



# **GreenyCare**

## *Automated Plant Monitoring and Regulation System*

### **Project Proposal**

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## Introduction

In modern agriculture and indoor gardening, maintaining optimal environmental conditions is crucial for plant health and growth. GreenyCare aims to develop an automated plant monitoring and regulation system which helps the plants to grow within their required environmental conditions. This system will integrate several sensors and actuators to monitor and regulate key environmental parameters such as temperature, humidity, soil moisture, water quality, and plant growth. Consistent and optimal conditions for plant growth, leading to healthier and more productive plants would be achieved through this implemented automated system.

## Background and Context

Indoor gardening and agriculture are gaining popularity due to limited outdoor space and the desire for fresh produce year-round. However, maintaining optimal environmental conditions manually can be challenging and time-consuming. Nowadays, most of the people are used to bring potted plants and plant them. But due to changing environmental conditions and lack of water, they are unable to achieve the expected growth. As a solution to that, people are showing interest in using green houses. Traditional greenhouses rely on human involvement, which can introduce errors. In contrast, smart greenhouses automate tasks, minimizing human error and enhancing efficiency, ultimately resulting in improved crop cultivation and yield [1]. Therefore, the smart green house concept is currently being implemented.

There, temperature, humidity, water distribution and light control are done without human intervention. Relative Humidity (RH) impacts leaf growth, photosynthesis, pollination rate and finally crop yield. Dry environment conditions or high temperature conditions can make the delicate sepals dry quickly and result in the death of flower before maturity. Because of that it is very crucial to control air humidity and temperature [2]. Also providing water is essential. But in this case water quality is very important because variations in water pH have a direct effect on plant growth. Increases and decreases in the acidity of water also affect the pH value of the soil. Therefore, it appears that it is essential to monitor the pH value of water before supplying it [3]. It is a big problem that the currently used smart green house has provided solutions for temperature, humidity and water supply, but not much attention has been given to the quality of water [4]. Through our prototype, the quality of water is also searched, and if it is not available as required, the notice is made to the owner. Since the growth of the plant with the environmental conditions is also shown, if the owner wants to make a change, he can do it based on the data.

## Objectives

- GreenyCare aims to enhance the growth of plants which require specific conditions, when they are being planted on environments where that cannot be provided naturally.
- The use of sensors and actuators for temperature, humidity, soil moisture, water quality (pH), and plant growth measurement and maintenance will improve rate of the growth of plants.
- Real-time monitoring and controlling will be done with LabVIEW and the owner would be updated of any problem regarding the plant's condition or supplience.

## Project Scope

The project will focus on designing a prototype of an automated plant monitoring system which can be implemented in both industrial and residential scale green houses. Here a single plant will be monitored and its conditions will be detected and controlled through sensors and actuators. Temperature, humidity, soil moisture, water quality, and plant growth detection sensors will be used as sensors and a coil, cooling system, and a humidifier as actuators in the project.

Boundaries of the project will be as follows:

- Ranges of the sensors - This will be chosen and adjusted according to the desired values of the plant that will be grown.
- Accuracy of the system functionality - Depends on the readings of the sensors. Mainly focusing on showing the functionality through actuators when the sensor readings are out of desired range.

## Methodology

The flow and the functionality of GreenyCare would be as in the following figures. Condition inspection will be done continuously in real-time with the owner being updated with the growth of the plant and being informed of issues that the system is unable to solve by itself.

Temperature of the system will be checked (as shown in Figure 01) in real-time through a temperature sensor, which will give the signal to turn on the cooling unit along with the fan if the temperature value is high, and the fan and the coil will be turned on if the temperature is low.

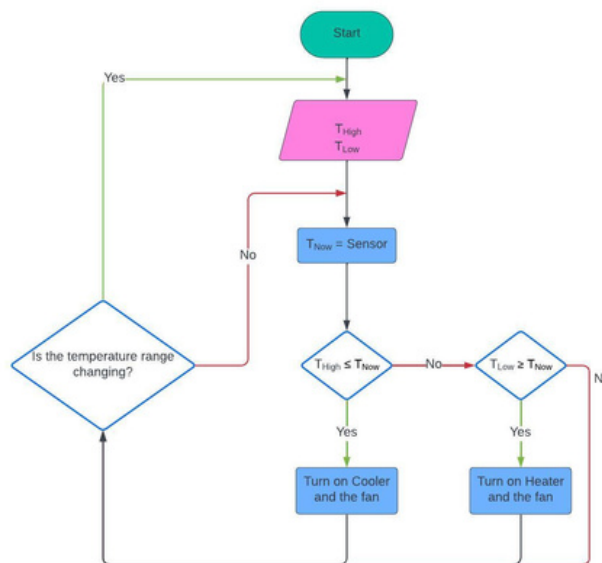


Figure 01

The humidity sensor measures the humidity in the room where the plant is located, and if it is less than the specified value range, it maintains the relevant humidity level by releasing water drops through the water sprinkler. If the humidity level is higher than the relevant range, the reduction is done through the operation of the fan.

