www.redhat.com
- Tomcat / httpd committer
 - Tomcat.apache.org / httpd.apache.org
- In Neuchatel Office



How does it started

- . Needs of cheap cluster demos (for TomcatCon)**

Bare Metal Cloud demo

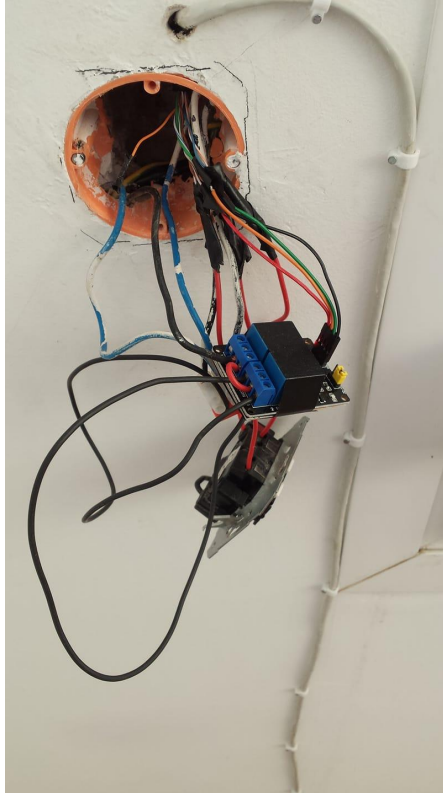
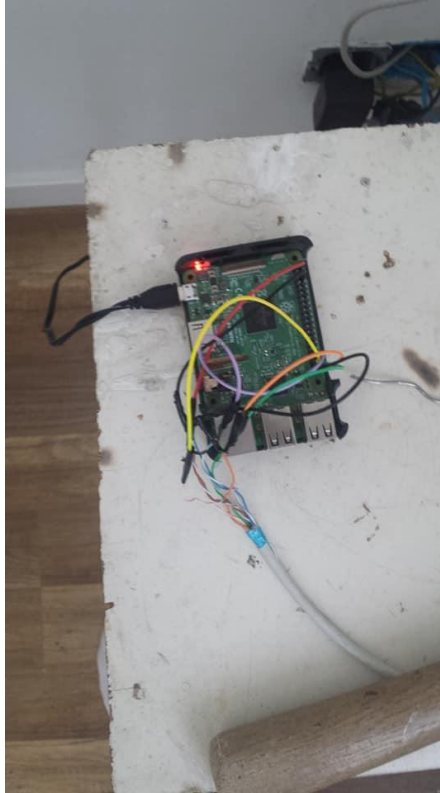


Firefox / Chrome / ansible

How does it started

- Needs of cheap cluster demos (for TomcatCon)
- New RPI4 = update the cluster.
- What with the old ones?)

What happens to the old ones...



RPI3

connected to relay board (hyperion)

connected the switch (manual comment)

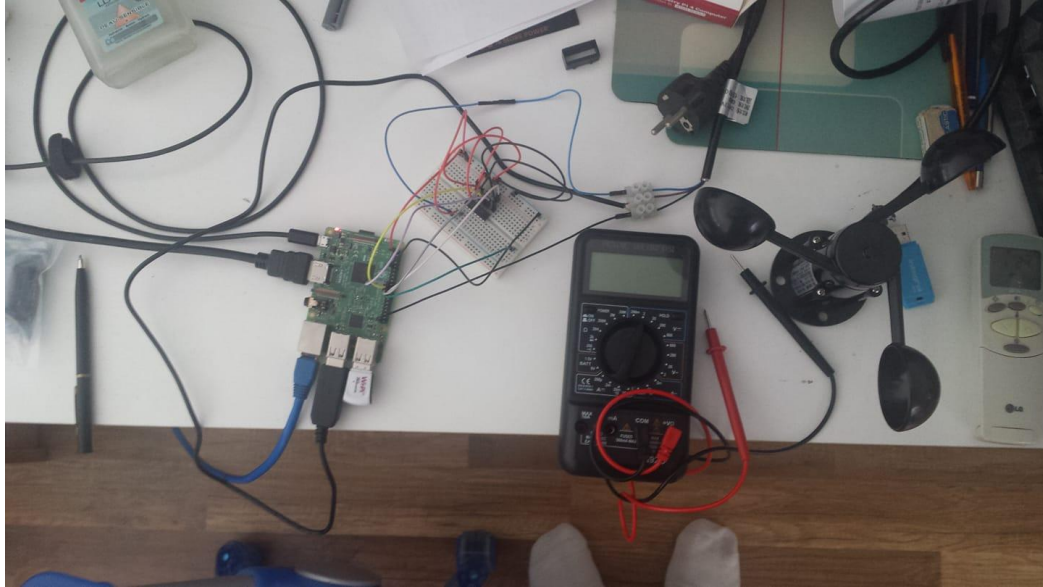
connected wifi and internet (remote control)

Using GPIO

Apache HTTPD and cgi python

<https://github.com/jfclere/door>

What happens to the old ones...



