

# Requirements

Hi!

My name is Pedro, I'm a biology researcher currently studying crickets 🦗, and I'm looking for help building a small environmental control system for my research project.

## Context

For my research project, I need to grow crickets in a controlled environment. I need to control **temperature**, **humidity**, and **environmental gas** concentrations.

I'm planning on having an enclosure with an area of 1m<sup>2</sup>, subdivided into 9 different spaces, where different crickets will grow.

I want to control the environment of all those 9 spaces with the same environmental control system. Only one of the spaces will have the sensors for temperature, humidity and gases. But all 9 will have actuators (fans and electrovalves, to adjust temperature/humidity and move air around).

I wanted to try and build this with a raspberry pi. I can handle some of the programming needed, as I know some programming and also have a bit of experience with a raspberry pi, but I don't know much about electronics and building circuits. Only the really basic stuff.

And that's where I need help!

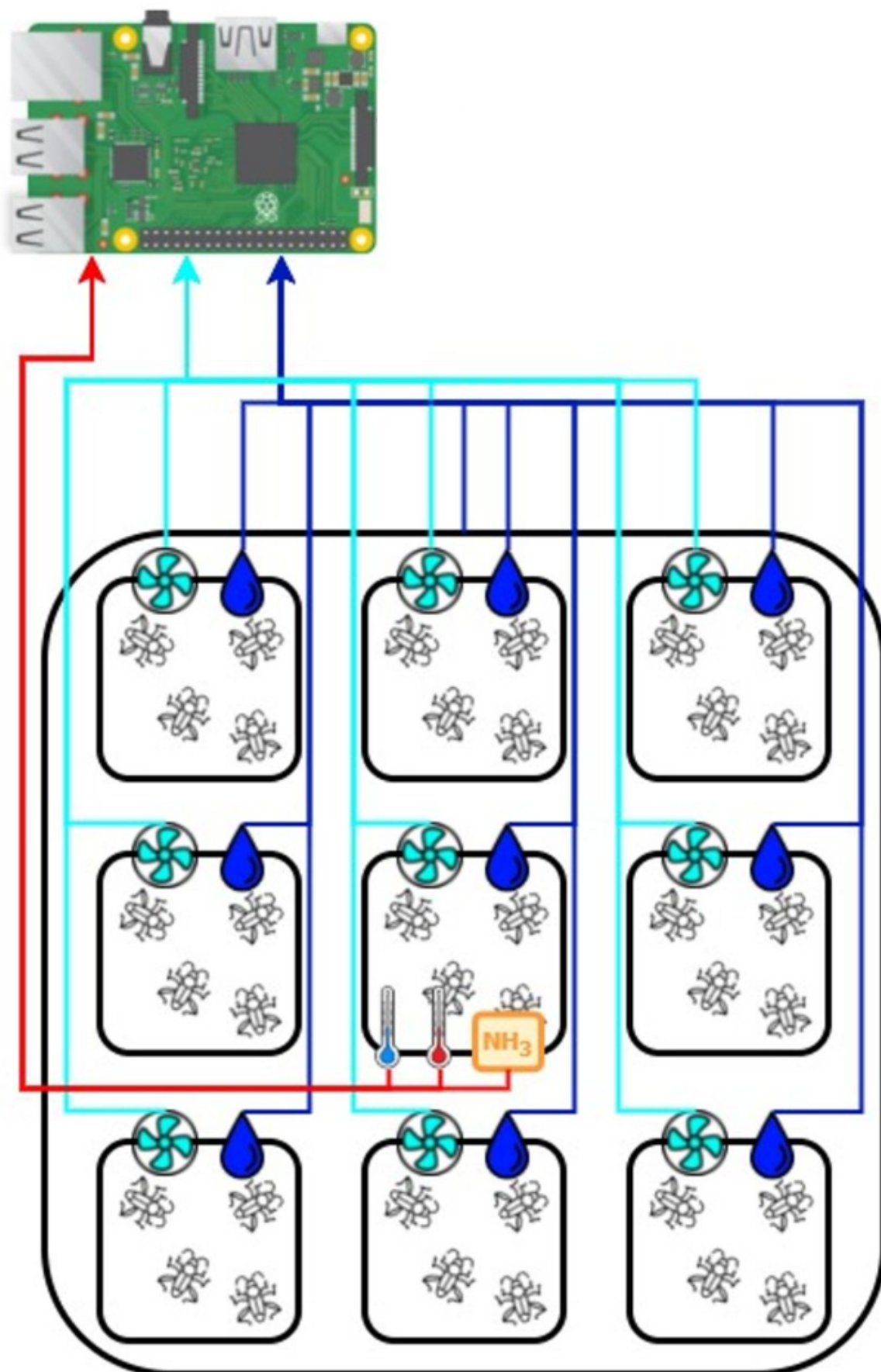
## What I need

I need to build an environmental control system using a **Raspberry PI 4**. I need to connect the following sensors and actuators to the raspberry pi:

- **Ammonia Gas Sensor**
  - **SEN-17053**
  - manual
- **CO2 Sensor**
  - **SCD40-D-R2**
  - manual
- **Temperature/Humidity Sensor**

- **SHT35**
- manual
- **Fans**
  - Standard 12V 3 PIN pc fan (example)
- **Electrovalves**
  - 12V electrovalve (example)

Here is, roughly, the vision I have of my idea:



- There will only be one of each sensor (temperature/humidity, CO2 and ammonia)
- The number of fans and electrovalves will need to vary between 1 and up to 9 (as in, I want to be able to add or remove fans/electrovalves up to a maximum of 9).
- I need the schematics or some sort of manual on how to build this, so that I can build it myself
- I need some basic driver software written in python to:
  - be able to control the speed of all fans (as a group, not individually) and the opening/closing of the electrovalves (also as a group, and not individually)
  - be able to receive data from all sensors and be able to analyse them using python

I have some breadboards, connecting cables, resistors, etc. I'm fine with using those. I just need to be able to build something that works.

This probably can't all be powered by the raspberry pi alone, and requires some sort of external power supply. If you can recommend some power supply, it would be much appreciated.

If you feel this would be easier with some sort of raspberry pi hat, I'm ok with that!

## Closing words

Do you think this can be done under these constraints?

Is it possible for you to come up with some sort of schematics to build this without having to buy the parts yourself?

If yes, what more information do you need from me?

And, of course, how much will your time and labor cost?

Thank you so much for your consideration!

Pedro

