

Modular control (1)

[Original article in French](#)

The goal

To be able easily, for a person without any technical knowledge, to install a set of automatic misting for indoor plants or terrariums, vivariums. A simple and versatile control for misting.

There are many commercial systems, relatively inexpensive, which allow one timer (per second) to control misting nozzles. Below, a completely arbitrary image choice and above all I have no opinion on these systems. They have qualities and defects as always



I tried to program these timers : the result has always been difficult and long, but I am not very clever ☹

Summary of objectives

- *Fine control (precise time) and user-friendly*
- *Simple, fast, safe installation (low voltage)*
- *And with this the usuals: “cheap”, “good quality”, “robust”, etc.*

The concept

For the command: we go through a PC, a smartphone or a tablet because it is the usual interface for many people . In addition, computing power and ergonomics are almost “natural”. The remote control (internet) is directly included. The precision of the controls (to the second) is without problem. Touch screens must make the control more intuitive, at least I hope.

For the nozzles, this it be less obvious. I have the choice between cone nozzles or wide diffusion nozzles. As I could not decide, I think that each user would choose what suits him best.

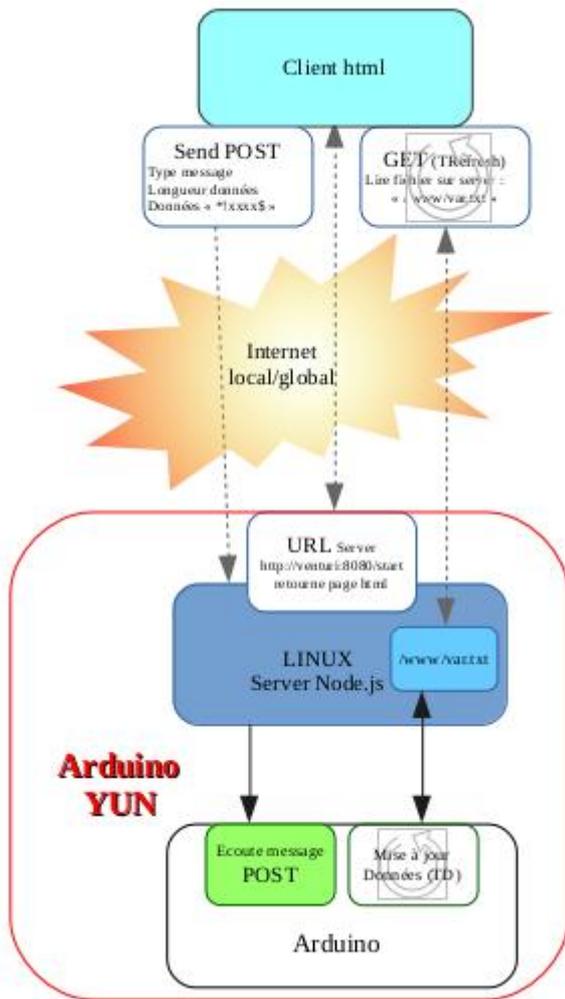
Summary of the concept

- *A control driven by a personal tool (mobile, tablet or PC)*
- *Nozzles of various mixed techniques*

The Modular Command

SOFTWARE ORGANIZATION

I already have a set of files that allows me to have a web server and to dialogue with a mobile, a tablet or a PC. The set based on an Arduino Yun can be represented as follows:



You will find the descriptions of my previous tribulations with the Arduino Yun ([data acquisition](#) , [engine control](#) in french). Once again, the Yun will serve as a basis for this new project.

A lack and improvement

Until now the web server (node.js) worked well but I had a big problem with the wifi access point of Yun. Can not restart correctly after a sudden stop of the Yun (eg power cut). With the procedure proposed by linino.org, this is now of old history, the access point works very well, more need to have external router in addition.

It is necessary to add a scheduler for programming the actions to be performed. Cron exists for all Linux distributions, OpenWrt is no exception, this is what will serve as our basis. The

