# FINAL PROJECT: SelFARMING

Sofía Bonilla - 2420171008
Miguel González - 2420171067
Juan Ardila - 2420171004

November 21, 2019

## 1 ABSTRACT

In the following report, the different strategies and parameters that were carried out to solve a very common problem in daily personal life such as the face-to-face care of a crop will be announced. Tools seen in the classroom were used as: programming in python, arduino and using equipment such as raspberry, among others. The advantages and disadvantages will be identified taking into account the result obtained and different images that represent the most real design possible to a vertical crop for the home.

## 2 INTRODUCTION

At present, it is very attractive to have a garden, plants or vertical crops in our home that in addition to beautifying a house, can be used for our daily consumption and to improve air quality but unfortunately the reality is that the vast majority of people choose not to build their crop since care is needed and that is the main problem, or many times people who have plants often forget to water them, put them on or take them out of the sun etc. Due to this, SelFARMING is a very optimal technological solution for this problem, since in an innovative way it is responsible for maintaining a vertical home crop automatically and / or manually, that is, we can have communication between the crop and the user but in a way that the person can carry out their activities and take advantage of having plants at home without the crop being affected by their care and maintenance.

In the case of vertical gardens, irrigation and fertilization elements must be carried out by automated systems. They require a substrate and a special support structure for its realization at height.[4]

## 3 THEORETICAL FRAMEWORK

The most important thing was that everything arose from a problem situation, likewise we were able to make an analysis and set ourselves goals that would help us solve the given problem.

We carry out the design taking into account vertical crops for more usual homes, that is, we do it as real as possible to be able to put it into practice.

The work begins with the realization of a good design, with a well-studied and analyzed planting chart. The final product must be visually balanced and harmonious. Surely the greatest impact will be offered by the different types of foliage. [4]

The construction of our project, due to the topics seen in the subject and putting into practice themes of previous subjects, could be developed using both software and hardware tools (python, arduino, raspberry, among others). However, we chose the sensors to use that best suited us to solve the problem that indirectly affects each person, since we are missing out on an opportunity to have a better quality of life for not having the required time needed to take care of A crop

One of the most important points that should be considered to establish a controlled environment of hydroponic agriculture is the use of computers, which can operate hundreds of devices in a greenhouse (ventilation, heating, mixing valves, irrigation valves, curtains, lights , etc.) using input parameters such as external and internal temperature, humidity, wind speed and direction. [3]

One of the most important tools for our website, was the Flask library (It is a minimalist scheme written in Python that allows you to create web applications quickly and with a minimum number of lines of code.) And we are guided by its documentation for to be able to create the page in the best way and with the functionalities we needed.

In this work, the ThingSpeak platform was very important, which is an Internet of Things (IoT) platform that allows you to collect and store sensor data in the cloud and develop IoT applications. Thinkspeak also offers applications that allow you to analyze and visualize your data in MATLAB and act on the data. Sensor data can be sent from Arduino, Raspberry Pi, BeagleBone Black and other HW. [6]

## 4 OBJECTIVES

• Implement a system based on IoT (Internet of things) for remote monitoring of vertical crops.
• Establish a system of communication between the system and the user through emails and web pages.
• Manipulate and control the humidity and light of plants through web platforms.
• Develop on a platform the state of the sensors, therefore, the state of the plant and thus verify that it needs the crop.

## 5 USED COMPONENTS

These are the most important components of our project

•

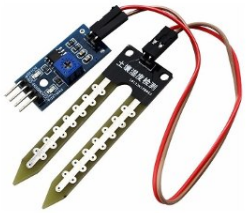

***Figure 1.*** *Soil moisture sensor (YL-69) .*

•


***Figure 2.****Light sensor (BH1750).*

•

***Figure 3.****Water level sensor (4033-1P).*

•

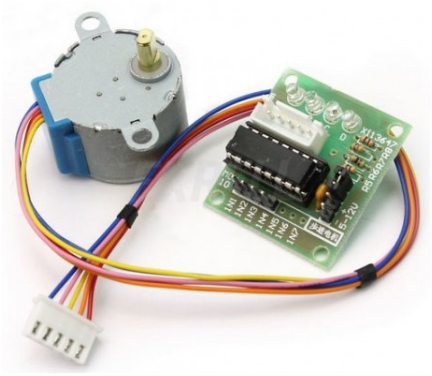

***Figure 4.*** *Stepper motor (28BYJ-48).*

•

***Figure 5.****Motor pump.*

•

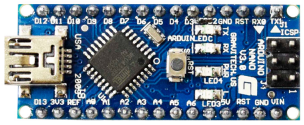

***Figure 6.****Arduino nano.*

• Raspberry pi 3b

# 6 PROBLEM STATEMENT

First, the problem of the project arose from a lived experience. Where it was possible to identify that it is required to devote enough time and attention to the care of a growing plant, garden or crop, an issue that is difficult for most people. This is how SelFARMING originated, an innovative technological system, capable of maintaining the care of a crop without being in person during the process, making real-time notifications of its status, through platforms such as thingspeak and via gmail.

The parameters that were taken into account to reach the expected result were:

- The irrigation system a plant needs.
- The lighting it requires or not to keep it alive
- The advantages of having a sustainable crop in homes.

The above was taken into account to achieve the objectives, first a page was created in Flask where the user had the option to write their email to receive notifications of the status of the crop.
At the same time I had the option to put the system in manual mode or in automatic mode.


