College of Engineering and Technology – Smart Village

Mechanical Engineering Department

Experimental Methods and Instrumentation EME2401 / ME241

Automated Green house system

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Submitted to:

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Introduction

- The purpose of an automated greenhouse is to create an optimal environment for plant growth through the use of technology, thereby maximizing efficiency, productivity, and sustainability in agriculture. By automating the monitoring and control of key environmental factors such as temperature, humidity, light, and soil moisture, the system reduces the need for manual labour, optimizes resource usage, and maintains consistent growing conditions. This results in higher quality and yields of crops, enables year-round cultivation, and allows for remote management and data-driven decision-making to continually improve the growing process.

- Scope and objectives.

Scope of an Automated Greenhouse:

1. Environmental Monitoring: Continuous tracking of temperature, humidity, light levels, soil moisture, and CO2 concentration.
2. Automated Control Systems: Adjust environmental conditions using fans, heaters, irrigation, ventilation, and lighting based on sensor data.
3. Data Collection and Analysis: Gather and store data for analysis to optimize conditions and improve crop yields.
4. Resource Management: Optimize water, energy, and nutrient usage to reduce waste and costs.
5. User Interface: Develop user-friendly interfaces for easy control and monitoring like LabVIEW.
6. Alert Systems: Implement mechanisms to notify users of deviations from optimal conditions.

Objectives of an Automated Greenhouse:

1. Optimize Plant Growth Conditions: Maintain ideal environment for plant growth maintaining good moisture for the soil and the suitable percentage for plant.

2. Enhance Efficiency: Reduce manual labour and optimize resource use as a result this will reduce the production cost for the plant.

3. Increase Productivity and Yield: Maximize plant health and yield this will conclude in increasing the profit also costumer reviews will be higher.

4. Facilitate Remote Management: Allow remote monitoring and control for flexibility.

5. Enable Data-Driven Decision Making: Analyse data for informed decisions this will result in activating the pump ac and motors to provide the best condition for plant growth.

6. Ensure Consistency and Reliability: Maintain stable conditions and reliable operation.

7. Support Scalability: Accommodate different greenhouse sizes and plant types.

System Requirements

- Hardware and software specifications.

Hardware:

Components used:

Sensors

. LDR

. Temperature

. humidity

. smoke

. moisture

. ultrasonic

Others

. Relays

. Bread Boards

. Jumpers

. LED

. Arduino

. Power source

Outputs

. UV lights from the LDR

. pump from the flame, moisture and humidity

. Motor (fan) From the temperature

Connected to a pump using a relay.

Software:

- LabView version and modules used.

LabVIEW Version 2014

Connect your Arduino to your computer using a USB cable.

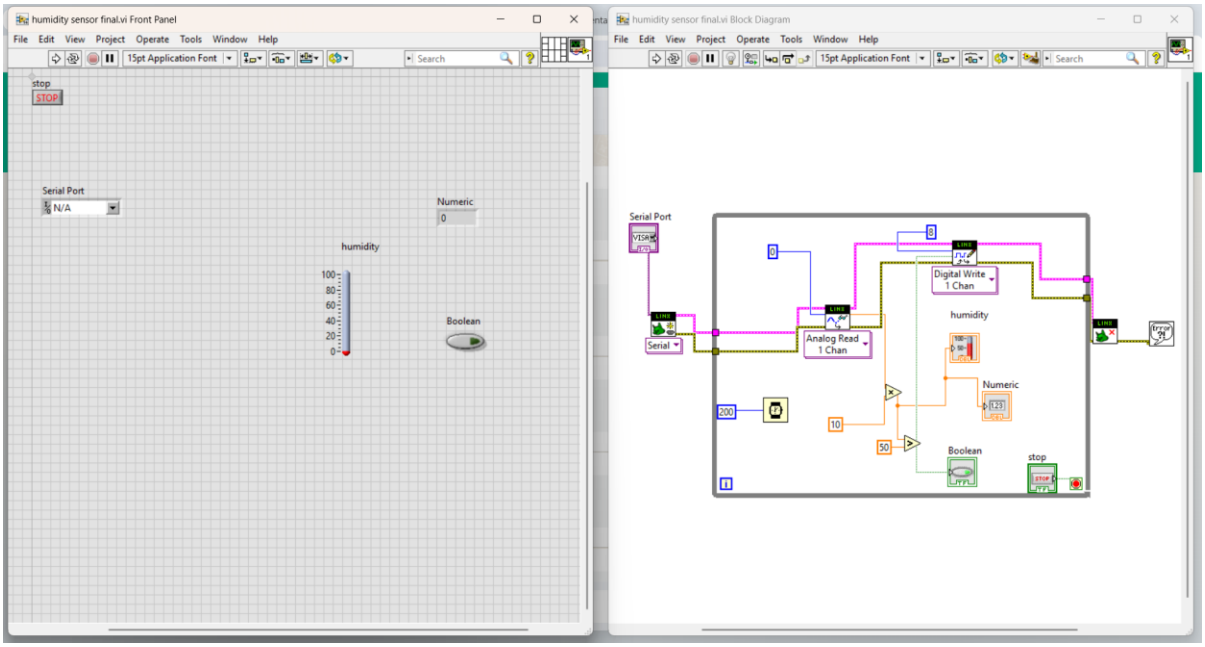
Used linx to connect from the software to the hard ware

