ABSTRACT:

study, design and realization of a prototype of an agricultural greenhouse and control it remotely using a wireless communication protocol

INTRODUCTION:

Agriculture is the foundation of human life because it is the main source of food and raw materials. Consequently, the development of the agricultural sector is necessary for the development of the country's economic situation. Unfortunately, many farmers still use traditional methods that lead to low yields. So, to deal with an increasingly competitive market, the systems of production in greenhouses becomes considerably sophisticated Thanks to many mechanization and automation intervention tools.

Our project aims to make Agriculture, in particular the culture of greenhouses, intelligent thanks to new technologies Like the Internet of Things that collect data from different types of sensors. The data collected provides information on various climatic factors that helps monitoring the system.

WHAT IS AN INTELLEGENT GREENHOUSE?

The Greenhouse is a construction used to control plant development (vegetables, flowers, etc.) By giving them more favorable conditions than the local conditions for optimal growth. it is used usually to grow plants above ground or outside their natural climate zone.

Intelligent greenhouses represent another generation developed of greenhouses based on the introduction of advanced technologies such as Big Data, IOT, etc. These greenhouses have a control system which makes it possible to collect and analyze in real time the data of plants and their environment and transmit it via internet to other platforms.

THE MOST INFLUENCING PARAMETERS ON CULTURE GROWTH UNDER A GREENHOUSE:

The climatic factors that influence the most on the climate inside the greenhouse are the temperature, air humidity, solar radiation, CO2 quantity. Actually, each of these factors generates a combination of effects which can be favorable or not to the functioning of the greenhouse according to the local conditions which prevail.

In Morocco, climatic areas are very diverse from the Mediterranean type to the Saharan type, to the north, rainy and cold winters, hot and dry summers. While in the south, temperatures are very high on the days (35 °) and very low at night (0 °) and the aridity of the soils is extreme.

Temperature and humidity intervene in a preponderant way in the growth and development of vegetation since the species for which protected cultivation techniques are implemented are essentially hot season species adapted to average air temperatures Locating between 17 ° C and 28 ° C.

Most vegetables require at least 8 hours of light per day to produce satisfactorily. In very cloudy areas or during short winter days, additional lighting will be necessary.

AROMATIC PLANT CHOSEN:

Aromatic plants are a set of plants used in cooking and herbal medicine for the aromas they give off, and their essential oils that can be extracted. These aromatic plants are grown as needed for their leaves, stems, bulbs, roots, seeds, flowers, bark, etc.

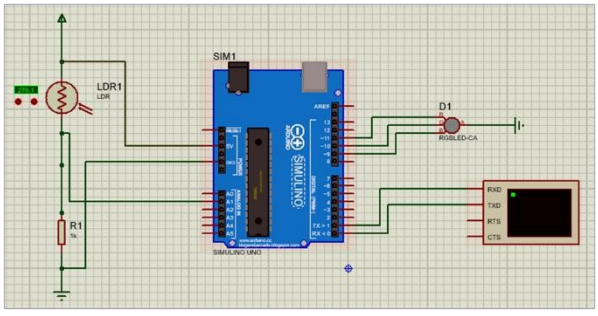
we have chosen as greenhouse culture in our project the Dianthus caryophyllus(CLOVE), the carnation of the florists, also called carnation wallflower, is an aromatic herbaceous perennial plant of the Caryophyllaceae family.

Characteristics:

- easy to grow and has a sweet aroma, which is also used to make perfumes.
- likes warm and sunny situations, The ideal temperature is 20°.
- particularly resistant to drought so it does not need to be watered daily but does not resist excess humidity.

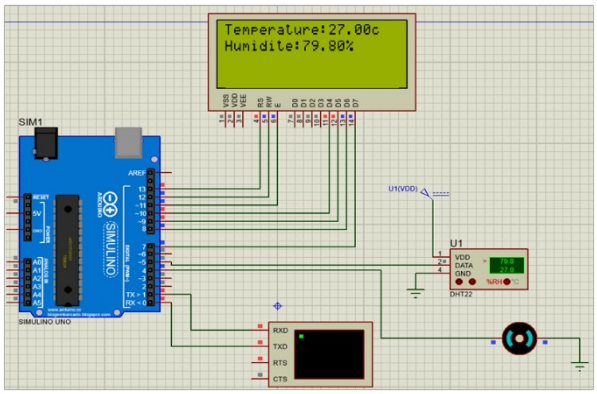
LIGHT CONTROL SOLUTION:

According to our bibliographical research, the duration of lighting needed per day varies according to the type of plants studied, in our case the plant chooses "Clove" requires a location in full sun.
The chosen technical solution is based on a light sensor LDR connected to a data processing element (ARDUINO MEGA), configured using a program to turn on 12v LEDs when the light captured is less than 750 lux.