***Figure 7.*** *Homepage of the website.*

MANUAL MODE: In this tab, different selections for the system could be made. In the first place we could be guided by the state of the humidity sensor to activate or deactivate the motorcycle pump. However, depending on the state of the light sensor, we also had the option of making the cover unfold or fold.


***Figure 8.*** *Manual mode tab.*

AUTOMATIC MODE: In this tab, we had some default data to start the fully automatic system with the help of the sensors, but there were also options for the user to enter data and thus be averaged, so when they were above or below of the average the irrigation system and the cover will be activated instinctively.


***Figure 9.*** *Auto mode tab.*

And finally it was in each tab, the button so that at any time the user could go to the ThingSpeak in order to interpret the results of the sensors at any time.

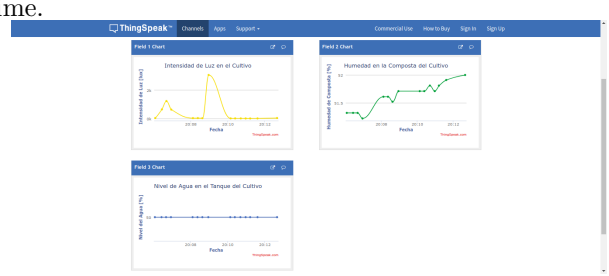


***Figure 10.*** *ThingSpeak page.*

# 7 RESULTS

Finally, it was possible to successfully design a semi-automatic system for a vertical home crop, with a website that makes it easy for the user to choose if they want a manual or automatic system for caring for it and without being in person in the process. Encouraging people to have plants in their home and to realize that they do not need to devote much time to care to have a garden, orchard or crop when they have a system like SelFARMING.

***Figura 11.*** *Final result of the project.*

# 8 CONCLUSIONS

In the development of the project, conclusions and advantages of having an automatic vertical crop at home could be reached.

- A crop of this type is easy to maintain since it is not necessary to have so much contact in person to be able to preserve it
- It lowers the ambient temperature, that is, it makes the space cooler and we can reduce the cost of electricity, since if it is a cooler environment we can stop using fans or air conditioning. “The temperature of the air increased above 28 C, reducing the fruit size by 50 percent. The temperature of

the fruits decreased 2.5 C with the use of meshes reducing cracking in the tomato "[1].

• Servo motors are better handled by arduino because the raspberry keeps data that does not allow the element to function properly, so it is better to use stepper motors in this case for stable operation of the cover mobilization that we use.

• It was very important to get the system to make notifications via gmail and show the status of the sensors by Thingspeak in real time so that communication could be maintained on the condition of the crop without being in person

# 9 REFERENCES


• [1] H. Schlam. (2011). Manejo automático de malla sombra y del riego en un invernadero con tomates. Dialnet, volumen(2), [Online].Available: https://dialnet.unirioja.es/servlet /articulo?codigo=3709169

• [2] F. Cáceres. (2004). Riego automático en ornamentales del exterior. Industria hortícola. [Online]. Available: http://www.horticom.com/revistasonline/horticultura /rh180/014$_0$19.*pdf*

• [3] A. Rojas. (2003). Sistema de Riego para Invernaderos Hidropónicos Basado en la Evapotranspiración del Cultivo. Naturaleza y Desarrollo, volumen(1). [Online]. Available: https://www.ciidiroaxaca.ipn.mx/revista /sites/www.ciidiroaxaca.ipn.mx.revista/files/pdf /vol1num1/riego.PDF

•[4] L. Martínez. (2018). Jardines verticales. Deck. [Online]. Available: https://www.revistadeck.com/paisajes-jardines/jardines-verticales/

• [5] P. Demin. (2004). Aporte para el mejoramiento del manejo de los sistemas de riego. [Online]. Available: https://inta.gob.ar/sites/default/files /inta$_a$*portes*$_p$*ara*$_e$*l*$_m$*ejoramiento*$_d$*el*$_m$*anejo*$_d$*e*$_l$*os*$_{sistemas_de_riego.pdf}$

• [6] (2018) Aprendiendo arduino. [Online]. Available: https://aprendiendoarduino.wordpress.com /2018/11/23/thingspeak/


# 10 ANNEXES

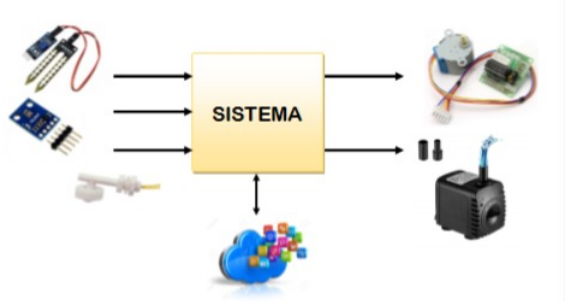


***Figure 12.*** *Block diagram (system outputs and inputs).*

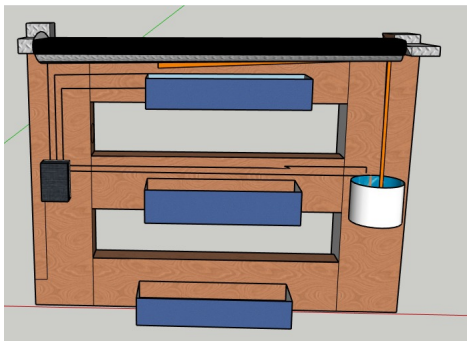

***Figure 13.*** *3D design of the vertical crop.*


***Figure 14.*** *Project Logo.*