RPI3

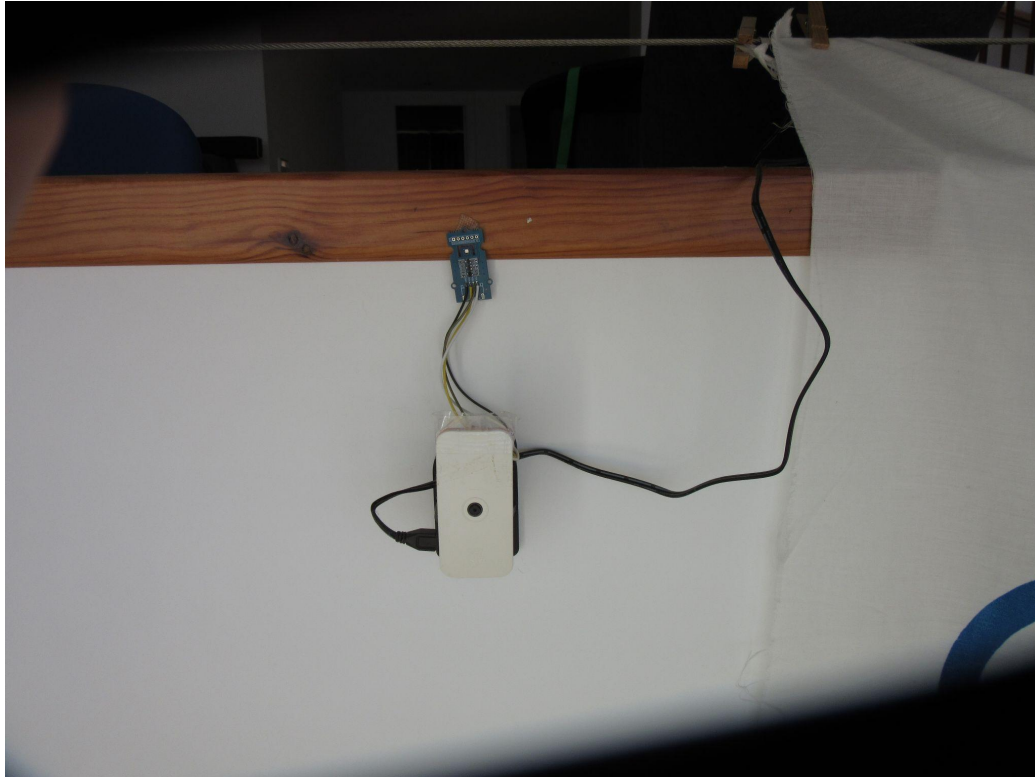
[windsensor](#) 9V power with USB
mcp3008 to convert the voltage
using SPI

Python script to read SPI and Wifi to the other
RPI3

<https://github.com/jfclere/door/blob/master/mcp3008.py>



What happens to the old ones...



RPI3 (well I changed it to a RPIzero W)
Controlled by a server ssh
Use raspberry pi v2 camera
Use BME280 I2C temp/pressure/humidity
<https://github.com/jfclere/pisolar/blob/main/bme280.py>



What happens to the old ones = avoid this!!