Design

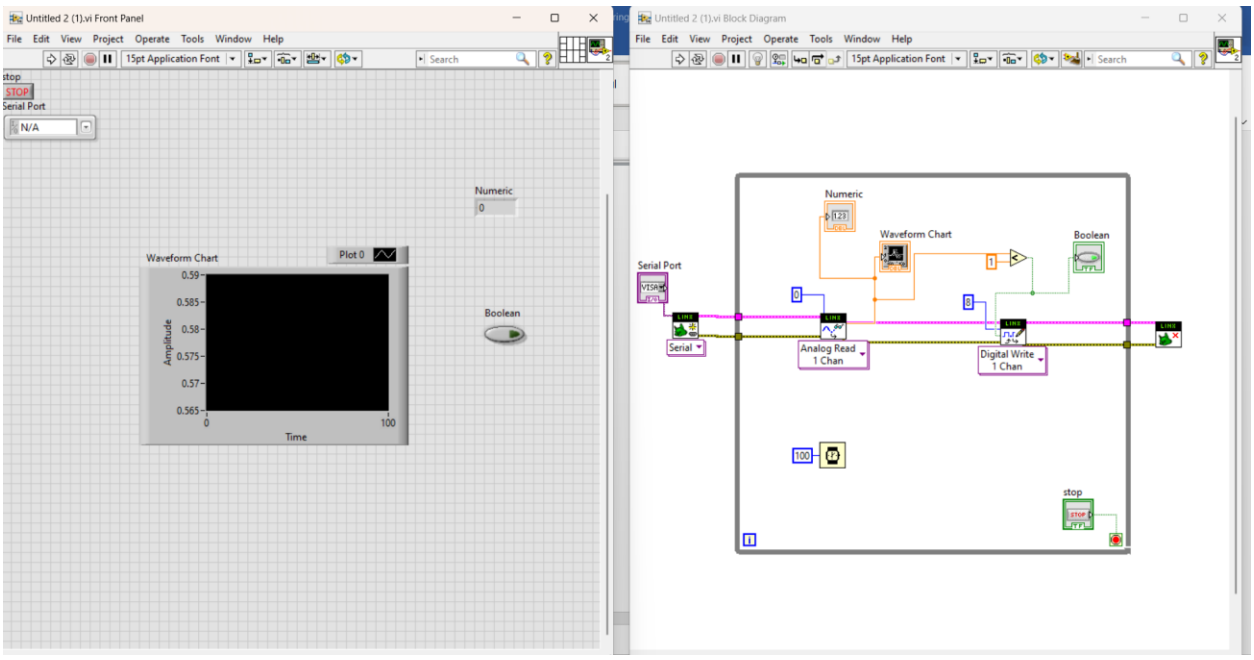
the maquette:

it is a mini greenhouse made with laser cutting. Moreover, it includes greens and plants inside of it.