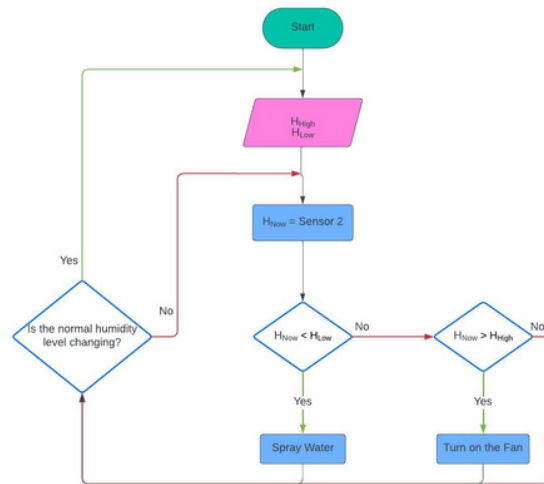


Figure 02

The moisture level of the soil is measured by the moisture sensor. At the same time, the pH sensor checks whether the pH value of the water to be given to the plant is at the correct value. If the moisture level is low and the pH value is around the relevant value, the water needed by the plant is given by the pump. If the moisture level is low, and the pH value is not at the relevant level, a notification will be sent to the owner.

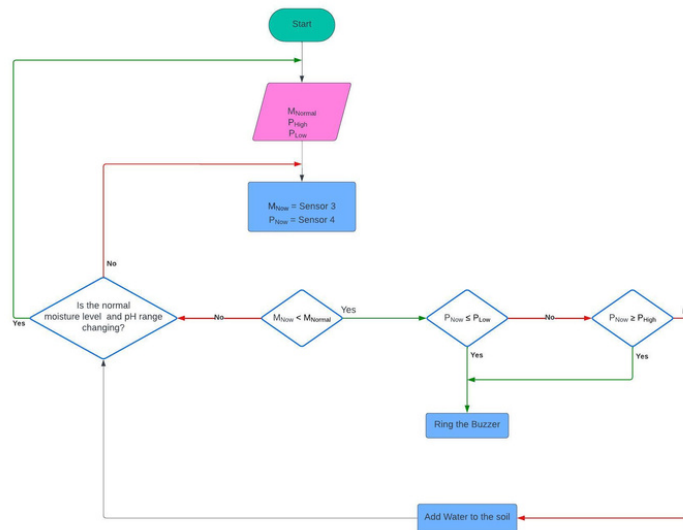


Figure 03

The growth of the plant will also be monitored by measuring the height and the spread of the plant within certain time slots based on the normal growing rate of that species. As an example, maybe the growth is measured weekly for a certain plant. If the plant is growing successfully then the monitoring system will continue its functionality and provide the relevant conditions, and if the growth measurement is not getting improved the owner will be notified about the issue by the system.

## Timeline

	Week	Task
February	1	Project Planning and Research
March	2	
	3	System Design
	4	
	5	Hardware Setup
April	6	
	7	Software Development
	8	
	9	Integration and Testing
May	10	
	11	Optimization
	12	
	13	Documentation

## Conclusion

In conclusion, GreenyCare is an solution to the challenges of indoor gardening and agriculture.This offers a continuously monitoring and regulating of key parameters, resulting in improved plant health and yield. Existing research and projects in this area demonstrate the feasibility and benefits of such systems, highlighting the need for further development and customization to specific plant species and environments.With careful planning, execution, and testing, integrated with all sensors and actuators we believe this project will contribute to the advancement of automated agriculture.

## References

- [1] -Design and Manufacture of a Smart Greenhouse with Supervisory Control of Environmental Parameters Using Fuzzy Inference Controller (Y. Alaviyan, MH. Sadafi, MH. Aghaseyedabdollah, A. Yazdizade)
- [2]- IoT based Smart Greenhouse(Ravi Kishore Kodali, Vishal Jain and Sumit Karagwal)
- [3]- pH Affects Seed Germination of Eight Bedding Plant Species(Candice A. ShoemakerI and William H. Carlson2)
- [4] - Design and Implementation a Smart Greenhouse(Khaldun Ibraheem Arif, Hind Fadhil Abbas)