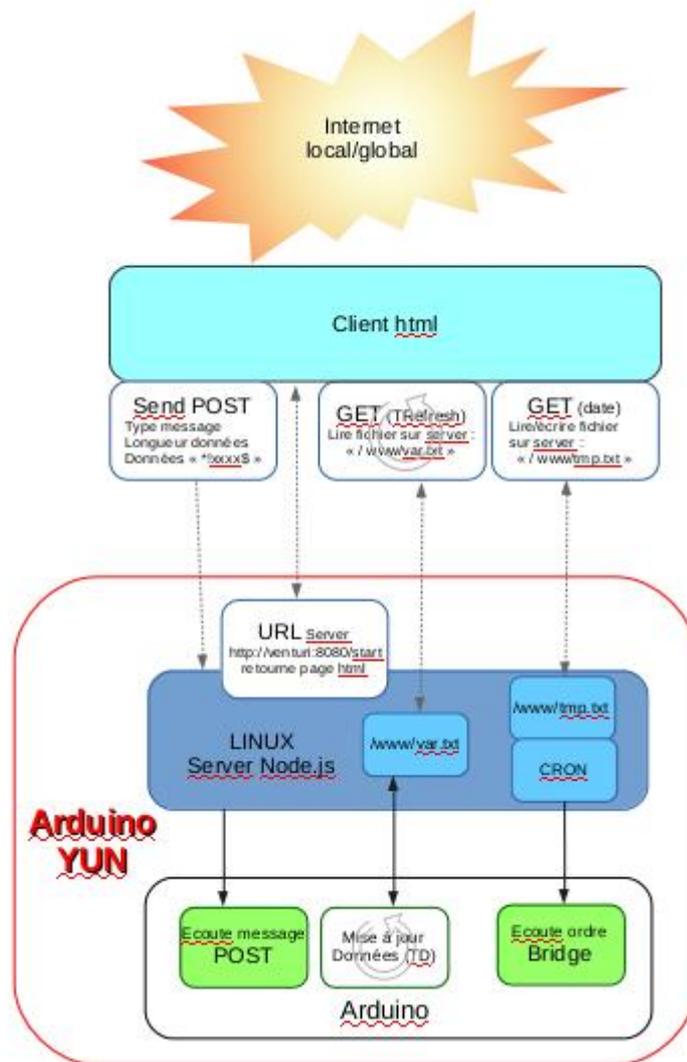
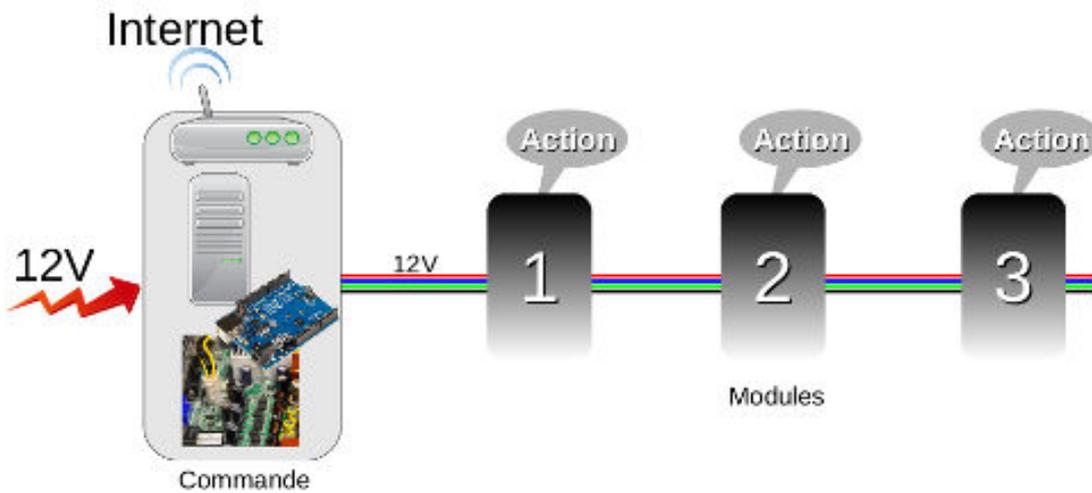


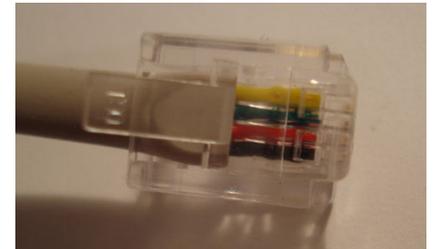
diagram of its use in our case:

PHYSICAL ORGANIZATION

*After a long time searching for a simple and cheap solution, I restarted on a modular system: a control and modules. A priori, the modular control is always a little more expensive, but it has, for me, virtues of flexibility extended. The basic wish was: **simple and versatile for the user**, a quick connection, one easy writing actions and go start !*