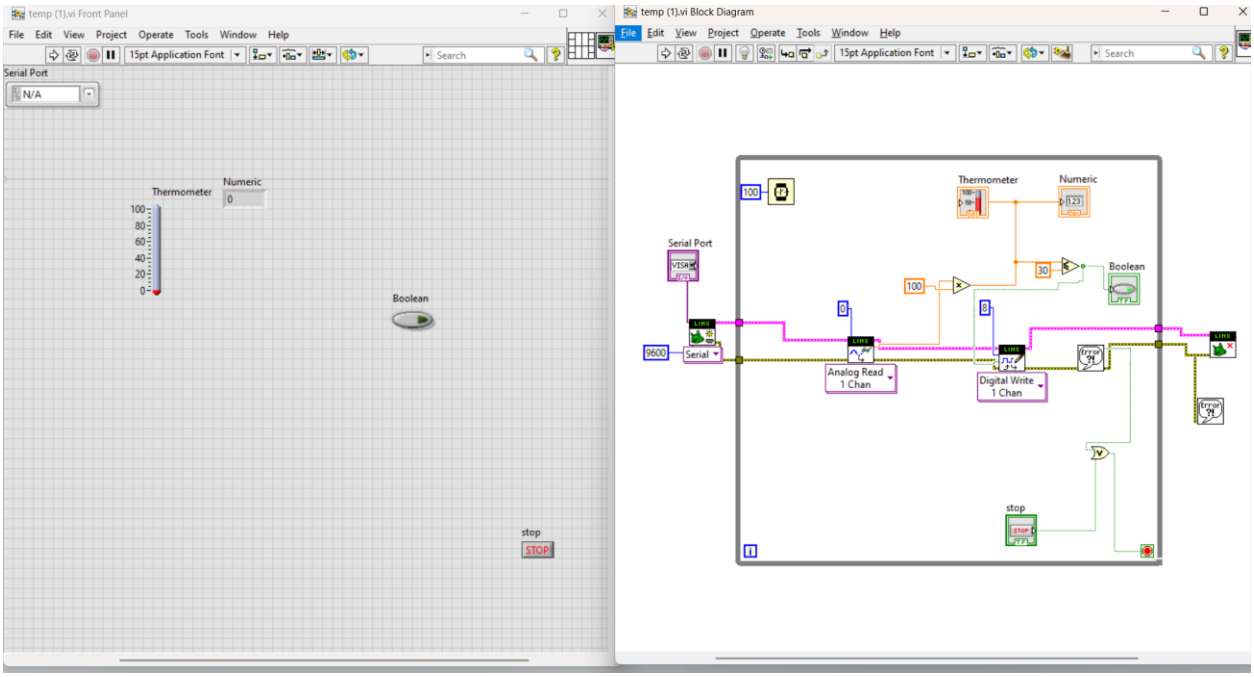
Humidity sensor:



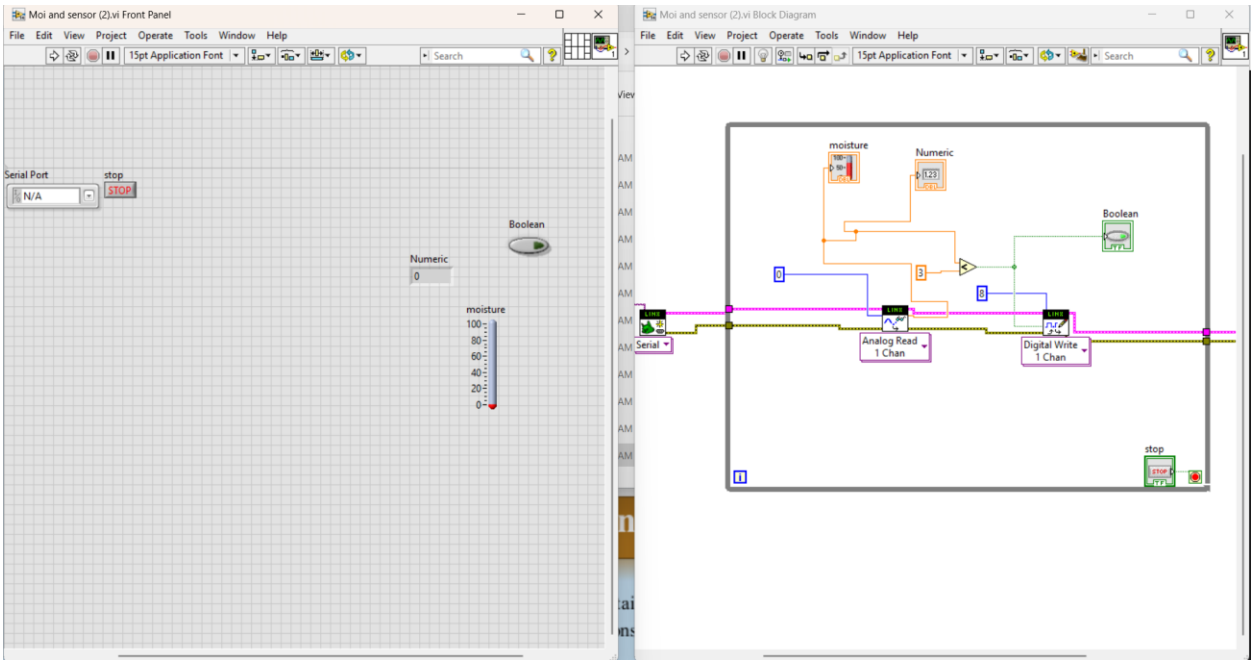
Smoke sensor:



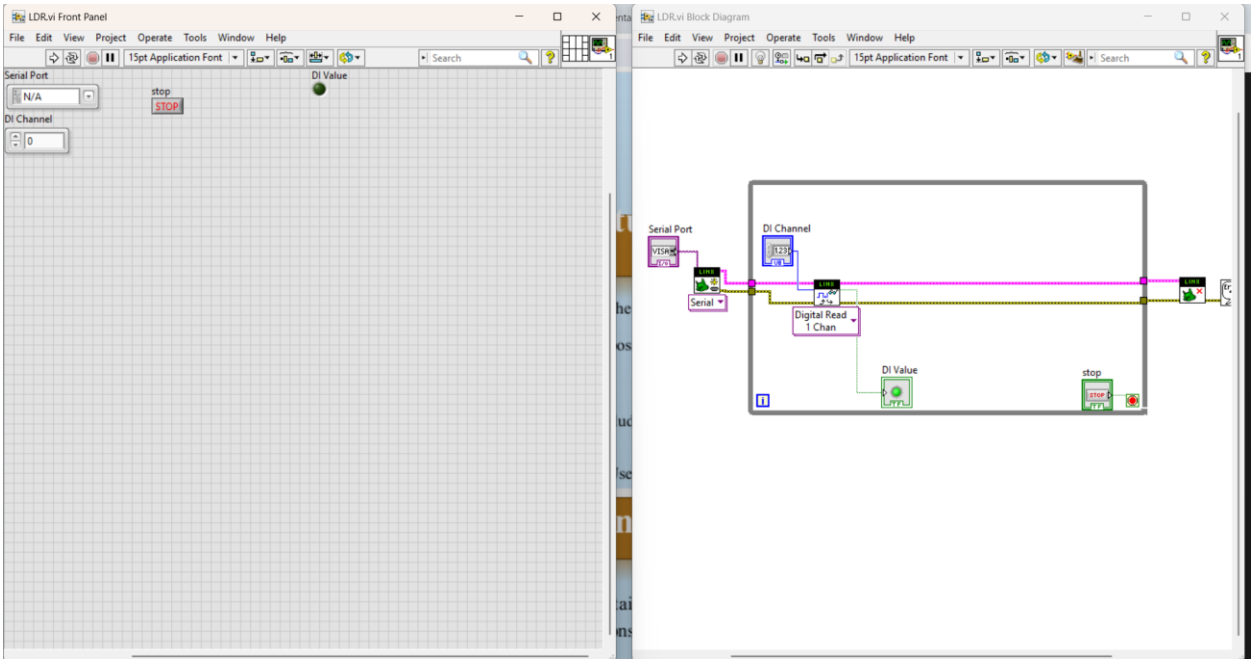
Temperature sensor:



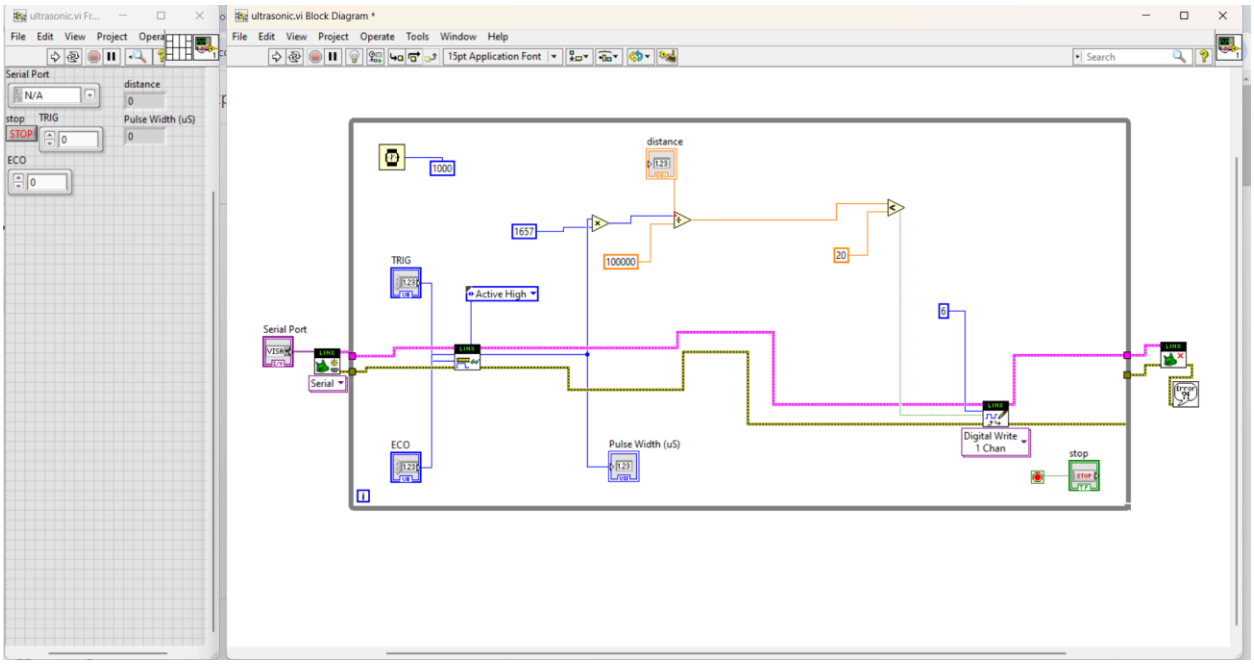
Moisture sensor:

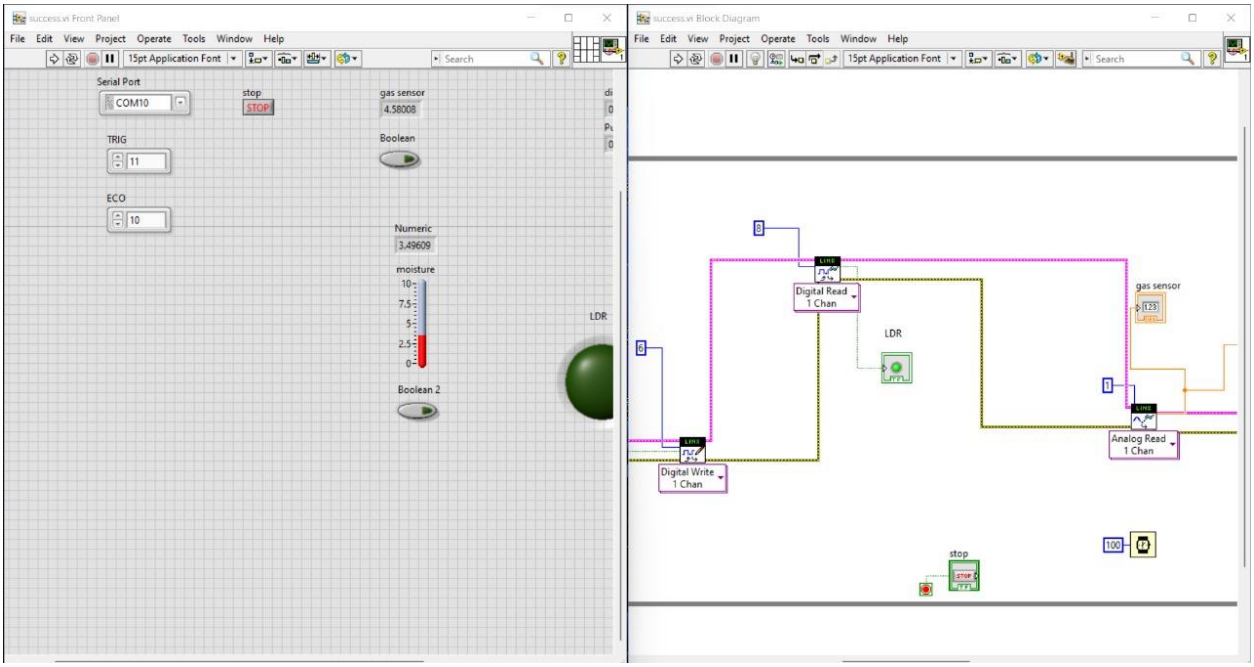


LDR sensor:



Ultrasonic sensor:





Implementation

In temperature sensor:

Temperature sensor has three legs one vcc is connected in the Arduino (5 v) pin. Ground is connected to the ground and the last pin which is output is connected to the analog pin (A0). It is connected to a fan using a relay and motor.

Moisture sensor:

- Moisture sensor has three legs one vcc is connected in the Arduino (5 v) pin. Ground is connected to the ground and the last pin which is output is connected to the analog pin (A0). Connected to a pump using a relay.

Smoke sensor:

smoke sensor (mq5) has 4 pins one vcc is connected in the Arduino (5 v) pin. Ground is connected to the ground and the last pin which is output is connected to the analog pin (A1). Did not use the digital pin which is the third one. Used a relay to connect with a motor. Motor will act when there is a smoke and will act a fire system produces water to save the condition.

Ultraviolet light sensor:

LDR (light dependent resistor) has 3 pins one vcc is connected in the Arduino (5 v) pin. Ground is connected to the ground and the last pin which is signal is connected to the digital pin (8).

Ultrasonic sensor:

Ultrasonic sensor has 4 pins. Vcc pin is connected in the Arduino (5v) ground is connected to the ground trig is connected to the digital pin (10). Echo pin is connected to the digital pin (11). The positive pole of the buzzer is connected to the digital pin (6) negative pole is connected to the ground.

Humidity sensor:

The sensor has 3 pins vcc is connected to the (5v) pin on the Arduino and the ground to the ground. Data connected to the pin (A1) and the led is connected to the breadboard. Relay is connected to the digital pin and to the pump.

- Challenges and solutions.

In temperature sensor the sensor was not working tried more temperature sensors still was not working on the other hand the code was right and the hardware connection it seems at the end that they were broken.

the moisture sensor was not showing any reading in the tank of the LabVIEW.

Testing and Validation

Testing the project was simply testing the five sensors used.

UV light sensor

The simplest and quickest sensor done of the five, whether hardware or software, when we let the sensor be exposed to sunlight, it detects it successfully, turning off the UV lamps with no issues or problems faced working on this sensor.