Going solar Try 1

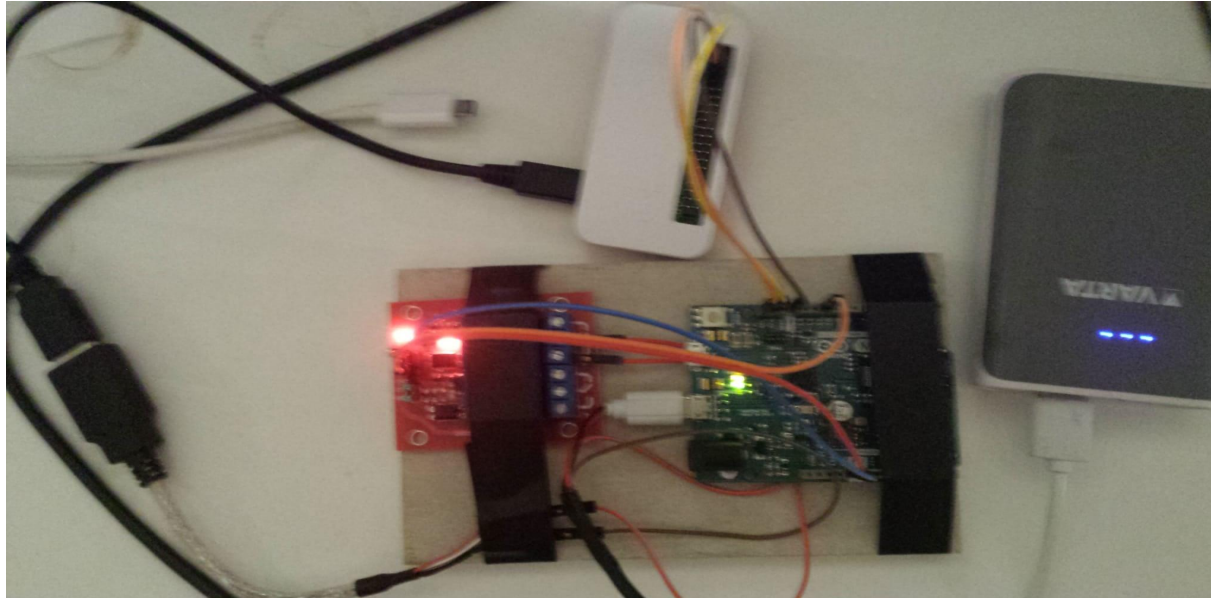
- **Pi Zero W 260mA/400mA / Camera**
- **9W panel**
- **Li-Po Rider PRO (charge and USB power)**
- **UPS Plco - LiPO Battery 8000mAh**



problems...

- **Dead after the first rainy days.**
- **Not really a few dollar project:**
 - **Solar panel : ~ 100 USD**
 - **Li-Po Rider PRO ~ 20 USD**