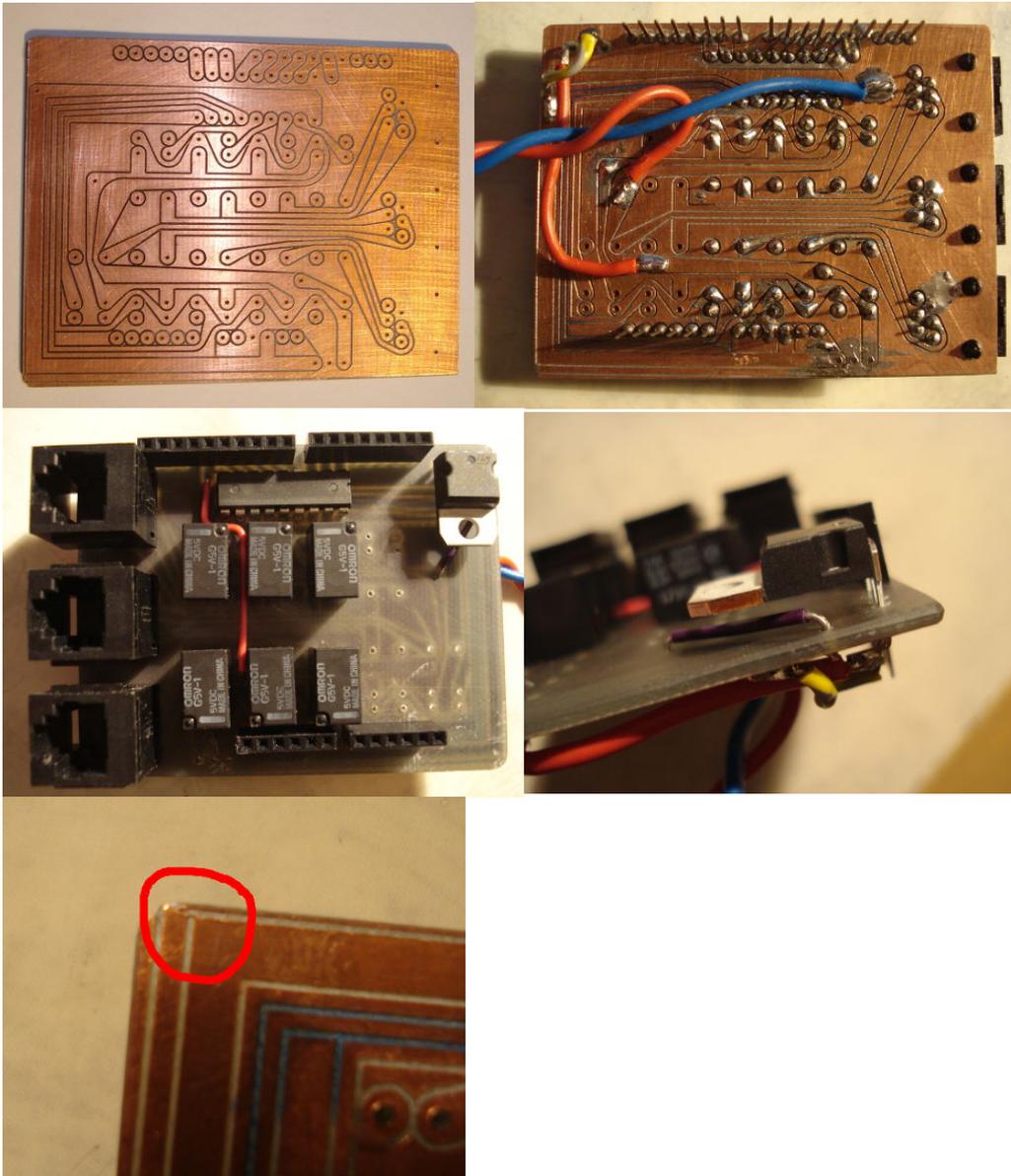
I use the telephone connections for the liaison between modulars box:



- *advantages :*
 - *Simple, robust and cheap. Cables are found in many shops.*
- *Disadvantages:*
 - *Low power transport, in fact this is the only true limitation in our case*
 - *By connector of the control, 3 modules separately piloted. Modules can be grouped on the same output.*

THE ELECTRONIC PART

The control is equipped, as you guessed, with an Arduino YUN. The electronic part is simple: electromagnets relay the outputs of Arduino YUN and allow to control 12V outputs in galvanic separation. For the various probes, it is 5V information that is processed directly by the Arduino YUN.



A few words about this circuit, a defect in the machining of the circuit. The place chosen for the 5V regulator was not good. Two problems detectable before assembly But I want to go fast and

Six relays, while I planned 9 outputs, is not a mistake! It is prudence when ordering material, I was not yet sure of the concept.