Smoke sensor

Detect any smoke gases that might arise from a fire in the greenhouse for any reason, allowing the fire extinguisher to do its job. On the one hand, the smoke sensor wasn't entirely successful in its initial attempts, but once the Arduino pins were changed, it served its intended purpose.

Moisture sensor

The first software code presented a problem because it only activated the water pump when the soil's moisture percentage was higher than predetermined levels. We resolved the problem so that the pump would operate when the percentage was lower than the predetermined threshold after repeatedly examining the code.

Ultrasonic sensor

There were no issues with the hardware or software as a buzzing sound is made whenever it detects any movement activity in the green house that could endanger the crops in any way possible.

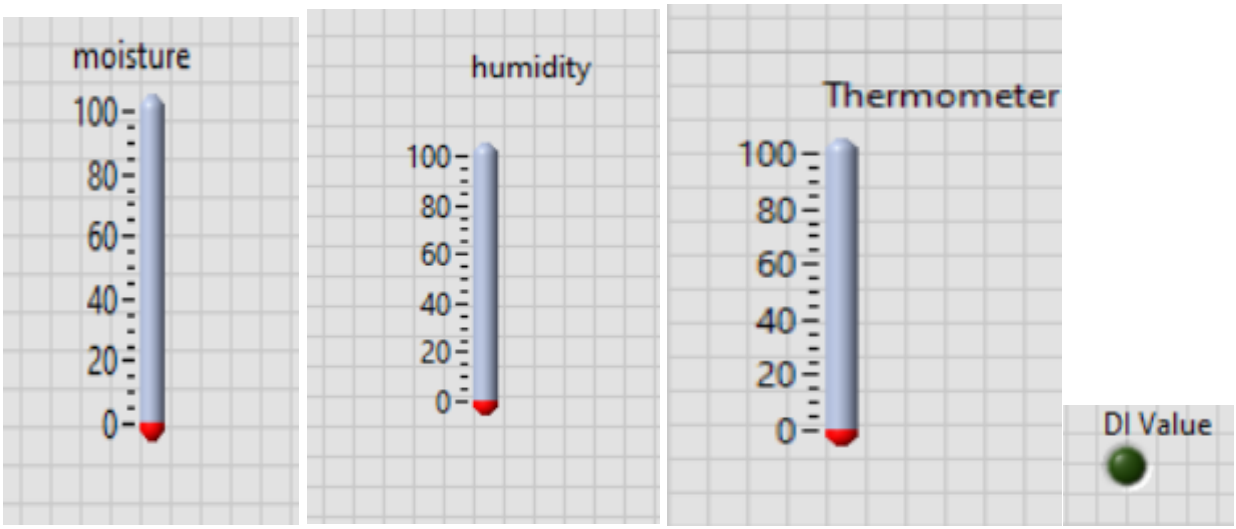
Temperature sensor

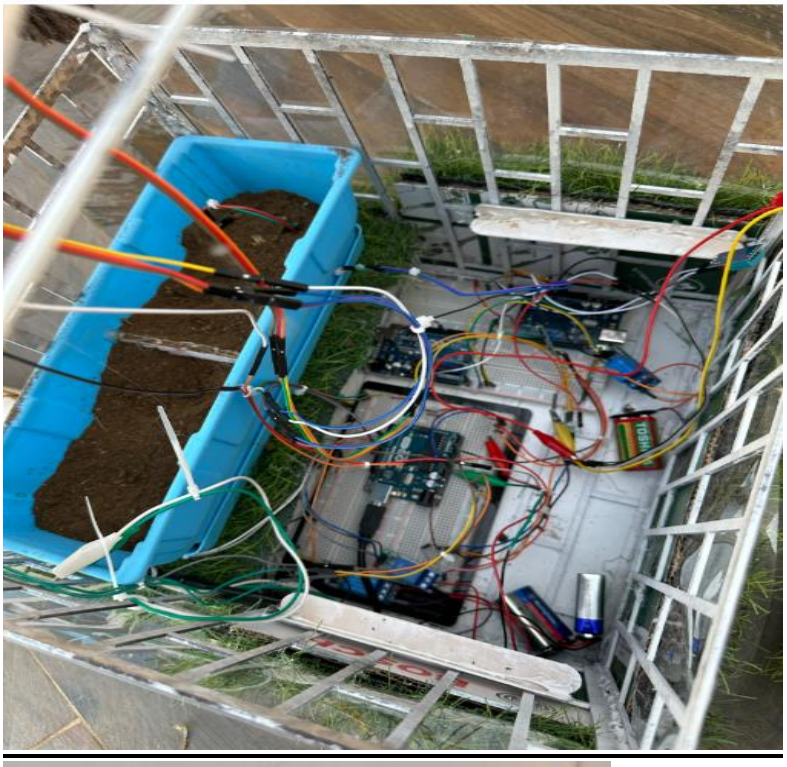
When a quantity of heat is applied to the sensor, which is able to raise the temperature to what's over 30 °C, the air conditioning fans start working efficiently. On the one hand, the LabVIEW software code was done correctly after some errors were detected when running the code. On the other hand, the hardware circuit was tested a couple of times because the temperature always fluctuated. To solve this problem, we connected the sensor with jumpers to the Arduino instead of connecting it directly to the breadboard.

Humidity sensor

The hardware circuit and software code may be implemented correctly, yet the sensor only fluctuates in a tiny, imperceptible range. There is no good reason why the sensor's intended purpose has not been fulfilled in the end.

Results and Discussion





Purpose of an automated green house:

Automated greenhouse is like smart homes for plants, it helps provide ideal conditions for the plant to grow using the most efficient way and stay healthy all year to produce as much crops as possible, in addition it protects plant from pests and bad weather, therefore making farming easier and better for the planet.

Purpose of each sensor:

1- LDR (light dependent resistor):

We use LDR to detect light rays coming from the sun, to ensure that the crops receive the needed amount of light, if the crops do not receive the needed amount of light UV light bulbs will turn on to help crops receive the needed amount of light to help with the photosynthesis process.