 - **LiPO Battery ~ 50 USD**
 - **Camera ~ 20 USD**

- Solution: Stop the RPI when needed. Try1**
- Cut the power (USB converter as off/on)**
 - Use Arduino and relay for off/on**
 - Use I2C to control the Arduino.**



Solution: Stop the RPI when needed. Try2

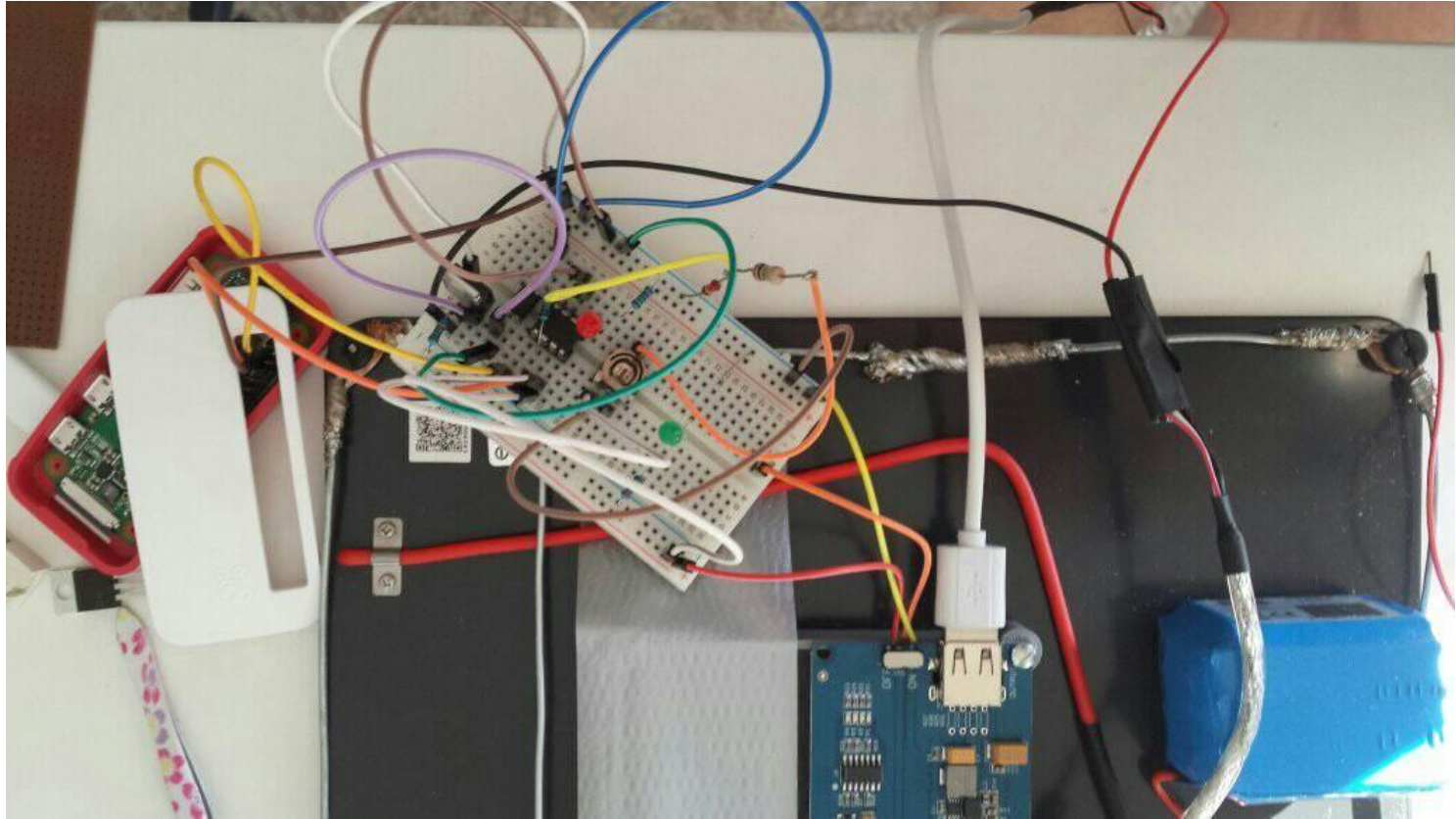
Problems of Try1:

- **Relay uses a too much energy**
- **Arduino doesn't work with 3.7V**

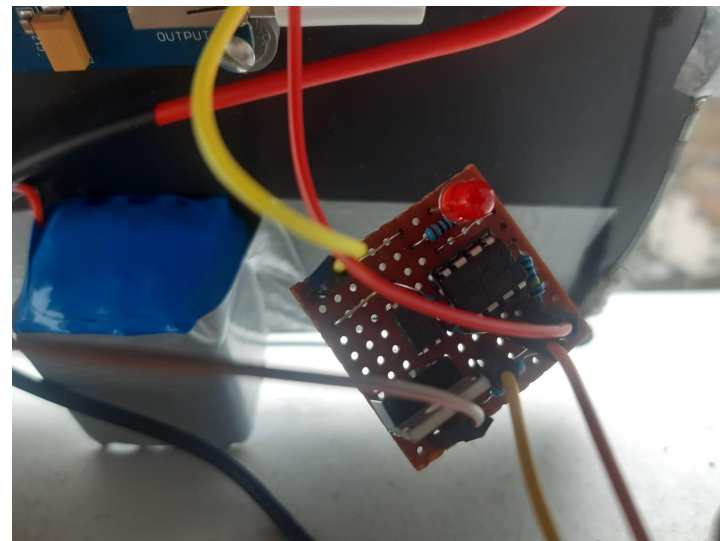
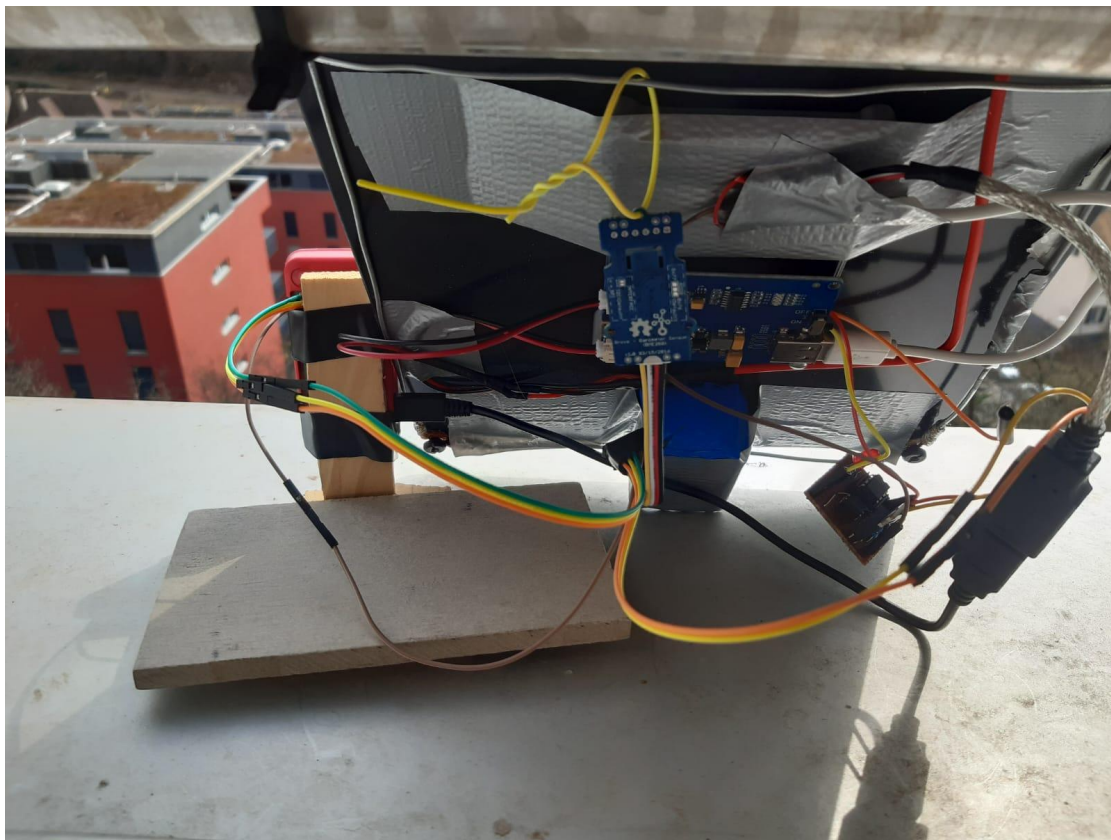
Solution:

- **Use mosfet (~1 USD)**
- **Use ATTiny45 (1.8-5.5V, low power 300 μ A, ~1USD)**
- **Software on ATTiny (Use Arduino IDE)**
- **Software on RPI3 python+shell script**
- **Cadaver and webdav to send images to server**

Going solar try2



Going solar try2



With BME280 I2C sensor

Going for next tries

- Cheaper panels ~20USD
- Small batteries (and cheaper) ~ 10USD
- Self made boxes (~1USD)
- Cheaper USB converter
 - PowerBoost 500 Basic 1.8V to USB (~10USD)

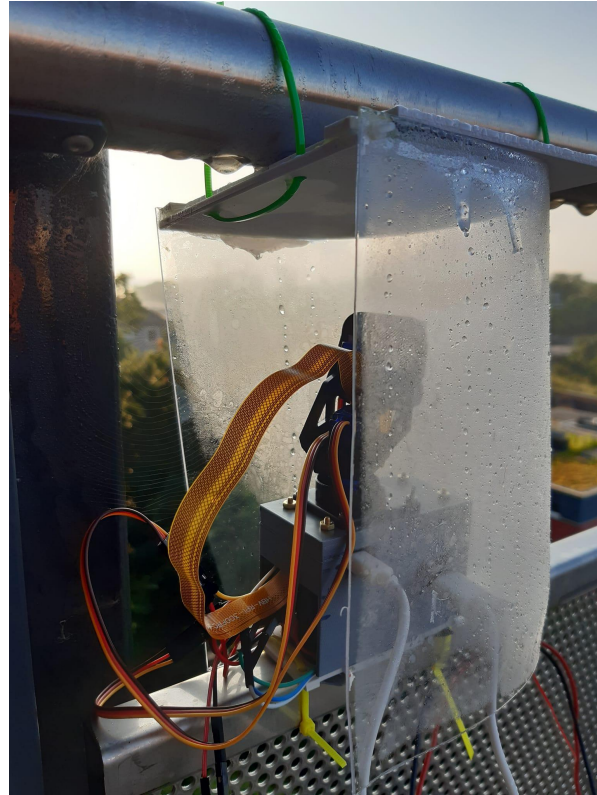
Failures panel



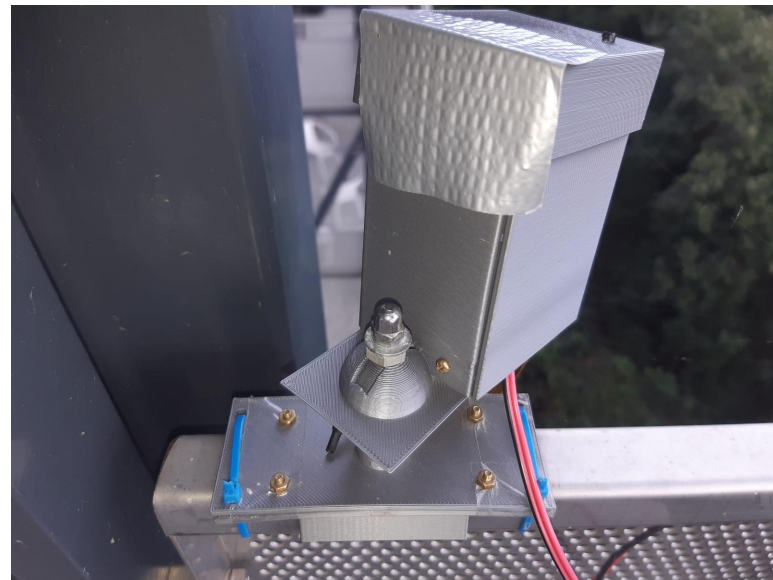
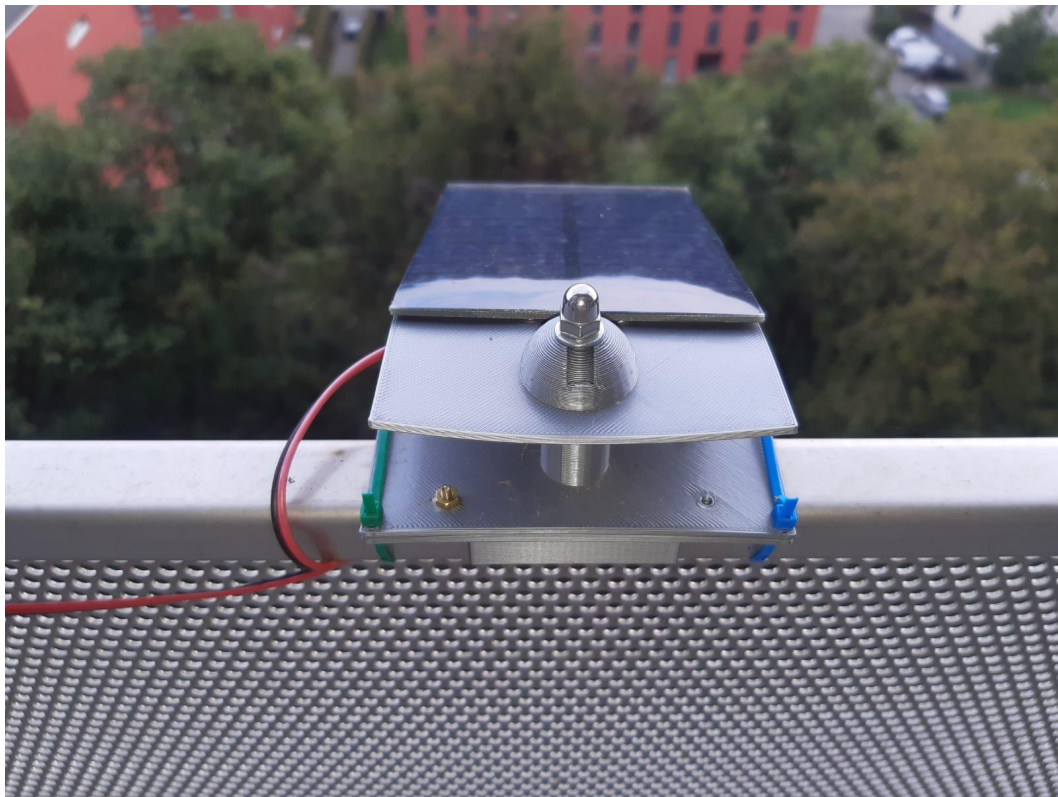
Failures printing box



Failures humidity



Actually running version



Going Objects

Price: about 95 USD

Small enough

Easy install (Shell script for RPI, Arduino + writer for the ATTiny45)

Use Wifi (wpa_supplicant.conf)

Configuration in the server via uniqueid (etc/machineid).

pi4neuchatel	Directory where send information
10	Time to wait before next cycle
440	Low battery voltage value (here 2.62 V)
0fd108a	Github commit id

Try it your self

Everything at:

<https://github.com/jfclere/pisolar>

Ask me:

jfclere@gmail.com

QUESTIONS
THANK YOU!