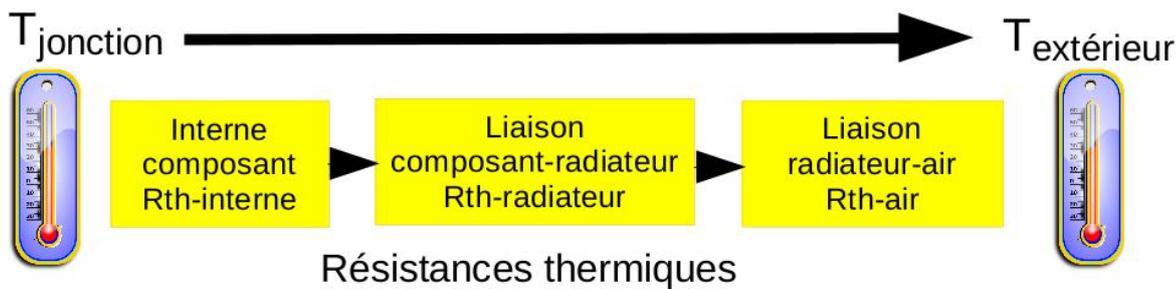
A big problem

Yes, for sure, I should have predicted it before, if I had looked more closely at the specifications of the components !! The Arduino Yun consumes 250 mA all the same, it is much more than an Arduino UNO, 125mA. To this must be added the new 5V-30mA relays,

ie a total current of about 550mA!

The regulator must dissipate $(12-5) = 7 \text{ V} * 550 \text{ mA} = 3.8 \text{ W}$, so a large radiator is needed!

As a reminder, the calculation of a dissipator



$$P_{\text{dissipée}} = \frac{T_{\text{jonction}} - T_{\text{extérieur}}}{R_{th_{\text{interne}}} + R_{th_{\text{radiateur}}} + R_{th_{\text{air}}}}$$

The figures in our case, Power dissipation: 3.8 W, outside temperature: 20 ° C (if it is in a box I have to count with 50 ° C, maybe more), temperature regulator 7805: 120 ° C, R_{th} -Internal temperature: 10 ° C / W, R_{th} -radiator: 0.5 ° C / W,

$$3.8 = \frac{120 - 20}{10 + 0.5 + R_{th_{\text{air}}}} \rightarrow R_{th_{\text{air}}} = 16 \text{ ° C / W}$$

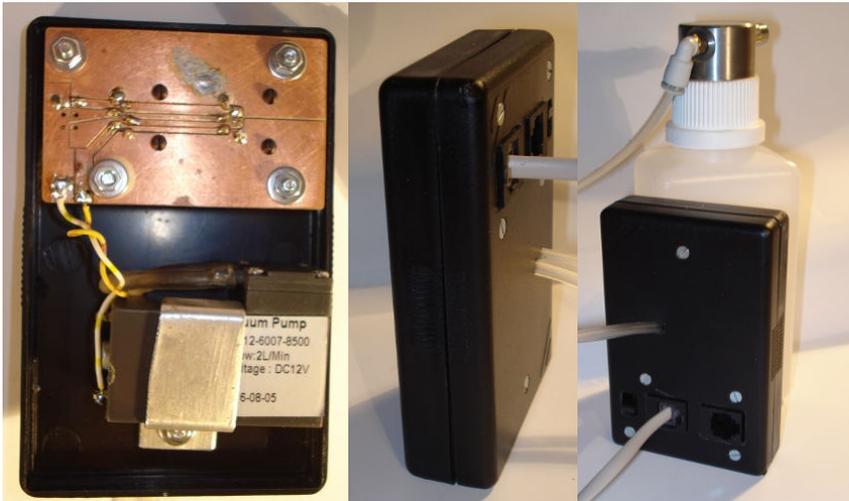
An aluminum plate of 90 × 50 is the maximum possible in the type of assembly (small plastic housing), this corresponds to an R_{th} of about 7 ° C / W, therefore insufficient. It would be necessary to switch to a type of radiator with fins, but it is not in the idea of the project.

So I decide to change and switch to a 12Vdc-5Vdc converter and at the same time I also change the 5V relays to 12V so as not to overload the 5V power supply.