2- Temperature sensor:

We use temperature sensor to ensure that plants have the ideal surrounding temperature, if the temperature is too high the AC will turn on to regulate the temperature.

3- Humidity

We use humidity sensor to measure the humidity the percentage of water vapor, if the humidity percentage is too low water sprinklers will turn on to increase the humidity percentage which regulates the plant's water loss levels.

4- Moisture sensor:

We use the moisture sensor to measure how wet the soil is, if the soil is dry the water pump will turn on Sand water the plant so that it will help the plant grow and have healthy roots.

5- Smoke sensor:

We use smoke sensor to detect if there is any fire or smoke inside the greenhouse, when smoke is detected fire extinguisher are turned on to extinguish and control fire in emergencies.

6- ultrasonic sensor:

We use ultrasonic sensor to detect any birds fly near by the crops, when the birds come near the buzzer will activate and produce a load voice which will scare the birds and them fly away.

Conclusion

- Summary of findings.

Implementing an automated greenhouse system using LabVIEW provides a highly effective solution for optimizing plant growth conditions through precise monitoring and control. With LabVIEW's intuitive graphical programming interface and robust integration capabilities, such as the LINX toolkit for interfacing with Arduino, users can seamlessly manage and automate environmental factors like temperature, humidity, and light. This results in enhanced operational efficiency, improved crop yields, and better resource management, making LabVIEW an ideal platform for modernizing agricultural practices in a sustainable and scalable manner.

- Impact and future work.

This will improve the overall production of plants worldwide also the cost of the plants will reduce sufficiency so more people will have the opportunity to have a healthier crop.

References

- https://youtu.be/PoUUP-MurRs?si=JsgOTDuWxwwT0lrJ

https://youtu.be/EFvbS6XzTVo?si=yzGQ8qNguO7p5CTP

https://youtu.be/r9BGaPY1Vqc?si=ZnUf45izdpZ31k40

Appendices

- Additional diagrams, code snippets, or data.