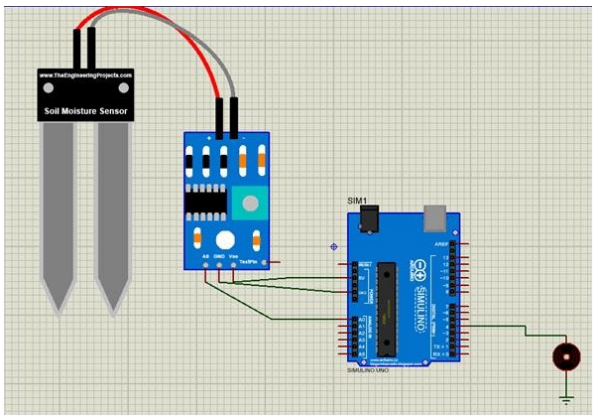
HUMIDITY CONTROL SOLUTION:

The technical solution chosen is based on a DHT 22 humidity and temperature sensor. Our plant appreciates a very humid atmosphere up to 60% humidity, from which if the value captured is lower than this limit, we control either automatically or manually the fog system.



THE WATERING SYSTEM CONTROL SOLUTION

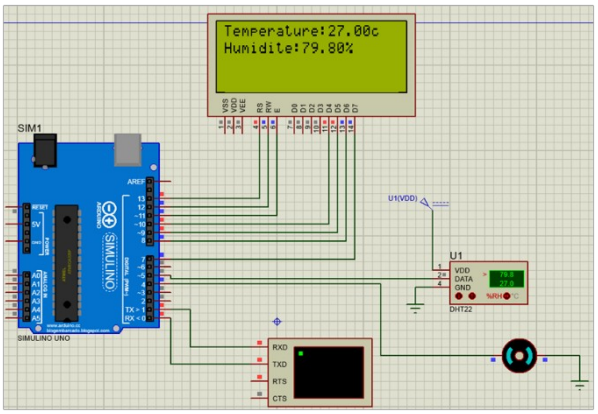
Watering is periodically or manually controlled. It is necessary to detect by a humidity sensorYL-69 the value of moisture in the soil and if it is less than 80% (which is equivalent to 610 as a value captured by the sensor) , a pump returns the water to the garden hoses.



THE TEMPERATURE CONTROL SOLUTION

The main and fundamental thing for a AMP and especially the Clove tree is to be in an area where the environment is a little warmer and the temperature varies between 20° and 24° and it must be clearly complained that the plant is severely affected when tried to grow in cold places or those that are at least below 20°C

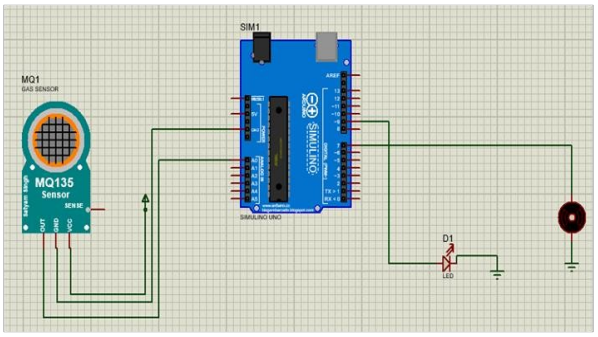
So if the temperature is lower than 20 ° we control the heating mat and if the temperature is higher than 24 ° we operate the fan extractors.



THE CO2 CONTROL SOLUTION

2 solutions are possible:

- Open periodically or if manually control the roof of the greenhouse
- If the amount of CO2 captured by the MQ135 sensor is exceptional (800 ppm CO2) order to open the roof with a motor. (1 ppm = 1 mg/kg)



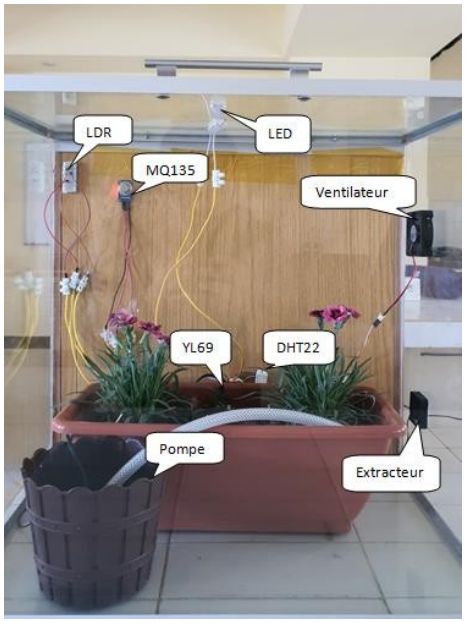
REALIZATION

We have designed the structure of our greenhouse prototype in such a way that it is in 2 parts:

- a wooden part that will play the role of a cabinet to contain all the cables and relay boards in addition to the Arduino board.
- the glass part reserved for the cultivation of plants to use the sun's rays as lighting during the day.

For the overall dimensions of the prototype, we have chosen 500 X 500 X 500 MM. 500 X 350 MM for the glass section and 500 X 150 MM for the wooden section.

THE ACTUAL ASSEMBLY OF ALL COMPONENTS IN THE GREENHOUSE



CONCLUSION

This work allowed us to put to the test our academic knowledges on the one hand and to improve on the other hand our theoretical and practical knowledge in electronics, electrical engineering, mechanics and computer science. In addition, it has been a source of discovery of several fields of study such as: agriculture, biotechnology...
In perspective, we propose the improvement of our project by:

- Use photovoltaic panels to reduce power consumption.
- Control more parameters like: soil temperature, PH ...
- Use data processing algorithms for growth predictions and crop harvesting.
- Disease detection by camera.