Points still suspended

- *Wiring probes (temperature, humidity air, soil moisture, ...) I do not know yet that it technique to use for connection. We'll see later !!*
- *Distance between the control board and the Arduino Yun, I have not found any suitable material, so I will tinker a bit.*

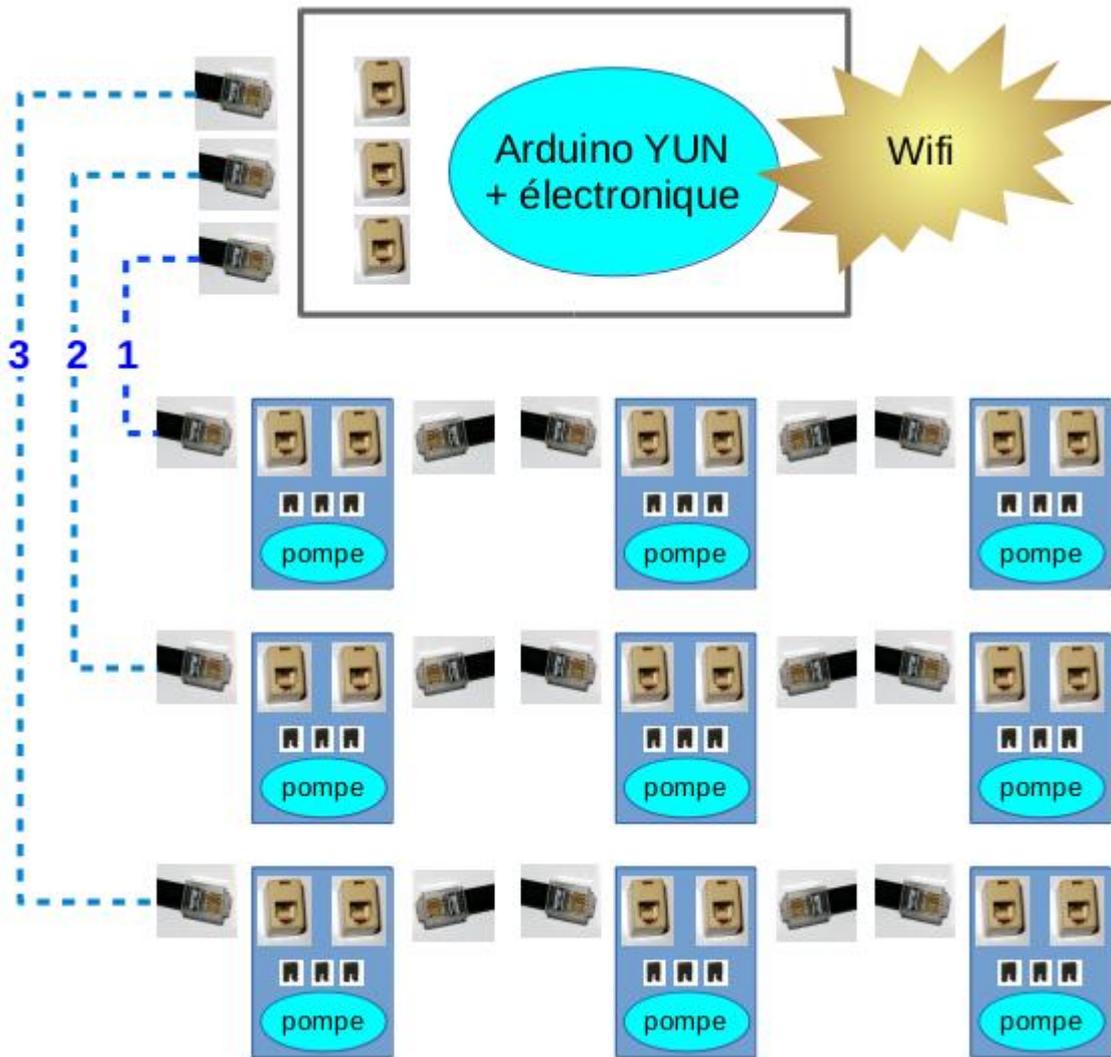
Modules



The modules are currently pumps or solenoid valves, but other functions can easily be imagined. On the I / O of the Arduino one can have digital outputs (ON / OFF) or PWM. To select the control outputs, a jumper defines the module number (the output number) in the parameterization. One can imagine several cases: one module per output, several modules on one output or one module on several outputs. Obviously a mixing is possible. The only limitation being the maximum current flowing through the channel.

SUMMARY

With the telephone connection each wire (channel) can control 3 modules separately, to illustrate the set:



Note: A pump per nozzle may seem an expensive choice, but this principle of module does not prohibit with a solenoid valve module for example to control several nozzles. These lightweight and combinable modules all allow for a variety of layouts.

Provisional conclusion

I have for once exposed a project under development. In order not to lengthen the article, I stop here the description. In the following article "control system (2)", I would present the finished project. You will have the plans and softwares available.

Modifications for the complete project (with information sensors) is in progress. The point that bothers me, what is the longevity for the Arduino Yun, the latest product presentations between ".org" and ".cc" are not made to reassure. Time will tell !!

See you soon !